Hempstead Harbor Protection Committee

WATER-MONITORING PROGRAM
HEMPSTEAD HARBOR
Long Island, New York

2008 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 Long Island Sound Study grant administered by the National 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 and enabled the HHPC to obtain future federal funds for the program.

The completion of the QAPP proved timely. During 2007, a copy of the QAPP, water-quality data, and other information from the water-monitoring program was requested for two separate shellfish-related projects. The information was used to help fill out the New York Department of Environmental Conservation's (DEC's) data on the level of pathogens in Hempstead Harbor and whether the harbor could be opened to shellfish harvesting in the near term.

Program Initiation

By 1990, there had been a history of chronic sewage spills from the failing treatment plants that were sited along Hempstead Harbor. These spills along with cutbacks in Nassau County Department of Health's water-quality monitoring program were the factors that motivated for CSHH to create a citizens water-monitoring program for Hempstead Harbor. The program was intended as a springboard for public education and outreach to foster an increased awareness of environmental issues and encourage public participation in local conservation efforts.

In the early 1990s, as CSHH developed the water-quality monitoring program for Hempstead Harbor, concerns about the health of Long Island Sound gained increased attention. CSHH recognized that the priorities established under the Long Island Sound Study's Comprehensive Conservation and Management Plan (CCMP) – i.e., low dissolved oxygen (hypoxia), toxic substance contamination, pathogen contamination, habitat degradation, and floatable debris – were the same priorities that also had to be addressed, perhaps to a different extent, for Hempstead Harbor. At the start, the Hempstead Harbor water-quality-monitoring program therefore included dissolved oxygen as critical monitoring parameter (among others). However, CSHH's primary purpose in establishing the program was to encourage all who live, work, and enjoy recreational activities around Hempstead Harbor to renew their interest in the harbor as well as Long Island Sound and to participate in restoration efforts. An important component of the program since its start 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 share jurisdiction over Hempstead Harbor recognized they also shared the harbor's water-quality problems but did not, individually, 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 a grant to prepare the *Harbor Management Plan for Hempstead Harbor* (2004), which was adopted by all nine HHPC municipalities.

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

CSHH's mission, to identify and eliminate environmental threats to Hempstead Harbor and surrounding communities, is longstanding. 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 for the Town of North Hempstead, offering a solution to problems of 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.

Some of the Girl Scout volunteers at Tappen Beach for the International Coastal Cleanup (9/20/08) (photo by Carol DiPaolo)

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 U.S. 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 advisory committees that have 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, the Glen Cove Master Plan Task Force (formed in 2006; the completed Master Plan was released for review in March 2009).

In 2007, CSHH continued working with HHPC, Glen Cove, Nassau County Departments of Health and Public Works, NY Sea Grant, as well as DEC to resolve problems with discharges into Glen Cove Creek from old pipes along the creek's bulkheads. Also, 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, and again in 2008, CSHH coordinated local activities as part of the International Coastal Cleanup. Also in 2008, CSHH was instrumental in convincing the Town of Oyster Bay to abandon plans to install a large artificial-turf field at Tappen Beach Park; the plan would have diminished green space at the park, and artificial turf is under investigation for potential health and environmental hazards.

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 in the mid-1990s by the then-NYS assemblyman, now NYS comptroller, Tom DiNapoli, and former Sea Cliff mayor Ted Blackburn. In 1995 funds were sought and received from the NYS 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 prepared the **Scudder's Pond Subwatershed Plan** (2006) and has secured nearly $2.5 million toward the implementation of its recommendations. This subwatershed (located in Sea Cliff) has been identified as one of the most significant contributors of bacteria-laden storm-water runoff to the harbor. The HHPC has recently begun a similar study in the **Powerhouse Drain subwatershed** in Glenwood Landing.

In 2007, HHPC applied for federal **No Discharge Zone (NDZ) designation** for Hempstead Harbor; the U.S. EPA approved the application on November 6, 2008. The NDZ designation affords the harbor the necessary legal basis to restrict boaters from discharging their wastes into the harbor and strengthens avenues for enforcement. The HHPC has also established a Web site (www.HempsteadHarbor.org) as a resource on the harbor. **Ongoing educational efforts** include the production of professional coastal interpretive signage; the purchase of a portable display unit that is used at area festivals, fairs, libraries, and town and village halls; 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 encompass the entire harbor; having harbor trails and land acquisition added to the state's Open Space Plan; having the harbor designated by the Long Island Sound Study as an inaugural "Long Island Sound Stewardship Site"; and having the harbor designated as part of the New York State Audubon Society's "Important Bird Areas of New York State." 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 dozens of 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 of annual contributions (dues) received from the nine member municipalities. These annual contributions total $82,500 for calendar year 2008.

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We offer special thanks to the National Fish and Wildlife Foundation for funding the 2006 development of the Quality Assurance Project Plan for the Hempstead Harbor Water-Monitoring Program and the 2007 and 2008 water-monitoring programs for Hempstead Harbor through the Long Island Sound Futures Fund.

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; 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.

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- 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 U.S. Environmental Protection Agency, Long Island Sound Study Office

View of Hempstead Harbor looking north from the Sea Cliff boardwalk (6/08) (photo by Carol DiPaolo)

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STATE OF THE HARBOR 2008

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 Matinecock 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.

Dramatic changes around the harbor have resulted in improved water quality. For example, efforts to restore the harbor resulted in the closure of a landfill, two incinerators, and a sewage treatment plant. 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. (In 2008, Nassau County purchased the plant from the City of Glen Cove.)

The remediation of some hazardous waste sites has been completed, and remediation of others is still underway. Also, revitalization plans are being implemented for sections of the waterfront that suffered the most abuse, such as along Glen Cove Creek and the eastern shore in Glenwood Landing.

Wetland restoration planting at Bar Beach lagoon in 2003 (above) and in 2005 (right)(photos by Kevin Braun)

Wetlands restoration projects have been expanded on the western shore of the harbor, south of the former Bar Beach Park, which is now part of the larger North Hempstead Beach Park. (In September 2007, Nassau County and the Town of North Hempstead entered an agreement to transfer ownership of the county-owned Hempstead Harbor Beach Park to the Town of North

Hempstead, which merged it with the adjacent town-owned Bar Beach Park; in May 2008, the combined beaches were renamed North Hempstead Beach Park.)

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 re-covered a large portion of the lower harbor south of the formerly referred to 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.

Natural regrowth of spartina beds in lower harbor along the western shore (10/15/08) (photo by Carol DiPaolo)

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, which flows from the harbor's 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, city, 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 for the municipalities that share jurisdiction over Hempstead Harbor to "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.

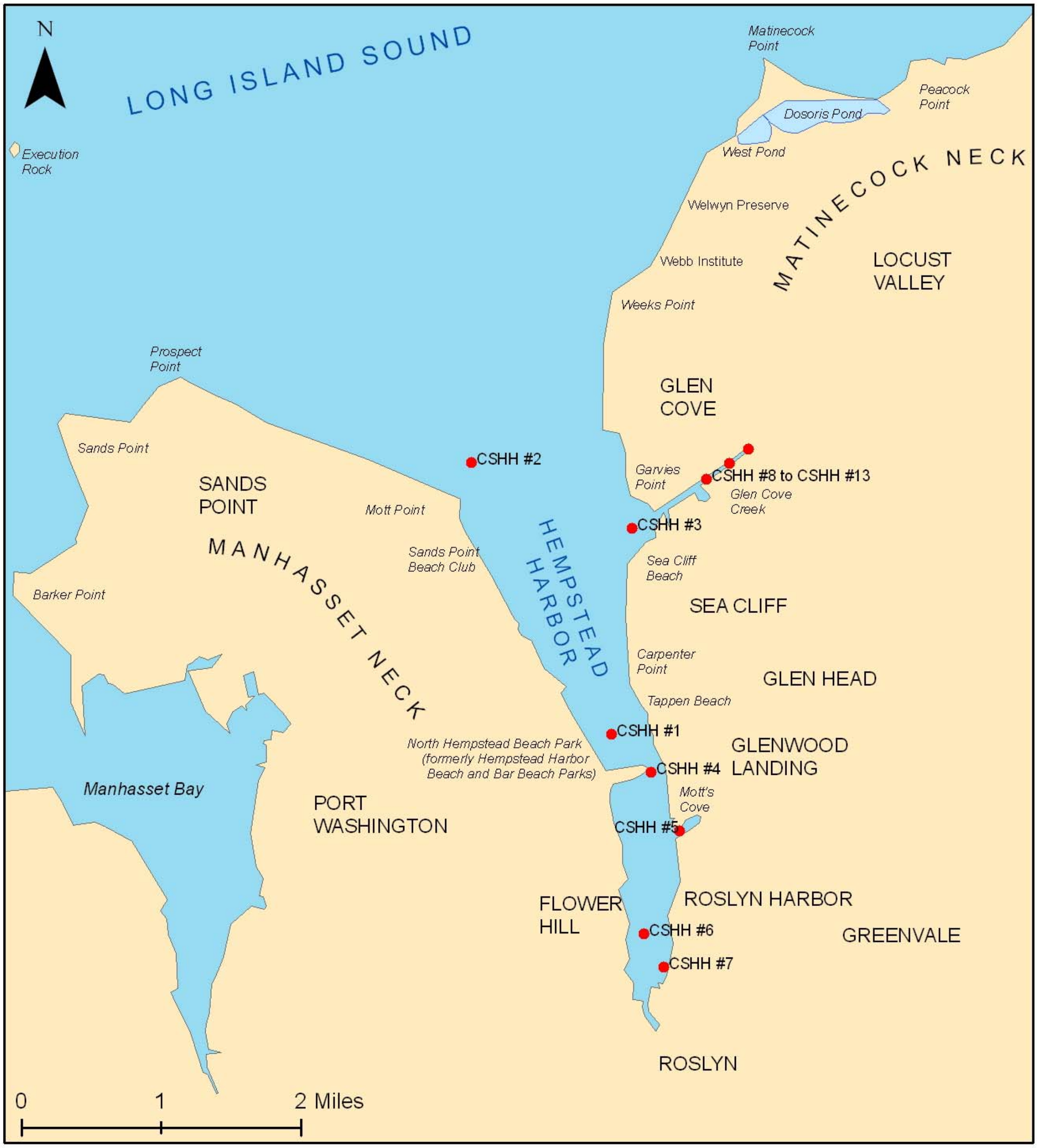
2.1. Quality Assurance Project Plan

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 13 stations in Hempstead Harbor. The principal stations that are sampled weekly during the monitoring season for all program parameters are located in the northern portion of the harbor, between the Bar Beach sand spit (now part of the 36.2-acre North Hempstead Beach Park) and Long Island Sound, as well as stations in Glen Cove Creek. *Table 1* includes the latitude/longitude points for most of the monitoring stations.



Map of Hempstead Harbor showing locations of CSHH Stations 1-13.

At the end of the 2004 monitoring season, CSHH #9, #10, #11, and #12 were added in the vicinity of the Glen Cove sewage treatment plant outfall (CSHH #8) (in Glen Cove Creek) specifically to provide additional samples for bacteria analysis by the NCDH. These stations 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; the four stations became a permanent part of the program in 2005. CSHH #13 was also established to monitor bacteria levels at the head of the creek and became a permanent part of the program in 2007. In 2008, CSHH #13 was set at 60 feet west of the Mill Pond weir, rather than moving within the distance of 60 feet from the weir, depending on the tide. Samples collected at CSHH #13 can help indicate whether the restoration of Mill Pond is curtailing bacteria inputs to Glen Cove Creek.

Aerial view of Glen Cove Creek, Sea Cliff Beach (foreground), Sea Cliff Yacht Club and dock, Glen Cove marinas, and Glen Cove STP (7/08) (photo by Joel Ziev)

The locations of upper-harbor CSHH monitoring stations are as follows:

- CSHH #1, at Beacon 11 (between Tappen Beach Marina on the east shore and North Hempstead Beach Park 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
- 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; and
- CSHH #13, 60 feet from the Mill Pond weir.

The four lower-harbor stations are often inaccessible during low tides and are monitored less frequently (monthly for full survey and as close to weekly, depending on the tide, for collection of samples for bacteria analysis). The locations of the lower-harbor stations are as follows:

- CSHH #4, at the North Hempstead Beach Park (formerly 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 walkway for the Sterling Glen and Horizon communities (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.)

Table 1. Latitude/Longitude Points for Monitoring Stations

Station ID	Latitude N		Longitude W	
	Degrees	Minutes	Degrees	Minutes
Upper-Harbor Stations				
CSHH #1, Beacon 11	40	49.540	73	39.120
CSHH #2, Bell 6	40	51.647	73	40.428
CSHH # 3, Red Channel Marker	40	51.213	73	39.123
CSHH #8, Adjacent to STP Outfall Pipe	40	51.514	73	38.515
CSHH #9, 10 ft West of #8				
CSHH #10, 20 ft West of #8				
CSHH #11, 50 ft East of #8				
CSHH #12, 100 ft East of #8	40	51.561	73	38.430
CSHH #13, 60 ft from Mill Pond Weir	40	51.706	73	38.139
Lower-Harbor Stations				
CSHH #4, East of North Hempstead Beach Park (formerly Bar Beach) Sand Spit	40	49.688	73	39.001
CSHH #5, Mott's Cove	40	49.317	73	38.770
CSHH #6, East of Pt. Washington transfer station	40	48.688	73	39.080
CSHH #7, West of Bryant Landing (formerly site of oil dock)				

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 13 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 #13 and monthly at CSHH #4, #5, #6, and #7. Chlorine testing is conducted weekly 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 2*.

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 an upgraded XLM circuit board and 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.

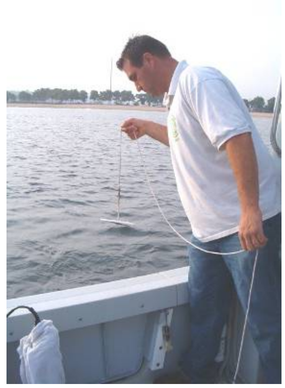
Table 2. CSHH Monitoring-Program Parameters

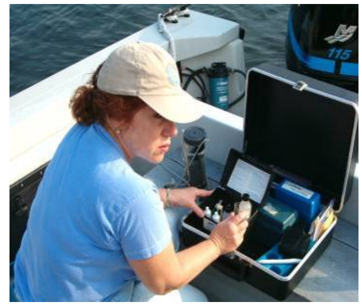
Parameter	Location	Analyzer or Method	Location of Analysis
Dissolved Oxygen	Vertical profiles at 1-meter intervals at CSHH #1-8, and 13	YSI 600	Field
Dissolved Oxygen	One location for electronic meter validation	LaMotte 7414	Field
Water Temperature	Vertical profiles at 1-meter intervals at CSHH #1-8, and 13	YSI 600	Field
Water Temperature	One station for electronic meter validation	Calibrated Thermometer	Field
Air Temperature	One measurement at each station during monitoring	Calibrated Thermometer	Field
Salinity	Vertical profiles at 1-meter intervals at CSHH #1-8, and 13	YSI 600	Field
pH	Vertical profile at 1-meter intervals at CSHH #1-8, and 13	YSI 600	Field
pH	One station for electronic meter validation	LaMotte 2218 reagent	Field
Turbidity	Two vertical locations at 0.5 meter and Secchi depth at CSHH #1, 2, 7, 8, and 13.	LaMotte 2020e (USEPA 180.1)	Field
Clarity	All stations	LaMotte Secchi Disk	Field
Ammonia	Grab sample at half-meter depth at all stations	LaMotte 4795 (Nessler Method)	Field
Ammonia	More refined method used at CSHH #1, 8, and other stations when the test above detects ammonia	LaMotte 3304 (Salicylate Method)	Field
Nitrate	Grab sample at half-meter depth at all stations	Hach 8192	Oyster Bay Town Lab
Nitrite	Grab sample at half-meter depth at all stations	Hach 8507	Oyster Bay Town Lab
Chlorine	Surface grab sample at CSHH #8	LaMotte 3308	Field
Fecal Coliform Bacteria	Grab sample half-meter depth at all stations	Membrane Filter	Nassau County Department of Health
Enterococci	Grab sample at half meter depth at all stations	Membrane Filter	Nassau County Department of Health
Precipitation	Village of Sea Cliff	Visually read rain gauge	Field

Turbidity is also recorded at stations CSHH #1, #2, #7, #8, and #13 during full surveys with a LaMotte 2020e portable turbidity meter; additional samples are taken at other locations if unusual conditions are noted. Turbidity samples are taken at two depths – at a half-meter below the surface and at Secchi-disc depth.

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.


Mark Ring with YSI 600


Tony Alfieri lowering Secchi disk



Carol DiPaolo doing Winkler titration for DO

3. MONITORING RESULTS

This section summarizes results of the CSHH sampling program. Where possible, historical data is used for comparison, including data from 1995 through 2008. *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. In addition to these direct effects of low DO levels, indirect effects can also occur. Low DO levels can cause some bacteria to produce hydrogen sulfide, which is a gas that can be toxic to fish.

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.

Previously, DO levels above 5.0 ppm were considered healthy; DO levels below 5.0 ppm were considered to cause various adverse impacts (related to growth, reproduction, and survival of organisms). The severity of impacts, and threshold DO levels where impacts occur, are strongly species dependent. (For example, bottom-dwelling marine species would be more affected than species that can move more easily to higher oxygen areas.)

A **new dissolved oxygen standard** was implemented by the DEC on February 16, 2008. For estuarine waters such as Hempstead Harbor, the **chronic, or long-term, DO standard is 4.8 ppm**. This means that DO levels of 4.8 and above are considered to be protective of most marine aquatic species. The **acute DO standard is 3.0 ppm**, which means that if DO concentrations fall below 3.0 ppm, conditions are considered hypoxic; under hypoxic conditions most juvenile fish will not be able to survive, many adult fish will avoid or leave the area, and species that cannot leave the area will die. For DO concentrations that are equal to or greater than 3.0 ppm and less than 4.8 ppm, the growth and abundance of certain marine species will be affected. The impact of hypoxia on marine life depends on the duration and area over which low DO levels occur; water temperature, salinity, and distribution and behavioral patterns of resident species also play a role in how marine organisms react to hypoxic conditions.

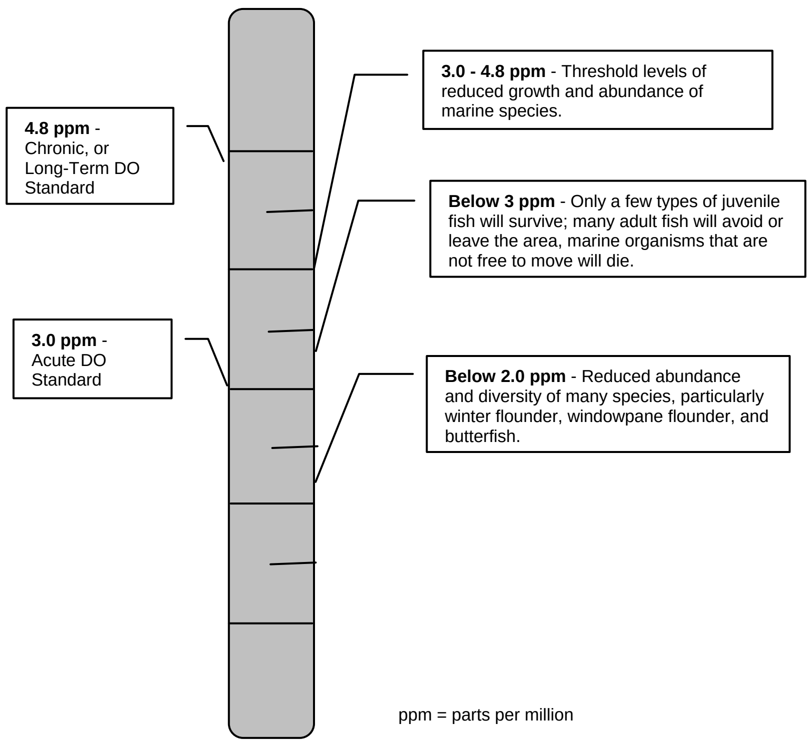


Figure 1. New DO standards and effect of depleted DO on marine life

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. These standards are similar to the New York standards, although not completely consistent.

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.

Fortunately, there were no fish kills during 2001 through 2004 despite extended periods of hypoxia. A clam kill occurred 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. (In August 2006, a small area near the mouth of Glen Cove Creek turned bright blue and had a distinctive odor. Several dozen small fish were seen dead or dying in the area as a result of low DO and hydrogen sulfide produced by sulfur bacteria present in the decomposition of algal cells.) (See *Section 4.7* of this report.) No fish kills in Hempstead Harbor were observed or reported in 2007 and 2008.

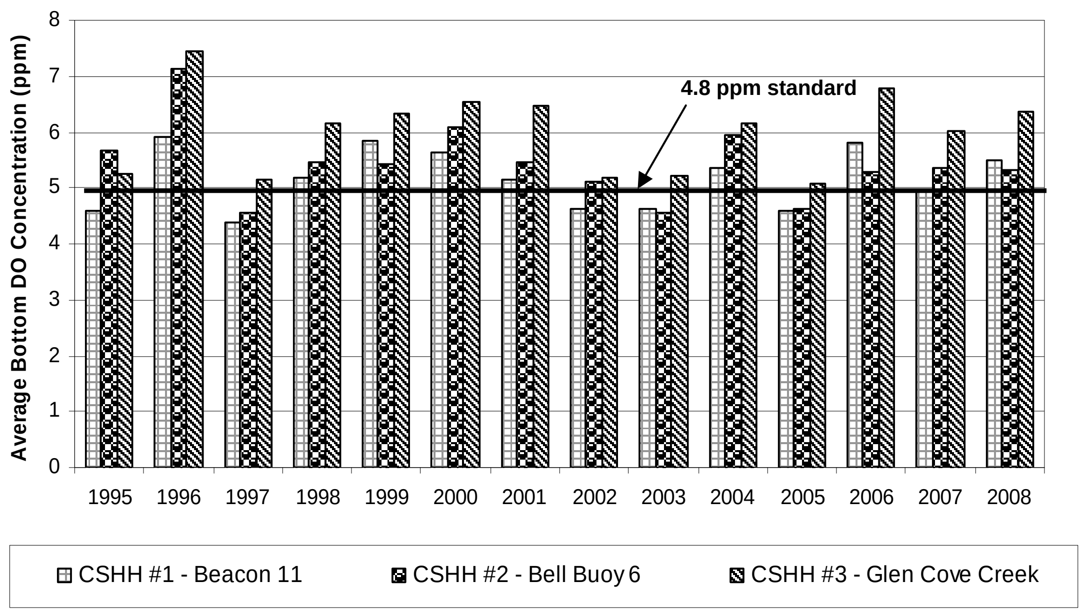


Figure 2. Measured average DO in Hempstead Harbor for 3 monitoring stations

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 3*, along with results for CSHH #8.

Table 3. Average Monitoring-Season Dissolved Oxygen Levels in Hempstead Harbor

Average Bottom DO (ppm)	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995
CSHH #1	5.50	4.99	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	5.31	5.37	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	6.35	6.02	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	5.73	5.93	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 all locations for the 2008 monitoring season were generally within the range of values for many previous years. Average levels at CSHH #1 (5.50 ppm) are above the average values of DO levels for the previous five years. Levels at CSHH #2 and CSHH #3 (5.31 ppm and 6.35 ppm respectively) were above the average for the previous five years but in the bottom half of the range of average values for that location. Levels at CSHH #8 (5.73 ppm) were the second lowest on record for that location.

The number of hypoxic measurements in 2008 was low. Hypoxic conditions were recorded on two days in July: July 16 at CSHH #1, CSHH #2, and CSHH #3 (1.17 ppm, 2.87 ppm, and 2.26 ppm respectively) and July 30 at CSHH #2 and CSHH #3 (1.37 ppm and 2.99 ppm respectively), and two days in August: on August 7 at CSHH #2 (1.28 ppm), and August 13 at CSHH #8 (2.34 ppm). No anoxic events were measured during May 14 through November 5, 2008 sampling.

The percentage of DO measurements in the high DO range increased in 2008 compared with levels in 2007 and seem to have returned to the measurements seen historically at each sampling location (see *Table 4*). The percentage of DO measurements in the mid- to low-level ranges (3 to 5 ppm) in 2008 compared with the percentage in previous years decreased significantly in all locations except CSHH #8. The percentage of DO measurements in the hypoxic range decreased in two of the four sampling locations in 2008 (CSHH#1 and CSHH #8) and were at or near their lowest percentages over the years tested. The increases at the remaining two locations (CSHH#2 and CSHH #3) resulted from only an additional one or two samples at levels less than 3 ppm.

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 apparently improved DO levels in 2008 could be the result of natural and human 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 air and water temperature and 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 4. DO Readings 1996-2008 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	
			CSHH #1–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
2007	5	24	3	14	11	52	2	10
2008	8	35	6	26	8	35	1	4
			CSHH #2–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
2007	3	15	7	35	9	45	1	5
2008	8	42	3	16	5	26	3	16
			CSHH #3–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
2007	7	33	6	29	7	33	1	5
2008	13	57	6	26	2	9	2	9

			CSHH #8–Glen Cove STP Outfall					
2001	12	63%	5	26%	1	5%	1	5%
2002	7	37	8	42	3	16	1	5
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
2007	8	40	6	30	5	25	1	5
2008	11	48	4	17	7	30	1	4

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 in the harbor that are in the southernmost limit of their habitat. Although a warming trend has been observed in Long Island Sound (about 1-1.1ºC warmer over the last 15 years at bottom and surface, respectively), when temperatures are averaged throughout the sound, a difference is also observed between the western and eastern portion of the sound: the western portion, influenced most by fresh water inputs, is cooler than the eastern portion, influenced most by ocean water. The effects of climate change are not discernible in Hempstead Harbor probably because the shallower water and tidal flushing are affected most by the cooler water of western Long Island Sound.

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 (0ºC), the saturation concentration of DO in water (meaning that the water is 100% saturated) is 14.6 ppm, whereas at 68ºF (20ºC), the DO saturation concentration is 9.2 ppm, and at 77ºF (25ºC), it is 8.3 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.

Figure 3 presents average annual water temperature for each monitoring location for the period of record. Many factors affect water temperature, but water temperature is more representative of conditions that occurred over several days and is not heavily influenced by daily variation in air temperature.

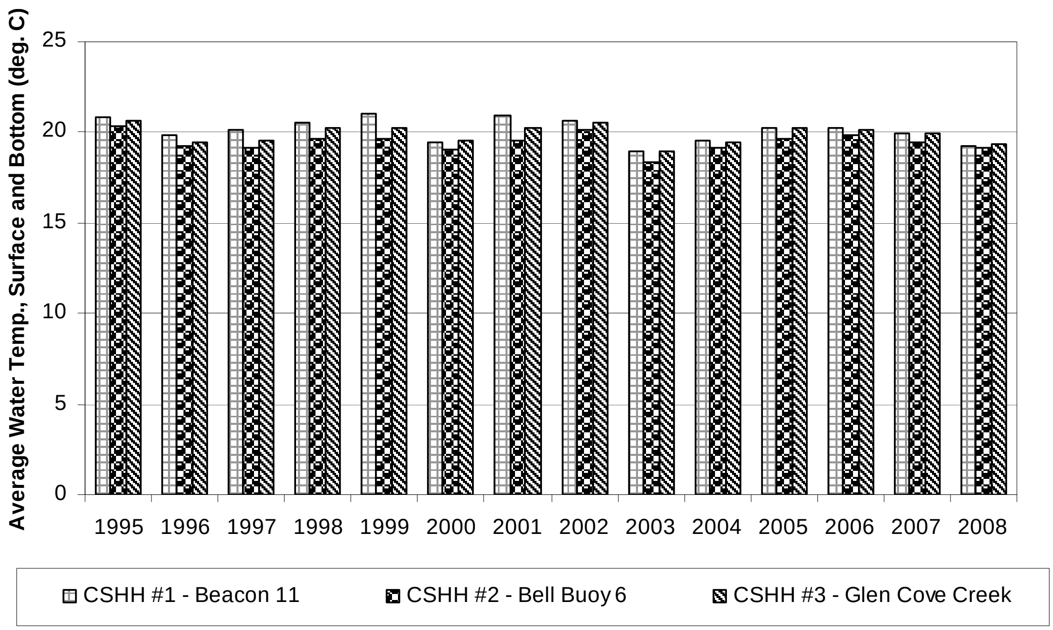


Figure 3. Average water temperature recorded during seasonal monitoring events

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 1ºC. 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 2008, water temperature was slightly cooler than typical in all locations (average water temperatures for all years is 20.1ºC, 19.4ºC, and 19.9ºC respectively). See *Appendix A* for additional air and water temperature monitoring data.

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 4 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 19.5ºC recorded at the three stations, whereas average air temperatures for 1995 through 2003 and 2005 were 2ºC warmer. Average air temperatures recorded from 2005 through 2007 were more consistent with average air temperature recorded from 1995-2003. In 2008, as in 2004, the air temperature was markedly cooler than previous years. The average temperature in 2008 was only 0.5ºC higher than 2004, making it the second coolest monitoring season on record.

Somewhat similar characteristics are apparent in the air temperature data as compared to the water temperature data collected by CSHH during the monitoring season.

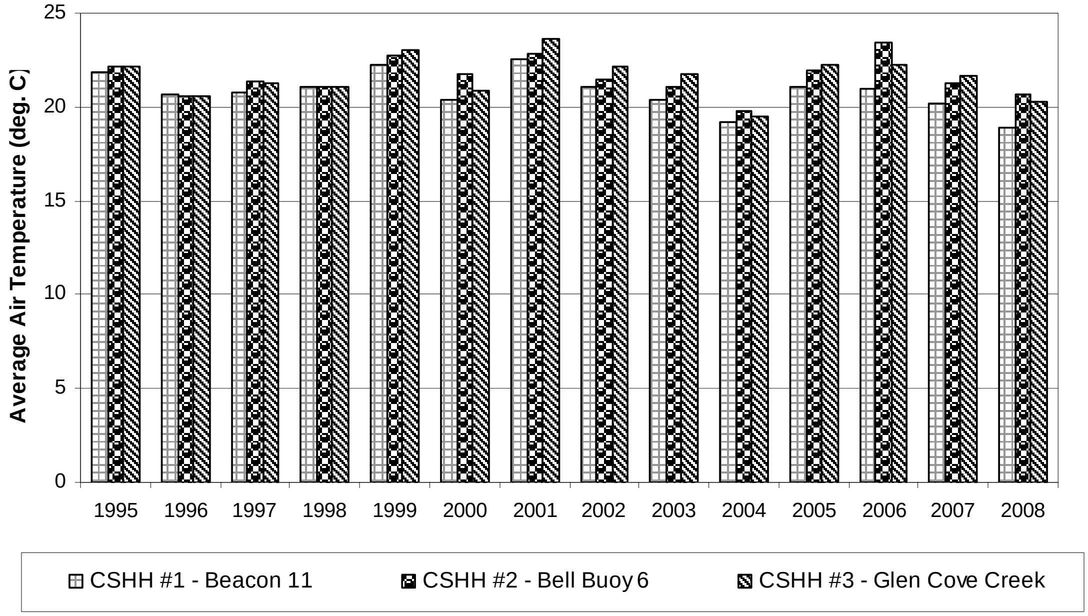


Figure 4. Average air temperature recorded during seasonal monitoring events

3.3. Salinity

Monitoring salinity assists in determining whether the harbor is being influenced by tidal water or, instead, by freshwater from the watershed (i.e., from rivers or streams, storm water, wastewater, or other discharges). 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 the typical salinity level of 32 ppt 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, *average* salinity readings in Hempstead Harbor usually range from 23 ppt to 27 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.

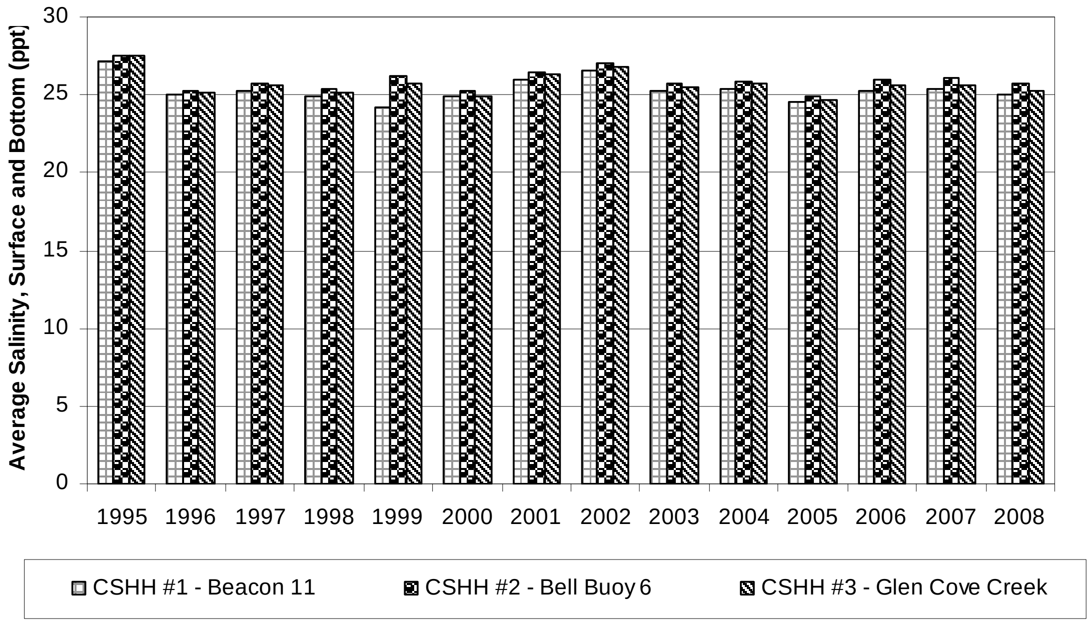


Figure 5. Measured average salinity in Hempstead Harbor during the monitoring season

In most years (1996 through 2000, and 2003 through 2008), 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 2008 (25.4 ppt) were approximately equal to average levels from 1996 through 2004 and 2006 through 2007. Levels in 2005 were the lowest measured during the period of record. See *Appendix A* for additional salinity data results.

In 2008, salinity levels were relatively constant and generally increased slightly as the seasons progressed from spring to fall. Salinity levels in June ranged approximately from 22.8 ppm to 25.6 ppm while salinity levels in October ranged from approximately 24.2 ppm to 26.8 ppm.

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. Measured average pH was relatively consistent over the previous three monitoring seasons; however, during the 2008 season the average pH is slightly lower in all locations (lower by approximately 0.2 over the previous years).

3.5. Turbidity/Water Clarity

In general, turbidity represents the clarity of the water. It is caused by suspended solids, dissolved organic matter, and plankton and may vary due to natural events such as tidal flux, rainfall, seasonal algae blooms, and ice melt. Human activities that cause eutrophication (excess nutrients) and sediment loading (e.g., from uncontrolled construction-site runoff) also increase turbidity.

3.5.1. Secchi-Disk Measurements

Water clarity is commonly 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, the depth at which the Secchi disk is visible is limited by the amount of plankton, algae, or other suspended matter in the water, and so Secchi readings are typically 1 to 2 meters for Hempstead Harbor during the summer months but can range from 0.25 m to 3 m during the monitoring season. For 2008, the range for the monitoring season was 0.3 m to 2.5 m. The large amount of plankton in the water also gives the harbor its usual green to brown color.

3.5.2. Turbidity-Meter Measurements

Although research related to the effect of turbidity on the marine environment is limited, there has been increased recognition of its significance and the need to standardize measurements of turbidity levels. For example, excessive increases in turbidity may cause harm to fish growth and survival as well as affect gill function in both naturally low and highly turbid waters.

The U.S. EPA's *Quality Criteria for Water* report (1986) stated that turbidity could affect both freshwater and marine species of fish in the following ways:

1. Kill the fish or reduce their growth rate, resistance to disease, etc.
2. Prevent the successful development of fish eggs and larvae
3. Modify natural movements and migrations of fish
4. Reduce the abundance of food available to the fish

Elevated turbidity is generally harmful in most aquatic environments and for most species. Although some species may benefit (e.g., small increases in turbidity may afford some species increased camouflage) this increased advantage would be at the expense of other species (e.g., larger predators) and may upset the ecological balance.

It is thought that the effect of additional turbidity with human-generated sources on water bodies depends on the determined "background" turbidity level of the water body (see, e.g., Johnson and Hines 1999; Meager 2005). (At this time the "background" turbidity level is unknown for Hempstead Harbor and Long Island Sound.)

In New York, the water quality standard for marine waters is that there shall be "no increase that will cause a substantial visible contrast to natural conditions." *Table 5* provides examples of West Coast jurisdictions that have established numeric standards measured in nephelometric turbidity units (NTUs).

Because of the previously cited significance of turbidity on the marine environment, turbidity sampling was initiated for Hempstead Harbor stations in July 2008. The turbidity at CSHH #1, #2, #7, #8, and #13 (the stations selected for weekly turbidity testing) ranged from 1.1 to 6.35 NTUs at the sampling depth of one-half meter. See *Appendix A* for additional turbidity data. (It should be noted that the results generated by the turbidity meter (LaMotte 2020e, EPA approved design) many be affected by color interferences from certain algal blooms.)

Given that the Secchi-disk depth decreases as the water sampled gets harder to see through, it follows that turbidity measurements should be inversely related and increase as the Secchi depth decreases. Based on scientific research, there is not a direct inverse relationship (Secchi Depth = N/Turbidity (where N is a variable coefficient) (Effler, 1988)), but in general, the above holds true. Turbidity readings were taken not only at a half-meter depth, but also at the Secchi-disk-transparency depth. See *Appendix A* for graphs showing the relationship between Secchi-disk-transparency and turbidity.

Table 5. Review of Turbidity Criteria

State	Criteria	Reference
State of Washington	"Extraordinary and excellent quality" waters – Not to exceed: • 5 NTU above background levels when the background is 50 NTU or less • 0% increase if the background is greater than 50 NTU "Good and fair quality" waters – Not to exceed: • 10 NTU above the background levels when it is less than 50 NTU • 20% increase if the background is more than 50 NTU	WAC 173-201A-210(1)(e)
State of Oregon	Not to exceed a 10% increase from background levels	OAR 340-041-0036
British Columbia	• Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters • Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters • Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters • Change from background of 10% when background is >50 NTU at any time during high flows or in turbid waters	www.env.gov.bc.ca/wat/wq/BCguidelines/turbidity/turbidity.html

3.6. Nitrogen

3.6.1. 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.

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 of nitrogen than the watershed sources (i.e., overfertilization of gardens, lawns, and farmlands; failing septic systems; storm-water runoff; and old or failing wastewater treatment plants). Inputs of nitrogen from the watershed are in the form of ammonia, nitrite, or nitrate. Ammonia and nitrate generally originate from fertilizer, and human or animal wastes from old or failing septic systems and wastewater treatment plants and storm-water runoff. Nitrate is also a product of properly functioning treatment plants, which convert ammonia to nitrate.

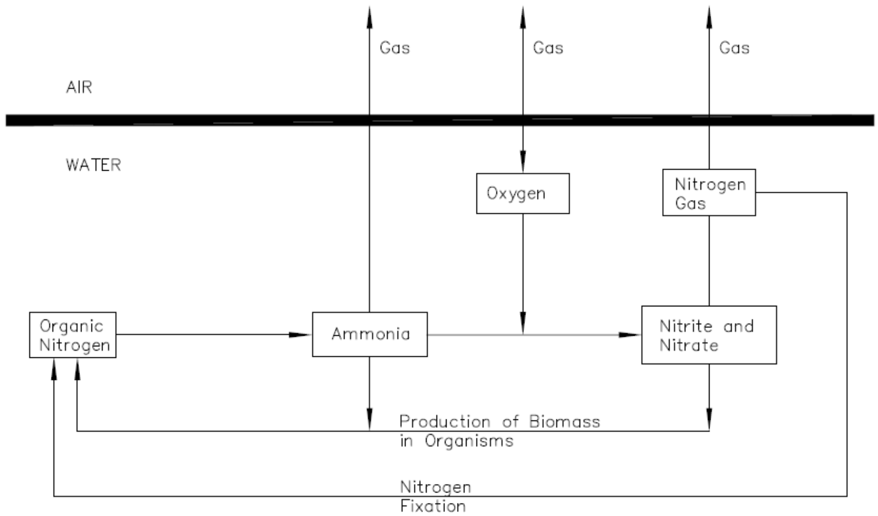


Figure 6. Nitrogen in marine environments
(Adapted from: Surface Water Quality Modeling, Steven Chapra, McGraw-Hill, 1997)

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, but as more oxygen is added, nitrite (which is highly unstable) quickly transforms to nitrate. 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 (nitrogen) 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. Treatment 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.

3.6.2. Nitrogen Monitoring by CSHH

CSHH takes samples weekly at upper-harbor stations (CSHH #1, #2, #3, and #8) and approximately monthly at other upper- and lower-harbor stations to test for ammonia, nitrite, and nitrate. In 2004-2006, the samples that were sent to the town lab for analysis produced results that indicated interferences with the ammonia testing techniques from possibly the saltwater, turbidity, or water color. In 2008, nitrite and nitrate samples continued to be analyzed at the Town of Oyster Bay lab using an electronic Hach kit, but ammonia was measured on board at the different stations using LaMotte testing kits that employ either the Nessler or salicylate methods.

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. Generally, ammonia is measured using the Nessler method at all stations and the salicylate method at CSHH #1 and #8. 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.

3.7. Chlorine

CSHH's program includes testing for total residual and free and available chlorine at CSHH #8 to monitor the amount of chlorine discharged from the STP 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. However, the plant currently does not have a back-up generator and so retains the chlorination system and runs it in conjunction with the UV system to prevent untreated sewage from entering the harbor in the event of a power failure. The amount of chlorine residual in the STP discharge has decreased to 0.5 ppm (the typical chlorine residual was 2 ppm before the UV system began operating). On March 1, 2008, Nassau County purchased the plant from Glen Cove but retained the operator, Severn Trent Environmental Services, Inc.; it is anticipated that the county will install a back-up power source by summer 2009, so that all use of chlorine can be eliminated.

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, whereas **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. Through 2005, NCDH measured and recorded the most probable number (MPN) of bacterial cells present in a sample and then calculated the logarithmic average or geometric mean 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. In 2006, NCDH began using a filtration method of measuring fecal coliform and enterococci. This methodology is believed to be more precise and has the advantage of producing results in 24 hours, a shorter time frame than was required with the previous methodology. The filtration method produces results measured in colony forming units (CFUs).

The membrane-filter test is performed by pulling a sample of water through a sterile filter with a vacuum pump. The filter is then placed on an agar plate and incubated. Bacteria from the water that collected on the plate multiply during incubation, forming colonies that can be seen and counted without a microscope.

Tappen Beach Park and marina at eastern shore of Hempstead Harbor (7/08)
(photo by Joel Ziev)

3.8.1. Beach Monitoring for Bacteria Levels

Each beach season, samples for bacteria testing are collected twice a week by the Nassau County Department of Health at five beaches around the harbor. These bacteria samples are analyzed at the NCDH laboratory in conformance with beach-closure standards that were implemented in 2004 (see *Section 3.8.2*). (In 2008, NCDH discontinued the analysis of fecal coliform for beach closures but continued both fecal coliform and enterococci analyses for the midharbor samples collected by CSHH.)

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, 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). Therefore, even though water quality has improved remarkably, beach closures started to increase because of the preemptive-closure program. In 2008, the beaches around Hempstead Harbor were closed preemptively for eight days (as was the case in 2006 and 2007), related to seven rain events. The beach closings occurred on 6/15, 7/24, 7/28, 8/6, 8/12, 8/15, 8/16, and 8/30, based on a threshold of ½-inch of precipitation over a 24-hour period.

3.8.2. 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. The NCDH began doing parallel testing in 2002, using the state's then-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 enterococcal standard was that it takes only 24 hours to obtain results, whereas it took 48 hours to obtain results using the coliform standard.

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

1. Based on a single sample, the upper value for the density of bacteria shall be:
   a. 1,000 fecal coliform bacteria per 100 mL; or
   b. 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:
   a. 2,400 total coliform bacteria per 100 mL; or
   b. 200 fecal coliform bacteria per 100 mL; or
   c. 35 enterococci per 100 mL.

As of the 2008 season, enterococcus is the sole indicator organism recommended by the USEPA, and requirement by the New York State Sanitary Code for Bathing Beaches (Subpart

6-2), for evaluating the microbiological quality of saline recreational beach water and, therefore, NCDH discontinued analyzing beach water samples for fecal coliform.

3.8.3. Monitoring Midharbor Points and Glen Cove Creek for Bacterial Levels

CSHH collects samples for bacteria analysis weekly (weather and tide permitting) at the 13 CSHH monitoring stations in Hempstead Harbor. Five of these sites (CSHH #9-13) started as temporary sites but became part of the regular sampling program to test for the presence of bacteria from discharge pipes in Glen Cove Creek in the vicinity of the STP.

Unusual discharges from these pipes were noted in 2004-2006 and were brought to the attention of city officials in Glen Cove, the NCDH, and HHPC, NC Department of Public Works (DPW), and DEC. In 2006, a boat tour of Glen Cove Creek took place with representatives from Glen Cove, the city's consultants, and CSHH to view the discharge pipes along the creek. Also in 2006, 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. As several water samples from the area continued to show high levels of fecal coliform and enterococci, further investigation was needed. In 2007, HHPC requested a meeting and follow-up with Glen Cove officials, consultants, as well as representatives from CSHH, DEC, NCDH, NCDPW, and NY Sea Grant (NEMO Program). As result, NCDPW and NCDH did further testing, but there were no definitive answers as to the source of the bacteria. In 2008, NCDPW further investigated the discharge pipes in question using a camera, and NCDH did dye testing at a possible source, but efforts by both county departments and the City of Glen Cove provided inconclusive results. CSHH will continue to monitor all of the stations in the creek and inform both NCDPW and NCDH of any unusual conditions.

3.8.4. Comparing Bacteria Data

Variability in bacteria concentrations from samples collected at an individual beach on a particular day is 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.

In 2008, average monthly bacteria results for enterococci at the area beaches ranged from 0.42 CFU/100 mL at Sands Point Golf Club in April to 427.56 CFU/100 mL at Bar Beach in August. Overall, Bar Beach (now the southern part of North Hempstead Beach Park) witnesses the highest average bacteria levels whereas Hempstead Harbor Beach (which is now the northern part of North Hempstead Beach Park) sees the lowest (see *Table 5*).

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, #12, and #13 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 again during next monitoring season.

Table 5. Monthly Average Beach Enterococci Data for 2008

	Units in CFU/100 mL	Tappen Beach	Sea Cliff Beach	North Hempstead Beach (S) (former Bar Beach)	North Hempstead Beach (N) (former Hempstead Harbor Beach)	Sands Point Golf Club
April	**Enterococci**	**3.52**	**1.72**	**14.70**	**3.53**	**0.42**
May	**Enterococci**	**18.65**	**68.13**	**33.75**	**5.15**	**26.04**
June	**Enterococci**	**29.80**	**54.40**	**23.81**	**77.31**	**8.42**
July	**Enterococci**	**47.60**	**97.41**	**23.61**	**13.41**	**85.59**
August	**Enterococci**	**28.51**	**65.88**	**427.56**	**11.88**	**161.00**
Season Average	**Enterococci**	**25.62**	**57.51**	**104.69**	**22.26**	**56.29**

**The New York State standard sets the upper limits of enterococci at 104 colony forming units (CFU) per 100 milliliters of water for a single sample and 35 CFU for the 30-day logarithmic average; the units in the table above are calculated as an arithmetic average.*

In general, bacteria levels at CSHH #2 are lower than other locations. CSHH #2 is located at the mouth of the harbor and is thus less influenced by discharges to the watershed, which are likely the largest source of bacteria to the harbor.

3.8.5. Shellfish Pathogen TMDLs

Shellfish beds in Hempstead Harbor and most other areas around western Long Island Sound have been restricted or closed to harvesting for approximately 75 years. Pathogen contamination is the main concern with shellfish beds because of the risk to humans who consume shellfish contaminated by harmful bacteria or viruses present in the water. Total and fecal coliform are the indicator organisms that are used to determine whether certain water bodies are safe for shellfish harvesting. These coliform bacteria are associated with human and animal waste and are used to indicate the presence of other more harmful bacteria, similar to the processes used to measure water quality for beaches (see the Beach Closure Standards at **3.8.2** above).

In August 2007, DEC announced the release of a report on "Shellfish Pathogen TMDLs for 27 303(d)-listed Waters" and an informational meeting to discuss the TMDLs (total maximum daily loads) scheduled for August 10, 2007. Under Section 303(d) of the federal Clean Water Act, states are required to develop plans to decrease the total maximum daily loads of all pollutants that cause violations of water-quality standards. The DEC had listed 71 "Class SA" water bodies as being pathogen impaired, which therefore made them impaired for shellfishing; 25 of these water bodies were included in a 2006 TMDL report, and 27, including Hempstead Harbor, were described in the 2007 report. (Class SA is the highest classification given to marine and estuarine waters and is applied to waters that are considered to have ecological, social, scenic, economic, or recreational importance. Class SA waters are offered the highest level of protection and must, by law, be suitable for recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, and as habitat for fish and other marine life.) Representatives of CSHH, HHPC, and NCDPW attended the informational meeting on the TMDLs, which were developed based on available data and scientific modeling assumptions. Both CSHH and HHPC provided comments on the TMDLs for Hempstead Harbor and requested that the comment period for the report be extended to allow the report writers to gather additional information available from the Hempstead Harbor water-monitoring program and NCDC and NCDPW.

The TMDL report called for a 95% load reduction that contradicted even recent DEC test results, which showed that a portion of the harbor's shellfish beds may soon be reopened. DEC's Bureau of Water Assessment and Management agreed to extend the report comment period and to examine data provided by CSHH, HHPC, and NCDH to help develop more realistic TMDL assumptions and reduction targets. EPA approved the TMDL report in September 2007.

At the urging of CSHH and HHPC, a follow-up meeting was held. On October 16, 2008, at DEC’s East Setaucket office, representatives from CSHH, HHPC, and NCDPW met with Regional DEC shellfish staff and Central Office (Albany) officials from the Division of Water (via teleconference). The DEC stated that the ultimate objective of the TMDL is to open the harbor to shellfishing, and, therefore, in the event that the entire area of Hempstead Harbor’s Class SA waters is opened, the TMDL would be satisfied and no additional remedial actions (other than monitoring) would be required. However, there may be a portion of the harbor’s SA waters that will not be reopened—even in the long term—and the harbor may therefore require some percentage reduction in coliform. Discussion then focused on whether the HHPC and local municipalities would be given credit for the numerous efforts already undertaken to reduce pathogens. The DEC stated that it would be sufficient for municipalities to continue these efforts along with monitoring to see whether reductions occur. It was agreed that Nassau County’s recently developed computer model, which can calculate coliform loadings in surface water from the surrounding land uses, would be a good tool to use in helping to monitor progress on pathogen reduction for Hempstead Harbor.

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 airborne 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 2008.

The total quantity of precipitation that fell in June through October in 2008 was slightly higher than the quantity that fell in 2007 but less than what fell in 2006 and 2002 through 2004. In general, the distribution of precipitation varied from month to month. June and July were atypically dry while August and September were extremely wet.

Table 6. Monthly Rainfall Totals for the 1997-2008 Monitoring Seasons, in mm

	June	July	August	September	October	Total
2008	79.5	91	205.5	177.5	118	671.5
2007	159.5	198.5	132.5	36.5	136	663
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
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+

4. OBSERVATIONS

4.1. Reconnaissance Trip

The purpose of the pre-sampling season reconnaissance trip is to check all stations in the upper and lower harbor and in Glen Cove Creek to see what changes, if any, have occurred along the harbor's shoreline from the previous season. In April 2008, there were no notable storms or other events prior to our April 18 station check, which was conducted from 8 AM to 11:30 AM–timed around the incoming tide, with high tide at about 11 AM. April 2008 was relatively dry, with only about 42 mm of rainfall up to April 18, as compared with about 193 mm for the same period in 2007. The mornings were still very cool (mid- to high 40s°F or 7-8°C). A green algal bloom seemed present throughout most of the harbor, although Glen Cove Creek was more of an opaque green as compared with the rest of the harbor.

Osprey nest on Beacon 11 (4/18/08) (photo by Carol DiPaolo)

We began the survey at CSHH #1 (where ospreys were on a nest at the top of the navigational light) and then worked our way to the lower harbor and then back north to Bell 6 and around to Glen Cove Creek. As we traveled along the eastern shore and to CSHH Stations #4-7, we noted the large Gladsky Marine crane and barges that were anchored off of the National Grid property, as they were in the previous season. A "Soil Mechanics Drilling Corporation" apparatus was being used at the power plant, and the Hinfin/Glen Harbor property was being used as a staging area (as it was in 2007) for the building of the new viaduct. Work continued at the Roslyn Viaduct, with a large gantry spanning nearly half the distance from east to west. (By October, the work had moved to the western end of the viaduct.) It seemed that the lower harbor had silted in from previous seasons, and it was difficult to get as far south as we had previously.

Former Hinfin property–staging area for Roslyn viaduct construction (4/18/08) (photo by Carol DiPaolo)

Girders used for the Roslyn viaduct at the staging area along the harbor (11/12/08)(photo by Carol DiPaolo)

Gantry for Roslyn viaduct construction (4/18/09) (photos by Carol DiPaolo)

As we made our way north again, we saw a duck blind on the west shore just about midway between the two osprey platforms. Six fishing boats were in the harbor, and people were fishing off of Bar Beach. We were told that flounder were being caught. Two barges with cranes, a tug, and 18 other barges were tied off of the Port Washington gravel-transfer operation. Moorings were being set in the mooring field off of Sea Cliff and Glen Cove, and six old dock sections had been tied off below the promenade on the north side of Glen Cove Creek. The north side of the creek at the head of the creek had large sections that had previously collapsed and further eroded.

Collapsed bulkhead on north side of Glen Cove Creek
(4/18/08) (photo by Carol DiPaolo)

Wildlife Observations

There was a lot of bird activity in the harbor–the ospreys were back and building their nests, as were the Canada geese (a goose nest was visible at the shoreline below Horizon and Sterling Glen in Roslyn and one also by the green tank on the north side of Glen Cove Creek). Seven ospreys were seen, six of which were on nests at (1) Beacon 11, (2) blue sailboat in the lower harbor (no eggs), (3) pilings on the west shore of the lower harbor, below the southern most osprey platform and (4) on the platform, and (5) two nests on the pilings just south of Bar Beach.

Also noted throughout the harbor were 6 swans, 3 egrets, 12 cormorants, 2-dozen Canada geese, 1 duck, and 1 belted kingfisher.

(During the winter months, the usual migratory birds were seen in the harbor: buffleheads, old squaw, and scaups. Also, on January 22, 2008, a seal was seen off of Sea Isle, near the marina, in Glen Cove Creek. Seals were also seen at about the same time off of Center Island.)

Osprey nests in lower harbor–on bow of sailboat and on pilings of old oil dock (4/18/08) (photos by Carol DiPaolo)

On April 23, we had our first fishing report from Hempstead Harbor Anglers Club member Pete Emmerich:

> *Sea Cliff has been loaded with adult bunker for 2 weeks, a friend of mine has already caught 8 bass to 25 lbs on live bunker all in shallow (2 feet) of water in the back and local in the Harbor.*
>
> *I was launching Keith's boat on Sunday–you have to see the size and amount of spearing in Glen Cove Marina!*

4.2. Fish-Survey Reports

The two reports described below have been cited because they provide additional information 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) 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. Following the submission of the fish-monitoring report to DEC, KeySpan was required to determine the steps it could take to reduce the mortality of fish and other marine life that resulted from the power plant's operation.

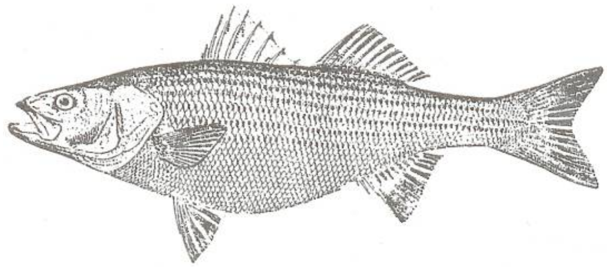
In 2007, KeySpan (which was acquired by National Grid in 2008) provided a technology review for the Glenwood Landing plant. On October 15, 2008, the DEC released its review of the best technology available to address the problem. The DEC determined that the following, used in combination, represent the best technology available for "minimizing adverse environmental impacts from the cooling water intake structure" at the Glenwood Landing plant:

Installation and operation of variable speed pumps;
Continuous operation of the traveling screens and the existing fish-return system; and
Aggressive pump shutdowns when one or both units are not operating.

Based on the comments received by the end of the comment period in December 2008, the DEC will modify the permit for the power plant and reissue the permit for public comment, possibly by June 2009. Whatever technology is decided on and installed at the power plant to reduce fish mortality will require another monitoring plan to determine the efficacy of the technology.

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

Seine surveys for the NYDEC's striped bass study have been conducted in western Long Island bays since 1984 and in the Hudson River since 1979. Every year, the DEC prepares a report on the previous season's surveys entitled "A Study of the Striped Bass in the Marine District of New York State," which encompasses the information from the western Long Island beach seine surveys and the Hudson River young-of-the-year striped bass surveys.



Striped bass (H.B. Bigelow and W.C. Schroeder, Fishes of the Gulf of Maine, U.S. Fish and Wildlife Service, Fishery Bulletin 74 (1953)

The DEC has found that striped bass generally spend their first year of life in the lower Hudson River, but over recent years the nursery for young-of-the-year striped bass has been expanding. In spring, yearling fish can be found not only in the Hudson River, but also in bays around western Long Island. And 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.

Most of the seining for western Long Island occurs in Jamaica, Little Neck, and Manhasset Bays, but Hempstead Harbor, Cold Spring Harbor, and Oyster Bay are also surveyed. In 2008, the survey crew seined at five stations in Hempstead Harbor once a month from May through October. DEC marine biologist Jennifer O'Dwyer provided preliminary information on the seining so that we could compare the crew's catch with our monitoring observations and fishing reports; on the following dates the crew caught:

May 15 — Mostly silversides (over a thousand at one station) and killifish, along with 2 lion's mane jellyfish, 1 Atlantic herring, and 1 pipefish.

June 10 — Mostly bay anchovies (1,024) and silversides (1,802), but also a young-of-the-year bluefish, an older bass, 4 older tautogs, 2 green crabs, 3 male and 1 female horseshoe crabs, 1 male blue-claw crab, and some comb jellies and shrimp. (Interestingly, two schools of fan lance were in the area but most were able to swim through the netting. The crew also caught an adult diamondback terrapin (255 mm across 275 mm long) near the bar at the southern end of the Town of North Hempstead Beach Park.)

July 9 — A large number of silversides (1,827) along with 2 young menhaden, 73 young of-the-year bluefish, 55 killifish, 25 young-of-the-year winter flounder, 1 female horseshoe crab, 3 tautog, 1 tomcod, 2 grubby sculpin, 8 northern pipefish, 1 male blue crab, 6 green crabs, 2 Asian shore crabs, and 1 older bass that jumped the net and got away. (The catch also included a lot of small comb jellies with some shrimp, mixed in with some algae--mostly ulva with some filamentous green and some red algae.)

August 20 — A large number of silversides (1,071), 20 striped bass, 18 bluefish, 343 killifish, 25 menhaden, 2 alewife, 69 pipefish, 37 tautog, 13 cunner, 33 winter flounder, 8 spot, 4 grubby sculpin, 1 rock gunnel, 1 banded drum, 1 crevalle jack, 6 blue crabs, 10 green crabs, 6 spider crabs, 2 calico (lady) crabs, and 6 mud crabs. (This was an amazing catch in terms of both the diversity of species caught and quantity. Jennifer O'Dwyer commented that she hadn't remembered ever catching so many pipefish before. She also reported that it seemed that the jellyfish had moved out and the shrimp and algae had moved in. The crew caught a few net-fulls of ulva and fucus at some sites and some grass shrimp in each haul. Also, one of the blue-claw crabs was a female with eggs.)

September 16 A large number of silversides (1,395) and bluefish (830—all young of the year), 262 killifish, 1 sheepshead minnow, 3 striped sea robins, 3 blue runners, 10 menhaden (young of the year), 1 winter flounder (young of the year), and 2 lady crabs. (Most of the bluefish (724) were part of a large school and caught in one set.)

October 15 354 silversides, 187 killifish, 21 bluefish (young of the year), 304 bay anchovies, 1 tautog (yearling), 1 pipefish, 8 green crabs. (Only a small amount of comb jellies and shrimp were seen in the water.)

4.3. Fish Observations and Recreational Fishing Reports

Fish observations are generally limited to what can be seen dockside at marinas, in shallow water near bulkheads, or just below the surface of the water at midharbor stations. Often, however, schools of fish can be seen also at a distance, breaking the surface in chase of smaller fish in the food chain or away from larger fish. To obtain more information about the fish and other marine life that inhabit Hempstead Harbor, we rely on written reports and studies such as those mentioned above, as well as reports from local residents who use the harbor for recreational fishing and other activities. The description below summarizes our monitoring observations and includes reports from local fishing enthusiasts who regularly fish in Hempstead Harbor and near neighboring bays.

May

Because of boat-engine problems, we had only two sampling dates for the month–May 14 and 21 (sampling was cancelled May 28-June 4, 2008). On May 14, fish were jumping near CSHH #2, and a moon jelly was seen near Beacon 11 (moon jellies hadn't been seen during weekly monitoring over the last several years). On May 21, we saw our first comb jelly of the season–a sea walnut–at CSHH #3. We thought this might be a signal of another shift in the appearance of comb jellies in the harbor, which usually are not seen until June.

June

On June11, we spotted lots of bunker breaking the surface of the water near the barges tied off of the western shore of the harbor, and large schools of young bunker (most were about 5 inches long) were in Glen Cove Creek.

Hempstead Harbor Angler Pete Emmerich also noted large numbers of bunker and on June 13 reported:

> *Yes, we are slamming the bass, but concentrating near Rye Beach. The harbor is full of bunker and blues but they are up and down with the time of day and night. Across the way in 60 feet of water has been a runway for bunker and bass.*

A few days later, on June 17, Pete reported:

> *Wild fishing last night, the harbor is loaded with bunker, all stacked up by the tugboat slips on the west side of the harbor by the barges. Marking bass everywhere now, caught well last night between Prospect and Matinecock.*

On June 19, during water sampling, we saw fish jumping at the surface and gulls diving into water around them. About 9 dead horseshoe crabs were seen (in Tappen marina, near Beacon 11, and in Glen Cove Creek). (During the previous week there was evidence of horseshoe-crab spawning on Tappen Beach, and 3 dead horseshoe crabs were seen then.) On June 25, things were quiet on the water, but nine dead horseshoe crabs were seen floating at the surface pretty close together between CSHH #2 and #3, and the casualties were probably the result of mating activities.

July

On monitoring dates throughout the month, the two varieties of comb jellies that we usually see in Hempstead Harbor–sea walnuts and sea gooseberries–were present in large numbers. Also, on July 16, Pete Sattler from the Interstate Environmental Commission reported his fishing and diving observations:

> *Fishing for blues and striped bass strong. Fluke slow and hard to meet minimum length in NY (20.5") or CT (19.5"). Scuba diving observations for July 12 off the coast of Westchester and mid-sound near Execution Lighthouse: few short lobster with some keepers; lots of blackfish, porgies, flounder (to 15") and small fluke; visibility (horizontal) to 20'.*

Hempstead Harbor angler Pete Emmerich agreed for the most part with Pete Sattler's observations but had a different view regarding the situation with fluke on July 16:

> *Fishing is good.*
>
> *Bass seemed to have moved on, although we had a good season. They are around for sharpies who know what hours to fish, depth and water temp. I spoke to a buddy this week who had 7 large bass, but the hot fishing is in deep water off Rye Beach.*
>
> *Hot blue fishing with bass in western sound out of Manhasset Harbor. I have a charter captain friend who has been cleaning up on blue fish.*
>
> *I disagree with the fluke assessment. We are blessed again this year that the fluke are all over the western sound and deep in Hempstead Harbor. I came into the marina last night and was followed by 4 guys in a boat who caught 7 fluke in 1.5 hours, 4 were keepers over 20.5 inches. Yes, there are many throwbacks, but I have seen many 5-pound fish this year. Also we have caught many sea robins, we saw almost none last year.*
>
> *The fact that there are so many blackfish gets me nuts that we can't fish for them, but I am optimistic about our chances in October. Blacks are resident fish, so I really would like a more precise location and water depth where all those blacks were seen.*

August

Throughout August, comb jellies were noted in large quantities on monitoring dates. By mid-August 2008, we had observed only one blue claw crab (near the Tappen Marina dock), and this was in stark contrast to the situation the year before, when there was an unprecedented number of blue crabs throughout the harbor. The DEC seining crew, however, caught a half-dozen blue crabs during the August seine.

On August 21, Pete Emmerich reported that he had been out on the harbor the preceding night and had a chance to catch up with local anglers:

> *I am told that the harbor is "dead"– no luck catching or getting even a bite of fluke or sea robin. I marked plenty of bait in the harbor, had bluefish coming up next to my boat as I cleaned it just north of the barges. Marina is loaded with bait and snappers with larger fish crashing them (small blues or schoolie stripers). A friend cruised the western sound and could find no bunker. He also told me of a large bunker kill in Greenwich this week. Lots of bunker in the morning, dead bunker floating by afternoon.*
>
> *Only report I got was fluke at Mamaroneck and Execution [Rock Lighthouse].*

September

By early September, only small numbers of comb jellies were noted, but by midmonth the numbers increased somewhat, including mostly smaller sized sea walnuts. Large schools of baitfish were observed in the harbor and Glen Cove Creek on monitoring dates throughout the month, and clouds of tiny shrimp, too numerous to count, were noted around the main dock at Tappen Marina.

On September 17, the low tide seemed to be about 3 feet below the usual low tide mark on the Tappen Marina wall, and slipper shells and some blue mussels–no barnacles–covered the entire wall in that space between the water surface and about 3 feet above. From the usual low water mark on the wall and above, the entire surface was filled with barnacles and nothing else. We had seen this also in a previous low tide. In Glen Cove Creek, we noted that only barnacles covered the seawall, as we had seen for most of this season. We also saw a large school of peanut bunker at the head of the creek.

Hempstead Harbor Angler Pete Emmerich was out fishing at night on September 17 and reported the following on September 18:

> *Snappers in the marina, plenty of signs of bait, but I could not find a bluefish or bass. I did hear that yesterday morning they were catching blues right off the dock of the Glen Cove Anglers Club…*

October

On October 2, we were surprised to see a large, new set of tiny blue mussels on the seawall along Glen Cove Creek (CSHH #8-11), where previously we had seen only barnacles. Comb jellies were present throughout the harbor, but their numbers diminished, and by October 21 none were observed. Large schools of baitfish and tiny shrimp too numerous to count were seen from the main dock at Tappen Marina (as were slipper shells on the sea wall around the marina–just at the low tide mark and below) at the beginning of the month, but their numbers dropped off by the end of the month.

November

November 5 was the final monitoring date for the season, and things were very quiet around the harbor. A few shrimp were around the main dock at Tappen Marina, and no comb jellies were noted.

View of eastern shore of the harbor at Cedarmere (11/12/08) (photo by Carol DiPaolo)

4.3.1. Crabs

An assortment of crabs can be seen around Hempstead Harbor, including blue-claw, lady, green, spider, horseshoe, mud, fiddler, and Asian shore crabs. Some are walking crabs, and some are swimmers, like the blue-claw crabs, which have back legs that are shaped like paddles. The Asian shore crab is an invasive species that started showing up around Long Island Sound in the late 1990s; it can tolerate a wide range of salinity and may be pushing out native species.

Although blue-claws have always been present in Hempstead Harbor, particularly in the lower harbor, they appeared in remarkable numbers in 2007. In summer 2008, we hoped to see the crabs in large numbers again, but instead we were surprised by their absence, except for the very few we saw in August.

4.3.2. Jellies

Two types of comb jellies (which are classified separately from the stinging-celled jellyfish) are seen in Hempstead Harbor: 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. They usually appear in large numbers in Hempstead Harbor in late June and through mid-October. In 2008, we saw a sea walnut in May, but none were observed again until July. However, the DEC seine crew caught a few comb jellies in June; the crew also caught a few in the October 15 seine, although we didn't observe any during our monitoring on that day or later.

Two tentacled types of jellyfish that may be seen in the harbor are the purple-brown **lion's mane jellyfish**, with long tentacles that sting, and the round, bell-shaped moon jelly that has short tentacles around its rim that do not produce a stinging sensation. **Moon jellies** are easily identified by the four, whitish, horseshoe-shaped gonads on the top of the bell. It's been several years since we've seen either the lion's mane jellyfish or the moon jelly in large quantities in the harbor; in 2008, the DEC seine crew caught 2 lion’s mane jellyfish during the May 15 seine, and at about the same time we saw a moon jelly by Beacon 11.

4.4. Shellfish

Shellfishing was an important commercial activity in Hempstead Harbor from about the first quarter of the nineteenth century into the first quarter of the twentieth century, and clams and oysters were shipped regularly to New York City, until restrictions were imposed because of dwindling resources. By 1928, the lower portion of the harbor was closed to shellfishing because of increasing levels of bacteria in the water (as was the case for most bays in western Long Island Sound and other New York waters). For a time, clam dredgers could be seen in Hempstead Harbor harvesting clams and then transporting them to the Peconic Bay, where they were transplanted and remained for several weeks for purification so they could be sold commercially.

By the late 1990s, clams, oysters, and mussels were abundant throughout the harbor, and because of improved water quality, it seemed time to pursue one of the longstanding goals of reopening the harbor's shellfish beds. In 1998, CSHH initiated the first step and worked with the Interstate Environmental Commission, DEC, Town of North Hempstead (TNH), and local baymen to conduct a hard-clam survey to determine the extent and condition of the clam population. The survey showed a healthy population of hard clams, but rigorous water sampling would have to be conducted by DEC to determine whether water quality had improved enough to reopen the shellfish beds.

In 2004, DEC began collecting water samples in the outer portion of Hempstead Harbor, north of the Glen Cove breakwater, with good results. In 2007, DEC met with CSHH, HHPC, and Town of Oyster Bay (TOBAY) to discuss, among other things, water-sampling results and assistance with sampling from TOBAY staff. Water sampling was completed in 2008, and results were good. Several samples of the shellfish from the harbor were collected and tested for chemical contamination, but the results from those analyses are still being reviewed. If the results of the chemical analyses show that the shellfish are healthy, there are still more steps that must be completed before the outer portion of Hempstead Harbor is reclassified, including conducting a shoreline survey/pollution-source inventory of the harbor and dye testing of the Glen Cove sewage treatment plant.

4.4.1. Shellfish Seeding

At the same time that DEC shellfish division was nearing completion of a series of water-quality tests that would determine whether a section of the upper harbor could be reopened for shellfish harvesting, Nassau County Executive Thomas Suozzi began exploring the possibility of seeding Hempstead Harbor with clams and oysters as part of the county’s “Healthy Nassau” campaign. The seeding project was a joint initiative that included Nassau County, the TNH, TOBAY, Cornell Cooperative Extension, Frank M. Flower & Sons Oyster Company, as well as HHPC and CSHH, and was intended to add biomass to the harbor using a resource that could help improve water quality–each clam and oyster can filter 1 to 2.5 gallons of water per hour, with daily estimates (for oysters) of 30 to 60 gallons.

The seeding took place on October 9, 2007. The shellfish stock came from Cornell Cooperative Extension and Frank M. Flower & Sons Oyster Company, and included more than 1.3 million seeds, consisting of two types of hard-shell clams (Mercenaria mercenaria and M. mercenaria notata) and oysters. (The M. mercenaria notata has markings that are different from the northern quahog stock normally found in Hempstead Harbor, which would help in gauging the survival rate of the seeds during later surveys.)

Because of space limitations, about 10 tubs of oysters were left behind. Each tub contained about 10,000 oysters that had been started in May 2007 (and were expected to reach maturity within 18 to 24 months). On October 10, 2007, following our scheduled water-quality sampling, we met Nassau County DPW staff at Tappen Marina to load the Environmental Resources boat with the oysters that remained from the day before. We went back to the seeding area and took GPS readings at eight sites as each tub of oysters was spread out over the harbor.

4.4.2. 2008 Survey to Assess Survival of Seed Clams and Oysters

In late summer 2008, CSHH requested a permit from DEC to conduct a survey of shellfish in the area of the 2007 seeding project in Hempstead Harbor to gauge the survival rate of the seeds. We selected seven of the GPS points mentioned above for raking. The area seeded in 2007 included a transition from thick, muddy bottom to a harder, sandier bottom.

Two baymen–Bill Fetzer and Craig Oddo–volunteered to help us with the survey, using their boat, hand rake, and other equipment, in addition to the town's boat and our usual monitoring equipment. The baymen are members of the North Oyster Bay Baymen's Association and have worked previously with the TOBAY to help with the town's clam and oyster seedings.

The areas we selected to rake also approximated stations 24-26 of the shellfish density survey for Hempstead Harbor that was conducted by Cashin Associates, P.C., for the Town of Oyster Bay and for the Hempstead Harbor Protection Committee in August 2008.

4.4.2.1 Findings

We were surprised at how deep and thick the black mud was in the deeper-water stations. At these stations we did not find hard-shelled clams and oysters; we did find an abundance of the very small surf clams referred to as "duck feed." The bottom transitioned to sand as we moved closer to shore—starting first as a very hard bottom and then into softer sand. Although we found a few clam seeds of both types of clams used in the seeding project—Mercenaria mercenaria and M. mercenaria notata—they seemed to be naturally occurring because they were too small to have been from the 2007 seeding project.

In areas with the sandier bottom, we found a variety of clam sizes, from littlenecks to chowder, and the largest number in one raking included 10 clams. We also found a variety of other clams, some crabs, 4 small mantis shrimp, small snails, oyster drills, and broken shells of oysters, clams, and crepidula (slipper shells).

Surf clams or "duck feed" found in black mud (10/10/08)
(photo by Carol DiPaolo)

Close-up of duck feed in foreground (10/10/08)
(photo by Carol DiPaolo)

We did not find clams or oysters that appeared to be from the 2007 seeding project, and that may be due to any of the following:

1. The normal survival rate for seeded clams and oysters is 10-20 percent, and we may have simply missed the survivors.
2. We (and/or the clams and oysters) may have drifted from the waypoints taken in 2007.
3. Many of the seeds may have ended up in the thick muddy bottom and did not survive.
4. Most of the seeds may have been destroyed by predators (such as the blue-claw crabs, which were abundant in 2007).

Part of the contents of one of the rakings (10/10/08)
(photo by Carol DiPaolo)

We had intended to make a second trip to look for last year's seeds, but weather conditions and scheduling limitations prevented us from doing so in the last weeks of October. Also, it had been suggested to us that a diver scanning the bottom might be able to provide a more precise picture of the clam population and seed survival.

4.5. Birds

During 2008, **belted kingfishers, egrets, blue herons, swans, gulls, terns, mallards, black ducks, Canada geese, cormorants**, and **ospreys** were observed throughout the season, along with the usual swallows, pigeons and other land-based birds that are frequently seen along the shores of the harbor but not counted or specifically noted on data sheets during monitoring.

Osprey nest and cormorants on old pilings in lower harbor (10/15/08) (photo by Carol DiPaolo)

Observed less frequently during monitoring were **green herons**, **black-crowned herons,** and **hawks** or **falcons.** Unusual sightings in 2008 included our first sighting of a **turkey vulture** flying over Glen Cove Creek in May (and we had been told that turkey vultures were also seen near Manhasset Bay) and a blue heron that appeared to be multicolored (like a tricolored—or Louisiana—heron).

Among the 7 osprey nests that we saw in the harbor (one was built later than the ones we had seen in April, and one of the two platforms was not occupied), we were again able to observe the osprey nest on the sailboat off of Motts Cove. The nest was in place in April with no eggs, but, by June 11, two hatchlings were observed there. By July 2, the two chicks were about the size of large chickens

There are usually two duck blinds kept in the lower harbor and moved into place in the autumn. On October 15, one of the two duck blinds had tall grasses wrapped around it for camouflage (it was set along the north shore of Mott's Cove).

Duck blind in Mott's Cove (10/15/08) (photo by Carol DiPaolo)

4.6. Diamondback Terrapins

Diamondback terrapins are the only turtle found in estuarine waters and generally grow up to 9 inches long. In spring of 2005, diamondbacks were observed in large numbers in the lower harbor, near the Roslyn viaduct. Diamondbacks typically converge by the hundreds in one area in the spring and mate for several weeks, and information about their presence in Hempstead Harbor 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.

Female diamondback turtle (Source: NOAA photo library; see http://www.photolib.noaa.gov/coastline/images/big/line2365.jpg)

In 2006, dramatic changes occurred in the area near the viaduct with the construction of the Sterling Glen and Horizon senior communities at Bryant Landing and the start of construction for the new viaduct. Construction of the viaduct continues, and materials are barged to an area north of Mott's Cove and then trucked to the viaduct. It is not known whether this activity has had an impact on the diamondbacks.

In 2006, two turtles were reported seen in Glen Cove Creek, and one was caught during a seining in Hempstead Harbor for the DEC's striped bass survey. No sightings of diamondbacks were reported in 2007. In May 2008, a local resident reported seeing a small diamondback terrapin at Sea Isle in Glen Cove Creek, and in June 2008 the DEC seine crew caught an adult diamondback terrapin (255 mm across 275 mm long–about 11 inches–long; this is longer than the average size recorded) near the bar at the southern end of the Town of North Hempstead Beach Park.)

4.7. Algal Blooms

Color and turbidity of water within the harbor in 2008 was, for the most part, typical of conditions generally 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 0.75 m to 2.5 m. In 2008, the lowest Secchi-depth reading was 0.25 m. 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 dominant type of algae present in the harbor gives the water its color, which is typically brown or green.

In 2008, noticeable plankton blooms occurred on June 19; July 2, 16, 30; and August 20, 27. The first two made the water look murky green. Often, only portions of the harbor are affected. For example, on July 16, the water was a thick, brown consistency at Tappen Marina and Motts Cove, and plankton samples were taken in which 15 different species of plankton were present—most of them were dinoflagellates (one-celled plankton that have two flagella (strand-like appendages) that help to propel them forward in the water). On July 30, Tappen Marina was brown and murky, but the lower harbor was a very thick green. Also, the upper portion of Glen Cove Creek was often a lighter opaque green, which may have been due more to sedimentation from sections of the failing bulkhead on the north side of the creek.

Crew teams in the lower harbor (8/08)
(photo by Carol DiPaolo)

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) NO₂	NO₃	NH₃
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) NO₂	NO₃	NH₃
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) NO₂	NO₃	NH₃
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

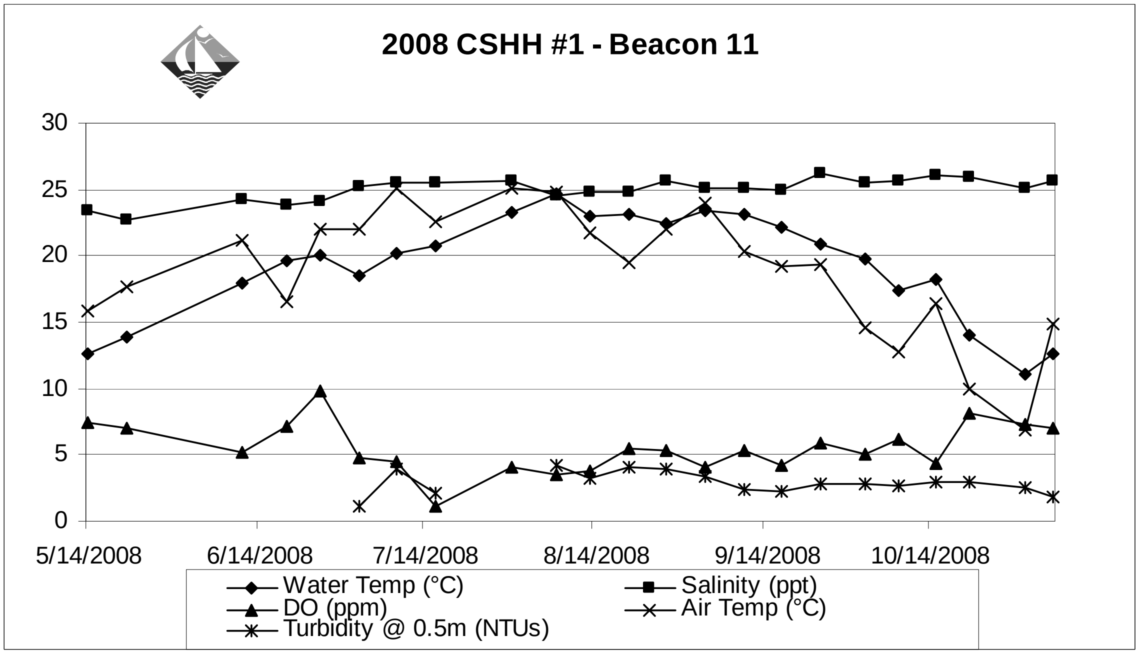
WAVE HEIGHT - should be entered to nearest half foot, using two digits: CALM = 0.0; 2 1/2 FOOT WAVES = 2.5

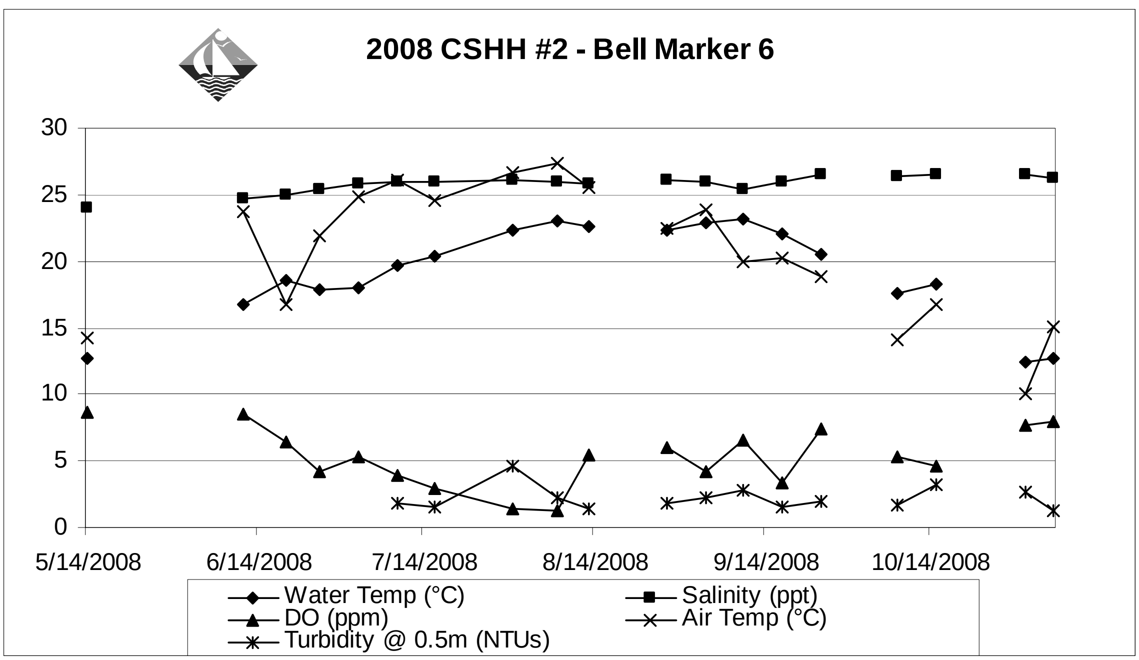
SAMPLE TYPE - 3 = fresh water pond/stream/drain, 4 = sewage, 5 = beach, 6 = other

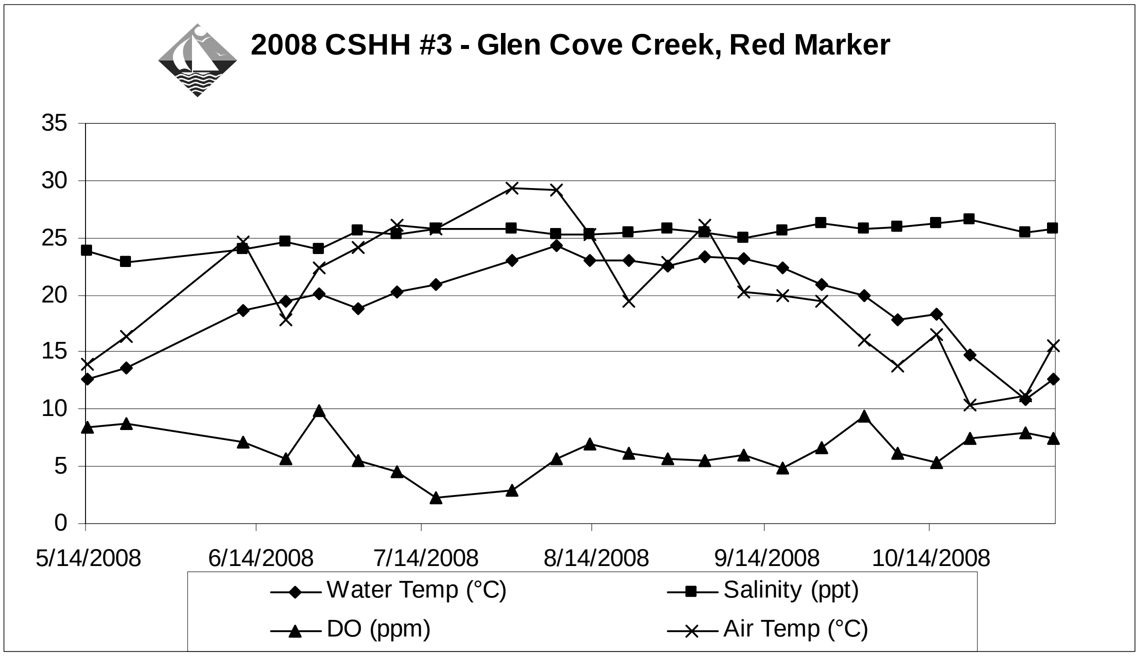
COMMENTS, REMARKS - use this area to record any unusal conditions or observations.

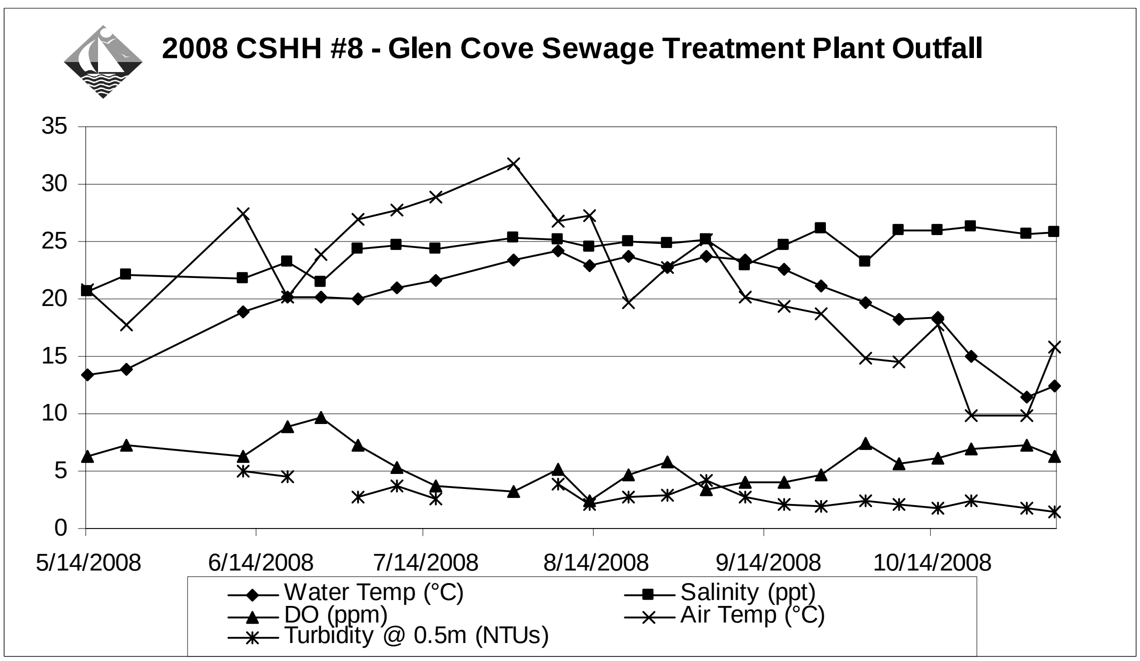
APPENDIX A

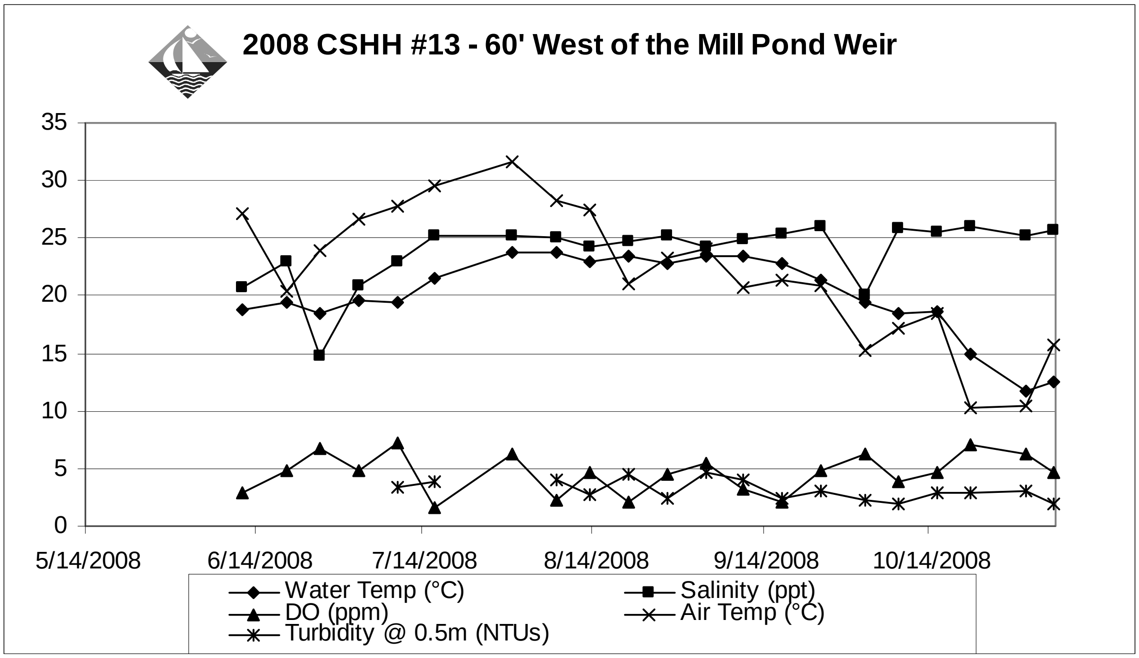
2008 Field Monitoring Results

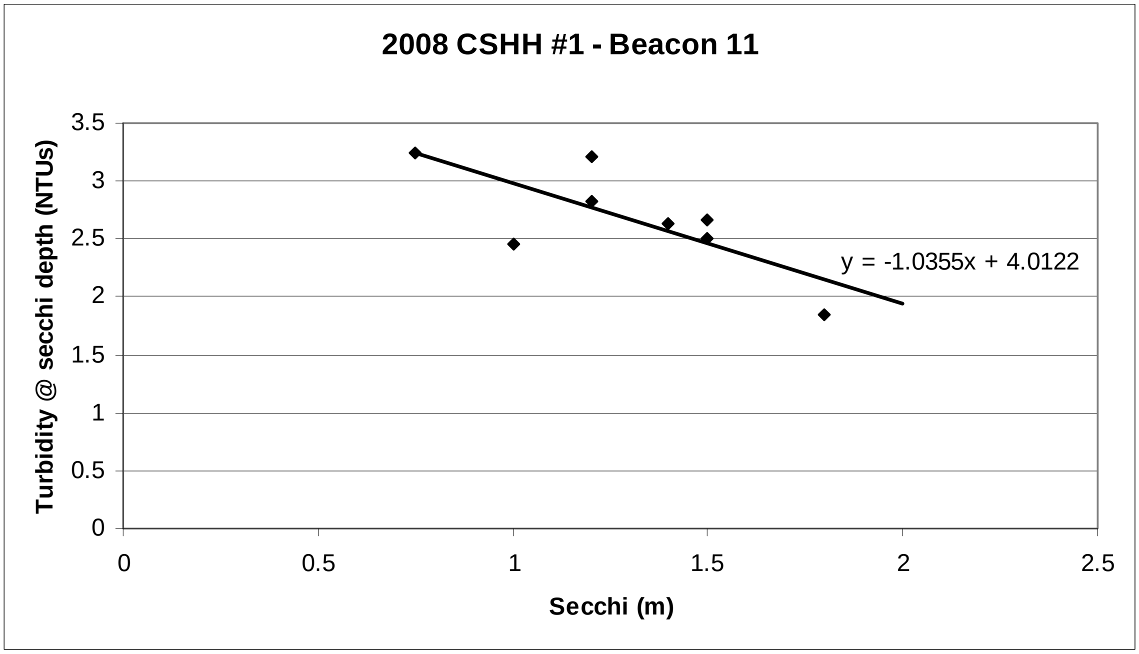

2008 CSHH #1 - Beacon 11
30
25
20
15
10
5
0
5/14/2008
6/14/2008
7/14/2008
8/14/2008
9/14/2008
10/14/2008
Water Temp (°C)
Salinity (ppt)
DO (ppm)
Air Temp (°C)
Turbidity @ 0.5m (NTUs)

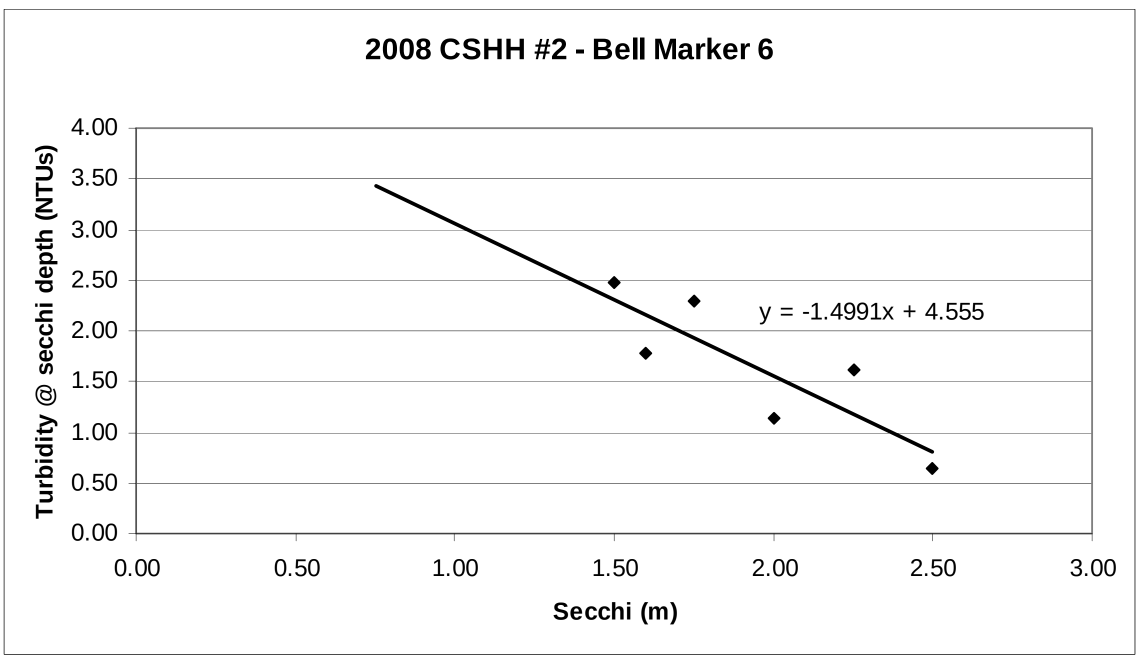

2008 CSHH #2 - Bell Marker 6
30
25
20
15
10
5
0
5/14/2008
6/14/2008
7/14/2008
8/14/2008
9/14/2008
10/14/2008
Water Temp (°C)
Salinity (ppt)
DO (ppm)
Air Temp (°C)
Turbidity @ 0.5m (NTUs)

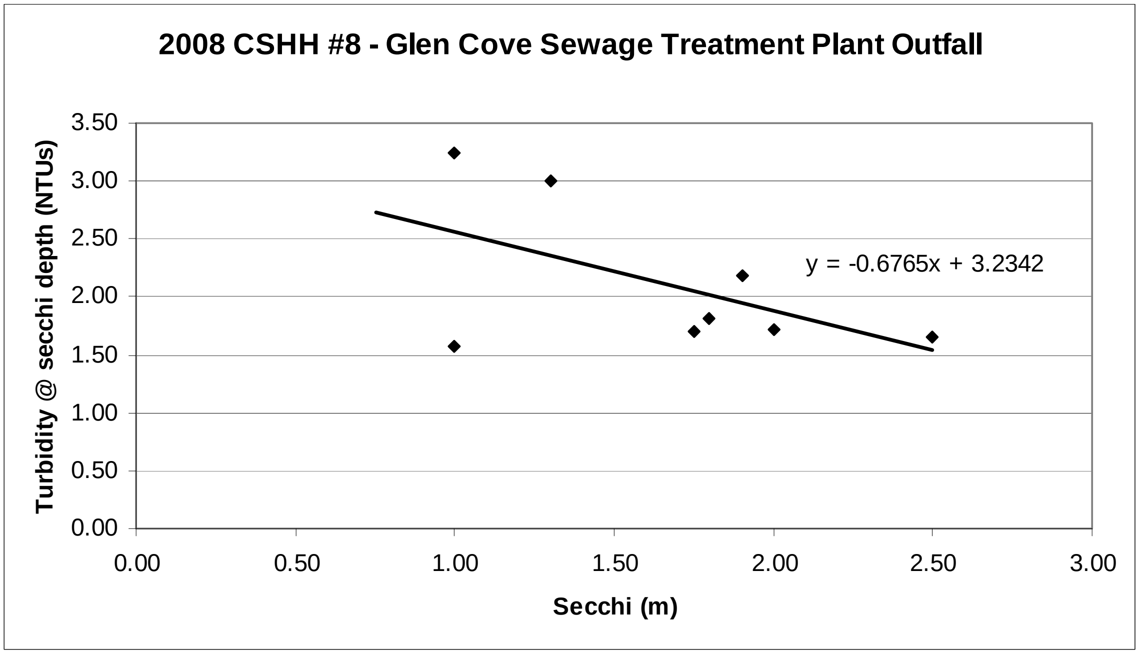

2008 CSHH #3 - Glen Cove Creek, Red Marker
35
30
25
20
15
10
5
0
5/14/2008
6/14/2008
7/14/2008
8/14/2008
9/14/2008
10/14/2008
Water Temp (°C)
Salinity (ppt)
DO (ppm)
Air Temp (°C)

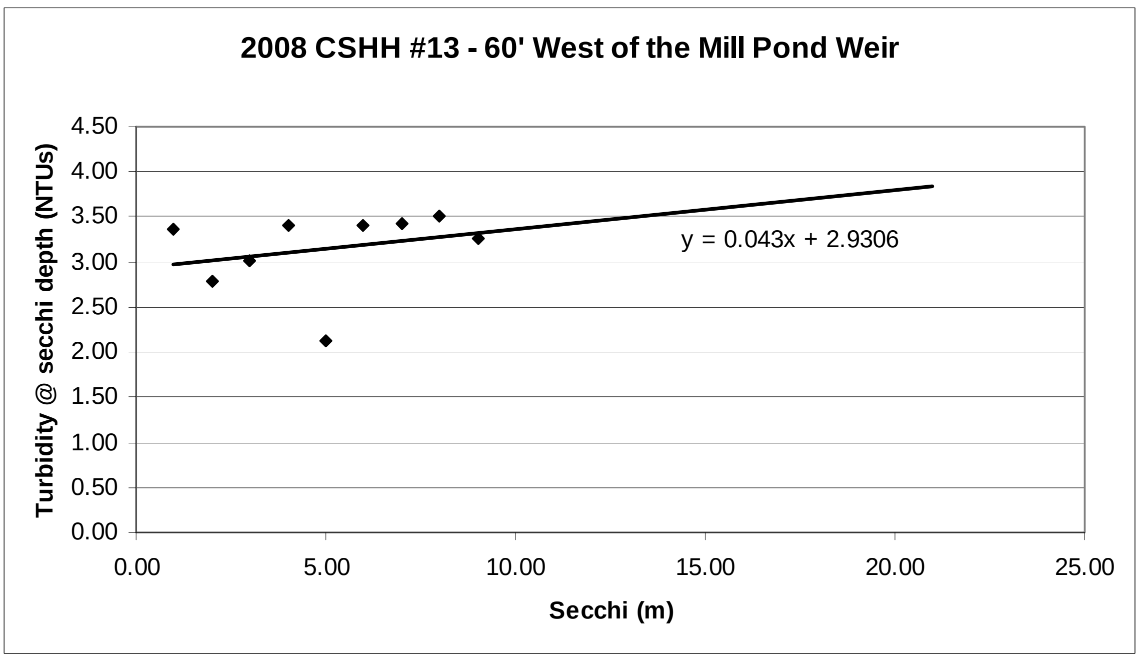

2008 CSHH #8 - Glen Cove Sewage Treatment Plant Outfall
35
30
25
20
15
10
5
0
5/14/2008
6/14/2008
7/14/2008
8/14/2008
9/14/2008
10/14/2008
Water Temp (°C)
Salinity (ppt)
DO (ppm)
Air Temp (°C)
Turbidity @ 0.5m (NTUs)


2008 CSHH #13 - 60' West of the Mill Pond Weir
35
30
25
20
15
10
5
0
5/14/2008
6/14/2008
7/14/2008
8/14/2008
9/14/2008
10/14/2008
Water Temp (°C)
Salinity (ppt)
DO (ppm)
Air Temp (°C)
Turbidity @ 0.5m (NTUs)


2008 CSHH #1 - Beacon 11
Turbidity @ secchi depth (NTUs)
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
Secchi (m)
y = -1.0355x + 4.0122


2008 CSHH #2 - Bell Marker 6
Turbidity @ secchi depth (NTUs)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
Secchi (m)
y = -1.4991x + 4.555


2008 CSHH #8 - Glen Cove Sewage Treatment Plant Outfall
Turbidity @ secchi depth (NTUs)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
y = -0.6765x + 3.2342
0.00
0.50
1.00
1.50
2.00
2.50
3.00
Secchi (m)


2008 CSHH #13 - 60' West of the Mill Pond Weir
Turbidity @ secchi depth (NTUs)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
y = 0.043x + 2.9306
0.00
5.00
10.00
15.00
20.00
25.00
Secchi (m)

CSHH Water-Monitoring Program 2008

Date	**Water Temp (°C)**			**Salinity (ppt)**			**DO (ppm)**		**pH (ppm)**		**Air Temp**	**Secchi(m)**	**Turbidity**	**Depth (m)**	**Time**
	Surface	Bottom	Average	Surface	Bottom	Average	Surface	Bottom	Surface	Bottom	(°C)		(NTUs)	(bottom)	(AM)
CSHH #1 - Beacon 11															
11/5/08	12.51	12.60	12.56	25.37	25.85	25.61	6.98	7.06	7.5	7.5	14.8	1.8	1.89/1.84	3.4	8:55
10/31/08	10.25	11.87	11.06	24.19	25.96	25.08	8.90	7.31	7.7	7.6	6.8	1.5	2.55/2.50	2.7	8:30
10/21/08	13.95	13.98	13.97	25.95	25.96	25.96	8.39	8.16	7.7	7.6	9.9	0.75	2.94/3.25	4.6	8:55
10/15/08	18.12	18.26	18.19	25.85	26.19	26.02	6.54	4.41	7.7	7.4	16.4	1.4	2.89/2.64	3.9	8:45
10/8/08	17.19	17.64	17.42	25.23	25.99	25.61	7.48	6.12	7.7	7.5	12.7	1.2	2.71/3.21	3.5	8:45
10/2/08	19.58	20.08	19.83	25.27	25.69	25.48	6.73	5.04	7.6	7.5	14.6	1.2	2.74/2.82	2.6	8:30
9/24/08	20.75	21.09	20.92	25.87	26.5	26.19	9.65	5.86	8.1	7.7	19.3	1.0	2.79/2.46	5.0	8:45
9/17/08	22.11	22.31	22.21	24.77	25.14	24.96	4.52	4.22	7.6	7.5	19.2	1.5	2.26/2.66	2.9	8:34
9/10/08	23.03	23.23	23.13	25.09	25.18	25.14	5.70	5.33	7.5	7.6	20.3	1.5	2.34	4.6	8:30
9/3/08	23.46	23.32	23.39	24.88	25.32	25.10	6.28	4.02	7.8	7.5	24.0	0.75	3.31	2.7	8:45
8/27/08	22.29	22.57	22.43	25.49	25.88	25.69	9.40	5.38	8.1	7.7	22.0	0.80	3.87	5.2	8:45
8/20/08	23.07	23.08	23.08	24.7	24.92	24.81	6.51	5.41	7.8	7.7	19.5	0.75	4.03	2.7	8:35
8/13/08	23.10	22.81	22.96	24.16	25.56	24.86	8.86	3.77	8.0	7.4	21.7	0.75	3.23	4.2	8:45
8/7/08	24.86	24.54	24.70	24.19	24.74	24.47	3.83	3.5	7.4	7.3	24.8	1.00	4.20	2.8	8:45
7/30/08	24.15	22.46	23.31	25.43	25.86	25.65	9.12	4.09	7.9	7.4	25.1	1.25		4.6	8:30
7/16/08	22.53	19.02	20.78	25.08	26.08	25.58	6.57	1.17	7.6	7.2	22.6	1.80	2.08	4.5	9:00
7/9/08	20.47	20.02	20.25	25.39	25.54	25.47	5.23	4.52	7.4	7.4	25.1	1.50	3.88	3.1	8:36
7/2/08	19.35	17.74	18.55	25.04	25.53	25.29	7.82	4.7	7.8	7.4	22.0	1.00	1.10	4.2	8:25
6/25/08	20.03	19.97	20.00	24.1	24.18	24.14	9.47	9.76	8.1	8.1	22.0	1.00		2.8	8:47
6/19/08	19.71	19.58	19.65	23.51	24.29	23.90	11.48	7.20	8.2	7.9	16.6	0.75		3.4	8:50
6/11/08	18.89	16.89	17.89	24.04	24.33	24.19	6.82	5.17	7.6	7.4	21.2	1.00		4.6	8:45
5/21/08	13.93	13.72	13.83	22.19	23.32	22.76	7.93	6.98	7.7	7.7	17.7	1.00		3.3	9:07
5/14/08	13.24	12.13	12.69	22.72	24.06	23.39	8.99	7.42	7.9	7.8	15.9	2.00		5.4	8:15
Average			*19.25*			*25.01*		*5.50*		*7.55*	*18.88*				

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH (ppm)		Air Temp	Secchi(m)	Turbidity	Depth (m)	Time
	Surface	Bottom	Average	Surface	Bottom	Average	Surface	Bottom	Surface	Bottom	(°C)		(NTUs)	(bottom)	(AM)
CSHH #2 - Bell Marker 6															
11/5/08	12.77	12.64	12.71	26.05	26.32	26.19	8.45	7.98	7.7	7.7	15.1	2.50	1.28/0.64	6.5	9:35
10/31/08	12.32	12.49	12.41	26.40	26.51	26.46	8.65	7.62	7.7	7.7	10.0	1.50	2.62/2.47	8.4	9:05
10/21/08	Station abandoned because of wind and waves.														
10/15/08	18.11	18.33	18.22	26.36	26.59	26.48	7.12	4.65	7.6	7.4	16.7	1.75	3.15/2.3	8.2	9:15
10/8/08	17.19	18.08	17.64	26.16	26.56	26.36	7.28	5.34	7.7	7.5	14.1	2.25	1.72/1.61	7.7	9:27
10/2/08	ABANDONED STATION BECAUSE OF WIND AND WAVES.														
9/24/08	20.47	20.52	20.50	26.32	26.68	26.50	8.79	7.37	8.1	7.8	18.8	1.60	1.94/1.78	7.3	10:15
9/17/08	21.95	22.22	22.09	25.79	26.11	25.95	5.79	3.32	7.8	7.6	20.2	2.00	1.52/1.14	6.6	9:05
9/10/08	23.22	23.23	23.23	25.42	25.51	25.47	7.37	6.53	8.0	7.9	19.9	1.50	2.78	7.4	9:00
9/3/08	23.07	22.80	22.94	25.72	26.21	25.97	5.96	4.13	7.7	7.5	23.8	1.50	2.20	6.3	9:10
8/27/08	22.41	22.34	22.38	26.11	26.18	26.15	6.81	6.01	7.9	7.8	22.4	1.50	1.76	7.8	10:25
8/20/08	Station abandoned because of wind and waves.														
8/13/08	23.07	22.02	22.55	25.75	25.87	25.81	8.38	5.51	8.0	7.7	25.6	1.50	1.40	8.8	9:18
8/7/08	24.10	21.99	23.05	25.64	26.23	25.94	10.04	1.28	8.1	7.2	27.4	1.00	2.30	7.7	9:22
7/30/08	23.88	20.70	22.29	25.87	26.18	26.03	11.80	1.37	8.3	7.2	26.7	0.75	4.60	9.2	10:15
7/16/08	22.40	18.35	20.38	25.64	26.15	25.90	8.67	2.87	8.0	7.3	24.6	2.00	1.50	8.3	10:36
7/9/08	20.57	18.89	19.73	25.81	26.02	25.92	8.15	3.94	7.9	7.4	26.1	2.00	1.76	7.6	9:17
7/2/08	19.15	16.82	17.99	25.62	25.87	25.75	10.28	5.30	8.2	7.5	24.9	1.50		9.5	10:25
6/25/08	19.77	16.04	17.91	25.14	25.60	25.37	11.01	4.15	8.3	7.4	21.9	1.25		7.4	9:15
6/19/08	20.27	16.84	18.56	24.59	25.41	25.00	11.57	6.35	8.4	7.8	16.8	2.00		7.7	9:30
6/11/08	18.27	15.20	16.74	24.57	24.86	24.72	9.58	8.54	8.0	7.6	23.7	1.50		8.5	9:35
5/21/08	Engine problems prevented monitoring at all stations.														
5/14/08	13.15	12.13	12.64	23.74	24.22	23.98	9.46	8.72	8.0	8.0	14.2	2.50		8.6	8:45
Average			*19.15*			*25.78*		*5.31*		*7.58*	*20.68*				

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH (ppm)		Air Temp (°C)	Secchi(m)	Turbidity (NTUs)	Depth (m) (bottom)	Time (AM)
	Surface	Bottom	Average	Surface	Bottom	Average	Surface	Bottom	Surface	Bottom					
CSHH #3 - Glen Cove Creek, Red Marker															
11/5/08	12.65	12.60	12.63	25.27	26.36	25.82	7.85	7.49	7.7	7.6	15.6	2.00		3.7	10:05
10/31/08	10.61	11.13	10.87	25.15	25.64	25.40	8.89	7.91	7.7	7.7	11.1	2.00	1.95/2.59	3.5	9:30
10/21/08	14.63	14.78	14.71	26.30	26.75	26.53	7.57	7.49	7.71	7.7	10.4	1.00		3.6	9:25
10/15/08	18.17	18.35	18.26	26.19	26.41	26.30	6.17	5.29	7.53	7.4	16.6	1.75		4.7	9:40
10/8/08	17.69	17.93	17.81	25.51	26.24	25.88	6.92	6.12	7.63	7.6	13.8	2.00	1.39/1.79	4.0	9:55
10/2/08	19.93	19.97	19.95	25.80	25.81	25.81	9.45	9.45	8.0	8.0	16.0	1.00		2.7	9:10
9/24/08	21.02	20.82	20.92	25.77	26.66	26.22	9.33	6.62	8.0	7.7	19.5	1.20		4.6	10:43
9/17/08	22.21	22.47	22.34	25.43	25.88	25.66	5.64	4.81	7.7	7.6	20.0	1.80		3.9	9:35
9/10/08	22.94	23.25	23.10	24.56	25.44	25.00	7.44	6.03	8.0	7.8	20.2	1.00		4.8	9:25
9/3/08	23.43	23.33	23.38	25.21	25.74	25.48	8.53	5.49	8.1	7.7	26.1	0.80		2.8	9:37
8/27/08	22.73	22.37	22.55	25.55	26.03	25.79	7.36	5.62	7.9	7.7	22.8	1.50		5.0	10:50
8/20/08	22.96	23.16	23.06	25.26	25.49	25.38	8.14	6.11	8.1	7.9	19.5	1.00		3.8	9:55
8/13/08	23.10	22.98	23.04	24.76	25.65	25.21	9.72	6.90	8.1	7.9	25.2	1.25		5.1	9:40
8/7/08	24.68	23.96	24.32	25.12	25.54	25.33	8.67	5.67	8.0	7.6	29.1	1.00		3.3	9:40
7/30/08	24.17	21.71	22.94	25.54	26.03	25.79	10.48	2.99	8.2	7.3	29.3	1.25	1.57	5.2	10:45
7/16/08	22.92	18.94	20.93	25.38	26.04	25.71	6.97	2.26	7.7	7.2	25.7	2.25		4.9	11:00
7/9/08	21.22	19.25	20.24	24.89	25.82	25.36	7.83	4.46	7.7	7.4	26.1	1.50	1.66	3.4	9:45
7/2/08	19.99	17.65	18.82	25.43	25.68	25.56	10.02	5.59	8.2	7.6	24.2	1.50		5.4	10:50
6/25/08	21.01	19.21	20.11	22.78	25.10	23.94	8.68	9.90	8.1	8.0	22.4	1.50		3.1	9:45
6/19/08	20.26	18.68	19.47	24.22	25.04	24.63	12.08	5.62	8.4	7.6	17.8	1.20		4.3	10:10
6/11/08	20.42	16.80	18.61	23.4	24.53	23.97	9.78	7.06	8.0	7.7	24.6	1.25		4.1	10:00
5/21/08	13.89	13.44	13.67	22.68	23.06	22.87	8.57	8.70	7.8	7.8	16.3	1.75		3.8	9:45
5/14/08	13.19	12.20	12.70	23.45	24.32	23.89	9.56	8.45	8.0	7.9	14.0	2.50		4.9	10:15
Average			*19.32*			*25.28*		*6.35*		*7.68*	*20.27*				

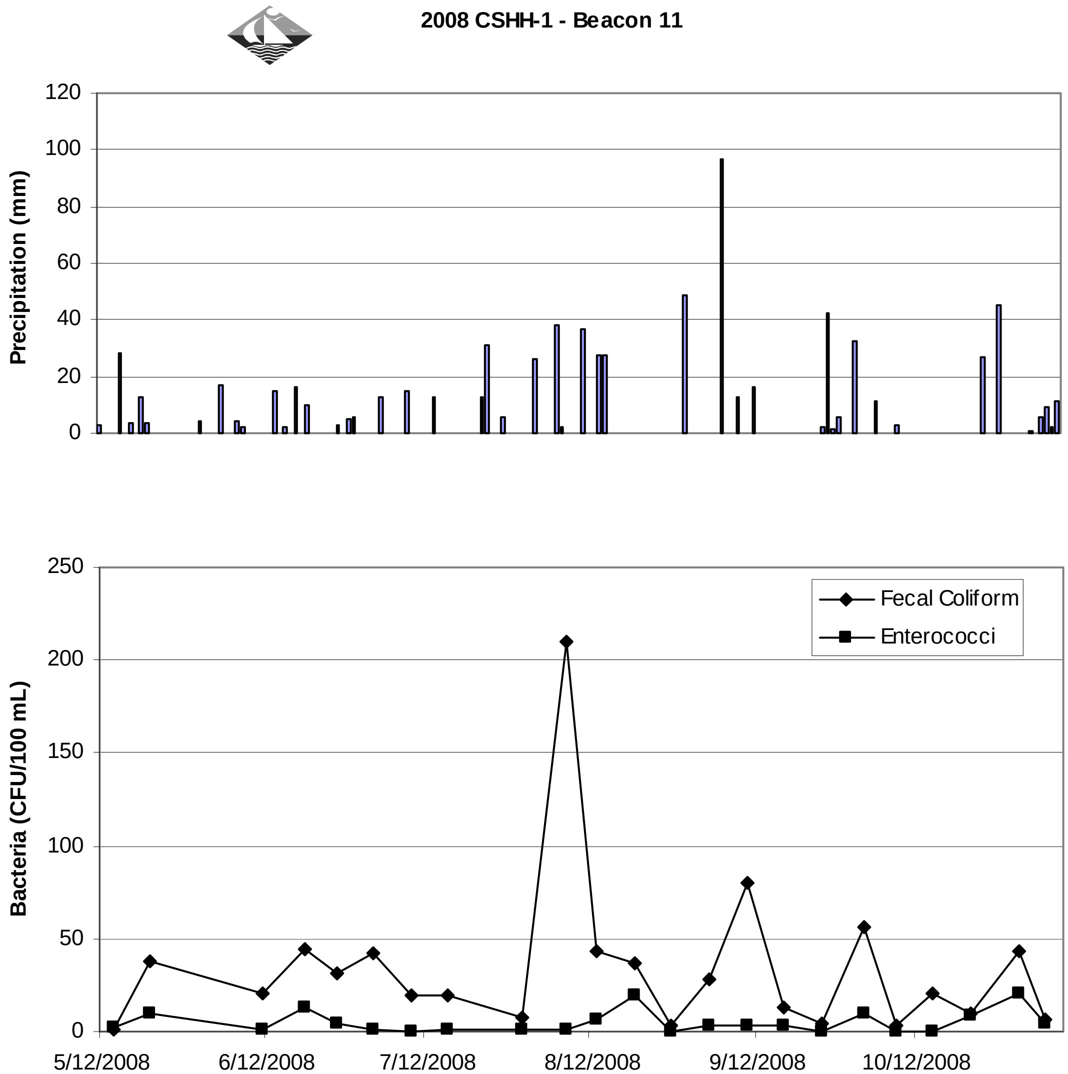
Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH (ppm)		Air Temp	Secchi(m)	Turbidity	Depth (m)	Time
	Surface	Bottom	Average	Surface	Bottom	Average	Surface	Bottom	Surface	Bottom	(°C)		(NTUs)	(bottom)	(AM)
CSHH #8 - Glen Cove Sewage Treatment Plant Outfall															
11/5/08	12.46	12.47	12.47	25.65	25.96	25.81	7.20	6.34	7.6	7.5	15.8	2.50	1.53/1.66	2.8	10:40
10/31/08	10.92	11.88	11.40	24.90	26.27	25.59	8.11	7.23	7.7	7.6	9.9	2.00	1.82/1.72	3.1	10:00
10/21/08	15.47	14.63	15.05	25.79	26.64	26.22	6.64	7.01	7.6	7.7	9.9	1.30	2.46/3.01	3.2	9:55
10/15/08	18.63	18.25	18.44	25.73	26.14	25.94	6.48	6.06	7.5	7.5	17.7	1.80	1.8/1.81	4.5	10:08
10/8/08	18.65	17.96	18.31	25.95	26.07	26.01	5.23	5.65	7.5	7.5	14.5	1.75	2.13/1.7	3.0	10:15
10/2/08	18.60	20.69	19.65	20.70	25.74	23.22	8.51	7.38	7.8	7.7	14.9	1.00	2.48/3.24	2.3	9:45
9/24/08	21.01	21.32	21.17	25.62	26.50	26.06	9.58	4.61	8.1	7.5	18.7	1.00	1.96/1.58	3.3	11:05
9/17/08	22.50	22.52	22.51	23.65	25.65	24.65	4.92	4.09	7.60	7.6	19.3	1.90	2.10/2.19	2.9	10:05
9/10/08	23.32	23.56	23.44	20.25	25.41	22.83	5.90	4.06	7.8	7.6	20.1	1.25	2.76	3.2	9:45
9/3/08	24.04	23.27	23.66	24.48	25.78	25.13	8.37	3.40	8.0	7.5	25.1	0.75	4.13	2.6	10:00
8/27/08	23.02	22.42	22.72	23.92	25.75	24.84	5.96	5.76	7.6	7.7	22.8	1.25	2.88	4.2	11:05
8/20/08	23.69	23.57	23.63	24.64	25.28	24.96	8.31	4.64	7.8	7.5	19.7	1.25	2.69	3.1	10:40
8/13/08	22.97	22.91	22.94	23.74	25.28	24.51	8.73	2.34	8.0	7.4	27.2	1.00	2.17	4.2	10:10
8/7/08	24.41	24.01	24.21	24.65	25.52	25.09	6.58	5.20	7.7	7.6	26.8	1.25	3.82	2.5	10:18
7/30/08	24.36	22.27	23.32	24.91	25.76	25.34	11.95	3.16	8.3	7.4	31.7	1.00		4.4	11:10
7/16/08	22.31	20.97	21.64	22.95	25.75	24.35	6.87	3.67	7.6	7.3	28.8	0.75	2.64	4.6	11:13
7/9/08	21.83	19.99	20.91	23.78	25.58	24.68	10.37	5.26	7.9	7.4	27.7	1.00	3.65	2.5	10:13
7/2/08	21.01	18.90	19.96	23.34	25.47	24.41	8.98	7.23	7.9	7.8	27.0	1.00	2.78	4.9	11:15
6/25/08	20.65	19.59	20.12	17.99	24.88	21.44	10.90	9.75	8.0	8.0	23.9	1.25		2.2	10:16
6/19/08	20.22	20.02	20.12	21.85	24.47	23.16	11.47	8.90	8.3	8.0	20.1	1.00	4.53	3.8	10:40
6/11/08	20.07	17.63	18.85	19.30	24.31	21.81	8.25	6.36	7.7	7.5	27.4	1.25	4.97	2.8	10:50
5/21/08	13.87	13.72	13.80	20.86	23.36	22.11	8.58	7.29	7.7	7.7	17.8	1.00		3.3	10:15
5/14/08	13.93	12.71	13.32	17.26	23.97	20.62	8.93	6.32	7.8	7.6	20.8	2.00		4.2	10:45
Average			*19.63*			*24.29*		*5.73*		*7.59*	*21.20*				

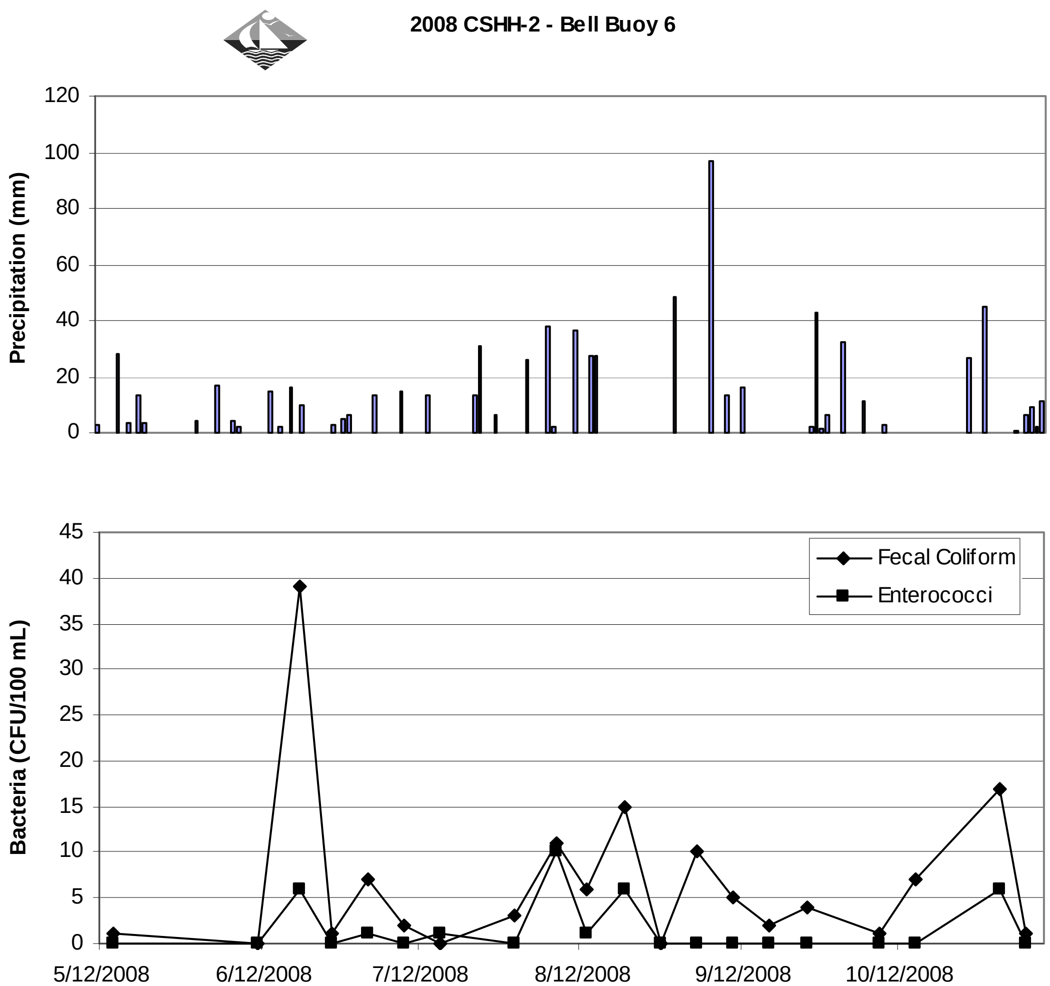
Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH (ppm)		Air Temp (°C)	Secchi(m)	Turbidity (NTUs)	Depth (m) (bottom)	Time (AM)
	Surface	Bottom	Average	Surface	Bottom	Average	Surface	Bottom	Surface	Bottom					
CSHH #13 - 60' West of the Mill Pond Weir															
11/5/08	12.59	12.57	12.58	25.70	25.83	25.77	6.63	4.68	7.50	7.41	15.8	1.50	1.98/3.37	1.9	11:05
10/31/08	11.92	11.64	11.78	24.35	26.09	25.22	6.80	6.23	7.41	7.43	10.4	2.00	2.98/2.79	1.9	10:10
10/21/08	15.43	14.34	14.89	25.70	26.42	26.06	5.42	7.10	7.47	7.67	10.2	1.20	2.95/3.01	2.5	10:18
10/15/08	18.69	18.47	18.58	25.32	25.89	25.61	6.00	4.58	7.47	7.34	18.5	1.25	2.95/3.41	3.2	10:30
10/8/08	18.59	18.31	18.45	25.78	26.05	25.92	3.38	3.80	7.30	7.30	17.1	1.80	1.89/2.12	2.5	10:43
10/2/08	18.80	20.07	19.44	16.26	23.90	20.08	8.49	6.20	7.37	7.37	15.3	1.10	2.21/3.41	1.2	10:02
9/24/08	21.35	21.39	21.37	25.68	26.29	25.99	7.36	4.78	7.71	7.43	20.8	1.00	3.08/3.42	2.0	11:30
9/17/08	22.80	22.73	22.77	25.03	25.62	25.33	3.16	2.13	7.4	7.4	21.3	2.00	2.37/3.51	3.6	10:25
9/10/08	23.26	23.61	23.44	24.25	25.40	24.83	7.38	3.15	7.7	7.3	20.7	1.00	4.05/3.27	3.1	10:00
9/3/08	23.58	23.42	23.50	23.54	24.87	24.21	7.81	5.52	7.8	7.6	24.1	0.75	4.66	1.3	10:20
8/27/08	22.88	22.78	22.83	24.81	25.73	25.27	5.35	4.55	7.5	7.5	23.3	1.25	2.35	2.7	11:30
8/20/08	23.44	23.44	23.44	24.58	24.94	24.76	3.10	2.08	7.5	7.3	21.1	1.25	4.53	3.5	11:05
8/13/08	23.06	23.01	23.04	23.86	24.7	24.28	5.95	4.59	7.6	7.5	27.4	1.30	2.68	3.1	10:30
8/7/08	24.18	23.49	23.84	24.69	25.30	25.00	3.95	2.23	7.5	7.3	28.3	1.50	3.94	2.3	10:35
7/30/08	24.10	23.52	23.81	24.86	25.51	25.19	10.69	6.24	8.0	7.6	31.7	1.00		3.6	11:30
7/16/08	22.65	20.47	21.56	24.65	25.61	25.13	8.66	1.66	7.8	7.1	29.6	1.00	3.78	4.4	11:41
7/9/08	18.58	20.27	19.43	21.07	24.77	22.92	8.44	7.21	7.5	7.4	27.7	1.00	3.45	1.1	10:30
7/2/08	20.53	18.78	19.66	16.27	25.35	20.81	9.75	4.81	7.9	7.4	26.6	1.00		3.9	11:35
6/25/08	18.31	18.68	18.50	4.60	24.83	14.72	13.06	6.70	7.9	7.5	23.9	-----		2.4	10:30
6/19/08	19.86	18.96	19.41	21.67	24.21	22.94	11.92	4.82	8.1	7.4	20.4	1.00		4.1	11:00
6/11/08	20.25	17.16	18.71	17.30	24.18	20.74	14.40	2.91	8.4	7.2	27.1	1.00		2.9	11:15
Average			*20.05*			*23.84*		*4.57*		*7.40*	*21.97*				

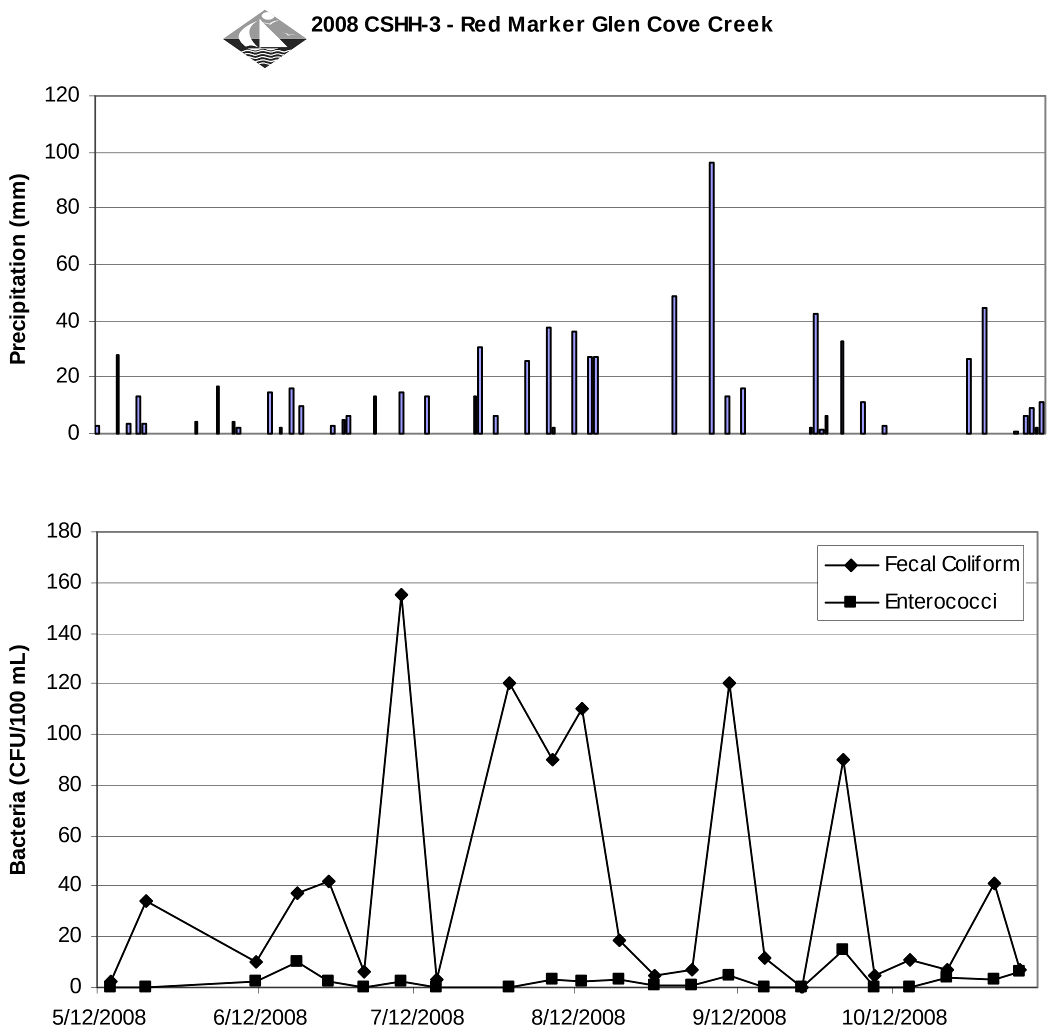
Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH (ppm)		Air Temp	Secchi(m)	Turbidity	Depth (m)	Time
	Surface	Bottom	Average	Surface	Bottom	Average	Surface	Bottom	Surface	Bottom	(°C)		(NTUs)	(bottom)	(AM)
CSHH #4 - North Hempstead Beach (former Bar Beach) Spit															
10/15/08	18.09	18.09	18.09	26.01	26.02	26.02	5.61	5.59	7.47	7.5	19.4	1.50		4.6	11:00
8/27/08	22.52	22.51	22.52	25.55	25.60	25.58	6.86	6.46	7.9	7.8	21.6	0.80		2.0	10:05
7/30/08	24.19	23.66	23.93	25.37	25.64	25.51	10.41	7.87	8.1	7.8	27.2	0.60		2.3	8:50
7/16/08	22.13	19.80	20.97	25.31	25.92	25.62	5.46	1.70	7.5	7.2	22.7	1.50		5.9	9:16
7/2/08	19.32	17.97	18.65	25.06	25.49	25.28	7.55	4.67	7.8	7.5	23.3	0.75		6.4	8:45
Average			*20.83*			*25.60*		*5.26*		*7.54*	*22.84*				
CSHH #5 - Mott's Cove															
10/15/08	18.22	18.28	18.25	25.60	26.03	25.82	4.82	4.62	7.4	7.3	19.3	1.50		2.2	11:15
8/27/08	22.49	22.49	22.49	25.12	25.45	25.29	8.74	6.55	8.0	7.9	21.0	0.75		1.9	9:50
7/30/08	23.87	23.72	23.80	25.09	25.46	25.28	6.64	5.72	7.6	7.6	27.4	0.75		1.8	9:10
7/16/08	21.33	21.22	21.28	25.31	25.52	25.42	2.99	2.98	7.3	7.2	23.0	1.25		1.6	9:35
7/2/08	19.00	18.93	18.97	25.06	25.09	25.08	5.59	5.58	7.5	7.5	23.6	0.75		1.5	9:05
Average			*20.96*			*25.37*		*5.09*		*7.50*	*22.86*				
CSHH #6 - East of Former Incinerator Site															
10/15/08	18.22	18.20	18.21	25.31	25.95	25.63	5.62	4.80	7.4	7.4	19.8	1.50		5.8	11:28
8/27/08	22.51	22.44	22.48	24.90	25.14	25.02	9.57	7.66	8.1	8.0	22.3	0.75		2.1	9:35
7/30/08	24.61	24.17	24.39	25.08	25.40	25.24	7.84	5.90	7.7	7.6	28.0	0.75		2.1	9:30
7/16/08	23.08	22.10	22.59	24.74	25.27	25.01	5.73	4.16	7.4	7.3	24.2	1.00		1.9	9:53
7/2/08	19.20	19.09	19.15	25.10	25.12	25.11	6.36	5.81	7.6	7.6	24.6	1.00		2.6	9:28
Average			*21.36*			*25.20*		*5.67*		*7.55*	*23.78*				
CSHH #7 - West of Bryant Landing (formerly site of oil dock)															
10/15/08	18.04	18.20	18.12	24.48	25.33	24.91	5.57	5.37	7.4	7.4	18.6	1.00	3.35/3.27	2.1	11:50
8/27/08	21.93	22.44	22.19	23.76	24.75	24.26	9.97	8.33	8.1	8.0	21.0	0.50	6.35	1.9	9:15
7/30/08	24.73	24.65	24.69	24.79	24.98	24.89	8.22	5.41	7.8	7.5	28.6	0.25	5.70	1.4	9:45
7/16/08	23.41	23.15	23.28	24.40	24.59	24.50	7.30	6.84	7.6	7.6	23.8	0.75		1.6	10:05
7/2/08	20.35	20.06	20.21	24.45	24.62	24.54	7.00	6.44	7.6	7.6	24.6	1.00	4.94	1.5	9:40
Average			*21.70*			*24.62*		*6.48*		*7.59*	*23.32*				

APPENDIX B

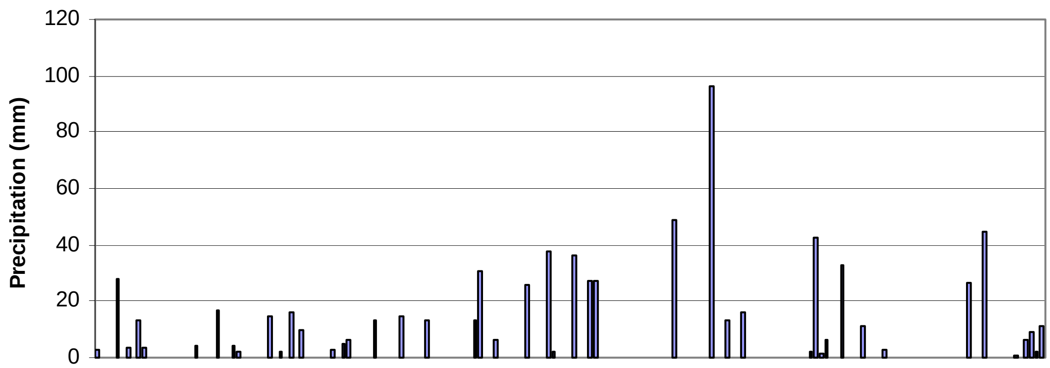
2008 Bacteria and Precipitation Data

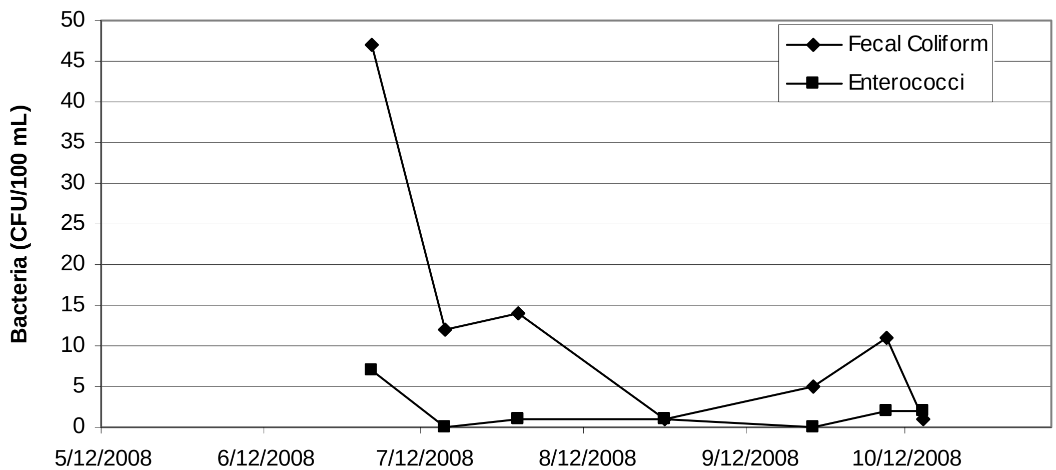

2008 CSHH-1 - Beacon 11
Precipitation (mm)
0
20
40
60
80
100
120
Bacteria (CFU/100 mL)
0
50
100
150
200
250
Fecal Coliform
Enterococci
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
10/12/2008


2008 CSHH-2 - Bell Buoy 6
Precipitation (mm)
120
100
80
60
40
20
0
Bacteria (CFU/100 mL)
45
40
35
30
25
20
15
10
5
0
Fecal Coliform
Enterococci
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
10/12/2008

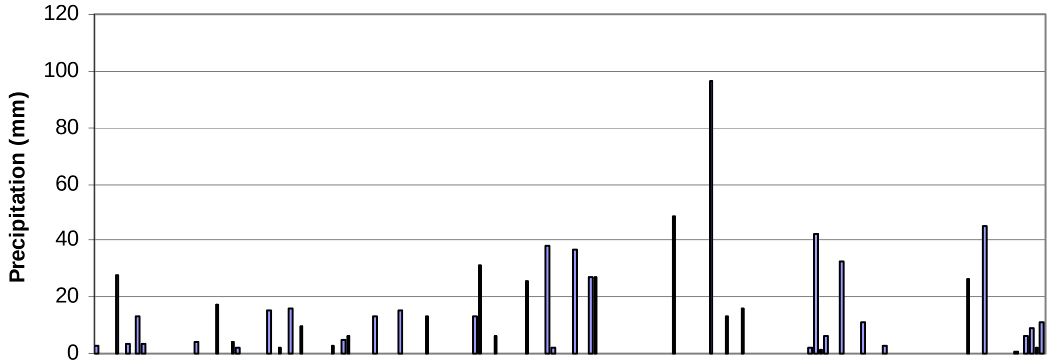

2008 CSHH-3 - Red Marker Glen Cove Creek
Precipitation (mm)
0
20
40
60
80
100
120
Bacteria (CFU/100 mL)
0
20
40
60
80
100
120
140
160
180
Fecal Coliform
Enterococci
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
10/12/2008

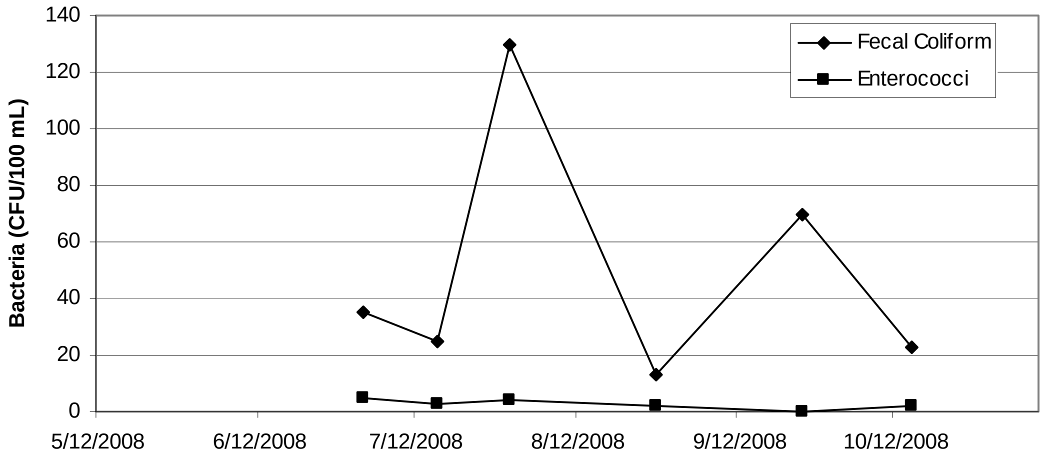
2008 CSHH-4 - North Hempstead Beach (S)(former Bar Beach) Spit Creek



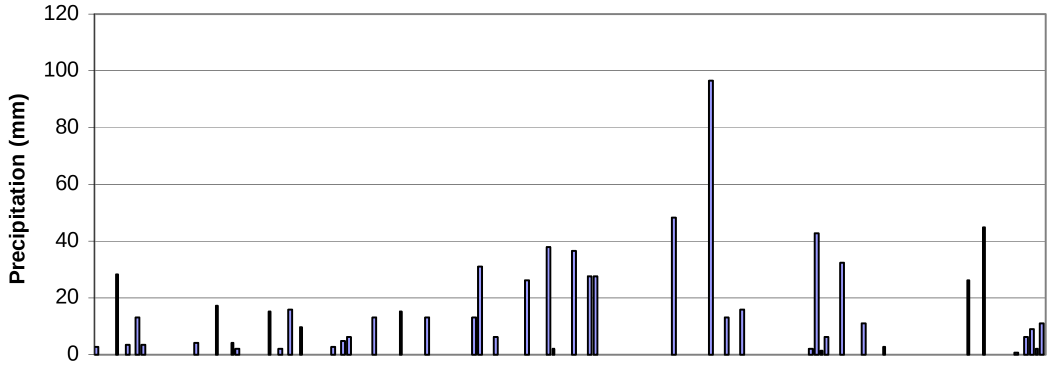


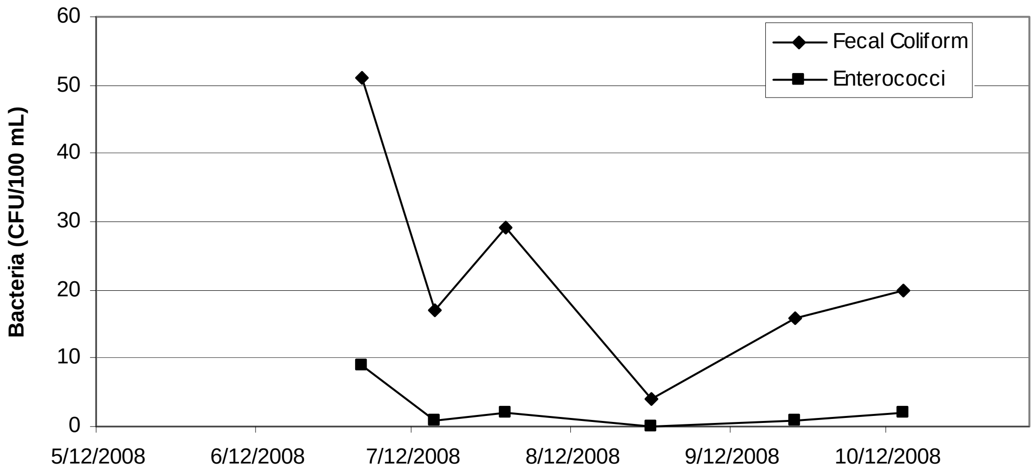
2008 CSHH-5 - Mott's Cove



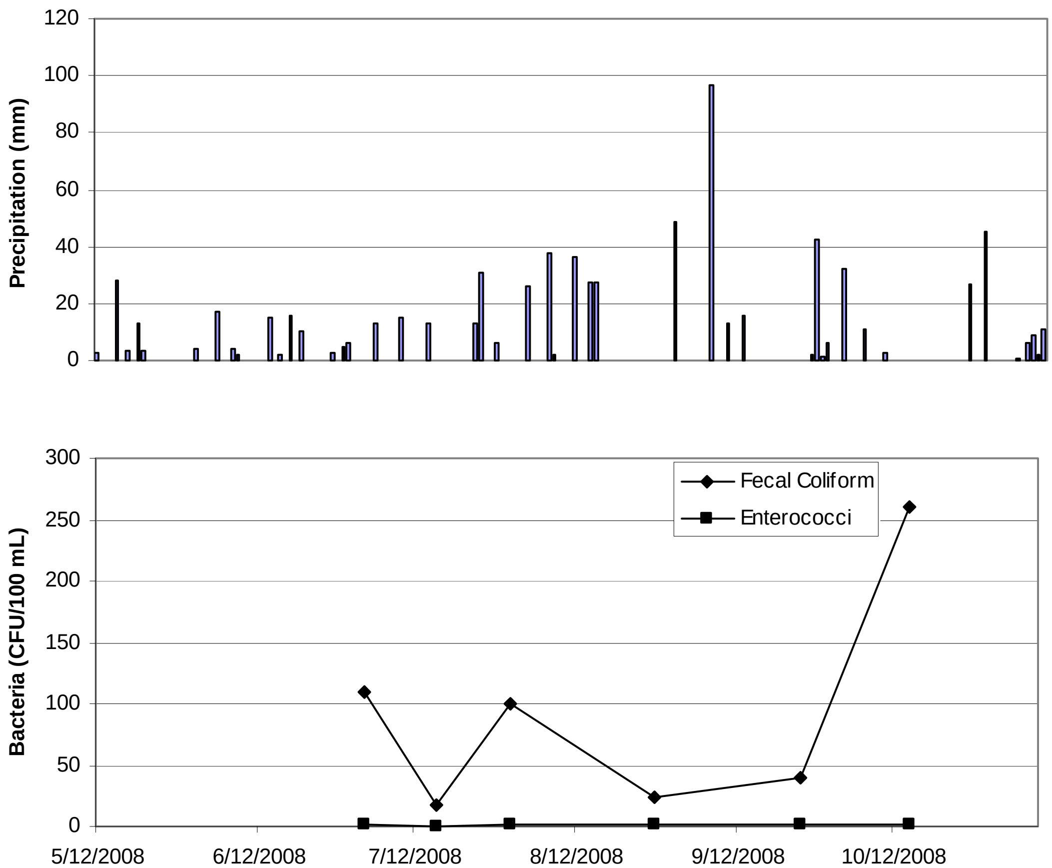


2008 CSHH-6 - East of the Incinerator

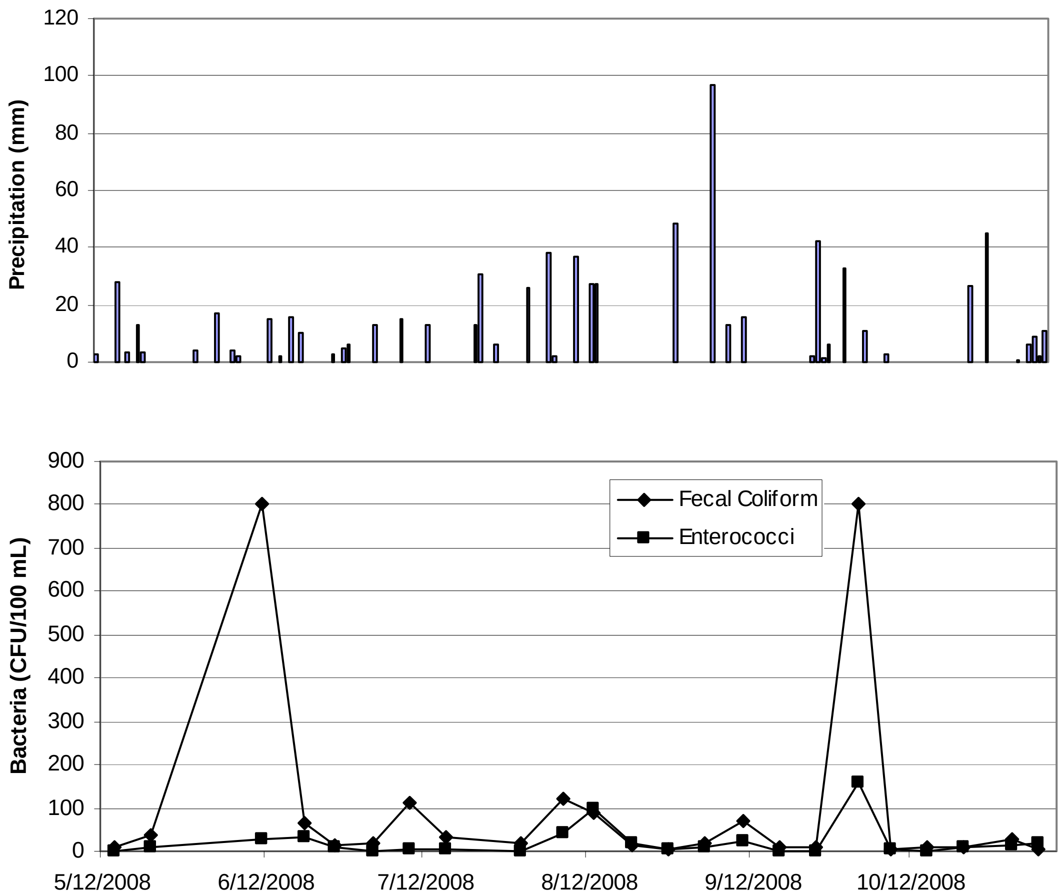




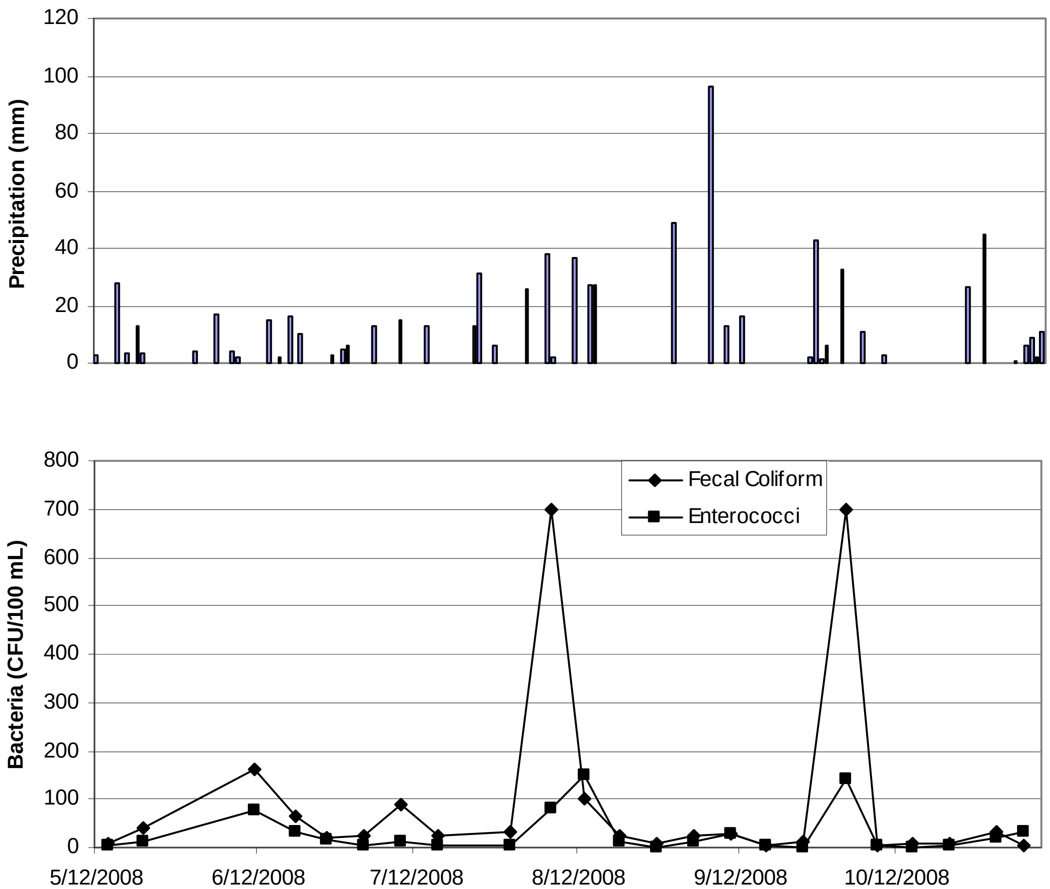
2008 CSHH-7 - Bryant Landing



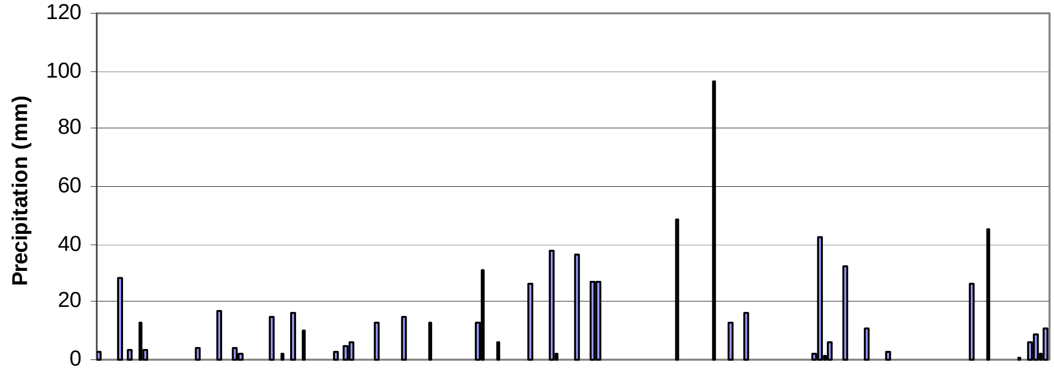
2008 CSHH-8 - Glen Cove STP

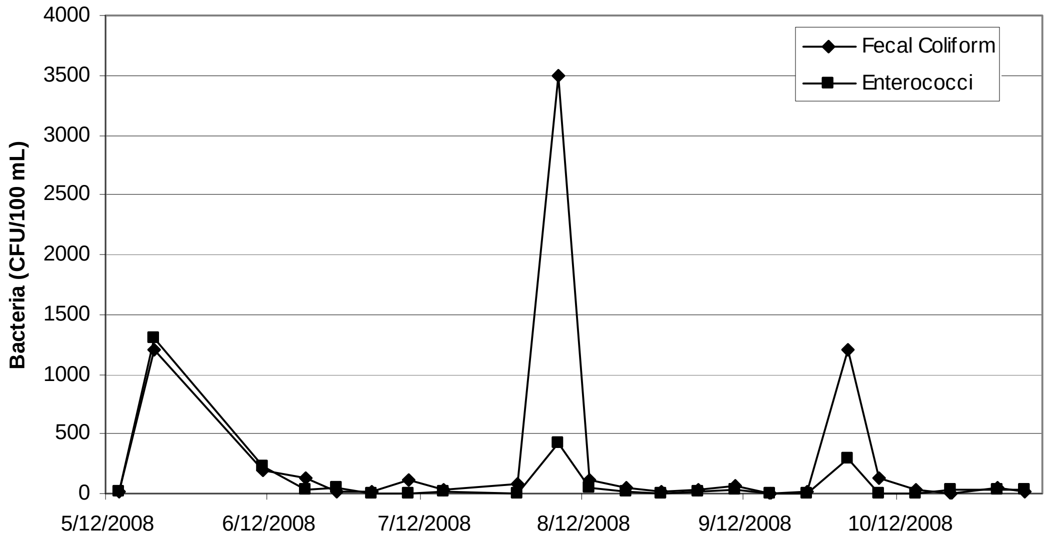


2008 CSHH-9 - First Pipe West of STP Outfall

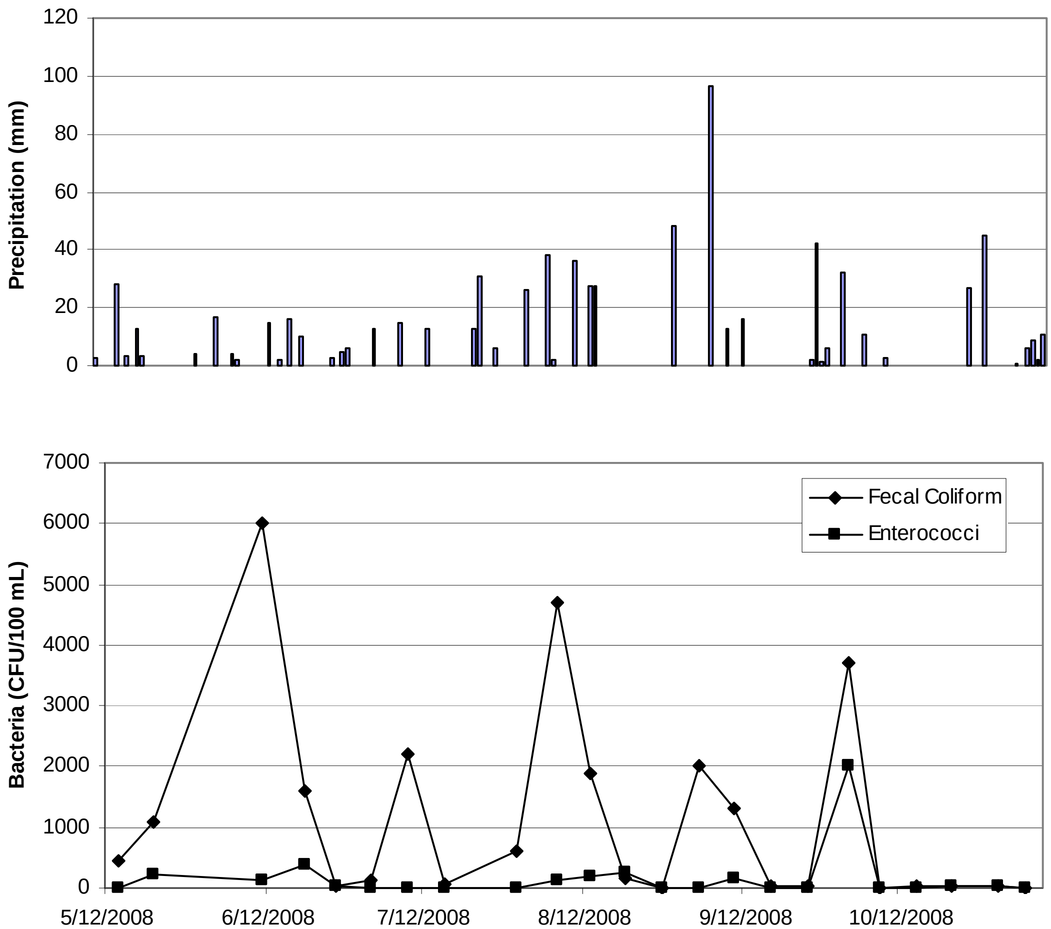


2008 CSHH-10 - Pipe at Corner of Seawall, West of STP Outfall

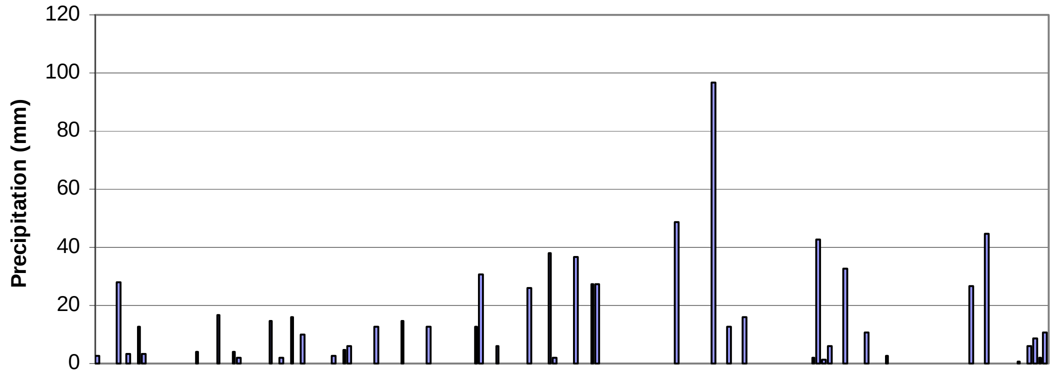


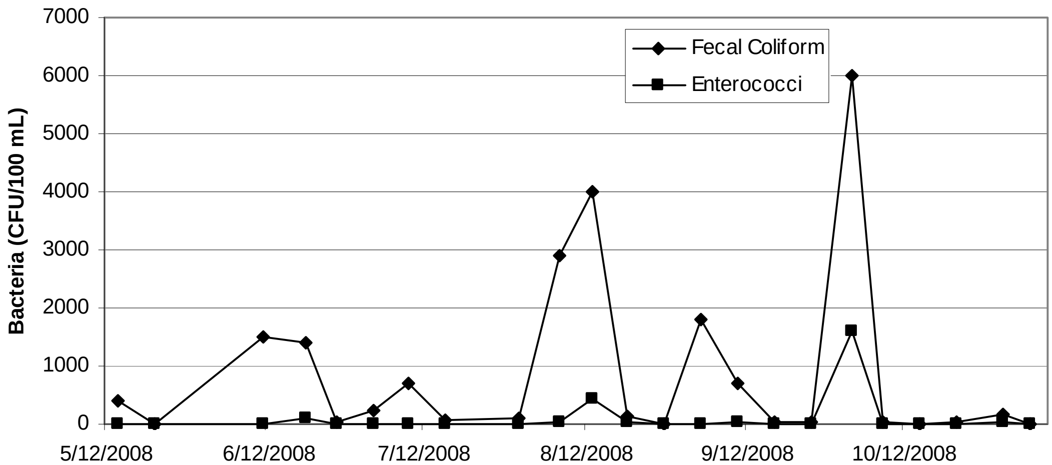


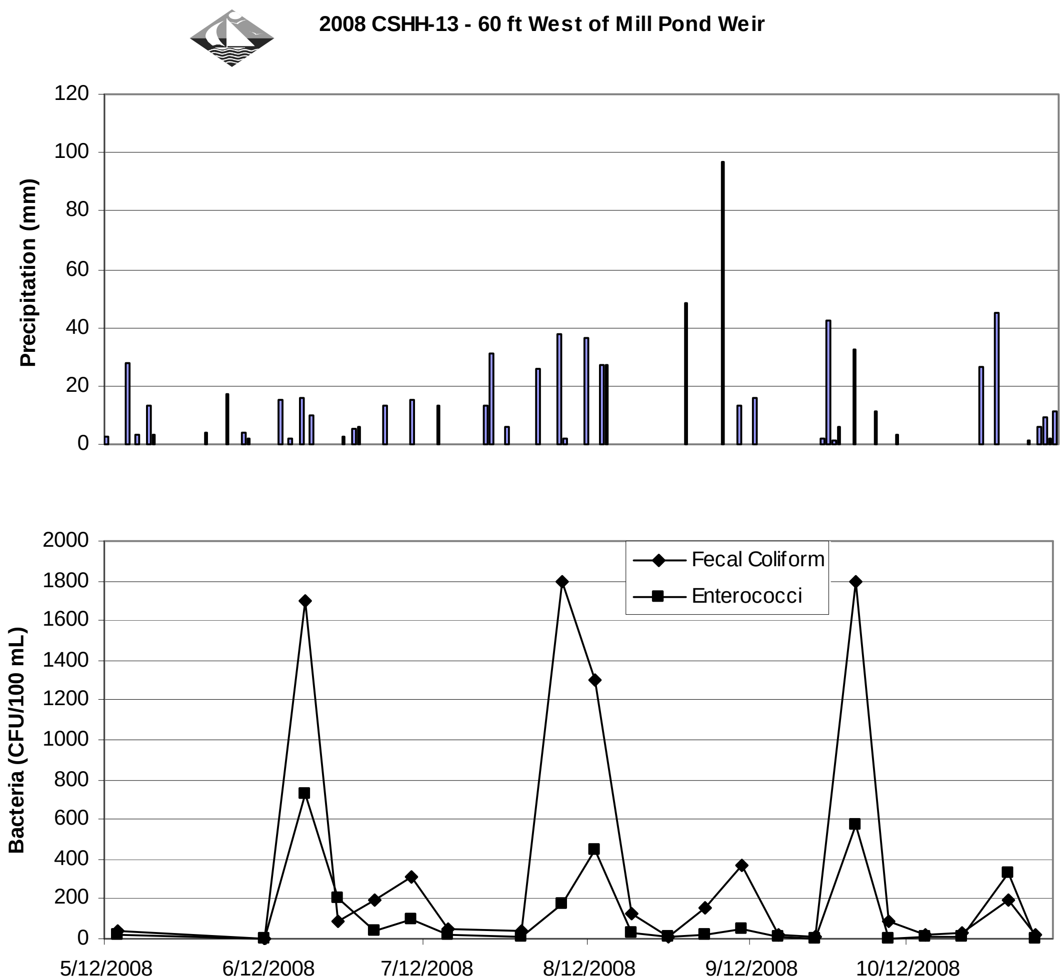
2008 CSHH-11 - 50 Yards East of STP Outfall



2008 CSHH-12 - East of STP Outfall, By Bend in Seawall






2008 CSHH-13 - 60 ft West of Mill Pond Weir
Precipitation (mm)
0
20
40
60
80
100
120
Bacteria (CFU/100 mL)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Fecal Coliform
Enterococci
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
10/12/2008

CSHH #1 - Beacon 11

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
5/14/08	1	0.00	2	0.00
5/21/08	38	6.16	10	4.47
6/11/08	21	9.28	1	2.71
6/19/08	44	32.75	13	5.07
6/25/08	31	30.60	4	3.73
7/2/08	42	33.12	1	2.69
7/9/08	20	29.94	0.1	1.39
7/16/08	19	29.35	1	1.39
7/30/08	8	18.90	1	0.56
8/7/08	210	28.27	1	0.56
8/13/08	43	34.23	7	1.63
8/20/08	37	40.43	20	3.44
8/27/08	3	24.03	0.1	1.70
9/3/08	28	30.88	3	2.11
9/10/08	80	25.46	3	2.63
9/17/08	13	20.04	3	2.22
9/24/08	4	12.84	0.1	0.77
10/2/08	56	23.06	10	1.93
10/8/08	3	14.75	0.1	0.98
10/15/08	21	11.29	0.1	0.50
10/22/08	10	10.71	9	0.62
10/31/08	43	17.23	21	1.80
11/5/08	6	11.02	4	1.50

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgFC (log average for fecal coliform) and Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 1,000 CFU/100 ml for fecal coliform; 200 Log AvgFC/100 ml; 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

CSHH #2 - Bell Marker 6

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
05/14/08	1.00	0.00	0.10	0.00
06/11/08	0.10	0.32	0.10	0.10
06/19/08	39.00	1.97	6.00	0.77
06/25/08	1.00	1.57	0.10	0.39
07/02/08	7.00	2.29	1.00	0.49
07/09/08	2.00	2.23	0.10	0.36
07/16/08	0.10	2.23	1.00	0.57
07/30/08	3.00	1.43	0.10	0.32
08/07/08	11.00	1.60	10.00	0.56
08/13/08	6.00	2.11	1.00	1.00
08/20/08	15.00	7.38	6.00	1.57
08/27/08	0.10	3.12	0.10	0.90
09/03/08	10.00	3.97	0.10	0.90
09/10/08	5.00	3.39	0.10	0.36
09/17/08	2.00	2.72	0.10	0.23
09/24/08	4.00	2.09	0.10	0.10
10/08/08	1.00	2.51	0.10	0.10
10/15/08	7.00	2.74	0.10	0.10
10/31/08	17.00	4.92	6.00	0.39
11/05/08	1.00	3.30	0.10	0.28

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgFC (log average for fecal coliform) and Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 1,000 CFU/100 ml for fecal coliform; 200 Log AvgFC/100 ml; 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

CSHH #3 - Glen Cove Creek

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
05/14/08	2.00	0.00	0.10	0.00
05/21/08	34.00	8.25	0.10	0.10
06/11/08	10.00	8.79	2.00	0.27
06/19/08	37.00	23.26	10.00	1.26
06/25/08	42.00	24.95	2.00	3.42
07/02/08	6.00	17.47	0.10	1.41
07/09/08	155.00	27.04	2.00	1.52
07/16/08	3.00	21.25	0.10	0.83
07/30/08	120.00	24.05	0.10	0.21
08/07/08	90.00	47.34	3.00	0.49
08/13/08	110.00	43.45	2.00	0.49
08/20/08	19.00	68.93	3.00	1.16
08/27/08	5.00	40.79	1.00	1.12
09/03/08	7.00	23.10	1.00	1.78
09/10/08	120.00	24.47	5.00	1.97
09/17/08	12.00	15.71	0.10	1.08
09/24/08	0.10	5.50	0.10	0.55
10/02/08	90.00	9.81	15.00	0.94
10/08/08	5.00	9.17	0.10	0.60
10/15/08	11.00	5.69	0.10	0.27
10/22/08	7.00	5.10	4.00	0.57
10/31/08	41.00	17.00	3.00	1.12
11/05/08	7.00	10.20	6.00	0.94

CSHH #4 – North Hempstead Beach (S)(former Bar Beach) Sand Spit

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
07/02/08	47.00	0.00	7.00	0.00
07/16/08	12.00	23.75	0.10	0.84
07/30/08	14.00	19.91	1.00	0.89
08/27/08	1.00	3.74	1.00	1.00
09/24/08	5.00	2.24	0.10	0.32
10/08/08	11.00	7.42	2.00	0.45
10/15/08	1.00	3.80	2.00	0.74

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgFC (log average for fecal coliform) and Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 1,000 CFU/100 ml for fecal coliform; 200 Log AvgFC/100 ml; 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

CSHH #5 - Mott's Cove

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
07/02/08	35.00	0.00	5.00	0.00
07/16/08	25.00	29.58	3.00	3.87
07/30/08	130.00	48.45	4.00	3.91
08/27/08	13.00	41.11	2.00	2.83
09/24/08	70.00	30.17	0.10	0.45
10/15/08	23.00	40.12	2.00	0.45

CSHH #6 - East of the Former Incinerator Site

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
07/02/08	51.00	0.00	9.00	0.00
07/16/08	17.00	29.44	1.00	3.00
07/30/08	29.00	29.30	2.00	2.62
08/27/08	4.00	10.77	0.10	0.45
09/24/08	16.00	8.00	1.00	0.32
10/15/08	20.00	17.89	2.00	1.41

CSHH #7 - West of Old Oil Dock

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
7/2/08	110.00	0.00	1.00	0.00
7/16/08	18.00	44.50	0.10	0.32
7/30/08	100.00	58.28	1.00	0.46
8/27/08	24.00	48.99	2.00	1.41
9/24/08	40.00	30.98	1.00	1.41
10/15/08	260.00	101.98	2.00	1.41

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgFC (log average for fecal coliform) and Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 1,000 CFU/100 ml for fecal coliform; 200 Log AvgFC/100 ml; 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

CSHH #8 - Glen Cove STP Outfall

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
05/14/08	11.00	0.00	0.10	0.00
05/21/08	37.00	20.17	8.00	0.89
06/11/08	800.00	68.80	26.00	2.75
06/19/08	63.00	123.09	31.00	18.61
06/25/08	12.00	84.57	7.00	17.80
07/02/08	17.00	56.63	2.00	10.31
07/09/08	110.00	64.67	4.00	8.53
07/16/08	32.00	33.97	3.00	5.54
07/30/08	17.00	31.76	2.00	2.63
08/07/08	120.00	51.77	40.00	5.57
08/13/08	90.00	49.23	100.00	12.45
08/20/08	12.00	38.53	17.00	19.20
08/27/08	6.00	26.56	3.00	13.25
09/03/08	17.00	26.56	8.00	17.48
09/10/08	70.00	23.85	23.00	15.65
09/17/08	11.00	15.66	0.10	3.93
09/24/08	10.00	15.10	0.10	1.41
10/02/08	800.00	40.18	***160.00***	3.12
10/08/08	6.00	32.62	3.00	2.56
10/15/08	10.00	22.11	1.00	1.37
10/22/08	10.00	21.69	7.00	3.20
10/31/08	30.00	27.02	16.00	8.83
11/05/08	6.00	10.16	20.00	5.83

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgFC (log average for fecal coliform) and Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 1,000 CFU/100 ml for fecal coliform; 200 Log AvgFC/100 ml; 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

CSHH#9 - First Pipe West of STP Outfall

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
05/14/08	8.00	0.00	3.00	0.00
05/21/08	39.00	17.66	14.00	6.48
06/11/08	160.00	36.82	78.00	14.85
06/19/08	64.00	73.64	34.00	33.36
06/25/08	22.00	60.85	15.00	34.14
07/02/08	24.00	48.22	5.00	21.12
07/09/08	90.00	54.63	12.00	18.86
07/16/08	24.00	37.38	3.00	9.83
07/30/08	34.00	36.44	4.00	5.18
08/07/08	700.00	84.68	80.00	10.36
08/13/08	100.00	86.94	***150.00***	19.48
08/20/08	24.00	86.94	11.00	26.96
08/27/08	7.00	52.53	2.00	16.02
09/03/08	23.00	48.58	13.00	20.28
09/10/08	30.00	25.87	27.00	16.32
09/17/08	5.00	14.21	3.00	7.46
09/24/08	12.00	12.37	0.10	2.92
10/02/08	700.00	31.08	***140.00***	6.82
10/08/08	3.00	20.68	5.00	5.63
10/15/08	8.00	15.87	1.00	2.91
10/22/08	8.00	17.44	4.00	3.09
10/31/08	32.00	21.22	22.00	9.08
11/05/08	6.00	8.19	33.00	6.80

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgFC (log average for fecal coliform) and Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 1,000 CFU/100 ml for fecal coliform; 200 Log AvgFC/100 ml; 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

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

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
05/14/08	19.00	0.00	10.00	0.00
05/21/08	***1200.00***	151.00	***1300.00***	***114.02***
06/11/08	190.00	163.02	***220.00***	***141.95***
06/19/08	130.00	***309.48***	31.00	***206.97***
06/25/08	23.00	82.82	44.00	***66.95***
07/02/08	23.00	60.12	4.00	33.10
07/09/08	110.00	67.84	4.00	21.69
07/16/08	27.00	45.92	14.00	12.50
07/30/08	80.00	48.35	2.00	4.60
08/07/08	***3500.00***	169.82	***420.00***	14.73
08/13/08	120.00	173.55	52.00	27.96
08/20/08	47.00	199.35	10.00	25.71
08/27/08	10.00	109.57	5.00	18.53
09/03/08	29.00	89.44	16.00	28.08
09/10/08	60.00	39.66	36.00	17.18
09/17/08	8.00	23.08	7.00	11.51
09/24/08	15.00	18.36	6.00	10.39
10/02/08	***1200.00***	47.84	***300.00***	23.56
10/08/08	130.00	64.58	8.00	20.51
10/15/08	25.00	54.21	2.00	11.51
10/22/08	7.00	52.78	33.00	15.69
10/31/08	43.00	65.15	29.00	21.50
11/05/08	19.00	28.43	31.00	13.65

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgFC (log average for fecal coliform) and Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 1,000 CFU/100 ml for fecal coliform; 200 Log AvgFC/100 ml; 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

CSHH #11 - 50 Yards East of STP Outfall

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
05/14/08	19.00	0.00	10.00	0.00
05/21/08	***1200.00***	151.00	***1300.00***	***114.02***
06/11/08	190.00	163.02	***220.00***	***141.95***
06/19/08	130.00	***309.48***	31.00	***206.97***
06/25/08	23.00	82.82	44.00	***66.95***
07/02/08	23.00	60.12	4.00	33.10
07/09/08	110.00	67.84	4.00	21.69
07/16/08	27.00	45.92	14.00	12.50
07/30/08	80.00	48.35	2.00	4.60
08/07/08	***3500.00***	169.82	***420.00***	14.73
08/13/08	120.00	173.55	52.00	27.96
08/20/08	47.00	199.35	10.00	25.71
08/27/08	10.00	109.57	5.00	18.53
09/03/08	29.00	89.44	16.00	28.08
09/10/08	60.00	39.66	36.00	17.18
09/17/08	8.00	23.08	7.00	11.51
09/24/08	15.00	18.36	6.00	10.39
10/02/08	***1200.00***	47.84	***300.00***	23.56
10/08/08	130.00	64.58	8.00	20.51
10/15/08	25.00	54.21	2.00	11.51
10/22/08	7.00	52.78	33.00	15.69
10/31/08	43.00	65.15	29.00	21.50
11/05/08	19.00	28.43	31.00	13.65

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgFC (log average for fecal coliform) and Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 1,000 CFU/100 ml for fecal coliform; 200 Log AvgFC/100 ml; 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

CSHH #12 - Bend in Seawall East of STP Outfall

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
05/14/08	400.00	0.00	2.00	0.00
05/21/08	0.10	6.32	0.10	0.45
06/11/08	***1500.00***	39.15	7.00	1.12
06/19/08	***1400.00***	59.44	***110.00***	4.25
06/25/08	33.00	***410.75***	5.00	15.67
07/02/08	240.00	***359.12***	2.00	9.37
07/09/08	700.00	***410.40***	5.00	8.26
07/16/08	60.00	***215.59***	6.00	8.01
07/30/08	100.00	178.18	2.00	3.31
08/07/08	***2900.00***	***332.21***	29.00	6.46
08/13/08	***4000.00***	***513.63***	***440.00***	19.78
08/20/08	130.00	***623.16***	24.00	27.98
08/27/08	14.00	***291.68***	1.00	14.37
09/03/08	***1800.00***	***519.95***	7.00	18.46
09/10/08	700.00	***391.29***	40.00	19.69
09/17/08	18.00	132.78	2.00	6.69
09/24/08	38.00	103.83	3.00	4.42
10/02/08	***6001.00***	***348.92***	***1600.00***	19.31
10/08/08	24.00	147.14	4.00	17.27
10/15/08	15.00	68.22	3.00	10.29
10/22/08	45.00	81.94	16.00	15.59
10/31/08	180.00	111.84	46.00	26.92
11/05/08	13.00	32.79	3.00	7.67

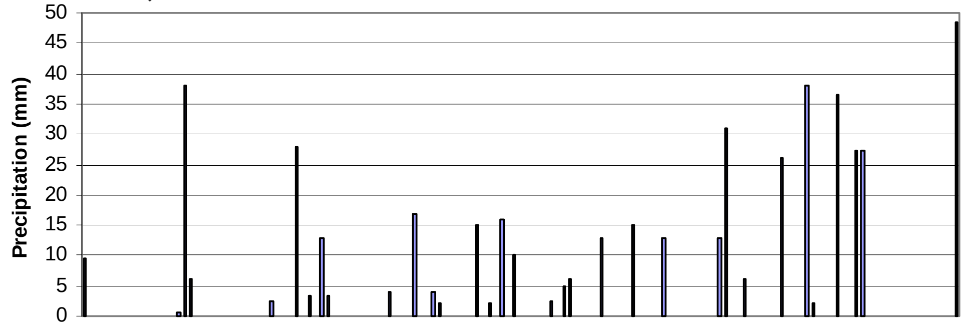
Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgFC (log average for fecal coliform) and Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 1,000 CFU/100 ml for fecal coliform; 200 Log AvgFC/100 ml; 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

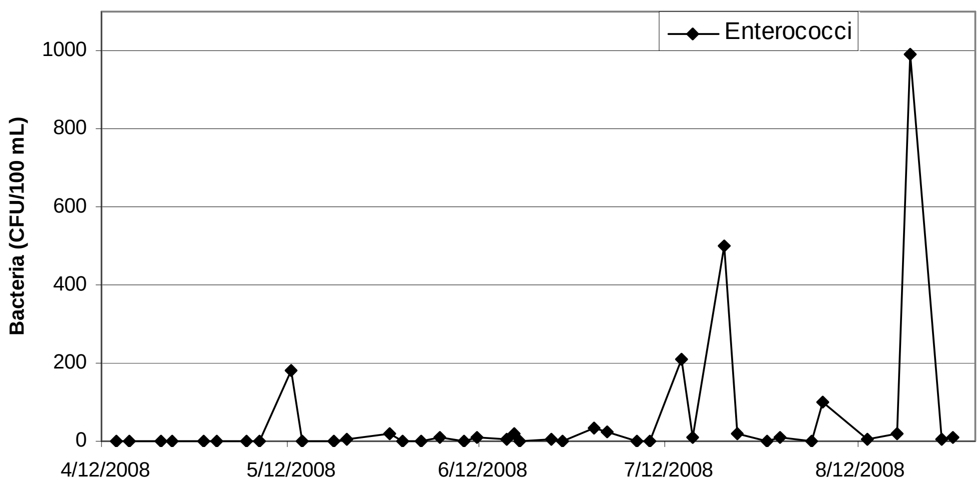
CSHH #13 – 0-50 Feet Downstream of Mill Pond Weir

	Fecal Coliform		***Enterococci***	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
5/14/08	34	0.00	24	0.00
6/11/08	0.1	1.84	0.1	1.55
6/19/08	***1700***	13.04	***730***	8.54
6/25/08	90	24.83	***200***	24.44
7/2/08	190	41.29	34	26.54
7/9/08	310	61.80	100	34.61
7/16/08	52	***215.85***	20	***99.86***
7/30/08	43	107.13	9	27.97
8/7/08	***1800***	187.94	***170***	***41.82***
8/13/08	***1300***	***268.95***	***450***	***60.92***
8/20/08	130	***338.19***	32	***68.51***
8/27/08	12	173.44	6	***42.10***
9/3/08	160	***225.58***	15	***46.62***
9/10/08	370	164.39	53	***36.93***
9/17/08	16	68.22	9	16.89
9/24/08	10	40.84	4	11.14
10/2/08	***1800***	111.26	***570***	27.70
10/8/08	90	99.17	2	18.51
10/15/08	23	56.89	8	12.68
10/22/08	33	65.76	12	13.44
10/31/08	190	118.50	***330***	32.47
11/5/08	20	48.18	3	11.37

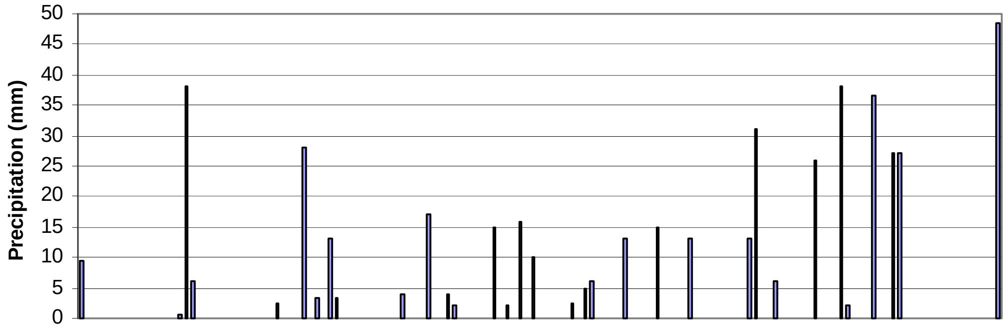
Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgFC (log average for fecal coliform) and Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 1,000 CFU/100 ml for fecal coliform; 200 Log AvgFC/100 ml; 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

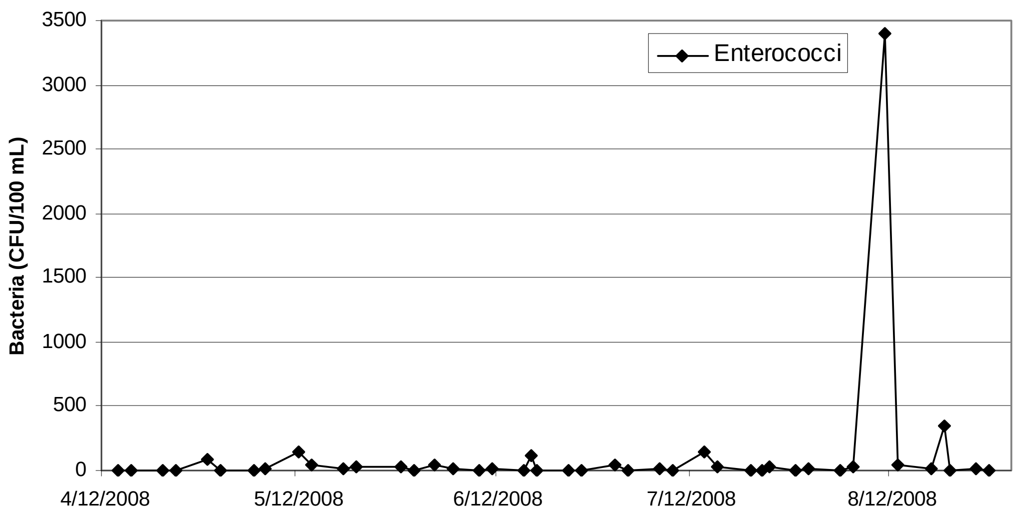
2008 Sands Point Beach



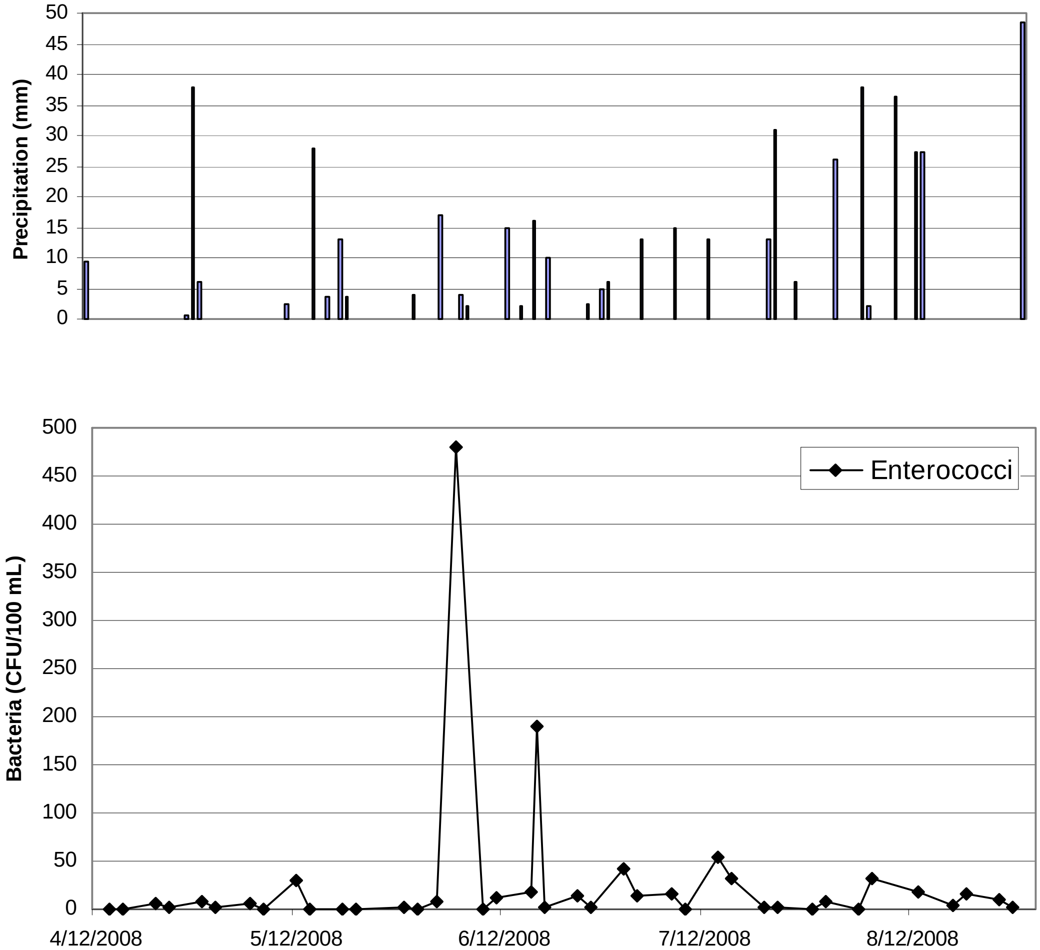


2008 North Hempstead Beach (S)(former Bar Beach)

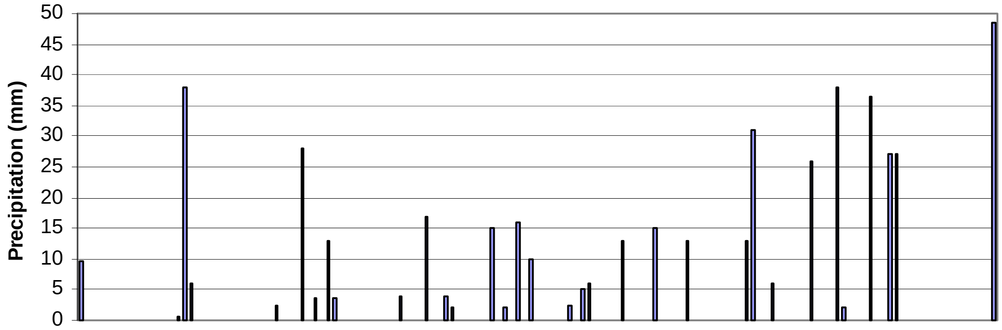


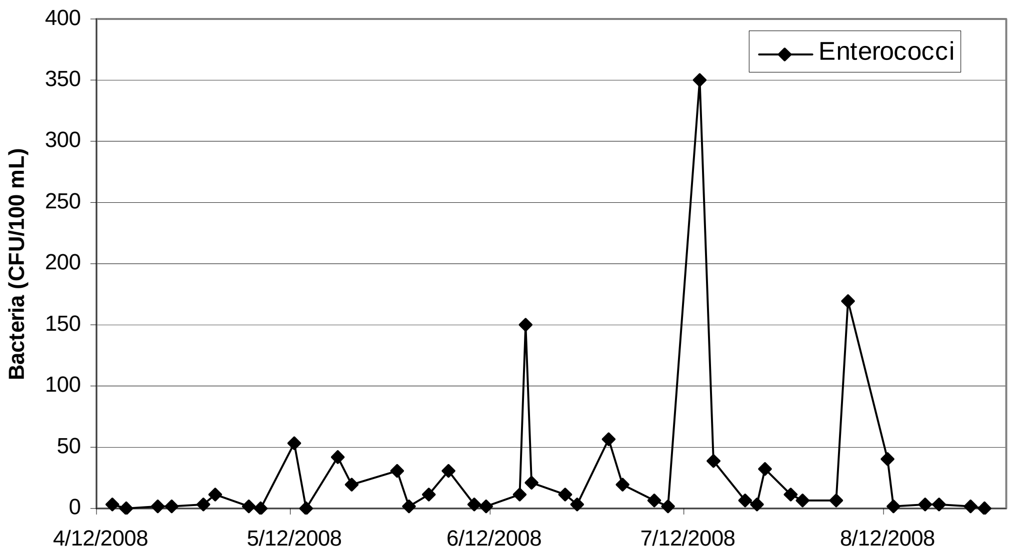


2008 North Hempstead Beach (N)(former Hempstead Harbor Beach)

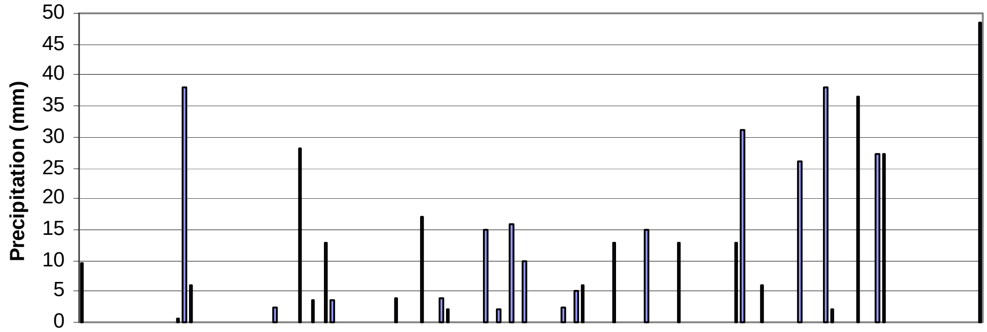


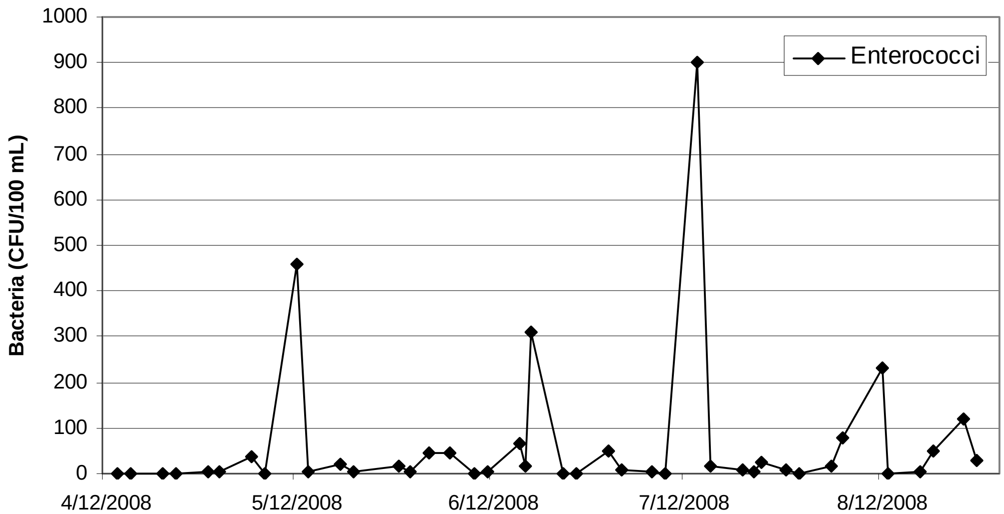
2008 Tappen Beach





2008 Sea Cliff Beach





Sands Point Beach (Formerly IBM Beach)

	Enterococci	
Date	**CFU/100ml.**	**Log AvgEnt**
04/14/08	0.10	0.00
04/16/08	0.10	0.10
04/21/08	0.10	0.10
04/23/08	0.10	0.10
04/28/08	2.00	0.18
04/30/08	0.10	0.16
05/05/08	1.00	0.21
05/07/08	1.00	0.26
05/12/08	***180.00***	0.54
05/14/08	0.10	0.45
05/19/08	0.10	0.54
05/21/08	5.00	0.67
05/28/08	21.00	1.50
05/30/08	0.10	1.07
06/02/08	1.00	1.39
06/05/08	8.00	1.75
06/09/08	1.00	1.75
06/11/08	11.00	2.10
06/16/08	6.00	2.02
06/17/08	20.00	2.54
06/18/08	0.10	1.89
06/23/08	6.00	2.58
06/25/08	0.10	1.92
06/30/08	31.00	2.69
07/02/08	22.00	3.25
07/07/08	0.10	2.36
07/09/08	0.10	1.77
07/14/08	***210.00***	2.52
07/16/08	10.00	2.86
07/21/08	500.00	5.46
07/23/08	18.00	6.15
07/28/08	0.10	6.17
07/30/08	10.00	6.47
08/04/08	1.00	3.86
08/06/08	100.00	5.34
08/13/08	4.00	12.52
08/18/08	18.00	9.47
08/20/08	***990.00***	15.88
08/25/08	4.00	8.55
08/27/08	10.00	8.70

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

North Hempstead Beach (S) (Formerly Bar Beach)

	Enterococci	
Date	**CFU/100ml.**	**Log AvgEnt**
04/14/08	0.10	0.00
04/16/08	1.00	0.32
04/21/08	1.00	0.46
04/23/08	0.10	0.32
04/28/08	80.00	0.96
04/30/08	6.00	1.30
05/05/08	1.00	1.25
05/07/08	17.00	1.73
05/12/08	***150.00***	2.85
05/14/08	40.00	3.71
05/19/08	12.00	7.30
05/21/08	27.00	8.32
05/28/08	22.00	19.17
05/30/08	1.00	11.78
06/02/08	38.00	14.46
06/05/08	14.00	19.39
06/09/08	1.00	14.15
06/11/08	15.00	14.23
06/16/08	3.00	8.22
06/17/08	***120.00***	10.74
06/18/08	7.00	10.33
06/23/08	1.00	7.32
06/25/08	0.10	4.96
06/30/08	39.00	6.16
07/02/08	6.00	6.14
07/07/08	13.00	5.08
07/09/08	2.00	4.67
07/14/08	***150.00***	6.86
07/16/08	28.00	7.79
07/21/08	0.10	3.99
07/23/08	3.00	3.88
07/24/08	24.00	5.33
07/28/08	1.00	6.71
07/30/08	9.00	6.89
08/04/08	2.00	5.19
08/06/08	32.00	6.12
08/11/08	***3400.00***	11.95
08/13/08	39.00	13.30
08/18/08	11.00	9.51
08/20/08	***350.00***	13.20
08/21/08	1.00	16.27
08/25/08	10.00	17.65
08/27/08	3.00	15.03

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

North Hempstead Beach (N) (Formerly Hempstead Harbor Beach)

	Enterococci	
Date	CFU/100ml.	Log AvgEnt
04/14/08	0.10	0.00
04/16/08	0.10	0.10
04/21/08	7.00	0.41
04/23/08	2.00	0.61
04/28/08	9.00	1.05
04/30/08	3.00	1.25
05/05/08	6.00	1.56
05/07/08	1.00	1.48
05/12/08	30.00	2.06
05/14/08	0.10	1.53
05/19/08	1.00	2.67
05/21/08	1.00	2.42
05/28/08	2.00	2.15
05/30/08	0.10	1.30
06/02/08	8.00	1.45
06/05/08	***480.00***	2.36
06/09/08	0.10	1.83
06/11/08	13.00	2.23
06/16/08	18.00	2.97
06/17/08	***190.00***	4.50
06/18/08	3.00	4.34
06/23/08	15.00	6.59
06/25/08	3.00	6.13
06/30/08	43.00	12.58
07/02/08	15.00	12.78
07/07/08	16.00	9.53
07/09/08	0.10	6.30
07/14/08	55.00	11.01
07/16/08	33.00	12.17
07/21/08	2.00	8.21
07/23/08	2.00	7.12
07/28/08	1.00	5.81
07/30/08	9.00	6.07
08/04/08	1.00	3.61
08/06/08	33.00	4.51
08/13/08	19.00	7.01
08/18/08	4.00	4.16
08/20/08	17.00	4.87
08/25/08	10.00	6.65
08/27/08	2.00	5.82

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

Tappen Beach

	Enterococci	
Date	**CFU/100ml.**	**Log AvgEnt**
04/14/08	3.00	0.00
04/16/08	0.10	0.55
04/21/08	2.00	0.84
04/23/08	1.00	0.88
04/28/08	4.00	1.19
04/30/08	11.00	1.73
05/05/08	2.00	1.76
05/07/08	0.10	1.23
05/12/08	54.00	1.87
05/14/08	0.10	1.40
05/19/08	42.00	2.51
05/21/08	20.00	3.09
05/28/08	30.00	4.74
05/30/08	1.00	4.06
06/02/08	11.00	4.06
06/05/08	30.00	5.48
06/09/08	3.00	8.00331562
06/11/08	1.00	6.50
06/16/08	11.00	8.66
06/17/08	***150.00***	11.52
06/18/08	21.00	12.17
06/23/08	12.00	10.21
06/25/08	3.00	9.14
06/30/08	56.00	12.13
07/02/08	20.00	12.70
07/07/08	6.00	10.97
07/09/08	1.00	8.82
07/14/08	***350.00***	17.65
07/16/08	39.00	18.97
07/21/08	7.00	14.18
07/23/08	3.00	12.14
07/24/08	32.00	13.39
07/28/08	11.00	15.24
07/30/08	7.00	14.20
08/04/08	6.00	10.98
08/06/08	***170.00***	14.08
08/12/08	41.00	22.24
08/13/08	1.00	16.77
08/18/08	4.00	9.86
08/20/08	4.00	9.08
08/25/08	2.00	7.77
08/27/08	0.10	5.03

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

Sea Cliff Village Beach

	Enterococci	
Date	**CFU/100ml.**	**Log AvgEnt**
04/14/08	0.10	0.00
04/16/08	0.10	0.10
04/21/08	2.00	0.27
04/23/08	0.10	0.21
04/28/08	3.00	0.36
04/30/08	5.00	0.56
05/05/08	37.00	1.02
05/07/08	2.00	1.10
05/12/08	***460.00***	2.16
05/14/08	3.00	2.23
05/19/08	20.00	5.68
05/21/08	3.00	5.33
05/28/08	17.00	10.51
05/30/08	3.00	10.51
06/02/08	46.00	13.45
06/05/08	47.00	13.81
06/09/08	2.00	13.81
06/11/08	4.00	12.1998536
06/16/08	67.00	11.51
06/17/08	15.00	11.82
06/18/08	***310.00***	15.91
06/23/08	2.00	14.93
06/25/08	1.00	11.68
06/30/08	50.00	14.90
07/02/08	10.00	14.37
07/07/08	4.00	10.00
07/09/08	0.10	6.58
07/14/08	***900.00***	12.73
07/16/08	15.00	12.93
07/21/08	8.00	7.05
07/23/08	4.00	6.66
07/24/08	24.00	8.5442215
07/28/08	7.00	10.38
07/30/08	2.00	8.94
08/04/08	15.00	7.83
08/06/08	80.00	9.68
08/12/08	***230.00***	22.92
08/13/08	1.00	17.24
08/18/08	3.00	9.88
08/20/08	50.00	11.45
08/25/08	***120.00***	16.02
08/27/08	28.00	16.94

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104 CFU/100 ml for enterococci; and 35 Log AvgEnt 35.

MO/DAY	AMT(MM)*	MO/DAY	AMT(MM)	MO/DAY	AMT(MM)	MO/DAY	AMT(MM)	MO/DAY	AMT(MM)
JAN		**MAY**		**JULY**		**SEPT**		**NOV**	
FEB		1	5.5	4	13C	6	96.5C	3	1
		4	1.5	9	15C	9	13B	5	6
MAR		8	1	14	13A	12	16B	6	9
4	1	9	30B	22	trace	25	2	7	2
5	11	12	2.5	23	13C	26	42.5A	8	11
7	30A	16	28C	24**	31A	27	1.5	13	8
8	61A	17	trace	27	6	28	6	14	4
14	1	18	3.5	28**		**Total**	**177.5**	15	27
15	3	20	13	**Total**	**91**			Tracking ended	
16	1	21	3.5						
19	28B	27	15C						
20	4	31	4						
27	2	**Total**	**107.5**						
31	5								
Total	**147**								

APR		**JUNE**		**AUG**		**OCT**		**DEC**	
1	6	4	17A	2	26B	1	32.5A		
4	26A	7	4	6**	38A	4	trace		
9	trace	8	2	7	2	5	11		
12	9.5	10	trace	8	trace	9	3		
27	0.5	14	15C	10	trace	21	trace		
28	38B	15**		11	36.5B	25	26.5		
29	6	16	2	12**		28	45		
Total	**86**	18	16C	14-15**	54.5	**Total**	**118**		
		20	10C	25	trace				
		23	trace	30**	48.5A				
		26	2.5	**Total**	**205.5**				
		28	5						
		29	6						
		30	trace						
		Total	**79.5**						

*Rainfall is recorded from midnight to midnight.
"A" designates that at least 12.5 mm of rain fell between midnight and 8 AM; "B" designates that the first 12.5 mm of rain fell by 4 PM; "C" designates that the first 12.5 mm of rain fell later in the evening, by midnight.
**Administrative beach closures: 6/15 (reopened 6/16); 7/24 (reopened 7/25); 7/28 (reopened 7/29); 8/6 (reopened 8/7); 8/12 (reopened 8/13); 8/15 (reopened 8/17); 8/30 (reopened 8/31) (beaches closed total of 8 days)

APPENDIX C

Summary Tables for 2008 and Previous Seasons

2008

	Units in CFU/100 mL	Tappen Beach	Sea Cliff Beach	North Hempstead Beach (S)(former Bar Beach)	North Hempstead Beach (N) (former Hempstead Harbor Beach)	Sands Point Golf Club
April	Enterococci	3.52	1.72	14.70	3.53	0.42
	Fecal	**na**	**na**	**na**	**na**	**na**
May	Enterococci	18.65	68.13	33.75	5.15	26.04
	Fecal	**na**	**na**	**na**	**na**	**na**
June	Enterococci	29.80	54.40	23.81	77.31	8.42
	Fecal	**na**	**na**	**na**	**na**	**na**
July	Enterococci	47.60	97.41	23.61	13.41	85.59
	Fecal	**na**	**na**	**na**	**na**	**na**
August	Enterococci	28.51	65.88	427.56	11.88	161.00
	Fecal	**na**	**na**	**na**	**na**	**na**
Season Average	*Enterococci*	*25.62*	*57.51*	*104.69*	*22.26*	*56.29*
	Fecal	***na***	***na***	***na***	***na***	***na***

na = not analyzed

2007

	Units in CFU/100 mL	Tappen Beach	Sea Cliff Beach	North Hempstead Beach (S)(former Bar Beach)	North Hempstead Beach (N) (former Hempstead Harbor Beach)	Sands Point Golf Club
April	Enterococci	35.8	73.42	15.02	8.82	7.62
	Fecal	**89**	**5.64**	**12.42**	**14.22**	**8.82**
May	Enterococci	43.92	9.49	26.36	35.91	16.22
	Fecal	**49.89**	**17.8**	**84.68**	**157**	**29.36**
June	Enterococci	14.89	10.57	46.44	45.11	38.39
	Fecal	**130.67**	**73.33**	**219**	**438.56**	**27.38**
July	Enterococci	16.4	10.52	36.4	51.33	143.89
	Fecal	**519.6**	**193.70**	**581**	**877**	**890.25**
August	Enterococci	17.78	72.78	68.56	188.44	297
	Fecal	**248.44**	**358.33**	**272.8**	**1173**	**166.11**
Season Average	*Enterococci*	*25.76*	*35.35*	*38.56*	*65.92*	*100.62*
	Fecal	***207.52***	***129.76***	***233.9***	***531.96***	***224.38***

2006

	Units in CFU/100 mL	Tappen Beach	Sea Cliff Beach	North Hempstead Beach (S)(former Bar Beach)	North Hempstead Beach (N) (former 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***

2005

	Units in MPN/100 mL	Tappen Beach	Sea Cliff Beach	North Hempstead Beach (S)(former Bar Beach)	North Hempstead Beach (N) (former 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***

2004

	Units in MPN/100 mL	Tappen Beach	Sea Cliff Beach	North Hempstead Beach (S)(former Bar Beach)	North Hempstead Beach (N) (former 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**
September	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***

2003

	Units in MPN/100 mL	Tappen Beach	Sea Cliff Beach	North Hempstead Beach (S)(former Bar Beach)	North Hempstead Beach (N) (former 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**
September	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***

2002

	Units in MPN/100 mL	Tappen Beach	Sea Cliff Beach	North Hempstead Beach (S)(former Bar Beach)	North Hempstead Beach (N) (former 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***

2001

	Units in MPN/100 mL	Tappen Beach	Sea Cliff Beach	North Hempstead Beach (S)(former Bar Beach)	North Hempstead Beach (N) (former 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***

CSHH #1 - Beacon 11

	2008					2007			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Turbidity (NTUs) (0.5 m)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
May	12.93	7.20	23.69	16.80	-	-	-	-	-
June	18.81	7.38	24.27	19.15	-	16.96	6.95	24.11	21.33
July	19.81	3.62	25.75	23.70	2.35	19.08	3.91	25.10	23.90
Aug.	23.25	4.52	25.28	22.00	3.83	22.67	3.61	25.92	21.70
Sept.	22.49	4.86	25.54	20.70	2.68	21.84	5.02	26.26	19.18
Oct.	16.37	6.21	25.96	12.08	2.77	19.3	4.65	26.99	16.64
Nov.	12.60	7.06	25.85	14.80	1.89	-	-	-	-
Average	18.04	5.83	25.19	18.46	2.70	19.97	4.83	25.68	20.55

	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
Aug.	23.64	3.29	25.64	23.78	23.73	1.85	25.36	24.4
Sept.	20.58	7.28	25.4	18.9	22.54	4.85	26.49	23.6
Oct.	16.41	7.98	25.56	14.78	16.3	7.36	25.09	13.3
Average	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
Aug.	22.33	3.86	26.31	24	21.75	2.1	25.79	23.6
Sept.	22.14	3.67	26.15	20.4	21.6	4.32	26.4	22.2
Oct.	16.53	7.66	25.21	12.9	16.49	6.73	25.23	12.8
Average	20.10	4.94	25.73	20.80	18.94	4.63	25.25	20.40

CSHH #1 - Beacon 11

	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
Aug.	24.02	2.91	26.89	25	23.25	2.96	26.19	25.4
Sept.	21.98	5.7	26.5	20.3	22.56	5.45	26.7	20.5
Oct.	17.12	7.13	26.38	13.5	17.05	7.86	26.79	15.8
Average	20.67	4.64	26.56	21.10	20.90	5.16	26.02	22.50

	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
Aug.	22.53	6.41	24.7	24.2	24.35	4.6	25.99	25
Sept.	20.99	4.9	25.07	20.9	21.9	5.57	25.72	22
Oct.	16.78	6.02	25.24	13.2	17.76	8.29	24.7	12
Average	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
Aug.	23.95	3.66	24.84	24.5	21.85	1.96	25.96	21.5
Sept.	22.02	4.57	25.48	20.5	22.13	3.26	25.81	19.5
Oct.	17.19	6.84	25.27	13.75	17.45	5.83	26.06	13.67
Average	20.52	5.17	24.88	21.10	20.10	4.39	25.20	20.81

CSHH #2 - Bell Marker 6

	2008					2007			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Turbidity (NTUs) (0.5 m)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
May	12.13	8.72	24.22	14.20	-	-	-	-	-
June	16.03	6.35	25.29	20.80	-	16.03	6.92	24.66	22.53
July	18.69	3.37	26.06	25.58	2.62	17.62	4.49	25.88	24.67
Aug.	22.12	4.27	26.09	25.13	1.82	21.65	3.28	26.36	22.77
Sept.	22.19	5.34	26.13	20.68	2.11	21.55	5.43	26.78	21.48
Oct.	16.30	5.87	26.55	13.60	2.50	19.32	5.07	27.65	17.08
Nov.	12.64	7.98	26.32	15.10	1.28	-	-	-	-
Average	17.16	5.98	25.81	19.30	2.07	19.23	5.04	26.27	21.71

	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
Aug.	21.91	1.91	26.42	26.53	23.13	2.07	25.58	26.6
Sept.	20.41	5.98	26.24	20.33	22.8	2.98	27.01	24.2
Oct.	17.66	7.3	26.32	18.89	17.01	6.84	25.91	13.9
Average	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
Aug.	21.47	3.04	26.62	24.1	21.01	1.74	26.14	23.6
Sept.	21.96	6.17	26.33	20.7	21.2	5.38	26.55	22
Oct.	17.37	8.16	25.63	14.3	17.19	6.47	26.03	15
Average	19.49	5.57	26.06	21.50	18.37	4.55	25.70	21.10

CSHH #2 - Bell Marker 6

	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
Aug.	22.85	3.08	27.23	25.4	22.33	3.83	26.46	26
Sept.	21.97	5.84	26.89	21.4	21.88	5.8	27.07	21.1
Oct.	17.74	7.68	27.25	13.9	16.94	8.55	27.24	15.9
Average	20.13	5.11	26.99	21.50	19.58	5.46	26.41	22.80

	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	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
Aug.	22.08	6.46	24.95	24.7	22.88	4.29	26.8	25
Sept.	20.89	6.08	25.54	22.3	22.15	5.75	26.84	26
Oct.	16.86	7.18	26.07	16.3	17.18	8.46	26.3	13
Average	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
Aug.	22.88	3.3	25.27	24.5	21.12	2.86	26.41	21.37
Sept.	21.62	6.03	25.82	20.5	21.33	3.18	26.79	19.75
Oct.	17.18	6.9	26.27	13.75	18.02	5.22	26.59	14.5
Average	19.66	5.45	25.40	21.10	19.12	4.54	25.69	21.37

CSHH #2 - Bell Marker 6

	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
Aug.	21.1	4.29	24.99	23.17	22.9	4.87	27.77	25.12
Sept.	22.05	8	25.73	20.17	21.73	5.27	28.44	21.5
Oct.	16.95	9.11	25.34	15.75	17.48	7.72	27.8	15.83
Average	19.20	7.14	25.28	20.53	20.30	5.67	27.53	22.16

CSHH #3 - Glen Cove Creek

	2008					2007			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Turbidity (NTUs) (0.5 m)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
May	12.82	8.58	23.69	15.15	-	-	-	-	-
June	18.23	7.53	24.89	21.60	-	16.82	8.47	24.15	21.98
July	19.39	3.83	25.89	26.33	1.62	19.19	4.75	25.40	24.25
Aug.	23.12	6.08	25.68	24.15	-	22.67	5.98	26.16	23.20
Sept.	22.47	5.74	25.93	21.45	-	21.87	5.18	26.63	22.13
Oct.	16.43	7.25	26.17	13.58	1.67	19.31	4.7	27.59	17.7
Nov.	12.60	7.49	26.36	15.60	-	-	-	-	-
Average	17.86	6.64	25.52	19.69	1.64	19.97	5.82	25.99	21.85

	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
Aug.	23.19	5.13	26.13	25.46	23.53	2.16	25.67	25.3
Sept.	20.58	7.5	26	19.85	22.76	5.23	26.8	24.8
Oct.	16.91	8.55	26.17	16.03	16.66	8.14	25.58	14.3
Average	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
Aug.	22	4.3	26.48	22.8	21.26	3.74	25.92	23.6
Sept.	22.02	4.66	26.34	21.3	21.48	4.81	26.49	22.4
Oct.	16.86	7.62	25.97	13.1	16.97	6.58	25.61	15.6
Average	19.87	5.76	26.04	20.90	18.90	5.21	25.45	21.80

CSHH #3 - Glen Cove Creek

	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
Aug.	23.36	2.49	27.1	26.9	23.09	4.83	26.34	27.7
Sept.	21.78	6.49	26.71	22	22.1	6.92	26.88	21.3
Oct.	17.7	7.98	27.05	14.7	17.02	9.01	27.12	16.3
Average	20.53	5.20	26.83	22.10	20.23	6.47	26.27	23.60

	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
Aug.	22.66	6.44	24.68	23.5	23.82	4.87	26.44	26
Sept.	21.45	6.13	24.99	20.5	21.8	6.16	26.25	23
Oct.	16.69	7.5	25.52	16.7	16.74	8.7	25.81	14
Average	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
Aug.	23.39	3.87	25.14	24.5	21.34	2.29	26.29	21.5
Sept.	21.88	5.76	25.75	20.5	21.61	3.12	26.67	20
Oct.	16.9	7.79	25.88	13.75	17.12	5.69	26.69	13.67
Average	20.28	6.16	25.16	21.10	19.55	5.14	25.66	21.25

CSHH #8- Glen Cove Creek STP Outfall

	2008					2007			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Turbidity (NTUs) (0.5 m)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
May	13.22	6.81	23.67	19.30	-	-	-	-	-
June	19.08	8.34	24.55	23.80	4.75	17.69	8.75	24.03	22.83
July	20.53	4.83	25.64	28.80	3.02	19.76	4.46	25.26	26.50
Aug.	23.23	4.49	25.46	24.13	2.89	22.76	5.27	25.84	24.33
Sept.	22.67	4.04	25.84	20.80	2.74	22.17	6.05	26.27	21.75
Oct.	16.68	6.67	26.17	13.38	2.14	19.3	5.13	27.59	17.76
Nov.	12.47	6.34	25.96	15.80	1.53	-	-	-	-
Average	18.27	5.93	25.33	20.86	2.84	20.34	5.93	25.80	22.63

	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	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
Aug.	24	8.85	25.71	25.18	24.32	3.45	25.32	27.2
Sept.	20.65	8.25	25.36	20.2	23.24	5.07	26.42	25.2
Oct.	17.12	8.18	25.97	15.57	16.98	7.31	25.28	14
Average	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
Aug.	22.78	5.98	25.89	24.4	22.51	5.23	25.51	26.1
Sept.	22.22	4.66	25.62	22.1	21.58	4.87	25.99	23.5
Oct.	16.6	7.79	25.72	13.4	16.49	6.49	25.1	14.6
Average	20.49	6.22	25.50	22.20	19.10	5.28	25.09	22.10

CSHH #8- Glen Cove Creek STP Outfall

	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
Aug.	24.64	4.85	26.67	27.7	23.82	6.16	25.86	29.2
Sept.	21.91	6.01	26.41	23	22.45	5.74	26.58	22.1
Oct.	17.67	7.69	26.77	16.4	16.67	9.56	26.54	16.7
Average	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
Aug.	23.58	7.75	24.18	24.5	24.28	5.32	26.19	26
Sept.	21.17	8.63	24.81	23.6	21.78	6.14	25.84	24
Oct.	17.25	7.17	24.87	15.3	16.63	8.63	25.53	15
Average	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
2008	25.01 ppt	25.78 ppt	25.28 ppt	24.29 ppt
2007	25.41 ppt	26.07 ppt	25.62 ppt	24.30 ppt
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

Total Precipitation Per Month

	June	July	August	September	October
2008	9.5 mm	91 mm	205.5 mm	177.5 mm	118 mm
2007	159.5 mm	198.5 mm	132.5 mm	36.5 mm	136 mm
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	***2008***	***2007***	***2006***	***2005***	***2004***	***2003***	***2002***
Beacon 11, CSHH #1	5.50 ppm	4.99 ppm	5.8 ppm	4.59 ppm	4.94 ppm	4.63 ppm	4.64 ppm
Bell Buoy 6, CSHH #2	5.31	5.37	5.3	4.63	5.57	4.55	5.11
Glen Cove Creek, Red Channel Marker, CSHH #3	6.35	6.02	6.8	5.09	5.76	5.21	5.20
Glen Cove STP Outfall, CSHH #8	5.73	5.93	7.0	5.76	6.22	5.28	6.11

Averages for Bottom DO	***2001***	***2000***	***1999***	***1998***	***1997***	***1996***
Beacon 11, CSHH #1	5.16 ppm	5.64 ppm	5.85 ppm	5.17 ppm	4.39 ppm	5.90 ppm
Bell Buoy 6, CSHH #2	5.46	6.10	5.44	5.45	4.54	7.11
Glen Cove Creek, Red Channel Marker, CSHH #3	6.47	6.54	6.32	6.48	5.15	7.45
Glen Cove STP Outfall, CSHH #8	6.82	7.35	7.14	N/A	N/A	N/A