Hempstead Harbor Protection Committee

# Water-Monitoring Program
# Hempstead Harbor

**Long Island, New York**

# 2011 Water-Monitoring Report
# (Full Report, Including Appendices)

*Prepared by*


*Coalition to Save Hempstead Harbor*

*and*

FUSS & O'NEILL

# Program History

Twenty-five 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) (a municipal organization formed in 1995) was able to step up to 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 QAPP was updated and approved by EPA in 2011.)

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.

The results of the DEC's rigorous water-quality testing showed that dramatic water-quality improvements had been achieved in Hempstead Harbor. On June 1, 2011, the efforts of all parties that worked for years to improve conditions in the harbor culminated in the **reopening of 2,500 acres of shellfish beds for harvesting** in the northern portion of the harbor—a success story that has been highlighted all around Long Island Sound and beyond.

## 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 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 increased awareness of environmental issues, and to 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) (1994) – 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 a 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 its monitoring efforts, the nine 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 inter-municipal organization, specifically formed to protect and improve the water quality of Hempstead Harbor. CSHH became the first environmental organization to join the committee—as a nonvoting member and technical adviser.

HHPC first focused on abatement of stormwater runoff 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. (CSHH has been a member of the Long Island Sound Study's Citizens Advisory Committee since 1992 and served for three years as chair of its Communications Subcommittee.)

In 1996, CSHH initiated the creation of the **Water-Monitoring Work Group**, a soundwide network of environmental agencies and nonprofits connected with water-monitoring programs around Long Island Sound. The work group provided a forum for reviewing current testing parameters, methodologies, and equipment used by members and for examining testing results in a broader context. Among the work group's achievements was completion of the **Long Island Sound Mapping Project** (July 1998), which mapped sites monitored around Long Island Sound and identified the agencies and other organizations responsible for testing at those sites. The project was funded through a grant awarded to CSHH, on behalf of the work group, by EPA/Long Island Sound Study. The soundwide network established as a result of the work group remains an important resource to determine the location and extent of various water conditions around the sound.

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 the economy) of surrounding communities.

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

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

In 2002, CSHH was asked by the U.S. EPA Long Island Sound Study Office to plan and coordinate a **Stormwater Workshop** to help prepare Long Island communities to meet the requirements of the EPA Phase II Stormwater 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.

More recently, CSHH has served on review committees for restoration plan proposals such as the Scudder's Pond Restoration Program and Glenwood Road/Powerhouse Drain Stormwater Pollution Abatement Plan. In addition, in 2009, CSHH initiated a work group of local community organizations to focus on development of a townwide land-preservation plan. The work group considered various land-use planning vehicles along with a proposal to review the Town of Oyster Bay's Groundwater and Open Space Protection Plan (2006) in light of current local land-use and harbor preservation efforts. A first step toward a broader land-use preservation plan is to determine the feasibility of a watershed-protection overlay district for Hempstead Harbor. The scope of the Glenwood Road/Powerhouse Drain Stormwater Pollution Abatement Plan (due to be completed for the Hempstead Harbor Protection Committee in 2012) was expanded to include this element.

Also in 2009, CSHH became a member of the newly formed Long Island Sound/New York State Sentinel Site Work Group, which is charged with addressing climate change and ways to measure the impacts on Long Island Sound. (This is part of a bi-state—New York and Connecticut—approach to understanding climate-change indicators for Long Island Sound and selecting appropriate sites to measure them.)

In April 2011, CSHH organized an emergency cleanup of plastic disks that were accidentally released from an aeration tank at the Mamaroneck sewage treatment plant. The cleanup resulted in the collection of over 27,000 disks from five beaches around Hempstead Harbor and helped convinced Westchester County to send crews to continue cleanup efforts. Throughout the rest of the season, disks continued to wash up on Hempstead Harbor beaches as well as along the shores of other bays around Long Island Sound. In September 2011, CSHH coordinated local activities as part of the International Coastal Cleanup, as it has for all but two years since 1992.

CSHH continues to work with other environmental groups and agencies around Hempstead Harbor and Long Island Sound. For example, in November 2011, CSHH helped to scope out the density of blue mussels at a site in Hempstead Harbor that had been used as part of the National Status and Trends Mussel Watch program since 1986. CSHH has also participated on advisory committees that have been created around the harbor to develop various local 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 the Glen Cove Master Plan Task Force.

CSHH's programs and activities are supported by special fund-raising events, member contributions, and grants–including those awarded from the NYS Department of State, EPA's Long Island Sound Office, Long Island Sound Study, NY Sea Grant, the Rauch Foundation, the New York Community Trust, Long Island Community Foundation, and local businesses.

## HHPC

The idea for addressing Hempstead Harbor's water quality issues on a harbor-wide basis 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, and the HHPC (Long Island's first inter-municipal watershed organization) was born. The funds were used to hire 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 inter-municipal agreement to work cooperatively and to contribute financially on a pro-rata basis.

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 stormwater runoff to the harbor. The HHPC will soon complete a similar study for the **Powerhouse Drain subwatershed** in Glenwood Landing.

*No-wake, no-discharge sign in Hempstead Harbor (photo by Carol DiPaolo, 10/6/11)*

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. On September 6, 2011, New York State, following Connecticut's example, banned vessel sewage discharges from its portion of Long Island Sound, making the entire sound a no-discharge zone.

The HHPC has also established a Web site (www.HempsteadHarbor.org) and a Facebook page as resources on the harbor. **Ongoing educational efforts** include the production of professional coastal interpretive signage; the production of a series of three television programs; the purchase of a portable display unit that is used at area fairs, festivals, 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 two other intermunicipal efforts, the Manhasset Bay Protection Committee and the Oyster Bay/Cold Spring Harbor Protection Committee. The HHPC have also assisted with similar efforts in Northport Harbor and the Peconic Estuary.

Since 1995, the HHPC has received 22 grants, which have covered much 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 2011.

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# Acknowledgments

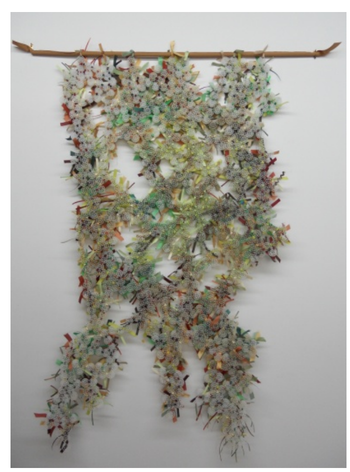
Environmental restoration and conservation require dedication, passion, patience, broad-based community support, and collaboration, as well as large infusions of technical expertise and funding. We therefore gratefully acknowledge the financial support and participation of all who have partnered with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

We offer special thanks to the National Fish and Wildlife Foundation for funding awarded through the Long Island Sound Futures Fund for the 2006 development of the Quality Assurance Project Plan for the Hempstead Harbor Water-Monitoring Program and for the 2007-2009 and 2011 water-monitoring programs conducted for the harbor.

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; the Town of Oyster Bay's Department of Environmental Resources for staff assistance and use of its boat; Nassau County Department of Health staff members who facilitate and perform the lab analysis and data review of bacteria samples collected at CSHH stations in Hempstead Harbor; Nassau County Department of Public Works staff; and members of the Nassau County Marine Police and the Underwater Search and Recovery Team.

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

- New York State Department of State
- New York State Department of Environmental Conservation
- New York Sea Grant/NEMO
- The Glenwood/Glen Head Civic Association
- U.S. Environmental Protection Agency, Long Island Sound Study Office
- The United Civic Council of Glen Head and Glenwood Landing

*Local artists Barbara Karyo and Sally Shore created a 5-ft-fish and wall hanging, respectively, from the plastic disks collected from Hempstead Harbor beaches (6/11)*

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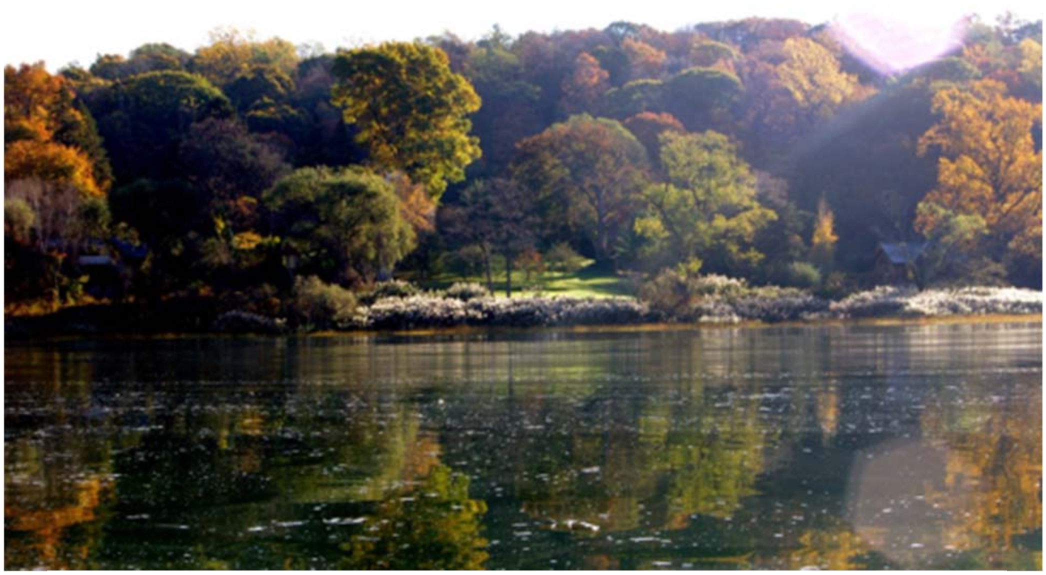
# 1 Harbor Overview

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, stormwater 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.)



*View of the William Cullen Bryant estate, Cedarmere, on east shore of Hempstead Harbor (photo by Jim Moriarty, 11/3/10)*

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 transferred ownership of the 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**, extending from Mott Point on the west to the Glen Cove breakwater on the east at the northern section of the harbor south to the Roslyn viaduct. Over the last 20 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.

By 2009, water quality had improved so dramatically in Hempstead Harbor that the results of water-quality testing undertaken by the NYS Department of Environmental Conservation (DEC) indicated that a portion of the outer harbor could be certified for shellfish harvesting. (The harbor had been restricted for shellfish harvesting for over 40 years.) The testing and regulatory process was completed in 2011, and on June 1, 2011, 2,500 acres of shellfish beds that form a band across the outer harbor were officially reopened for harvesting.

Today, Hempstead Harbor continues to support many diverse uses and activities. Fuel is transported to a Glenwood Landing oil terminal (Global Partners LP/ExxonMobil) that is adjacent to a power plant that has operated since the early 1900s. Farther 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.


*Legend community marina (L) and rock jetty (R) (photos by Carol DiPaolo (6/8/11)*

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 stormwater runoff abatement; continued improvements in water quality and reductions in bacteria levels; prevention of inappropriate land use and development, particularly along the shore; 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 full copy of this report and the electronic version 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 to 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 (CSHH) and the Hempstead Harbor Protection Committee. The QAPP documents the quality assurance and quality control (QA/QC) procedures implemented in the CSHH program. In 2010, work began to update the QAPP; the revision was completed and approved by EPA in July 2011.

Although the QAPP incorporated several new items into the water-monitoring program, the majority of the procedures outlined in the document had been implemented over the years since the inception of the program. 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.

*Outfall near pilings of an old dock in the lower harbor, west shore (photo by Jim Moriarty, 10/19/11)*

## 2.2 Location of Testing Stations

The principal CSHH stations that are sampled weekly during the monitoring season for all program parameters are located in the northern portion of the harbor, between the former 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.

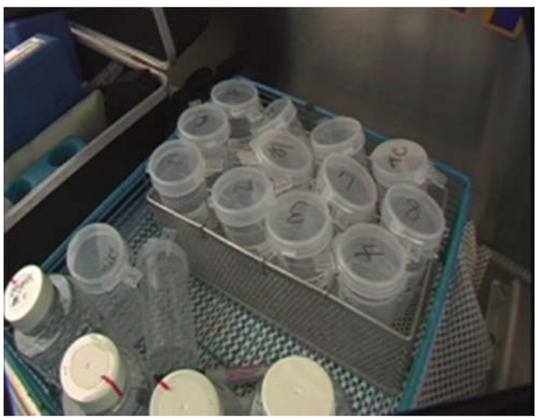

*Map of Hempstead Harbor showing locations of CSHH stations along with DEC stations sampled in 2010*

**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 |
| CSHH #15, about 50 yds from Scudders Pond Outfall, North of Tappen Beach pool area | 40 | 50.109 | 73 | 39.247 |
| CSHH #15A, at Scudder's Pond outfall pipe, north of the Tappen Beach pool area | | | | |
| CSHH #15B, at the Scudder's Pond weir on the east side of Shore Road | | | | |
| **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) | 40 | 48.474 | 73 | 38.923 |
| CSHH #14, about 50 yds from Powerhouse Drain outfall | 40 | 49.706 | 73 | 38.916 |
| CSHH #14A, at Powerhouse Drain outfall | | | | |

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.

In 2009, the water-monitoring program was greatly expanded. CSHH and the NYS Department of Environmental Conservation worked together on a plan to survey mid- and lower portions of the harbor for bacteria levels relative to water-quality standards for shellfish harvesting. Thirteen of the stations that were set up in 1988 as DEC's shellfish growing area (SGA) #50 sampling points were reestablished for 2009; SGA stations 1-13 stretched from the lower harbor (below the bar of the former Bar Beach) to a line across the harbor that is roughly in line with Glen Cove Creek. Stations 1A, 15, and 14 were also added along with sampling points at the Scudder's Pond outfall (#15A) located north of the Tappen Beach Pool and the Scudder's Pond weir (#15B). CSHH collected samples once or twice a week (depending on tidal cycles) at these points from August to early November, and the samples were delivered to the DEC lab for analysis. This component of the program was added to determine whether the opening of these areas of the harbor for shellfish harvesting would be feasible in the near future. Unfortunately, the results of this intensive sampling showed that all but two of the stations failed DEC shellfish standards on a regular basis.



*Different collection protocols for NCDH and NYSDEC; Tim Kelly and Dan Fucci (NCDPW) conducted a dye test to confirm flow from Scudder's Pond to outfall north of Tappen Pool (photos by Carol DiPaolo, 11/12/09)*

Samples from stations #14, 15, 15A, and 15B were also collected for analysis by the Nassau County Department of Health (using water-quality standards for bathing beaches) as an alternative way to monitor discharges from the Powerhouse Drain and Scudder's Pond. Powerhouse Drain and Scudder's Pond are known to be the largest contributors of bacteria to Hempstead Harbor through stormwater runoff, and remediation plans are currently being developed. The samples collected will establish a benchmark of bacteria levels before, during, and after remediation.

In 2010, CSHH station 14A was established as an additional sampling site for the Powerhouse Drain system. Samples from this station are taken directly from the large outfall adjacent to the National Grid building. Thanks to the efforts of Jack Tiernan, chief engineer at the plant, a gate was installed in the fencing over the outfall to accommodate the use of a sampling pole and jar to collect samples. The water samples are analyzed along with those mentioned above by the Nassau County Department of Health.

*Gate for water sampling at CSHH #14A above Powerhouse Drain outfall (L); detergent suds from Powerhouse Drain outfall (R)(photos by Carol DiPaolo, 8/4/10 and 7/19/10, respectively)*

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 C-1, at the mouth of Glen Cove Creek, between the Hempstead Harbor Club 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
- CSHH #13, 60 feet from the Mill Pond weir
- CSHH #15, about 50 yds from Scudders Pond Outfall, at northwest corner of the Tappen Beach pool area
- CSHH #15A, at the Scudder's Pond outfall pipe, north of the Tappen Beach pool area
- CSHH #15B, at the Scudder's Pond weir on the east side of Shore Road

*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 five 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 at Bryant Landing) 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 Sterling Glen and Horizon buildings.)
- CSHH #14, about 50 yds from Powerhouse Drain outfall
- CSHH #14A, directly from the Powerhouse Drain outfall

The 19 DEC monitoring locations are as follows:

- DEC #1, same as CSHH #6
- DEC #1A, same as CSHH #7
- DEC #2, center of lower harbor
- DEC #3, pilings, near mouth of Mott's Cove and CSHH #5
- DEC #4, south of North Hempstead Beach Park (formerly Bar Beach) sand spit, near boat ramp
- DEC #5, same as CSHH #4

- DEC #6, northeast of Beacon 11, near CSHH #1
- DEC #7, near gravel pile, west shore
- DEC #8, near C-9 navigational marker
- DEC #9, south of Dock Hill/Sea Cliff Park and north of Tilley's boathouse
- DEC #10, west shore at end of private dock, in line with C-A navigational marker
- DEC #11, at C-A navigational marker
- DEC #12, same as CSHH #3, at red channel marker C-1
- DEC #13, outside of Glen Cove marina in Glen Cove Creek
- DEC #14, same as CSHH #14
- DEC #15, same as CSHH #15
- DEC #15A, same as CSHH #15A
- DEC #15B, same as CSHH #15B
- DEC STP, same as CSHH #8.

## 2.3 Frequency of Testing and Testing Parameters

Testing is conducted weekly, from May to November, at each station, generally on the same day of the week and at the same time (beginning at approximately 7 AM and typically continuing for 5 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 18 testing stations for bacterial analysis by the Nassau County Department of Health. In addition, tests for dissolved oxygen (DO), salinity, water temperature, and pH are conducted weekly at CSHH #1, #2, #3, #8, and #13 and monthly to bimonthly at CSHH #4, #5, #6, #7, #14, and #15. Nitrite, nitrate, and ammonia samples are collected weekly at CSHH #1, #2, #3, #8, and #13 and monthly to bimonthly at CSHH #4, #5, #6, #7, #14, and #15. 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 sample of bottom water is also tested for DO using the Winkler titration method at the first station that is monitored for the day (generally CSHH #1) 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.

Turbidity is also recorded at stations CSHH #1-8, 13, 14, and 15 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-disk depth.

**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, 13, 14, and 15 | 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, 13,14, and 15 | 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, 13, 14, and 15 | YSI 600 | Field |
| pH | Vertical profile at 1-meter intervals at CSHH #1-8, 13, 14, and 15 | 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 #1-8, and 13, 14, and 15 | LaMotte 2020e (USEPA 180.1) | Field |
| Clarity | CSHH #1-8, 13, 14, and 15 | LaMotte Secchi Disk | Field |
| Ammonia | Grab sample at half-meter depth at CSHH #1, 7, and 8 | LaMotte 4795 (Nessler Method) | Field |
| Ammonia | More refined method used at CSHH #1, 7, and 8, and other stations when the preceding tests detect ammonia | LaMotte 3304 (Salicylate Method) | Field |
| Nitrate | Grab sample at half-meter depth at CSHH #1- 8, 13, 14, and 15 | Hach 8192 | Oyster Bay Town Lab |
| Nitrite | Grab sample at half-meter depth at CSHH #1-8, 13, 14, and 15 | Hach 8507 | Oyster Bay Town Lab |
| Fecal Coliform Bacteria | Grab sample half-meter depth at CSHH #1-13, 14, and 15 and just below surface or from outfall flow at 14A, 15A, and 15B. | Membrane Filter | Nassau County Department of Health |
| Enterococci | Grab sample at half meter depth at CSHH #1-13, 14, and 15 and just below surface or from outfall flow at 14A, 15A, and 15B. | Membrane Filter | Nassau County Department of Health |
| Precipitation | Village of Sea Cliff | Visually read rain gauge | Field |

LaMotte test kits are also used to measure ammonia. (Because previous years' test results indicate that the Nessler method is less reliable than the salicylate method for detecting ammonia in the harbor, beginning in 2012 the Nessler method will be dropped.) 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 Nassau County 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, data from the CSHH program from 1995-2010 is compared with 2011 data. *Appendices A, B,* and *C* include graphs constructed with the data collected during this period.

## 3.1 Dissolved Oxygen

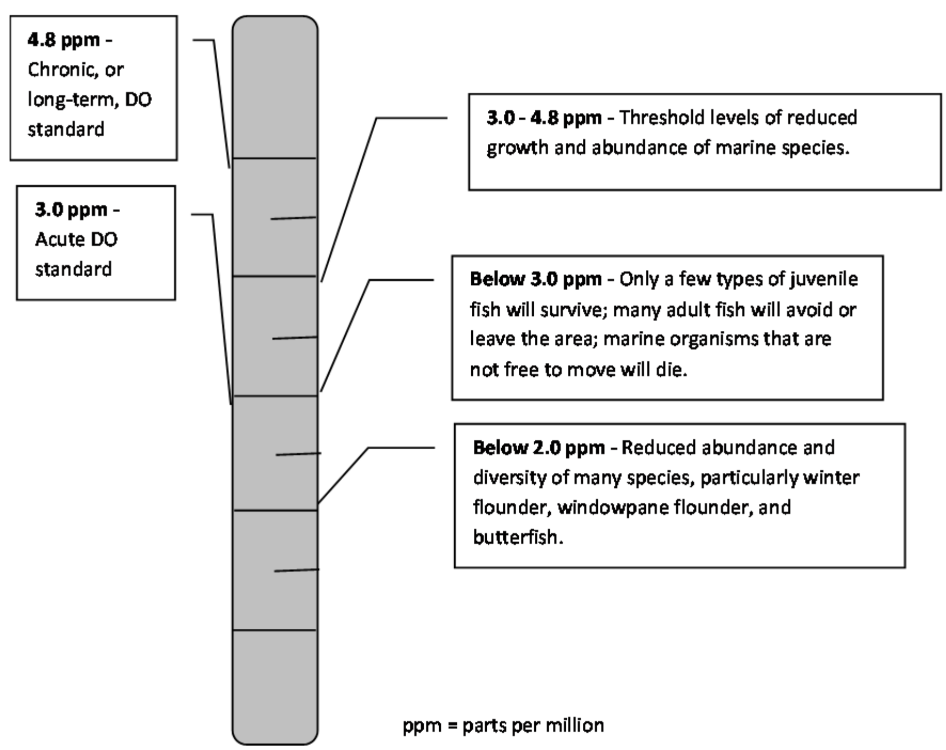
Dissolved oxygen, the form of oxygen that marine life needs to survive, is an important indicator of the health of our Long Island Sound estuary. Hypoxia (low oxygen) and anoxia (no oxygen) are common water-quality problems that occur during the summer in Hempstead Harbor and in other areas in and around Long Island Sound, particularly in the western sound. DO is indirectly affected by nutrient enrichment, particularly nitrogen, which can enter Hempstead Harbor through stormwater 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 effect.

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 by low DO 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 ppm 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**
**DO Standards and Effects of Depleted DO on Marine Life**




However, states often interpret effects of environmental conditions on marine life differently; for example, Connecticut's DO standard was 5.0 ppm through 2010 (it was changed to 4.8 ppm in 2011), and it specified maximum periods for which exposure to low DO is allowed. These standards are similar to the New York standards, although not completely consistent.

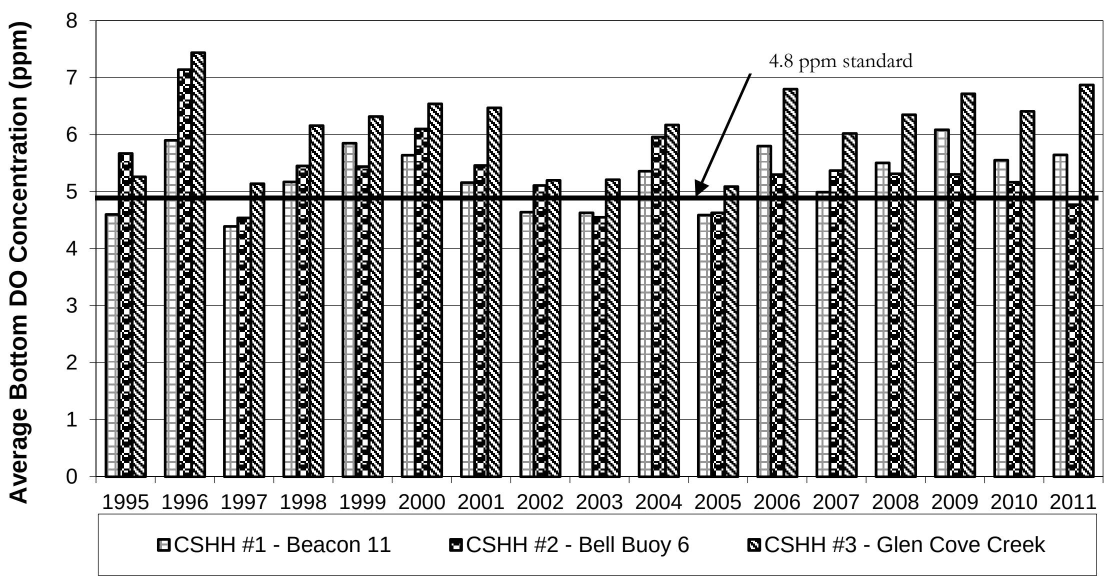
**Percent saturation** of dissolved oxygen is also monitored in Hempstead Harbor. Percent saturation is a measure of the amount of oxygen currently dissolved in water compared with the amount that can be dissolved in the water, and it is influenced by variability in water temperature and salinity. In 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, which, for purposes of this report, is less than 1.0 ppm ) 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 through 2011.

*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.

**Figure 2**
**Measured Average DO in Hempstead Harbor for 3 Monitoring Stations**



Average DO levels at all locations (depicted in *Figure 2*) for the 2011 monitoring season were generally within the range of values for many previous years. DO levels at CSHH #2 were noticeably lower than the past five years (~7% lower than the five-year average and slightly below the 4.8 ppm DO standard, at 4.77 ppm) whereas levels at CSHH #1 were slightly higher than levels from the previous five years (~2% higher than the five-year average). DO levels at CSHH #3 were above levels for the previous five years (~4% higher than the five-year average) and were the second highest seen since the monitoring began in 1995. The pattern of dissolved oxygen levels is mixed and does not appear to show collective improvement or degradation.

The number of hypoxic measurements in 2011 was moderate. Hypoxic conditions were recorded on three of the sampling days in July: July 6 at CSHH #2 and CSHH #8 (2.42 ppm and 1.55 ppm, respectively), July 20 at CSHH #1 and CSHH #2 (1.64 ppm and 1.56 ppm, respectively); and July 27 at CSHH #13 (2.78 ppm). Hypoxic conditions were recorded three days in August: on August 3 at CSHH #8 and CSHH #13 (2.98 ppm and 1.59 ppm, respectively); August 17 at CSHH #2 (2.87 ppm); and August 24 at CSHH #8 (2.98 ppm). Hypoxic conditions were recorded on two days in September: September 14 at CSHH #2 (2.93 ppm) and September 28 at CSHH #1 (2.37 ppm). Anoxic levels were recorded at CSHH #2 and CSHH #3 on August 24 (0.14 ppm and 0.48 ppm, respectively).

The percentage of DO measurements in the high DO range (> 6.0 ppm) decreased in 2011 at all stations except CSHH #3 compared with levels in 2010 (see *Table 4)*. The percentage of DO measurements in the mid- to low-level ranges (3 to 5 ppm) in 2011, compared with the percentage in previous years, increased in two of the four locations (CSHH #1 and CSHH #2 increased). The percentage of DO measurements in the hypoxic range increased in only one of the four sampling locations (CSHH #8). It should be noted that the percent changes resulted from only one or two additional hypoxic measurements at CSHH #2, CSHH #3, and #8.

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

| Average Bottom DO (ppm) | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 | 2004 |
|---|---|---|---|---|---|---|---|---|
| **CSHH #1** | 5.64 | 5.55 | 6.09 | 5.50 | 4.99 | 5.76 | 4.59 | 5.36 |
| **CSHH #2** | 4.77 | 5.16 | 5.30 | 5.31 | 5.37 | 5.27 | 4.63 | 5.96 |
| **CSHH #3** | 6.87 | 6.41 | 6.72 | 6.35 | 6.02 | 6.80 | 5.09 | 6.17 |
| **CSHH #8** | 6.14 | 6.26 | 6.73 | 5.73 | 5.93 | 7.05 | 5.76 | 6.58 |

| Average Bottom DO (ppm) | 2003 | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 |
|---|---|---|---|---|---|---|---|---|
| **CSHH #1** | 4.63 | 5.16 | 5.64 | 5.85 | 5.17 | 4.39 | 5.90 | 4.60 |
| **CSHH #2** | 4.55 | 5.46 | 6.10 | 5.44 | 5.45 | 4.54 | 7.11 | 5.67 |
| **CSHH #3** | 5.21 | 6.47 | 6.54 | 6.32 | 6.48 | 5.15 | 7.45 | 5.26 |
| **CSHH #8** | 5.28 | 6.82 | 7.35 | 7.14 | N/A | N/A | N/A | N/A |

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. Similarly, better DO levels 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 stormwater 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.

*Sea Isle at unusually high tide (photo by Carol DiPaolo, 10/26/11)*

**Table 4**
**DO Readings 1996-2011: Number and Percentage of Testing Dates/Samples at Which Bottom DO Tested at Specific Levels**

| | >6 ppm | | 5 to 6 ppm | | 3 to 5 ppm | | <3 ppm | |
|---|---|---|---|---|---|---|---|---|
| **CSHH #1–Beacon 11** | | | | | | | | |
| *Year* | # | % | # | % | # | % | # | % |
| **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 |
| **2009** | 11 | 48 | 6 | 26 | 4 | 17 | 2 | 9 |
| **2010** | 12 | 50 | 2 | 8 | 5 | 21 | 5 | 21 |
| **2011** | 9 | 39 | 3 | 13 | 9 | 39 | 2 | 9 |
| **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 |
| **2009** | 10 | 50 | 1 | 5 | 4 | 20 | 5 | 25 |
| **2010** | 10 | 43 | 1 | 4 | 6 | 26 | 6 | 26 |
| **2011** | 7 | 32 | 2 | 9 | 8 | 36 | 5 | 23 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **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 |
| **2009** | 14 | 61 | 5 | 22 | 2 | 9 | 2 | 9 |
| **2010** | 12 | 52 | 2 | 9 | 7 | 30 | 2 | 9 |
| **2011** | 15 | 68 | 3 | 14 | 3 | 14 | 1 | 5 |
| **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 |
| **2009** | 14 | 61 | 6 | 26 | 3 | 13 | 0 | 0 |
| **2010** | 13 | 57 | 2 | 9 | 6 | 26 | 2 | 9 |
| **2011** | 12 | 52 | 3 | 13 | 4 | 17 | 4 | 17 |

## 3.2 Temperature

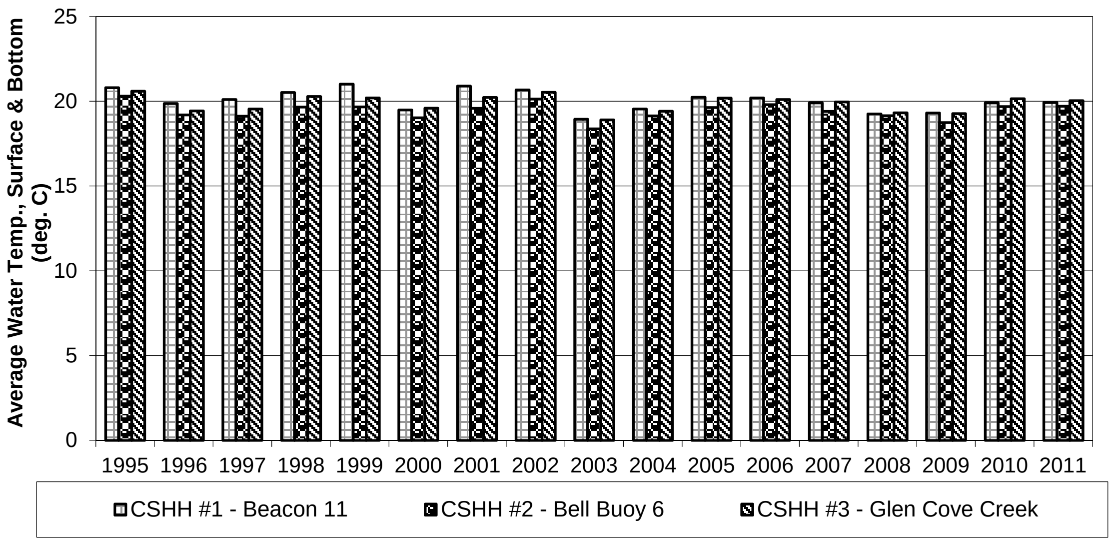
**Water temperature** is monitored to record seasonal and annual changes of temperature within the harbor and to determine whether temperature could be affecting marine life, especially organisms in the harbor that are in the southernmost limit of their habitat. Although a warming trend has been observed 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), DO reaches 100% saturation concentration in water when it is present at a level of 14.6 ppm, whereas at 68ºF (20ºC), 100% DO saturation concentration is reached at 9.2 ppm, and at 77ºF (25ºC), it is reached at 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; because 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**



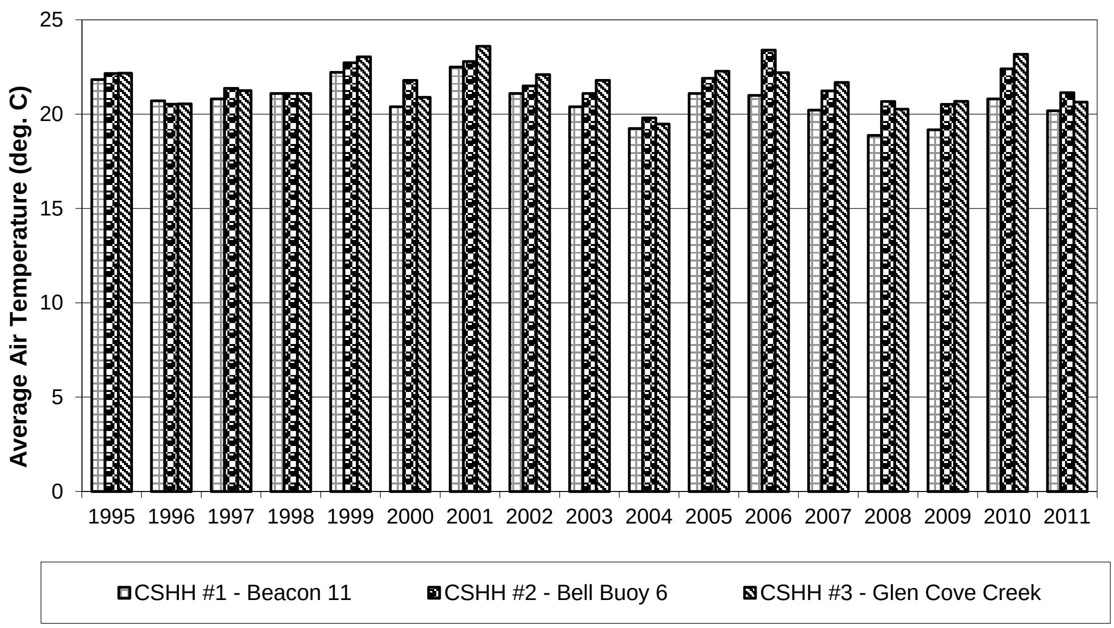

Measured water temperatures at CSHH #2 were slightly lower than at the other monitoring locations during each year, although the temperature difference is generally less than 1ºC. CSHH #2 is located at the mouth of the harbor and is more significantly influenced by the Long Island Sound's deeper, and thus cooler, water. In 2011, water temperature was slightly warmer than 2010 but similar to the average temperature at all locations in past years (average water temperatures for CSHH stations #1-3 for years 1995-2010 are 20.0ºC, 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, because 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 temperatures recorded at CSHH #1 through CSHH #3 for each year since 1995. Average air temperatures recorded during the monitoring events vary by approximately 5 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 2011, the average air temperature was similar to that seen in 1996 through 1997 and 2000. The average temperature in 2011 was less than 1ºC higher than 2008 and 2009 (the second and third coolest monitoring season on record respectively).

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

**Figure 4**
**Average Air Temperature Recorded During Seasonal Monitoring Events**



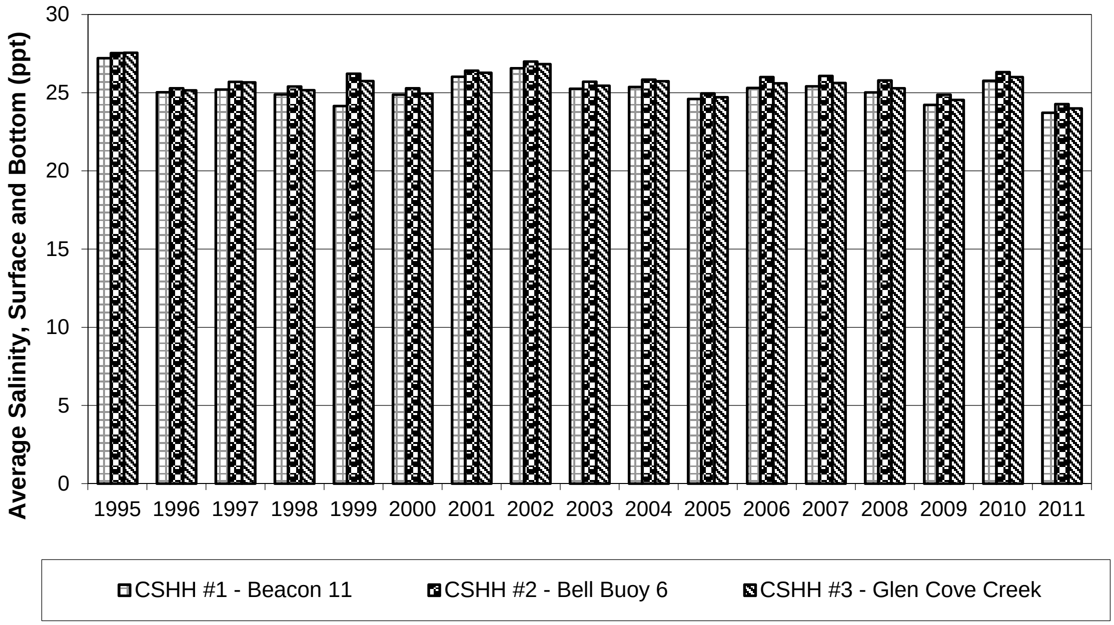

## 3.3 Salinity

Monitoring salinity assists in determining whether the harbor is being influenced by tidal water or, instead, by freshwater from the watershed (i.e., from streams, stormwater, 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 affects 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, salinity readings at these three stations within Hempstead Harbor usually range from 22 ppt to 28 ppt, with lower readings generally observed in the spring, and gradually increasing through the fall.

**Figure 5**
**Measured Average Salinity in Hempstead Harbor**

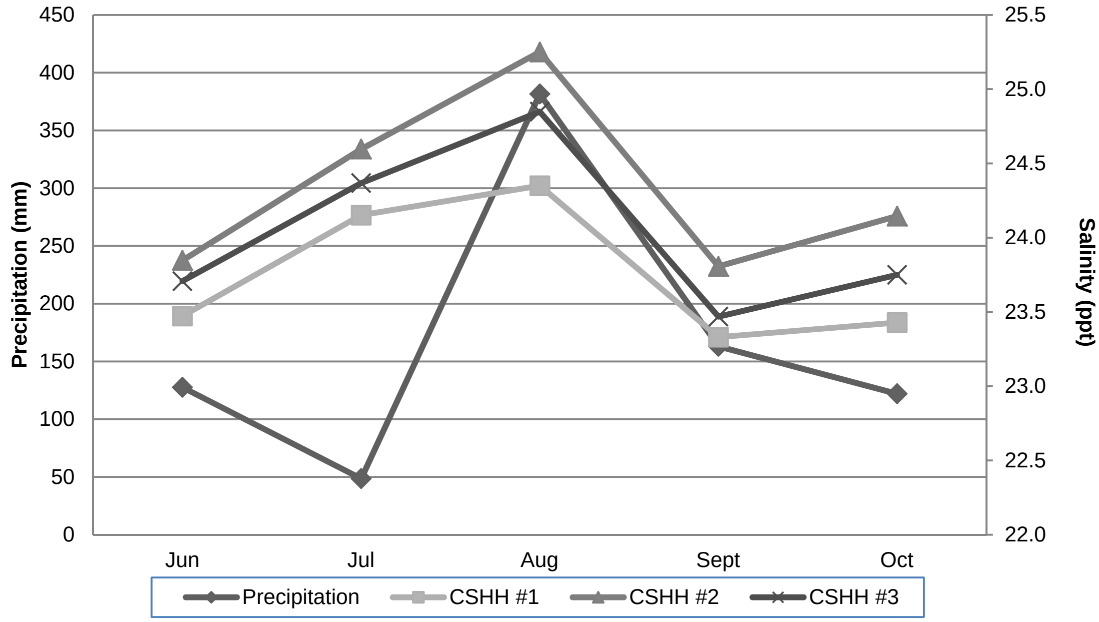



Additionally, salinity levels measured at the bottom of the harbor are generally higher than those near the surface, because high-salinity water is denser and tends to sink. Surface salinity levels are often approximately 1 ppt lower than those at the bottom, suggesting that slight stratification is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

In most years (1996 through 2000 and 2003 through 2010), 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 2011 (23.99 ppt) were lower than average levels recorded in all past years – lower even than the levels in 2005, which until 2011 were the lowest measured during the period of record. See *Appendix A* for additional salinity data results.

The surface and bottom readings for salinity levels at each station (CSHH #1-3) in June ranged from 22.55 ppt to 24.27 ppt, whereas readings in October for each station ranged from 22.90 ppt to 24.56 ppt—slightly higher. As shown in *Figure 6* (below), average salinity at each station (CSHH #1-3) appears to increase with decreasing precipitation in June and July. This relationship is not observed in August and September, but the precipitation during those months was heavily influenced by Hurricane Irene in August and Tropical Storm Lee in September. The higher amount of salinity in August could be the effects of storm surges – pushing higher-salinity ocean waters into the sampling area. In general, there may be some effect on salinity (particularly surface salinity) in areas influenced (diluted) by stormwater discharges. Also seen in the figure below, the most open harbor sampling location, CSHH #2, had the highest measured salinity levels of those shown.

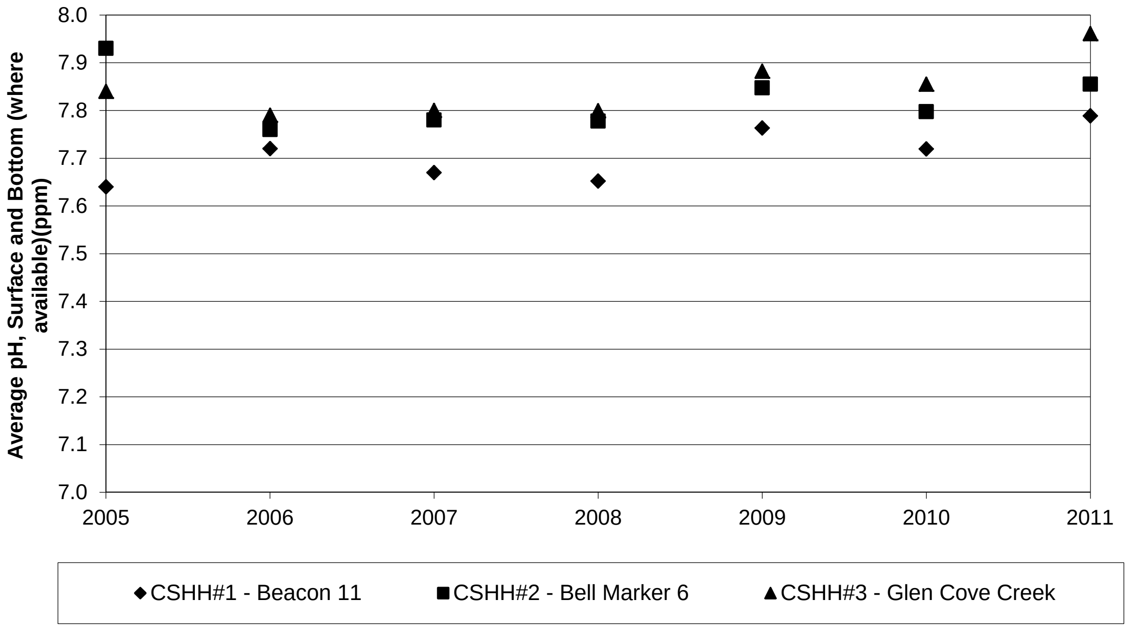
**Figure 6**
**2011 Average Monthly Salinity and Monthly Precipitation**




## 3.4 pH

*pH* is monitored to follow trends in aquatic life and water chemistry. Carbon dioxide ($CO_2$) released 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 during the 2011 season was higher than that seen in the previous five monitoring seasons. There is no likely relationship between the increased pH and higher rainfall witnessed in 2011 as the pH of rainwater is typically between 5.5 and 6.0 (more acidic, i.e., lower, than the pH of the Hempstead Harbor samples).

**Figure 7**
**Measured Average pH in Hempstead Harbor during Seasonal Monitoring Events**




## 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 typically range from 0.25 to 3 meters during the monitoring season. For 2011, the range for the monitoring season was 0.8 to 2.3 meters (for CSHH #1-3), as compared with a range of 0.8-3.0 meters for 2010. 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 from 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, regulatory agencies have not articulated a background turbidity level 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).

**Table 5**
**Review of Turbidity Criteria**

| State | Criteria | Reference |
|---|---|---|
| Washington | "Extraordinary and excellent quality" waters – Not to exceed:<br>• 5 NTU above background levels when the background is 50 NTU or less<br>• 0% increase if the background is greater than 50 NTU<br>"Good and fair quality" waters – Not to exceed:<br>• 10 NTU above the background levels when it is less than 50 NTU<br>• 20% increase if the background is more than 50 NTU | WAC 173-201A-210(1)(e) |
| 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<br>• 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<br>• Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters<br>• 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 |

Because of the previously cited significance of turbidity on the marine environment, turbidity sampling was initiated for Hempstead Harbor stations in July 2008. At each station monitored, turbidity is measured using a LaMotte 2020e meter at two depths—at a half meter below the surface and at Secchi-disk depth. (It should be noted that the results generated by the LaMotte 2020e (an EPA approved design) may 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 generally be inversely related and increase as the Secchi depth decreases (and vice versa). Although, based on a review of scientific literature, there is no direct inverse relationship between Secchi depth and turbidity measurements (i.e., Secchi Depth = N/Turbidity, where N is a variable coefficient) (Effler, 1988)), measures of conditions at Hempstead Harbor stations (except for CSHH #13 in 2010) clearly indicate an inverse relationship; that is, the greater the number for the depth at which the Secchi disk could be seen below the surface (the greater the transparency), the lower the number measured by the meter in NTUs (the lower the turbidity). In 2011, the turbidity ranged from 0.11 to 3.62 NTUs at the sampling depth of one-half meter (CSHH #1-#3); for the preceding year, the range was 0.31 to 5.54 NTUs, and since 2008 (when turbidity monitoring began), the range was 0.45 to 4.85 NTUs. See *Appendix A* for additional turbidity data.

## 3.6 Nitrogen

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.

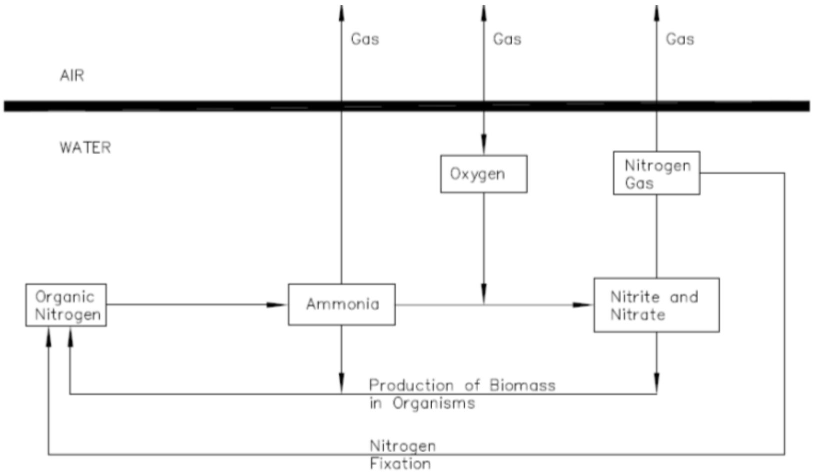
### 3.6.1 The Nitrogen Cycle

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; stormwater runoff; and old or failing wastewater treatment plants). Inputs of nitrogen from the watershed are in the form of ammonia, nitrite, or nitrate (*Figure 8* presents a diagram of the nitrogen cycle in the water environment.). Ammonia and nitrate generally originate from fertilizer, human or animal wastes from old or failing septic systems and wastewater treatment plants, and stormwater runoff. Nitrate is also a product of properly functioning treatment plants, which convert ammonia to nitrate.

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.

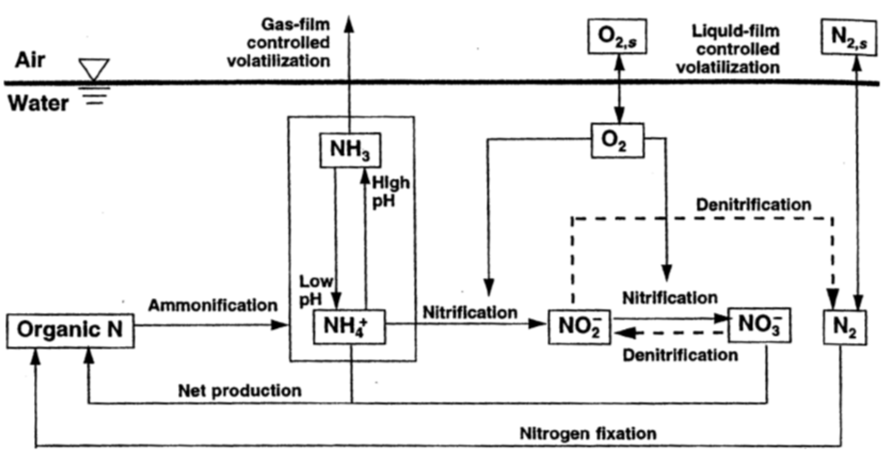
**Figure 8**
**Nitrogen in Marine Environments**
*(Adapted from: Surface Water Quality Modeling, Steven Chapra, McGraw-Hill, 1997)*




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.

*Figure 9* presents a schematic of the interrelationships between the nitrogen species and other environmental factors such as pH and oxygen, showing the processes that affect nitrogen in the marine environment.

**Figure 9**
**Nitrogen Species and Processes in Marine Environments**
*(Source: Chapra, 1997)*




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 CSHH #1, #2, #3, #8, and #13 and, when tidal and weather conditions allow, at CSHH #4-7, 14, and 15 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 2011 as in 2008-2010, nitrite and nitrate samples continued to be analyzed at the Town of Oyster Bay lab, Lockwood, Kessler and Bartlett, Inc., 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 stormwater discharges or may even indicate a large presence of fish. Generally, ammonia is measured using the Nessler and salicylate methods at CSHH #1, #7, and #8. If ammonia is detectable at CSHH #1, a midpoint in the harbor, ammonia levels are then measured at the other locations using both the Nessler and salicylate methods to see whether either will pick up detectable amounts of ammonia at those stations. (Because test results indicate that the Nessler method is less reliable in detecting ammonia in Hempstead Harbor, the Nessler method will be discontinued beginning in the 2012 monitoring season.) 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).

As stated above, ammonia represents the end-product of protein metabolism, but what is important for water-quality concerns is whether it is present in the un-ionized form as free ammonia, $NH_3$, which is toxic to fish (both freshwater and marine) or in the ionized form, $NH_4$+, which is innocuous. The relative concentration of each form is pH and temperature dependent (and to a small extent the fraction of un-ionized ammonia is inversely related to salinity). Higher pH and temperature are associated with increased levels of the more toxic form of ammonia ($NH_3$). pH has the largest effect on increasing ammonia toxicity, increasing the amount of free ammonia, $NH_3$.

***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 stormwater inputs is more complicated because the sources of nitrogen and other pollutants are so diffuse.

In 2011, ammonia (salicylate method) began to be detected starting in the month of September and continuing into November at various sampling locations. CSHH #8 had the most occurrences of detected ammonia, which is understandable given its location near the Glen Cove STP. See *Appendix C* for additional nitrogen data.

## 3.7 Chlorine

Through 2008, CSHH's program included 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. However, chlorine testing ceased in June 2009, after a backup generator was installed at the STP to make the ultraviolet (UV) light disinfection system fully operational; the chlorine vats at the STP were emptied at this time. (On March 1, 2008, Nassau County purchased the plant from Glen Cove but retained the operator, Severn Trent Environmental Services, Inc.)

The UV disinfection system, which was installed at the plant at the end of the 2006 monitoring season, uses UV light to disinfect the wastewater prior to discharge. UV disinfection leaves no chemical residual and will not affect the environment when water from the plant is discharged. However, while the plant did not have a back-up generator, the chlorination system ran in conjunction with the UV system to prevent untreated sewage from entering the harbor in the event of a power failure. During this time, the amount of chlorine residual in the STP discharge decreased to 0.5 ppm (the typical chlorine residual was 2 ppm before the UV system began operating). The replacement of the chlorination system with the UV disinfection system offers a significant benefit for water quality because it removes the risks posed by chlorine by-products, which can have an adverse impact on marine life. However, in 2010, a power failure caused a series of system failures at the STP that resulted in a large discharge of sewage to the harbor. Another power failure on March 10, 2011, caused an estimated 89,373 gallons of untreated sewage to enter Glen Cove Creek. (See, also, *Section 3.8.3.*).

## 3.8 Bacteria

The Nassau County Department of Health and the New York State Department of Environmental Conservation 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.

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

**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.

### 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 bacteria, 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 **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 (typically, the threshold is 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 2011, Sea Cliff and Tappen Beaches were closed preemptively for eight days, related to six rain events (threshold of ½-inch of precipitation over a 24-hour period). In addition, Sea Cliff Beach was closed for five days because of elevated bacteria levels recorded from June 1-16. North Hempstead Beach Park was closed preemptively for ten days, and an additional closure day due to high bacteria levels. North Hempstead Beach Park had additional preemptively closed events because it opens earlier in the season than other Hempstead Harbor beaches. The numbers of preemptive closures in 2011 increased significantly from those in past years because of the increased number of rain events that occurred with more than a half inch of rainfall.

### 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 required 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 at 20 CSHH monitoring stations in Hempstead Harbor (12 stations on a weekly basis and others depending on weather and tidal conditions). 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.

*White flow from pipe at CSHH #10, Glen Cove Creek (photo by Carol DiPaolo, 6/8/11)*

CSHH continues to monitor all of the stations in the creek and inform both NCDPW and NCDH of any unusual conditions. Occasionally, a white flow is observed from CSHH #10 and noted on both the NCDH data sheets for bacteria samples and the CSHH data sheets.

Also, as mentioned previously, despite upgrades to the Glen Cove sewage treatment plant, power failures have caused system failures within the STP, resulting in sewage spills into Glen Cove Creek. A large spill of 900,000 gallons of sewage occurred on June 26, 2010; another spill estimated at 89,373 gallons occurred on March 10, 2011. A detailed report of the March 10 spill was issued by the Nassau County Department of Public Works, including a description of corrective actions that were taken to prevent future incidents. In response to concerns about inadequate communication of sewage spills, Nassau County started an opt-in program whereby residents can request (through the county website) to be notified when sewage releases occur at county sewage treatment plants.

### 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 2011, monthly average bacteria results for enterococci at the area beaches ranged from 6.50 CFU (colony forming units)/100 ml at the Village Club of Sands Point/Sands Point Golf Club in April to 410.40 CFU/100 ml at the same location in May. Overall, in 2011, Village Club of Sands Point had the highest average bacteria levels, whereas Sea Cliff Beach had the lowest (see *Table 6*). It should be noted that Sea Cliff Beach had the highest average bacteria levels during in 2010 sampling season.

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 #8, #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. There were only 9-10 samples at CSHH #4, #5, #6, #7, #14, and #15, which makes seasonal evaluation using time series plots difficult.

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.

For a few of the sampling events, concentrations of the two indicator organisms fecal coliform and enterococci were noticeably different with concentrations of one organism being low and concentrations of the other being high (examples include June 6 at CSHH #6 and CSHH #7, July 7 at CSHH #11, and July 7 and 27 at CSHH #5 and CSHH #8). While this difference in the behavior of the two indicator organism is counterintuitive because one would expect that all indicators of fecal pollution should behave similarly, it is not uncommon. Scientific studies have found that though fecal coliform and enterococci are both used as fecal indicator organisms they are not highly correlated to each other. Both parameters indicate contamination, but the lack of correlation between the two may be related to bacteria source, the differing decay rates for the two species, and the possibility that they may have differing potential for regrowth in the watershed.

**Table 6**
**Monthly Average for Beach Enterococci Data for 2011**

| | Units in CFU/100 ml* | Sands Point Golf Club | North Hempstead Beach (N) (former Hempstead Harbor Beach) | North Hempstead Beach (S) (former Bar Beach) | Tappen Beach | Sea Cliff Beach |
|---|---|---|---|---|---|---|
| April | Enterococci | 6.50 | 20.75 | 92.50 | 31.60 | 14.20 |
| May | Enterococci | 410.40 | 40.88 | 89.63 | 325.63 | 48.51 |
| June | Enterococci | 22.60 | 24.11 | 72.30 | 10.46 | 29.11 |
| July | Enterococci | 74.50 | 113.90 | 63.30 | 13.44 | 19.59 |
| August | Enterococci | 21.22 | 49.23 | 28.41 | 7.52 | 19.81 |
| Season Average | Enterococci | 122.96 | 52.14 | 64.93 | 77.60 | 27.14 |

**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 some instances, and for fecal coliform only, on three dates at a few sampling locations (June 1 at CSHH #14A, CSHH #15A, and CSHH #15B; August 31 at CSHH #14A; and October 20 at CSHH #10, CSHH #11, and CSHH #15A), the bacteria results indicated levels that exceeded the laboratory's maximum measurable value. (This has to do with dilutions that are specified in the lab's protocol for analysis of fecal coliform samples—of 100 ml, 10 ml, and 1 ml—to be able to read 20-60 colonies per plate.)

### 3.8.5 Shellfish Pathogen TMDLs

Shellfish beds in most areas around western Long Island Sound have been restricted or closed to harvesting for between 40 and 70 years. In 2011, a portion of the shellfish beds in the northern section of Hempstead Harbor were reopened because of water-quality improvements. However, a large area of the harbor remains restricted from shellfish harvesting. 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. Fecal coliform is the indicator organism that is used to determine whether certain water bodies are safe for shellfish harvesting. This coliform bacteria is associated with human and animal waste and is 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 in *Section 3.8.2* above).

In August 2007, DEC announced the release of a report on 'Shellfish Pathogen TMDLs for 27 303(d)-listed Waters." 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.

On August 10, 2007, representatives of CSHH, HHPC, and NCDPW attended a DEC 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 DEC test results, which showed that a portion of the harbor's shellfish beds could 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 shell fishing, 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 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.

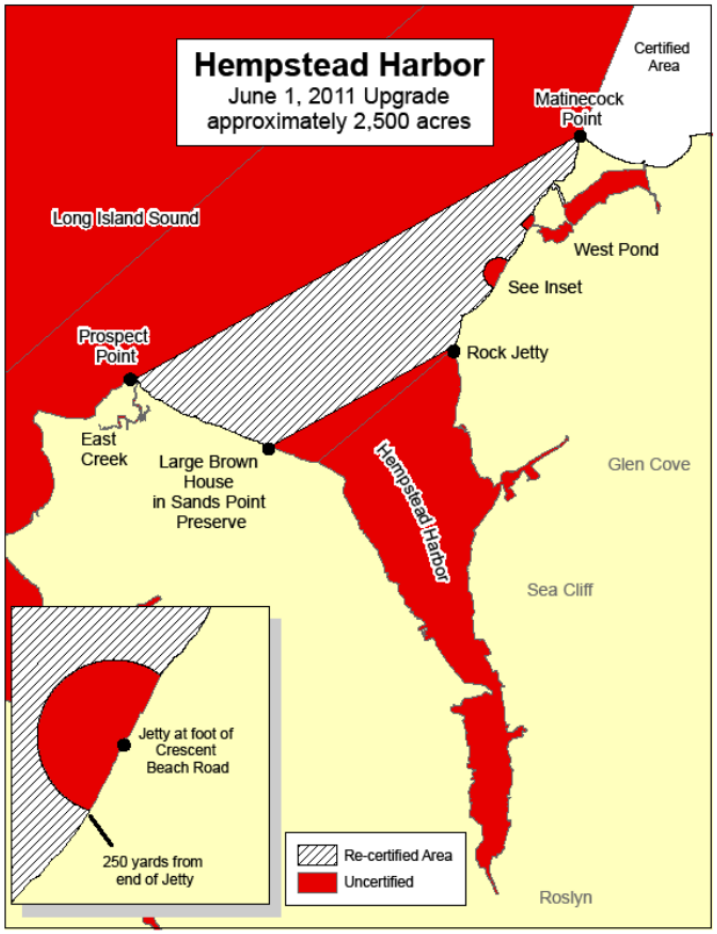
### 3.8.6 Monitoring Shellfish Growing Area #50

In 2009, in an attempt to assess shellfish water quality and determine whether opening mid- and lower sections of the harbor to shellfish harvesting should be pursued, CSHH partnered with DEC to collect samples in the area of the harbor just south of a line roughly from the entrance of Glen Cove Creek on the eastern side of the harbor stretching across to the western shore. Thirteen of the 19 stations sampled were the same stations established by DEC in 1988 for shellfish growing area (SGA) #50; six stations were new to SGA #50 and included areas intended to capture information for bacteria levels produced by stormwater or other discharges from Scudder's Pond and the Powerhouse Drain outfall. The samples were delivered to the DEC lab in East Setauket, where they were analyzed for fecal coliform. The results show that the sampling stations exceeded single-sample standards (49 FC/100ml) 37% of the time with DEC #13 (outside of Glen Cove Marina in Glen Cove Creek) exceeding at the highest rate, 53%.

CSHH did not collect samples at these stations in 2010 or 2011. Before this type of testing can be initiated once again, there would have to be some indication of additional water-quality improvements, e.g., from structural changes completed around the harbor to reduce runoff and bacteria loading.

### 3.8.7 Shellfish Beds Reopened in Outer Harbor

June 1, 2011, was opening day for the newly certified shellfish beds in Hempstead Harbor. After five years of rigorous water-quality testing, as well as testing of samples of hard-shell clams from the area, DEC and the NYS Department of Health determined that 2,500 acres of the outer portion of Hempstead Harbor could be reopened for shellfish harvesting year-round. For the first time in more than 40 years, clams, oysters, mussels, and scallops can be taken from this area by both commercial and recreational clammers, consistent with the size and quantity limits set for state waters. The rest of the harbor and East Creek, West Pond, and Dosoris Pond, which empty into the outer harbor, remain closed to shellfishing. Additionally, a small semicircular area around Crescent Beach is closed to




*NYSDEC's Map of Hempstead Harbor showing the recertified and uncertified shellfishing areas.*

shellfishing. (Crescent Beach has been closed for swimming for several years due to high bacteria levels caused by failing septic systems that drain into a stream that runs alongside of the beach and empties into the harbor.)

On the opening day, we interrupted our regular monitoring program to view activity in the area. Over 50 boats with clammers were busy off of the eastern shore of the harbor, pulling up clams in a variety of sizes. One clammer told us that he was pulling about a third of a bushel of clams per rake. Many of the boats were from Huntington Bay and Oyster Bay.

The high activity in the area continued for weeks after the opening, raising questions about how long such harvesting activity would continue and whether the shellfish resources in that area could sustain that level of pressure. By the end of the monitoring season, the number of boats harvesting clams in the area diminished significantly.


*Aerial view of the Crescent Beach closure line (provided by NYSDEC, 2011)*

The DEC will continue to monitor the water quality of the newly reopened shellfish area and make necessary changes to the area's classification as conditions warrant. The DEC follows a protocol for temporarily closing shellfish beds after a threshold (3 inches) and duration of rainfall, similar to that used by NCDH for closing beaches, to protect against health risks associated with high bacteria levels caused by stormwater runoff. CSHH will continue visit the area weekly and record the number of boats harvesting clams throughout the season.

*Jim Moriarty and News 12 team filming baymen clamming on the opening day of the harbor's shellfish beds (photos by Carol DiPaolo, 6/1/11)*

### 3.8.8 Bacteria Source Tracking

In March 2010, CSHH and HHPC developed a grant proposal (for funding under the Long Island Sound Futures Fund) to expand the water-monitoring program to include bacteria source tracking at mid-harbor stations as well as at specific outfalls that are suspected of contributing high levels of bacteria to Hempstead Harbor. The goal of the proposal was to determine whether most of the bacteria entering the harbor is primarily from human or nonhuman sources. The plan was to send water samples collected from Hempstead Harbor to a laboratory that does specialized genetic testing using a bacteroides marker.

Because water quality has greatly improved over the years, increasing numbers of water birds are now seen on and around the harbor, and there is a question as to whether the birds are a significant factor in bacterial levels in Hempstead Harbor. Bacteroides analysis, along with other types of monitoring, would help answer that question so that appropriate strategies could be formulated.

The proposal also included assessing areas upland of the outfalls and then developing a work plan to address the outfalls that were found to be the largest contributors of bacteria loading in the harbor. At completion of this work, a request would be made to DEC to do another round of tests to check whether structural enhancements were successful in improving water quality so that broader areas of the harbor could be certified for shellfish harvesting in the future.

Unfortunately, the proposal for bacteria source tracking was not approved for funding under the LIS Futures Fund. The proposal cannot be implemented until guaranteed funding sources are secured.

## 3.9 Precipitation

Precipitation affects Hempstead Harbor water quality through direct precipitation (precipitation that falls directly on the harbor surface) and through stormwater 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 stormwater 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 7* presents monthly total precipitation for June through October, 1997 through 2011.

The total quantity of precipitation that fell in June through October 2011 was significantly higher than the quantity that fell in previous years, with the highest seasonal total rainfall for the 15 years recorded. This accounted for the increased number of beach closures in 2011 (see *Section 3.8.1*). Typically, the distribution of precipitation varies from month to month. In 2011, July was very dry, whereas August was the wettest month of the monitoring season. Of note was the significant precipitation (157.5 mm) associated with Hurricane Irene that affected the area at the end of August.

**Table 7**
**Monthly Rainfall Totals for the 1997-2011 Monitoring Seasons, in mm**

| | June | July | August | September | October | Total |
|---|---|---|---|---|---|---|
| 2011 | 127.5 | 48.5 | 381.5 | 163 | 122 | 842.5 |
| 2010 | 50.5 | 103.5 | 61.5 | 97 | 146 | 458.5 |
| 2009 | 294 | 150.5 | 83 | 69 | 175 | 771.5 |
| 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

Sampling for the 2011 water-monitoring season began on May 26. The year 2011 proved to have an interesting mix of events.

The monitoring season was preceded by unusually heavy and **frequent winter snows**, with the last snow days on March 22 and 23. Also in March, an estimated **21.5 million plastic disks were released** from an aeration tank at a Mamaroneck sewage treatment plant that was being upgraded; disks appeared in great numbers in early April and continued to wash up on the shores of Hempstead Harbor and other bays around Long Island Sound throughout the season.

A rainier than usual spring and summer caused a greater than usual number of precautionary beach closures at the same time that a portion of the shellfish beds in Hempstead Harbor were certified for harvesting (on June 1) for the first time in more than 40 years. Heavy rain events caused temporary, precautionary closures of the newly opened shellfish beds as well.

On August 11, a pod of about 100 dolphins entered Hempstead Harbor just before sunset, repeating a scene that surprised and delighted local residents during the summer of 2009. On August 23, 2011, a 5.8 magnitude earthquake rocked Long Island and other areas along the northeast coast. This was followed by the approach of Hurricane Irene, which on August 27 was downgraded to a tropical storm by the time it hit this area; nevertheless, it dumped over 6 inches of rain around Hempstead Harbor, downed hundreds of trees, and caused massive power outages. There were frequent rain events in September and October, but only four brought more than a half an inch of rain; the last one topped out with a pre-Halloween snowfall (about an inch of snow on October 29).

*Red fox near intersection of Bryant Avenue and Glen Cove Avenue (photo by Amelia Bunich, 5/18/11)*

The following sections focus on marine life in Hempstead Harbor, with information collected from observations recorded during water-monitoring tours as well as from formal fish surveys and reports that pertain to Hempstead Harbor. However, local residents have helped fill out the picture of the harbor's habitat by reporting what they see not only in and on the water, but also close to the harbor's shores. In 2011, we received several reports (and photos) of red foxes in the area; one was seen in February by the vacant lots adjacent to Tappen Beach Marina; two foxes were seem frequently off Bryant Avenue near Glen Cove Avenue. There were also reports of red fox sightings near Littleworth Lane in Sea Cliff and Albin Avenue in Glen Cove.

## 4.1 Fish-Survey Reports

### 4.1.1 Glenwood Power Station Entrainment and Impingement Monitoring Report

The Glenwood Power Station Entrainment and Impingement Monitoring Report has been referenced in the Hempstead Harbor annual water-monitoring reports since 2005. The power-station report (by ASA Analysis & Communication, Inc., September 2005) summarized the biological monitoring program that KeySpan Generation LLC was required to conduct from January 14, 2004, to January 5, 2005, under its State Pollution Discharge Elimination System Permit (SPDES). The one-year **study estimated the numbers of fish and invertebrates that were 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.

The report was significant not only because it disclosed the vast numbers of fish and marine life that were being destroyed during the plant's operation, but also because it provided additional information on the number of fish species that can be found in Hempstead Harbor. Samples were collected weekly from March through September and every other week during the rest of the one-year monitoring period. **Thirty-four types of fish and several other marine animals** were found in the samples.

Following the submission of the 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. DEC responded in 2008 with an initial determination of the best technology available for "minimizing adverse environmental impacts from the cooling water intake" at the Glenwood Landing plant, even while new policies were being formulated.

In 2010, a draft policy established that closed-cycle cooling is the "performance goal for all new, existing, and repowered industrial facilities in New York" for the purpose of reducing fish and other marine life mortality resulting from the operation of cooling intake structures. An exemption would be provided for facilities operating at less than 15% of capacity, such as the Glenwood Landing power plant. However, even power plants eligible for the exemption would still be required to reduce marine life mortality and entrainment.

The DEC's final policy on closed-cycle cooling was issued in July 2011. On December 21, 2011, the Long Island Power Authority (LIPA) and National Grid submitted an Environmental Assessment Form for **plans to relocate a transmission line and the demolish substations of the Glenwood Landing power plant**, which has dominated the view of the waterfront in the lower harbor since the early 1900s. The demolition (slated to begin in 2012 and be completed in 2014) includes the "circulating water intake screen house."

### 4.1.2 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.

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 important 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. The crew seines at six stations in Hempstead Harbor; the 2011 catch totals for the harbor are included in the table below, provide by Jennifer O'Dwyer, Fish & Wildlife Technician at NYSDEC Bureau of Marine Resources, Diadromous Fisheries Unit. Columns 5-10 represent the months during which the seines were conducted—May 17, June 21, July 20, August 16, September 20, and October 19.

NYS DEC Western Long Island Beach Seine Survey - Hempstead Harbor 2011

| Type | Common_name | AGE* | 5 | 6 | 7 | 8 | 9 | 10 | Total |
|---|---|---|---|---|---|---|---|---|---|
| Diadromous: | AMERICAN EEL | 0 | 1 | | | | | | 1 |
| | ATLANTIC TOMCOD | 99 | 3 | 2 | 1 | | | | 6 |
| | BLUEBACK HERRING | 99 | 253 | | | 2 | | | 255 |
| | STRIPED BASS | 0 | | | 1 | 3 | | | 4 |
| | STRIPED BASS | 1 | | 21 | 7 | 22 | 2 | 1 | 53 |
| Marine: | BAY ANCHOVY | 99 | 6 | 111 | 1 | | 57 | 534 | 709 |
| | BLACKFISH (TAUTOG) | 0 | | | 8 | 20 | 1 | | 29 |
| | BLACKFISH (TAUTOG) | 1 | | | | 25 | | | 25 |
| | BLUEFISH | 0 | | 5 | 602 | 70 | 111 | 4 | 792 |
| | CUNNER | 99 | | | 4 | | | | 4 |
| | GRUBBY SCULPIN | 99 | | 1 | 3 | | 1 | | 5 |
| | INSHORE LIZARDFISH | 99 | | | 1 | 1 | | | 2 |
| | NORTHERN KINGFISH | 99 | | | | | 5 | | 5 |
| | NORTHERN PIPEFISH | 99 | 1 | 6 | 12 | 26 | 1 | 3 | 49 |
| | POLLOCK | 99 | 1 | | | | | | 1 |
| | SAND LANCE SPP. | 99 | | 11 | | | | | 11 |
| | SCUP | 99 | | | | | 1 | | 1 |
| | SILVERSIDE SPP. | 99 | 653 | 470 | 8708 | 8091 | 4651 | 2330 | 24903 |
| | WHITE MULLET | 99 | | | | | 13 | 25 | 38 |
| | WINDOWPANE FLOUNDER | 99 | | 1 | | | | | 1 |
| | WINTER FLOUNDER | 0 | | 11 | 18 | 14 | 3 | 1 | 47 |
| | WINTER FLOUNDER | 1 | | | 2 | 1 | | | 3 |
| Estuarine: | KILLIFISH SPP. | 99 | 14 | 30 | 197 | 163 | 149 | 95 | 648 |
| Freshwater: | GIZZARD SHAD | 99 | | | | 1 | | | 1 |
| Invertebrates: | BLUE CRAB | 1 | | | 3 | | 1 | | 4 |
| | CALICO (LADY) CRAB | 99 | | 4 | 1 | 5 | 2 | 1 | 13 |
| | HORSESHOE CRAB | 99 | | 3 | | | 1 | | 4 |
| | JAPANESE SHORE CRAB | 99 | | | | 2 | | 1 | 3 |
| | MUD CRAB | 99 | | 9 | 13 | 3 | | | 25 |
| | SPIDER CRAB | 99 | | 8 | 19 | 13 | | | 40 |
| | STARFISH | 99 | | 3 | 1 | 5 | 4 | 3 | 16 |
| | | # of Hauls | 5 | 6 | 6 | 6 | 6 | 5 | 34 |

* 0 = young-of-the-year ; 1 = older ; 99 = unknown

## 4.2 Marine-Life 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 mid-harbor 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

May 26 was our first survey date. We checked out both electronic meters—the YSI 600 and 600XLM. Because of time constraints and the tidal cycle, we collected only bacteria samples in the lower harbor and then moved to the upper harbor to do a full survey as well as collect bacteria samples. For the second year in a row, we saw comb jellies (sea walnuts) in May rather than in June— at one station. Near the same station, we also saw moon jellies. Because this was our first trip for the season into the lower harbor, we were interested in checking out the osprey nests; we saw 6 ospreys on 5 nests in the lower harbor and 4 ospreys in other areas. The **ospreys returned** to the usual places, including the blue sailboat, where we could see **3 eggs in the nest**. We also saw 5 cormorants; 2 dozen mallards; 5 great egrets and 1 snowy egret; over 6 dozen Canada geese; and 15 swans, including one on a nest in Glen Cove Creek.

*Osprey nest in sailboat in lower harbor (photos by Carol DiPaolo, 5/26/11)*

The DEC striped-bass survey team saw plenty of jellies in their seine catches for May, and most of the blueback herring that they caught for the season were caught in May—253 out of a total of 255. The team was also surprised to see a juvenile American eel in the May catch. (See also the table in *Section 4.1.2*.)

### June

There were five sampling dates in June (June 1, 8, 15, 22, and 29). On June 1, we saw a large school of bunker by Beacon 11 and lots of small shrimp (too numerous to count) by the Tappen Marina dock. We were able to get to only two stations and then interrupted the survey because of what we saw as we traveled closer to the shellfishing area. **June 1 was the official opening of the shellfish beds** in the northern part of the harbor, and we had planned to go to the shellfishing area to see how much activity there would be. About 55 clamming boats were busy raking up clams; one bayman told us that he was getting about a third of a bushel of clams in one raking. Most of the clammers were from outside of Hempstead Harbor. We went back to Tappen Marina to pick up a news team from News 12, who filmed the event. For the rest of the monitoring season, we included a trip to the shellfishing area to count the number of clamming boats; on June 29, there were about 31 clam boats in the area.

During the rest of the June sampling dates, we saw our usual complement of birds: cormorants, ducks, egrets, Canada geese, blue herons, ospreys, and swans. We were concerned about the osprey nest in the blue sailboat; on June 29, there was still one unhatched egg and one of the two osprey chicks looked very ill, and could not lift its head.

On June 1, 8, 15, and 22, we saw comb jellies (only sea walnuts) only at CSHH #1; on June 29, we observed sea walnuts at CSHH #3 and #5. The DEC seine crew covered all six of their stations on June 21 and had a successful catch, with 21 striped bass, ranging from 5.5 inches to 21 inches, caught at five of the stations. Each haul had some amount of algae, grass shrimp, and jellies. (See the table at *Section 4.1.2*)

*Clammers in newly opened shellfish beds in northeastern portion of the harbor (photo by Carol DiPaolo, 6/1/11)*

On June 29, many of the CSHH stations in the lower harbor, Glen Cove Creek, and areas with known storm-water problems had high bacteria levels following only a small amount of rain (0.5 mm within 24 hours of sample collection), but a near 2-inch rain event had occurred on June 23. On June 8, we noticed a very strong, white-opaque flow from CSHH #10 and lots of turbidity in the lower creek.

### July

Comb jellies—sea walnuts—were observed at some stations on the first two of the four sampling dates in July (July 6, 14, 20, and 27). By July 20, both sea walnuts and sea gooseberries were observed in thick masses, too numerous to count. This happened also around the same time last year.

Throughout July, we saw the usual variety of birds, but on July 27, ducklings and goslings made an appearance. On July 27, we did a full survey—upper and lower harbor—and observed a lot of bird activity throughout the harbor. In addition to the birds that had been noted previously, we saw terns through the harbor, a hawk flying over a portion of the upper harbor, and 4 small piper-type shore birds. We also saw the remaining chick on the sailboat/osprey nest being fed a fish from its parent; this was the chick that we thought wouldn't survive, but it made a remarkable recovery.

*Young osprey recovered and was soon ready to leave the nest (photo by Carol DiPaolo, 7/27/11)*

We saw only a few schools of baitfish in July and not much other fish activity. However, on July 20, the DEC seine crew schools covered all six of their stations and caught a good assortment of fish, including over 8,700 silversides and 602 young-of-the- year bluefish. The one young-of-the-year striped bass they caught was the first one caught to date on the north shore of Long Island. They also found normal amounts of shrimp and a lot of jellyfish at some of the stations. Each site had a very large amount of algae, with the net filling up with ulva and some red algae.

July was the driest month of the season (just under 2 inches of rain for the month), and bacterial levels were relatively low at most stations for samples collected on monitoring dates. However, samples collected on July 27 showed high bacteria levels for stations closest to outfalls, possibly showing the effects of two rain events, on July 25 (about a quarter of an inch) and July 26 (close to half of an inch). A white flow of water was observed from CSHH #10 on July 20, but there was no corresponding elevation in bacteria levels at that time.

We noted that on July 27, the entire DiNapoli tug and barge business that had been operating for years off the east shore of the lower harbor, north of Mott's Cove (off the former "HinFin" property slated for condominium development), had been moved to the west shore just north of the pier of the former Hempstead Harbor Beach. Also, because we didn't have our full supply of sampling jars on July 20, we returned on July 21 to collect bacteria samples at the remaining stations (at this time we saw lots of bubbles coming from the bottom at CSHH #13, with a strong sulfur smell). While collecting the samples, we were surprised to see the *Half Moon* (a **replica of Henry Hudson's ship**) in the harbor for an educational program. On July 27, there were only 7 clam boats observed near the northeastern shore of the harbor.

*Replica of Henry Hudson's ship,* Half Moon*, in Hempstead Harbor (photo by Carol DiPaolo, 7/21/11)*

### August

Throughout August, comb jellies—both types, sea walnuts and sea gooseberries—were noted in large quantities on monitoring dates (August 3, 17, and 24, and 31; boat wasn't available on August10), especially on the first two monitoring dates. Baitfish were also noted on all monitoring dates, with schools of bunker observed throughout the harbor on August 31. On August 3, **sea stars** (too numerous to count) were near the base of the bulkhead at Steamboat Landing, and a large blue mussel set was noted all along the bulkhead.

On August 5, fisherman Bob Chaputian saw **dolphins** in Long Island Sound and posted a video of the scene on YouTube (see http://www.youtube.com/watch?v=SdqAkZ4DO64). We also received a report that the dolphins were later seen in Cold Spring Harbor, and then on August 11, just before sunset, **about 100 dolphins made their way into Hempstead Harbor**. Noah Barker saw them near Morgan

Park as he was sailing out of Glen Cove Creek and posted several photos online, one of which was used for a *Newsday* article (see http://www.newsday.com/long-island/rare-dolphin-sightings-in-central-li-sound-1.3093815).

Along with the usual variety of birds observed around the harbor, we saw hooded gulls and 1 night heron. We were surprised at not seeing any blue-claw crabs in August, nor were any caught in the DEC's August seine hauls. The seine hauls did include a large number of silversides (8,091), 70 bluefish (young of the year), and 22 striped bass (older) (see also the table at *Section 4.1.2*).

August was a wet month with rain on 14 days of the month; two of the events brought about an inch of rain, and two others brought about 5.5 inches of rain (on August 14) and 6.3 inches (on August 27-28 as part of Tropical Storm Irene). As a result, there were preemptive beach and shellfish-bed closures. Bacteria levels were somewhat higher than usual this month for stations closest to outfalls, but there were fewer exceedances than expected; samples collected on August 31 from midharbor stations CSHH #1, 2, and 3 had very low bacteria numbers.

### September

During September, we had only three sampling dates (September 14, 21, and 28); weather conditions prevented sampling on September 7. Comb jellies (both sea walnuts and sea gooseberries) were seen at only one station on September 28, but large schools of baitfish were seen throughout the harbor and large numbers of small shrimp were seen by the Tappen Marina bulkhead near the main dock; these observations were similar to those noted during August 2010. On September 10, the Hempstead Harbor Anglers Club held the annual **snapper derby at the pier at Tappen Beach Park**; 115 children participated and caught 40 snappers. The DEC seine hauls for September included 4,651 silversides, 111 bluefish (young of the year), and 57 bay anchovies (see also the table at *Section 4.1.2*).

*Snapper derby catch at Tappen Beach pier (photo by Peter Emmerich, 9/10/11)*

In addition to the birds that are regularly seen around the harbor, 4 killdeer were seen on September 14; 1 belted kingfisher was seen on September 21, and 2 were seen on September 21 and September 28. About 2 dozen terns were fishing over all the large schools of bait on September 21.

September also was a wet month, but bacterial levels from samples collected on monitoring dates were relatively low, except for most samples collected in Glen Cove Creek on September 28, which was preceded by almost a half an inch of rain. Seven clam boats were seen on September 28.

### October

Sampling was conducted on October 6, 12, 20, and 26. The numbers of comb jellies continued to decline, with only one sea walnut noted at CSHH #1 on October 6. Large schools of baitfish were noted on October 6 (in Glen Cove Creek) and on October 26 (in the lower harbor and Glen Cove Creek). There were large numbers of small shrimp near the bulkhead at Tappen Beach Marina on October 20 and 26. The DEC seine crew caught the largest number of bay anchovies (534) in the October haul, out of a total of 709 for the season. The crew caught a significant number of silversides (2,330), but fewer species were caught, as is generally the case in October (see also the table at *Section 4.1.2*).

During monitoring dates in October we saw the usual variety of birds—cormorants, mallards, egrets, blue herons, and swans. We didn't see ospreys beyond October 6. We saw 4 hooded gulls on October 12 and 5 finches above the bulkhead at CSHH #13 (head of Glen Cove Creek) on October 26.

October had lower total rainfall than the preceding two months, but there were three events that produced more than an inch of rain. Samples collected on October 20 closest to the outfalls had very elevated bacteria levels, evidently showing the effects of the rain that fell the preceding day and continued overnight.

One of the highest tides of the season occurred on October 26, and made headlines as the **"King Tide."** Six clam boats were noted in the northeastern portion of the harbor.

*Unusually high tide nearly submerges the Glen Cove breakwater (L) and the Tappen Marina seawall (photos by Carol DiPaolo, 10/26/11)*

## November

We were able to continue sampling two weeks into November—November 2 and 9. On November 2, the weather was clear but chilly at the start—about 40°F compared with the warmer water (about 53°F at the surface). Steam rose from the surface at about 7:45 AM. Lots of seagulls were working the water and were on the beaches. We also saw about 3 dozen ducks and 6 dozen geese, along with 3 cormorants, 1 belted kingfisher, and 4 swans.

On November 9, we tried to do a full-harbor survey, but dense fog prevented us from going to the mouth of the harbor. It was warmer than the preceding sampling date—about 50°F at the start. A lot of baitfish were in Glen Cove Creek. We saw only a few types of birds—3 cormorants, a dozen mallards, 3 belted kingfishers, and 9 swans and 3 cygnets.

### 4.2.1 Crustaceans

An assortment of crustaceans can be seen around Hempstead Harbor. This group of marine organisms is characterized by, among other things, a segmented body, paired appendages, and a hard external skeleton that has to be shed to accommodate growth. Crabs, lobsters, shrimp, and barnacles are examples of this group of marine creatures.

We mention a variety of crabs that are either seen during weekly sampling or caught during the DEC seining that is conducted around the harbor; the crabs include blue-claw, lady (or pink calico), green, spider, 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. We didn't see blue crabs 2008 or 2009, and the 2009 DEC seines recorded only two blue crabs—one in July and one in October. Blue-claw crabs returned in large numbers in 2010, but the population did not match the quantity recorded in 2007. We saw no blue-claw crabs during the 2011 monitoring dates, but the DEC seine crew for the striped-bass survey caught 3 in July and 1 in September. (Spider crabs made up the largest number (40) of crabs caught in the DEC's 2011 seine hauls.)

*Blue-claw crabs from Hempstead Harbor (photos by Carol DiPaolo, 8/18/10)*

Although horseshoe crabs are included in the group of crustaceans seen around the harbor, they are not true crabs but more closely related to spiders. They are noted most during the spring mating season and in the fall when the beaches are covered with molted shells. The ubiquitous acorn barnacle is so plentiful that it is overlooked in weekly monitoring reports. These barnacles take up residence on rocks, bulkheads, pilings, docks, and boat bottoms all around the harbor.

### 4.2.2 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 2011, they were noted in a little earlier in the season, in May, and were seen during monitoring dates for the last time on October 6.

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 2011, we saw about a dozen moon jellies in Hempstead Harbor on May 26. The DEC seine hauls usually include a lot of jellies, but they are not noted in the total counts.

## 4.3 Shellfish

**For the first time in over 40 years, a portion of the shellfish beds in the northern section of Hempstead Harbor were reopened for harvesting.** That was the best news for the harbor, not only because the shellfish in the recertified area are now productive for both commercial and recreational harvesting, but also because this is the best indicator we could possibly have of the incredible improvements that have been made in the harbor's water quality.


*Baymen with full bags of clams (L) from Hempstead Harbor and sorted clams on board (photos by Carol DiPaolo, 6/1/11)*

June 1, 2011, was opening day for the shellfish beds in Hempstead Harbor, and the event created lots of excitement for local residents and drew clammers from a number of bays east of Hempstead Harbor. About 55 boats showed up early in the morning, looking forward to a very productive day raking for clams in waters that hadn't been harvested in decades. The boats were all clustered around the northeast portion of the recertified area. The event created a media buzz, and put the spotlight not only on Hempstead Harbor, but also Long Island Sound. Moreover, it created means of informing the public about the importance of local marine resources and the need protect and improve the water quality of bays all around Long Island Sound. Hempstead Harbor continues to be held up as one of the success stories as a funding recipient for water-quality improvements through the Long Island Sound Futures Fund.

The 2,500 acres of recertified shellfish beds extend in a wide strip from the east to west shore of the harbor. The southern boundary extends from a rock jetty in front of the Legend Yacht and Beach Club community (the site of the former Lowe estate) on the east shore to the large "brown house with chimneys" (noted on navigational charts), which is Falaise, part of the Sands Point Preserve, on the west shore. (All areas south of this line remain closed to shellfishing.) The northern boundary of the recertified area runs from Matinecock Point on the east shore to Prospect Point on the west shore. However, Dosoris Pond, West Pond, and a semicircular area extending 250 yards off of Crescent Beach on the east shore remain closed to shellfishing. East Creek on the west shore near Prospect Point also remains closed. (See the map in *Section 3.8.7*)

*Falaise at Sands Point Preserve (photo by Carol DiPaolo, 6/15/11)*

Shellfishing is historically significant for Hempstead Harbor, because it was an important commercial activity in the harbor from about the first quarter of the nineteenth century into the first quarter of the twentieth century. 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 our longstanding goals of reopening the harbor's shellfish beds. But the road to recertifying the shellfish beds was a long one that required tremendous collaboration as well as adherence to a strict process of water-quality testing and retesting.

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 density survey** to determine the extent and condition of the clam population; the survey showed a healthy population of hard clams. **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 were not completed and released until 2010.

One of the remaining steps toward recertifying a portion of Hempstead Harbor for shellfish harvesting was a dye study near the Glen Cove sewage treatment plant. On September 28, 2009, DEC-Bureau of Marine Resources' (BMR) in conjunction with the U.S. Food and Drug Administration (FDA) **conducted a hydrographic dye study in Glen Cove Creek (see below) and Hempstead Harbor**. The dye study provided information on the movement (dilution, dispersion, and time of travel) of the sewage effluent discharged by the Glen Cove STP. FDA produced a final report on the findings of the dye study in 2010. A shoreline survey of the harbor was also completed in the autumn of 2010, and at that point everything was lined up for the reopening of the shellfish beds in Hempstead Harbor in 2011.

*Hydrographic dye study in Glen Cove Creek (9/28/09) (photos by Carol DiPaolo)*

### 4.3.1 Monitoring and Enforcement for Hempstead Harbor Recertified Shellfish Beds

In the first few weeks after the opening of the shellfish beds in Hempstead Harbor, large numbers of clam boats could be seen daily, clustered in essentially the same northeast area of the recertified beds; they were loaded with large mesh bags of clams. CSHH incorporated a trip to the area during weekly monitoring surveys to count the number of boats in the area. Marine police and local harbor patrols were present in the weeks shortly after the opening of the shellfish beds, and most clam boats were from bays east of Hempstead Harbor, which corresponded to the periods over which some of those bays had been closed to shellfishing because of a biotoxin present in the water.

Concerns began to surface regarding the potential for overharvesting the area, the public's confusion over what area of the harbor had been recertified (some thought all of Hempstead Harbor had been recertified), and the difficulty of determining, from the water, exactly what area around Crescent Beach was closed to shellfishing. On June 20, 2011, a meeting coordinated by the HHPC brought all agency, municipal, and environmental representatives together to discuss, among other things:

- Jurisdiction – who can or should enforce?
- Area – identify boundaries of shellfish beds (whether there is a need for markers)
- Regulations (hours, catch, equipment, permits, etc.) and measures that could ensure sustainability
- Communications (re: closures, etc.)
- Public education
- Interagency coordination and assistance

As a result of the meeting, signs were prepared to post along the shoreline in areas that remain uncertified, and buoy markers were places outside of Crescent Beach to delineate the 250-yard radius around the beach that remained closed to shellfishing.


*One of two buoys marking closed area around Crescent Beach (L) and posting for area closed to shellfishing at Tappen Marina (photos by Jim Moriarty and Carol DiPaolo, 6/15/11 and 9/21/11, respectively)*

For rain events that require precautionary closures of the shellfish beds (generally rain events of three inches or more), DEC has a temporary-shellfish-closure information message available by phoning 631-444-0480, and most commercial baymen know to call that number. Most of the baymen know that excessive rain results in closures and so most won't go out until they learn which areas remain open and which are closed. The information is also posted at http://www.dec.ny.gov/outdoor/345.html with a link to http://www.dec.ny.gov/outdoor/7765.html. DEC also issues press releases to local media outlets.

### 4.3.2 Shellfish-Seeding Projects

While DEC shellfish division was nearing completion of the series of water-quality tests that would determine that 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 first seeding project on October 9, 2007, 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 shellfish stock for the seeding project 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.)

Two years later, on October 15, 2009, then-County Executive Tom Suozzi kicked off operations for the **second shellfish seeding** in Hempstead Harbor, which included 1.1 million clams and oysters. Funding for the 2009 shellfish-seeding operation was provided by the Long Island Sound Study, through the Long Island Sound Futures Fund.

Following the opening of the shellfish beds in Hempstead Harbor in 2011, the prospect of reseeding the beds was raised as a measure of sustainability, but finding the necessary funding for such a project is problematic given current economic circumstances.

### 4.3.3 Surveys 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 previously recorded for raking. The area seeded in 2007 included a transition from thick, muddy bottom to a harder, sandier bottom.

In the areas of thick, black mud (the deeper-water stations), we did not find hard-shelled clams and oysters; instead, we found 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. Here, 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). Although we found a few seed clams 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 preparation for Nassau County's second shellfish seeding in Hempstead Harbor, Cornell Cooperative Extension, Marine Division, staffers Matthew Sclafani, Neal Stark, and Gregg Rivara completed a **draft Sediment Suitability Assessment of Hempstead Harbor for Nassau County's Shellfish Restoration Program** (October 14, 2009). The goal of the survey was to determine suitable sites to plant seed clams and oysters in the area off of Morgan Park. The team chose a scuba survey to evaluate the bottom, and visual and "hand-grab" assessments were made to delineate the boundaries between mud and harder-type bottoms such as sand and sand-mud-shell mixes. This assessment was intended to help avoid placing the seed clams and oysters in the muddy bottoms that are not considered suitable habitats for their survival.

During the sediment assessment, a natural population of predominately hard clams (*Mercenaria mercenaria*) was observed in the central and southern area of the survey. They were also present in the northern survey area but not as frequently. The report stated that these observations validate the effort to enhance shellfish in this area because the area currently supports shellfish.

Also during the survey, the team observed and collected clam shells of the *notata* variety, which they felt were most likely from the 2007 seed plantings and originated from Frank M. Flower's and Son shellfish stock. *Notata* clams are not common in the area (typically < 1% frequency) and are easy to distinguish from the white clam variety by the dark zig-zag striped patterns on the shell. The average size of the 10

*notata* shells the Cornell team found was 27 mm. (The *notata* were between 8-12 mm at the time of the 2007 planting.)
Given the amount of clams that have been harvested in the first season of the opening of the shellfish beds in 2011, the baymen are the best sources of the types, sizes, and quantities of clams that have been found in the area. Most clams seemed to belong to the natural population of hard clams. The first rakings also seemed to yield a good mix of sizes, including little necks, which have the most commercial value. As mentioned previously, on opening day, a baymen said he was getting about a third of a bushel of clams in one raking. As the season progressed, reports from baymen were that they were getting fewer smaller clams and more chowder-size clams, so much so that the local market was flooded with them at a time—during warmer weather—when chowder clams are not in high demand. Further discussions are necessary with baymen and all other interested parties to determine the need and schedule for future shellfish population density surveys and seeding projects.

### 4.3.4 Mussel-Watch Project

As part of the Long Island Sound Study's indicators program, information on one of the indicators—the contaminant levels in blue mussels—was collected through the National Oceanic and Atmospheric Administration's (NOAA) Mussel Watch project. Due to budget cutbacks, NOAA could no longer collect mussel samples but could accept samples from staff of the LISS office and DEC and then complete the biological and data analyses.

*Blue mussels off of Village Beach Club of Sands Point (photos by Carol DiPaolo, 11/15/11)*

In trying to figure out the logistics of accessing sampling sites around Long Island Sound, CSHH was contacted regarding the site in Hempstead Harbor off of the Village Club of Sands Point (formerly the IBM Country Club/Guggenheim Estate), which had been used as part of NOAA's National Status and Trends Mussel Watch program since 1986.

Previous data showed abundant blue mussels at the site with a dramatic decrease in contaminant levels for a variety of heavy metals, pesticides, and hydrocarbons. However, the last mussel collection at this site occurred in 2000, and it was important to continue to collect data and at this and other sites in the project. CSHH scoped out the site prior to the scheduled collection date to determine access and present mussel population density and found that the site remained abundant with mussels, despite reports from local residents that the mussel beds had shrunk after Tropical Storm Irene hit in late August. The collection took place on November 21, but because of budget constraints, sample and data analyses have been delayed; the data may not be available until the autumn of 2012.

## 4.4 Birds

As has been the case over the last 15 years or so, during 2011 we saw a variety of birds that have become regular visitors to Hempstead Harbor. **Belted kingfishers, black ducks, blue herons, gulls, mallards, Canada geese, cormorants, snowy and great egrets, ospreys, swans,** and **terns** were observed throughout the season, along with the usual swallows, pigeons, crows, 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. Observed less frequently during monitoring are **green herons, black-crowned herons, plover-type birds,** and **hawks** or **falcons**.

Each year we see new, young members of the harbor's duck, Canada goose, and swan populations. In 2011, however, the total numbers of adults and young observed at any one time during monitoring were fewer than in previous years. For example, in 2010, approximately 30 swans were noted plus 11 cygnets on August 18, and 55 swans were noted in the lower harbor on October 20. In contrast, on July 27, 2011, we saw 18 adult swans and 5 cygnets, but the weekly totals during the rest of 2011 monitoring season generally didn't exceed a dozen swans.

*Family of swans in Glen Cove Creek and blue heron on corner of the bulkhead at the head of the creek (photos by Jim Moriarty and Carol DiPaolo, respectively, 6/8/11 and 10/12/11)*

There are six easily visible osprey nests in the harbor that have been established over the last 15 years. Over the last ten year or so, a blue sailboat has been moored in the lower harbor and has been used only by nesting ospreys. However, the sailboat broke its mooring early in 2010 and was removed. The returning ospreys chose an alternative nesting site, on a duck blind off the western shore of the lower harbor. Three eggs were in the nest a little later than usual in the season, but on July 23 we saw three thriving chicks; on August 11, we saw the three fledglings fly off the nest as we approached it. (The sailboat/former osprey nesting place was returned to its usual mooring site, but no ospreys claimed it.)

In 2011, the blue sailboat was in its usual place in the lower harbor, and ospreys rebuilt a nest there; we saw three eggs in the nest on May 26. On June 29, one of the eggs remained unhatched, and one of the two osprey chicks in the nest seemed very weak and not able to raise its head. On July 14, the weak chick was the only one that remained in the nest and didn't look like it would survive. On July 27, we saw an adult osprey on the sailboat feeding the chick fish; the chick made a remarkable recovery and seemed strong and was later able to leave the nest. Also in 2011, a new osprey nest was built on an old tug at the Gladsky Marine Salvage site in the lower harbor.

*Osprey nest on old tugboat (photo by Jim Moriarty, 10/12/11)*

Over the last few years, a pair of **peregrine falcons** has been sighted at the Glenwood Landing power plant. On October 28, 2009, we saw a pair of the falcons flying to and from a high ledge at the power plant. We did not see the falcons in 2010 or 2011 during monitoring dates.

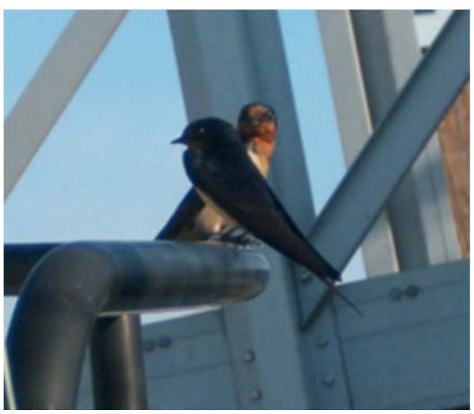
Although **red-tailed hawks** are often seen is wooded areas around the harbor, we don't usually see them during water sampling. However, on November 3, our last sampling date for 2010, three red-tailed hawks with striking coloration circled over the head of Glen Cove Creek. We received a report that on July 8, 2010, a red-tailed hawk was seen flying over a house in the Greenvale-Mott's Cove area chasing a turkey vulture.

In May 2008, we had our first sighting of a **turkey vulture** flying over Glen Cove Creek (we were told that turkey vultures were also seen near Manhasset Bay). And although we didn't see any turkey vultures during our 2009-2011 water-sampling tours, they had been seen frequently near the eastern shore of the harbor, flying over East Hills, Greenvale, Mott's Cove, and Sea Cliff. In 2011, turkey vultures were seen throughout the year but seemed to be more active closer to the shoreline in October; 2 turkey vultures were seen flying over St. Mary's Church in Roslyn Harbor on October 8 and 9, one was seen flying over the North Shore Country Club on October 20 and over Sea Cliff on October 26.

*Photo posted at en.wikipedia.org/wiki/Turkey_Vulture and retrieved 6/17/12, showing the bird's distinctive two-tone feather pattern underneath its wings*


*Red-tailed hawk flying over Glen Cove Creek (11/3/10) (L) and osprey in flight (9/11/10) (photos by Jim Moriarty)*

**Barn swallows** are so common and in such large numbers around the shore and marina bulkheads that we don't report sightings of them. At the beginning of the 2010 season, however, they caught our attention as they built nests under beams in the bulkhead at Tappen Marina. There seemed to be more nests than usual, and we were able to see the tiny chicks inside. In 2011, a similar situation occurred, and the swallows often used the railing of the monitoring boat as a perch.




*Barn swallows on bow of boat and on nest in Tappen marina (photos by Carol DiPaolo, 6/23/10)*

There have been some unusual visitors over the years as well, such as the young **bald eagle** that was seen over Glen Cove and then landed on Tappen Beach in August of 2004, and the young (about 1 year old) **great horned owl** that was rescued from the water at the Glen Cove Marina in Glen Cove Creek on August 9, 2009. During 2011, there were also some unexpected visitors: on April 9, **2 northern gannets** were seen on Tappen Beach; on August 28, a **south polar** skua (a dark, gull-like bird), showed up on Sea Cliff Beach, brought in with the hurricane winds; and in mid-December, a **brown pelican** was seen off of Sands Point at the Execution Rocks lighthouse.

## 4.5 Diamondback Terrapins

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

Diamondback terrapins are the only turtle found in estuarine waters and generally grow up to about 10 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.

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 (which was completed in 2011). It is not known whether or to what extent this activity had an impact on the diamondbacks.

Although there were no diamondback sightings reported for the lower harbor since 2006, they have been seen in other parts of the harbor since then, particularly around Brewer's Marina and the Sea Isle sand spit. 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 North Hempstead Beach Park.) In 2009, a small diamondback was reported seen in Brewer's Marina on July 11, and a large diamondback (about 10 inches) was seen on August 19 in the same area. In 2010, we received a report that someone had seen a large (about a foot long) diamondback swimming in Brewer's Marina near Sea Isle.

Occasionally, large sea turtles have made their way into Long Island Sound and have been spotted in local bays. On August 2, we had a report that a large sea turtle was seen at the Shelter Bay Yacht Club in Manhasset Bay. On October 24 we received a report from Paul Boehme, who was fishing for black fish about a half a mile north of the Glen Cove breakwater, that he had seen a large sea turtle, which he identified from photos as being a **Kemps ridley turtle**:

> *Last week I was out fishing and saw a sea turtle leisurely making his way north, about 100 yds off Maxwell's Jetty. When I came abreast of him he dived and I didn't see him again. Very graceful looking turtle with long front flippers and short rear ones. Body about 24". First time I've seen one in 40 years of fishing HH and environs.*

## 4.6 Algal Blooms

Color and turbidity of water within the harbor in 2011 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) generally range from 0.75 m to 2.5 m. In 2010, the lowest Secchi reading was 0.5 m and the highest was 3.0 m; in 2011, the lowest reading was 0.4 m and the highest was 2.3 m. 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 2009 and 2010 we were on the lookout for the start of a red tide, generally caused by the presence Alexandrium cells, some forms of which can be toxic, producing paralytic shellfish poisoning. Chris Gobler, associate professor at the School of Marine and Atmospheric Sciences at Stony Brook University, had detected some Alexandrium cells in Hempstead Harbor; larger quantities had been found in Northport and the western Peconic Bay.

In 2010, unusual water color was observed on three occasions. On June 16, water color was judged to be an abnormal red-brown to olive green in sections of the harbor. On August 31, the water in Tappen Marina had turned red in parts; a water sample we collected was analyzed by the NCDH and found to contain a mix of dinoflagellates, some that could cause red coloration along with other types of algae, none of which were toxin producers. The most dominant species was *Prorocentrum micans*, followed by *Prorocentrum triestinum*, *Gyrodinium* sp., and *Scripsiella trochoidea*. Also, on September 2, water color in the harbor was judged to be an abnormal brown. The last two events corresponded with reports of red tide in parts of the sound and ocean (*prorocentrum triestinum* was reportedly found in ocean water samples).

In 2011, the water color was judged to be a normal brown or green on most sampling dates. However, on June 29, the water was an abnormally brighter green in Glen Cove Creek and by the Glenwood Landing power plant; in those areas we also saw supersaturated levels of DO, indicating an algal bloom in progress. On August 24, the water in the lower harbor was a murky green in contrast with unusually clear water at the head of Glen Cove Creek; the situation reversed on September 14, with murky brown-green water in the creek.

# 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

**Human Activities**

☐ Barges/tugs, Pt. W. gravel op.____________ Gladsky____________ Raison____________
DiNapoli____________ Global/fuel____________ other____________

☐ Boats, power__________ sailboats__________ kayaks__________ crew__________

☐ Anglers, at beaches____________________ at piers____________________

☐ Other____________________________________________

**Floatables Observations (type, approximate number…)**

☐ Bottles, glass________ plastic________ ☐ Cans________ ☐Paper________ ☐Plastic bags/pieces________

☐ Styrofoam, cups________ pieces________ ☐Wood, boards________ pieces________

☐ Other____________________________________________

# Water Monitoring Data Sheet

Cal. Constants ____________

Air Temperature : ________ °C

Station :

Time : ________________ Date: ____________

Wind ______ Air °C ______ DO cal. ck. ______% sat.

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

Station :

Time : ________________

Wind ______ Air °C ______ DO cal. ck. ______% sat.

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

Station :

Time : ________________

Wind ______ Air °C ______ DO cal. ck. ______% sat.

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

# Water-Monitoring Data Sheet

## Wildlife Observations

Date ____________

**BIRDS**

| | Upper Harbor | Lower Harbor |
|---|---|---|
| ☐ Cormorants | ____________ | ____________ |
| ☐ Ducks, mallards | ________ ducklings ______ | ________ ducklings ______ |
| ☐ Egrets, great | ____________ | ____________ |
| snowy | ____________ | ____________ |
| ☐ Geese, Canada | ________ goslings ______ | ________ goslings ______ |
| brandts | ____________ | ____________ |
| ☐ Gulls, hooded | ____________ | ____________ |
| ☐ Herons, blue | ____________ | ____________ |
| night, green | ____________ | ____________ |
| ☐ Kingfisher, belted | ____________ | ____________ |
| ☐ Ospreys | ____________ | ________ chicks ______ |
| ☐ Plover-type, killdeer | ____________ | ____________ |
| ☐ Swans, mute | ________ cygnets ______ | ________ cygnets ______ |
| ☐ Other | ____________ | ____________ |

**JELLIES/JELLYFISH**

☐ Comb, sea walnuts: CSHH stations ☐#1_____ ☐#2_____ ☐#3_____ ☐#4_____ ☐#5_____ ☐#6____ ☐#7_____

☐#8-10_____ ☐#11____ ☐#12___ ☐#13____________

sea gooseberries: CSHH stations ☐#1_____ ☐#2_____ ☐#3_____ ☐#4_____ ☐#5_____ ☐#6____ ☐#7_____

☐#8-10_____ ☐#11____ ☐#12____ ☐#13____________

☐ Lion's mane: CSHH stations ☐#1_____ ☐#2_____ ☐#3_____ ☐#4_____ ☐#5_____ ☐#6____ ☐#7__________

☐ Moon: CSHH stations ☐#1_____ ☐#2_____ ☐#3_____ ☐#4_____ ☐#5_____ ☐#6____ ☐#7__________

**FISH**

☐ Baitfish ____________________

☐ Blue ____________________

☐ Bunker ____________________

☐ Striped bass ____________________

☐ Small shrimp ____________________

**CRABS**

☐ Asian shore ____________________

☐ Blue-claw ____________________

☐ Horseshoe ____________________

**OTHER** ____________________

____________________

____________________

| **Nassau Co. DOH PHL**<br>209 Main Street<br>Hempstead, NY 11550 | FORM NAME:<br>□ QC □ Equip Maint □ Training □ Comp Doc □ Other | |
|---|---|---|
| LABORATORY SECTION<br>□ Chemistry<br>□ Environmental Microbiology<br>□ Clinical Microbiology | Form. No.:<br>Date: | Rev: 0<br>Created By: CONNIE IANNUCCI |

## 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, NY 11550
RODGER P. SILLETTI Ph.D., D (ABMM), DIRECTOR TELEPHONE (516) 572-1202 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 | | Wind | Weather | Wave Height | Laboratory Use Only | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Air | Water | | | | 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 COVER CREEK | | | | | | | | | | |
| CSHH-4 | 10 | | 5 | BAR BEACH SPIT | | | | | | | | | | |
| CSHH-5 | 10 | | 5 | MOTT'S COVE | | | | | | | | | | |
| CSHH-6 | 10 | | 5 | EAST OF FORMER TNH INCINERATOR | | | | | | | | | | |
| CSHH-7 | 10 | | 5 | BRYANT LANDING | | | | | | | | | | |
| CSHH-8 | 10 | | 5 | GLEN COVE STP | | | | | | | | | | |
| CSHH-9 | | | 5 | FIRST PIPE WEST OF STP OUTFALL | | | | | | | | | | |
| CSHH-10 | | | 5 | PIPE AT CORNER OF SEAWALL WEST OF STP OUTFALL | | | | | | | | | | |
| CSHH-11 | | | 5 | 50 YARDS EAST OF STP OUTFALL | | | | | | | | | | |
| CSHH-12 | | | 5 | EAST OF STP OUTFALL BY BEND IN SEAWALL | | | | | | | | | | |
| CSHH-13 | | | 5 | 60 FEET WEST OF MILL POND WEIR | | | | | | | | | | |
| | | | | | | | | | | | | | | |

COMMENTS/REMARKS

*ESTIMATED COUNTES: ALL COUNTS ARE ABOVE UPPER ACCEPTANCE LIMIT (20-60), OR NO COUNTS WITHIN ACCEPTANCE LIMIT (20-60)
**TNTC = "TOO NUMEROUS TO COUNT"**

DATA ENTRY PROOFED

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

TEMP CONTROL: TIME RECEIVED: DATE ANALYZED:

DATE 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 rpeort shall not be reproced 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:**

| Nassau Co. DOH PHL<br>209 Main Street<br>Hempstead, NY 11550 | FORM NAME:<br>□ QC □ Equip Maint □ Training □ Comp Doc □ Other | |
|---|---|---|
| LABORATORY SECTION<br>□ Chemistry<br>□ Environmental Microbiology<br>□ Clinical Microbiology | Form. No.: | Rev: 0 |
| | Date: | Created By: CONNIE IANNUCCI |

## Beach Monitoring Daily Sampling Log

## COALITION TO SAVE HEMPSTEAD HARBOR

Elap ID #10339

NASSAU COUNTY DEPARTMENT OF HEALTH
DIVISION OF PLBLIC HEALTH LABORATORIES
209 MAIN STREET, HEMPSTEAD, NY 11550
RODGER P. SILLETTI Ph.D., D (ABMM), DIRECTOR TELEPHONE (516) 572-1202 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 | | Wind | Weather | Wave Height | Laboratory Use Only | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Air | Water | | | | Lab Number | Fecal Coliforms | Enterococci | Comments |
| CSHH-13A | 10 | | 5 | HEAD OF GLEN COVE CREEK-COUNTY PIPE | | | | | | | | | | |
| CSHH-13B | 10 | | 5 | DOG LEG @ HEAD OF GLEN COVE CREEK | | | | | | | | | | |
| CSHH-14 | 10 | | 5 | NW CORNER OF POWER PLANT ~ 50 YARDS FROM CEMENT OUTFALL | | | | | | | | | | |
| CSHH-14A | 10 | | 5 | CEMENT OUTFALL ADJACENT TO POWER PLANT | | | | | | | | | | |
| CSHH-15 | 10 | | 5 | NW CORNER OF TAPPEN POOL | | | | | | | | | | |
| CSHH-15A | 10 | | 5 | SCUDDER'S POND OUTFALL @ SEAWALL N. OF TAPPEN POOL | | | | | | | | | | |
| CSHH-15B | 10 | | 5 | SCUDDER'S POND WEIR | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

COMMENTS/REMARKS

*ESTIMATED COUNTES: ALL COUNTS ARE ABOVE UPPER ACCEPTANCE LIMIT (20-60), OR NO COUNTS WITHIN ACCEPTANCE LIMIT (20-60)

**TNTC = "TOO NUMEROUS TO COUNT"** **24hr rain:** **48hr rain:**

DATA ENTRY PROOFED

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

TEMP CONTROL: TIME RECEIVED: DATE ANALYZED:

DATE RECEIVED:

SAMPLE ACCEPTABLE: YES ☐ NO ☐ ANALYSIS SUCCESSFUL: YES ☐ NO ☐

**LABORATORY ACCREDITATION NOTICE:**

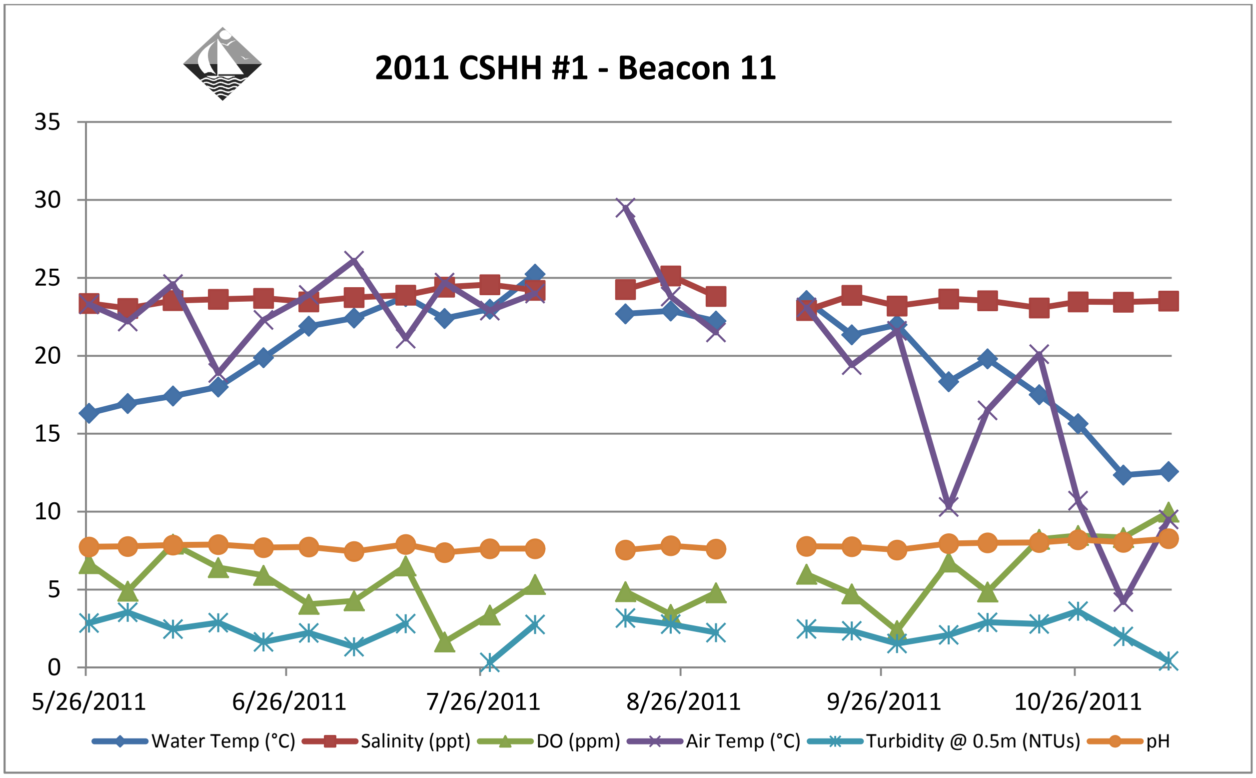
The results provided on this report have been produced in compliance with "NELAC" (National Environmental Laboratory Accreditation Conference) standards and relate only to the identified sample. Any deviations from the accepted "NELAC" collection requirements for non-potable samples are appropriately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

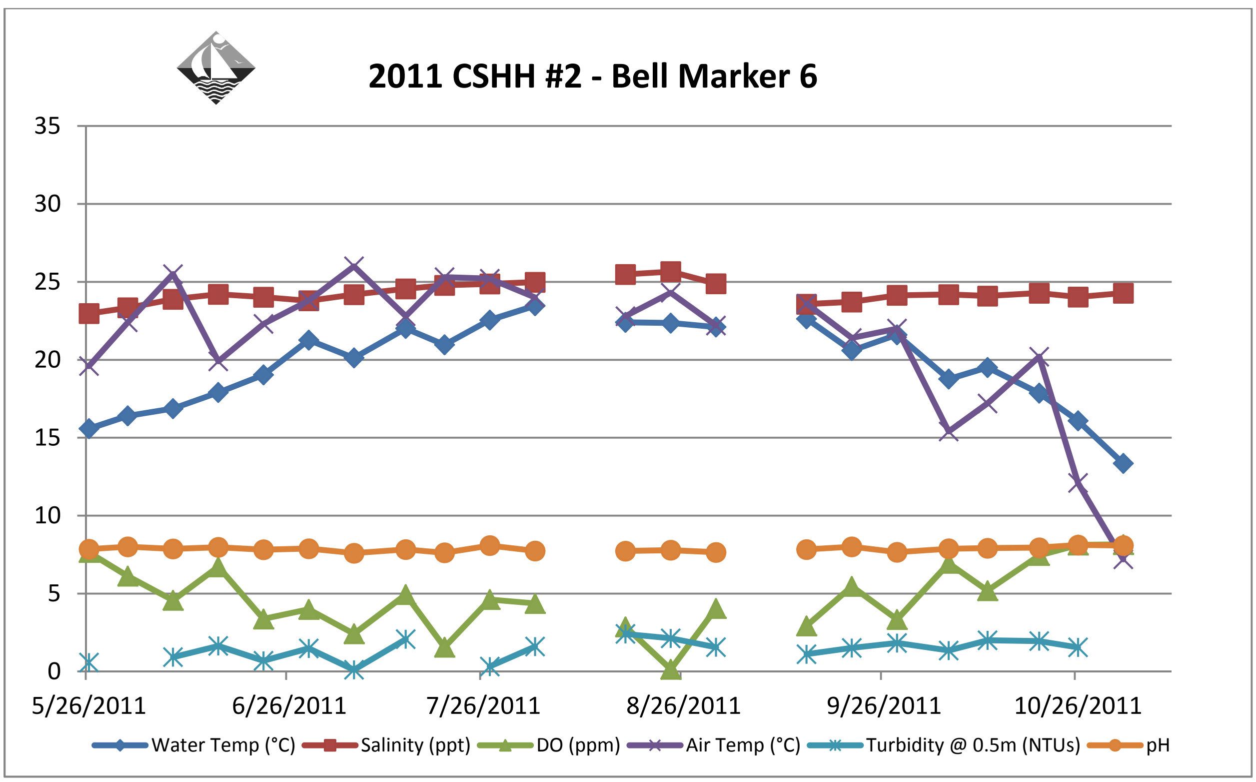
| VERIFICATION REVIEW | | |
|---|---|---|
| **Name:** | **Title:** | **Date:** |
| **Comments:** | | |

# Appendix A

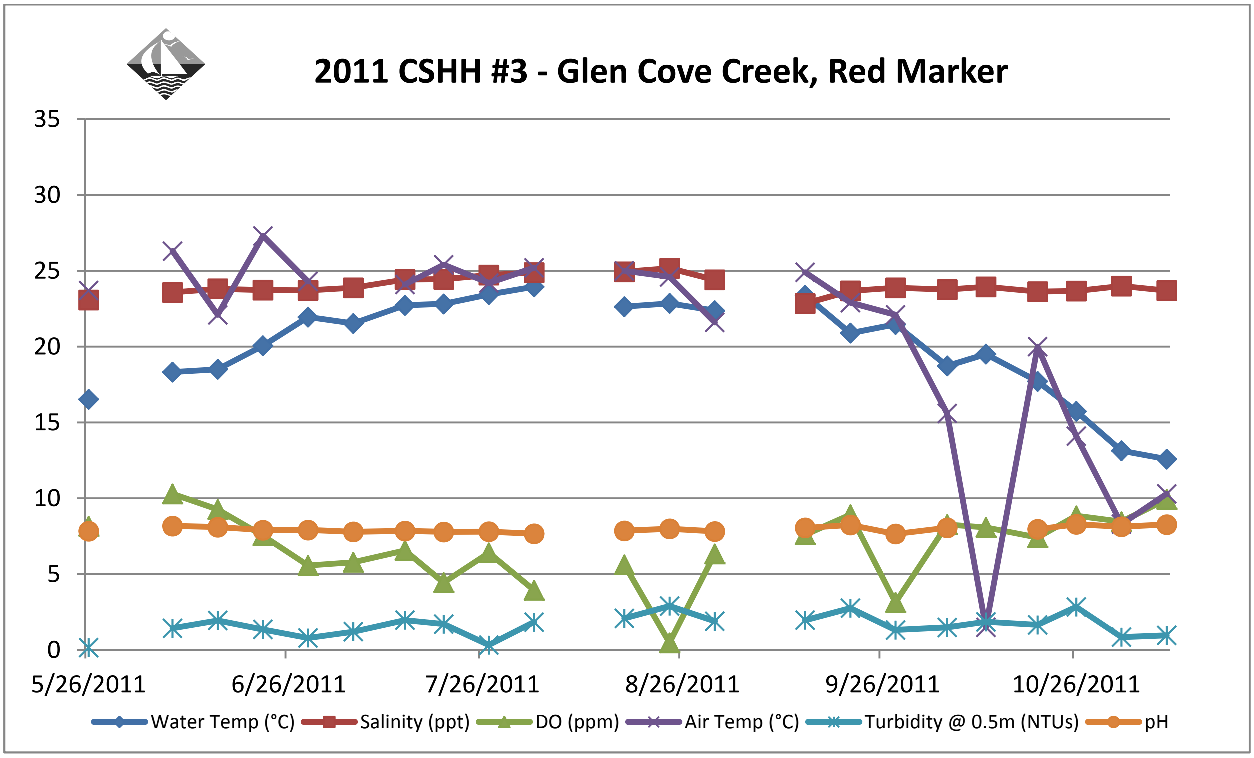
## 2011 Field Monitoring Results

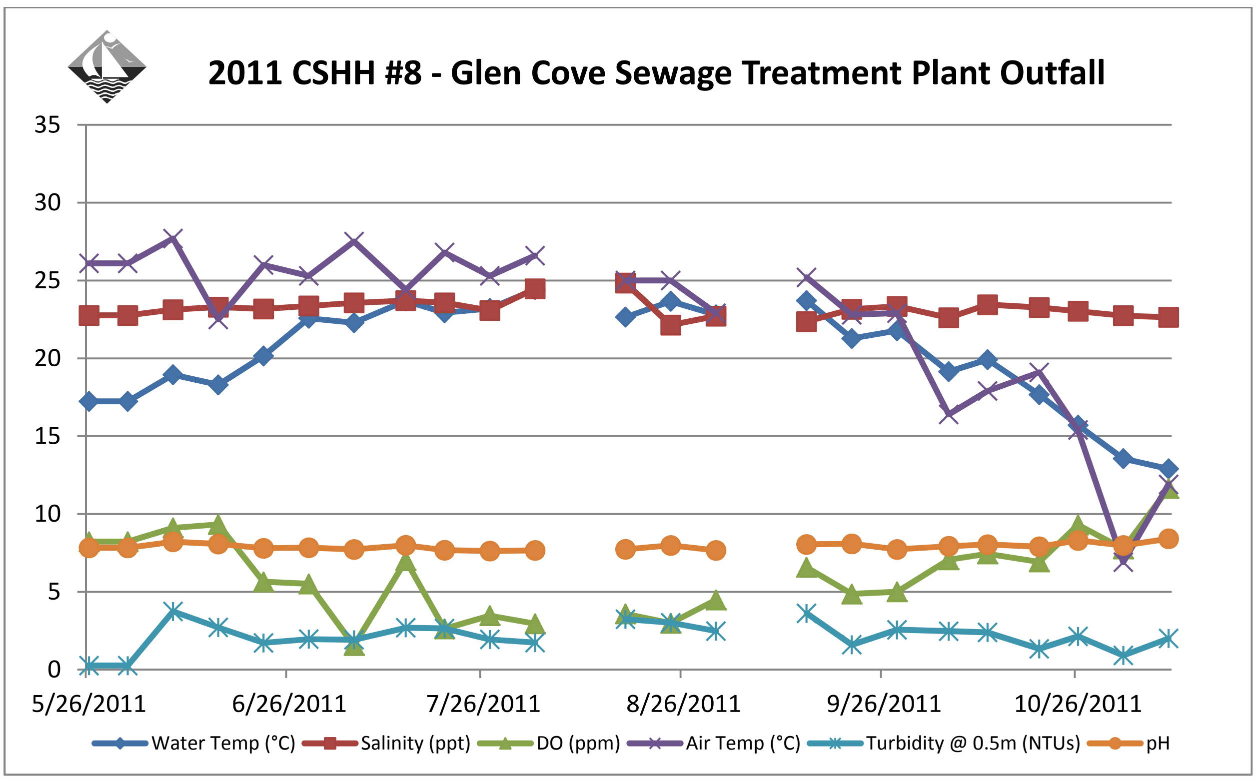
# 2011 Weekly Results
# Graphs for Water-Quality Parameters



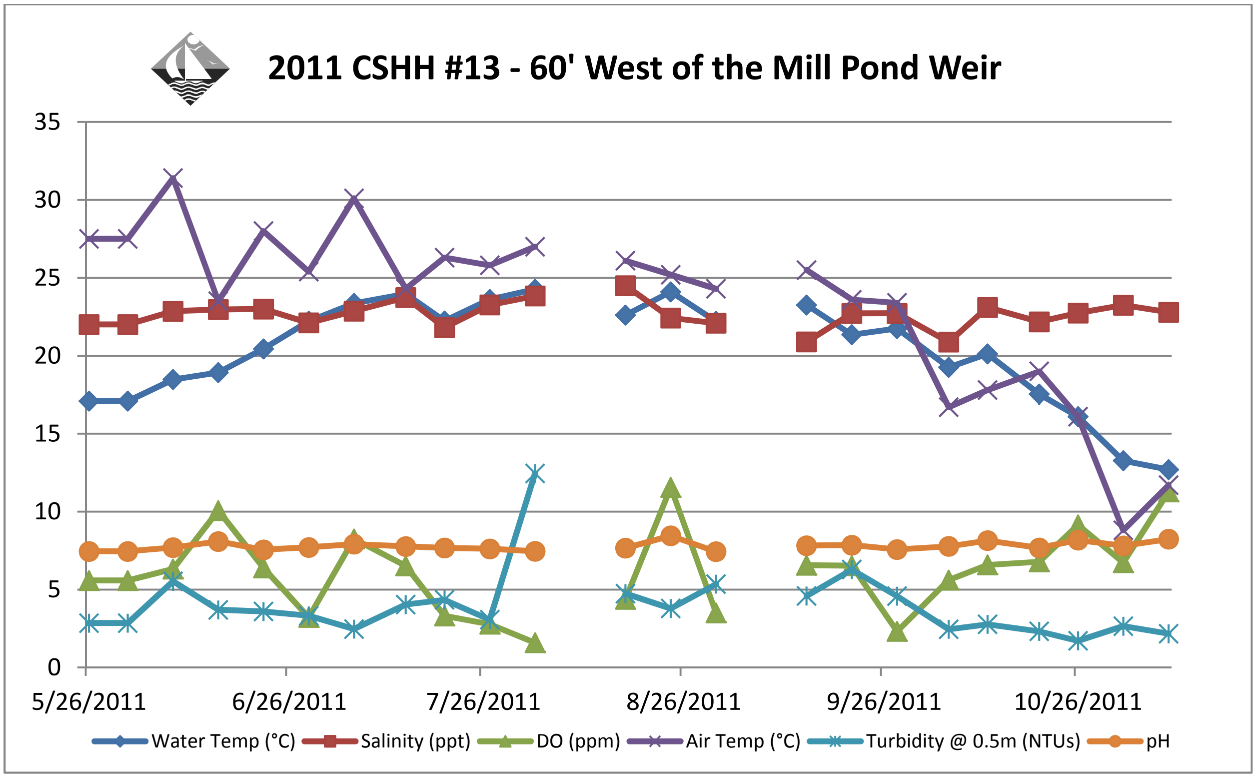



# 2011 Weekly Results
# Graphs for Water-Quality Parameters



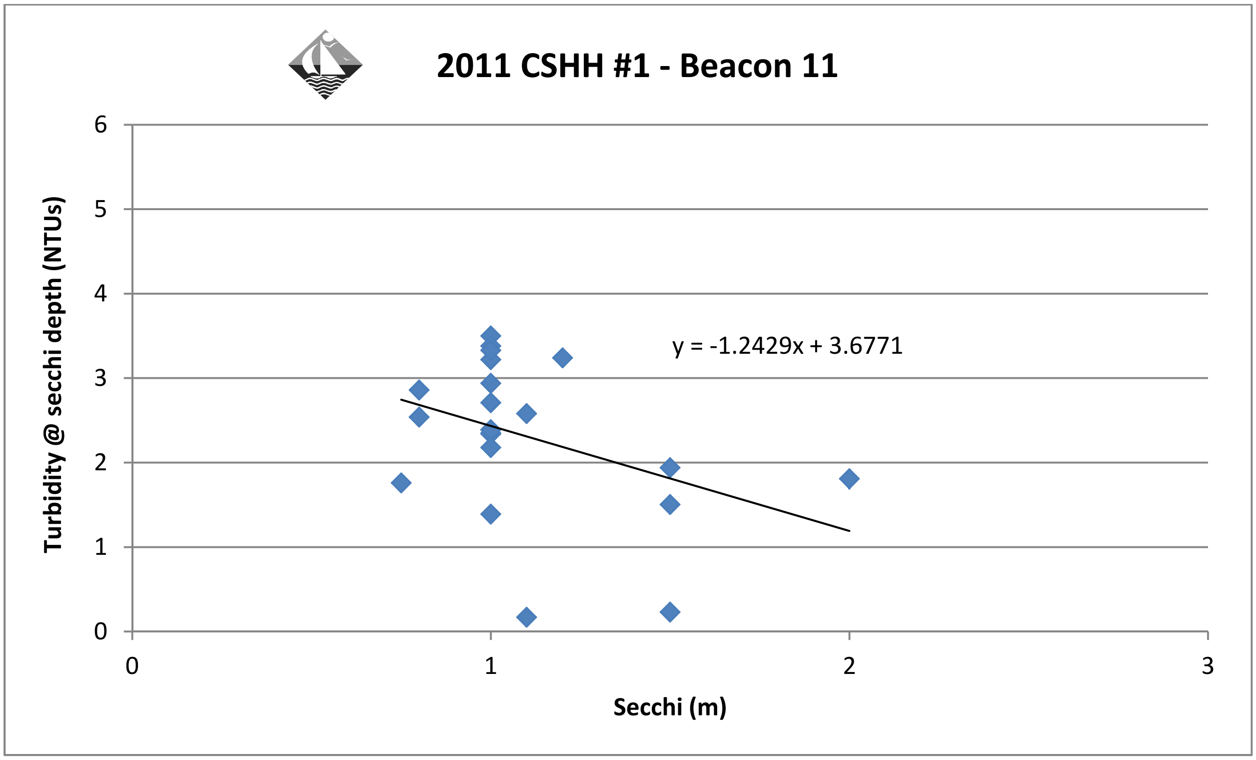



## 2011 Weekly Results
## Graphs for Water-Quality Parameters

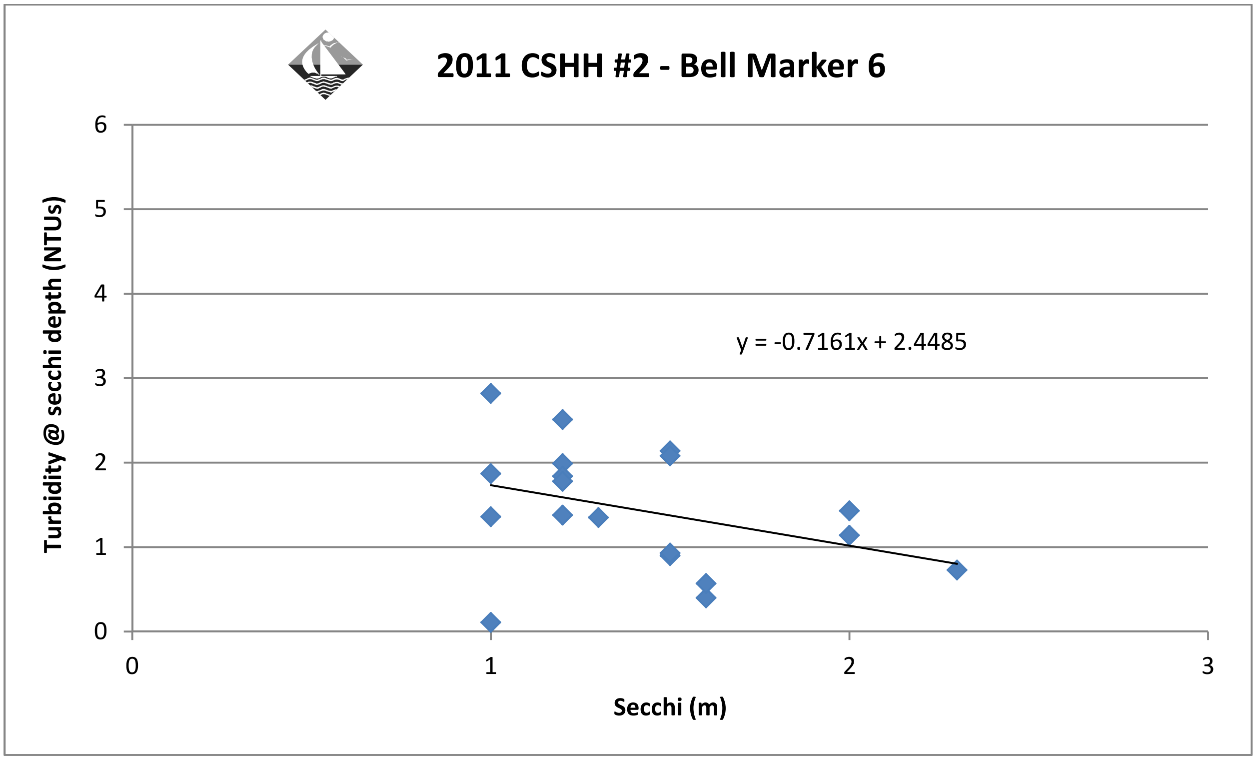


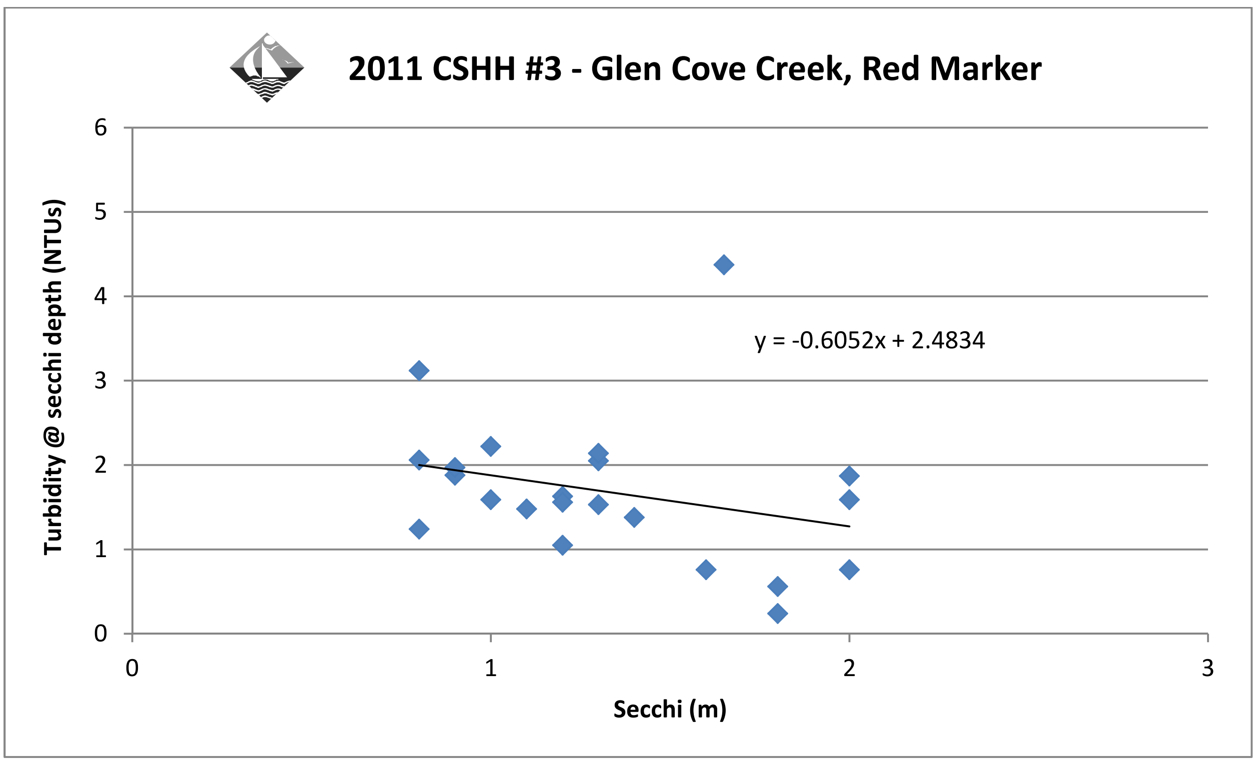
# 2011 Turbidity and Secchi Disk Transparency Graphs

Note: A linear relationship line and its formula are shown for each graph as generated by Microsoft Excel. This line depicts the inverse relationship between the Secchi-disk depth and turbidly at Secchi-disk depth (as the turbidity increases, the Secchi-disk depth decreases). The inverse relationship is further shown in the negative slope of the formula (y = mx +b where, m is the slope of the line [negative = inverse trend, positive = direct trend]).

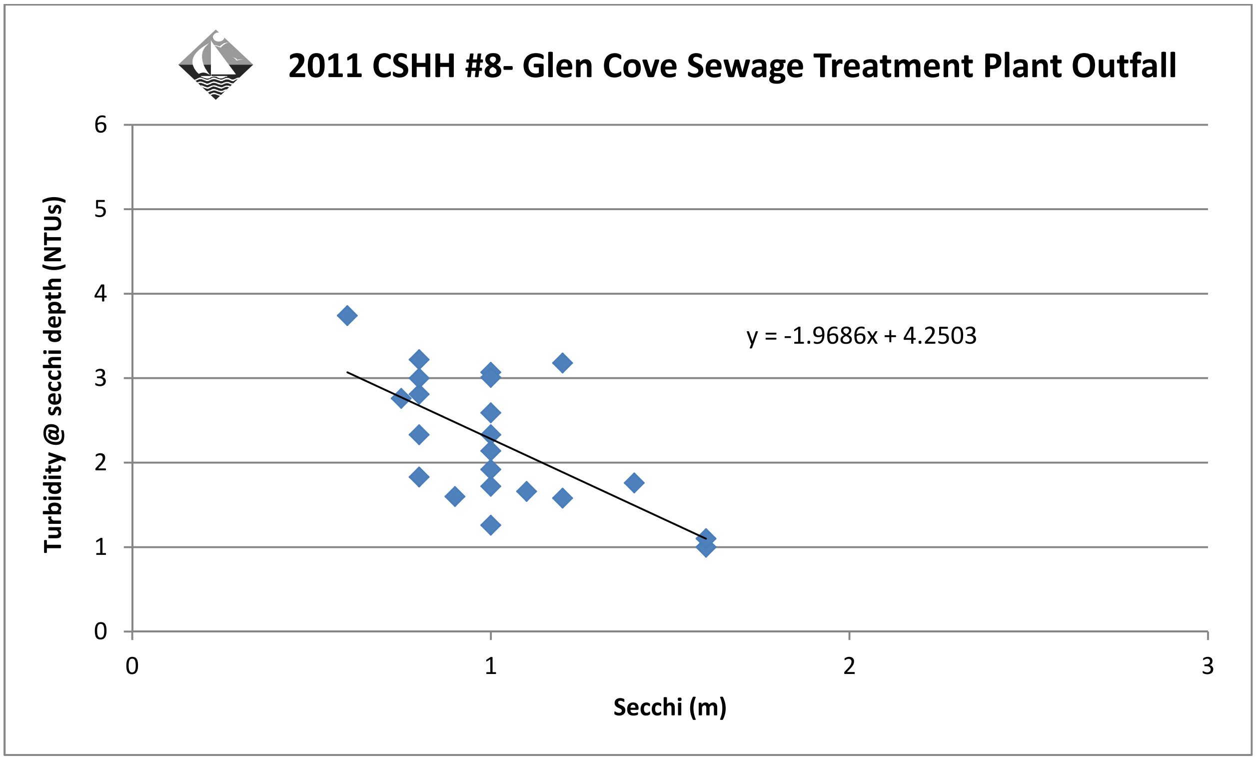


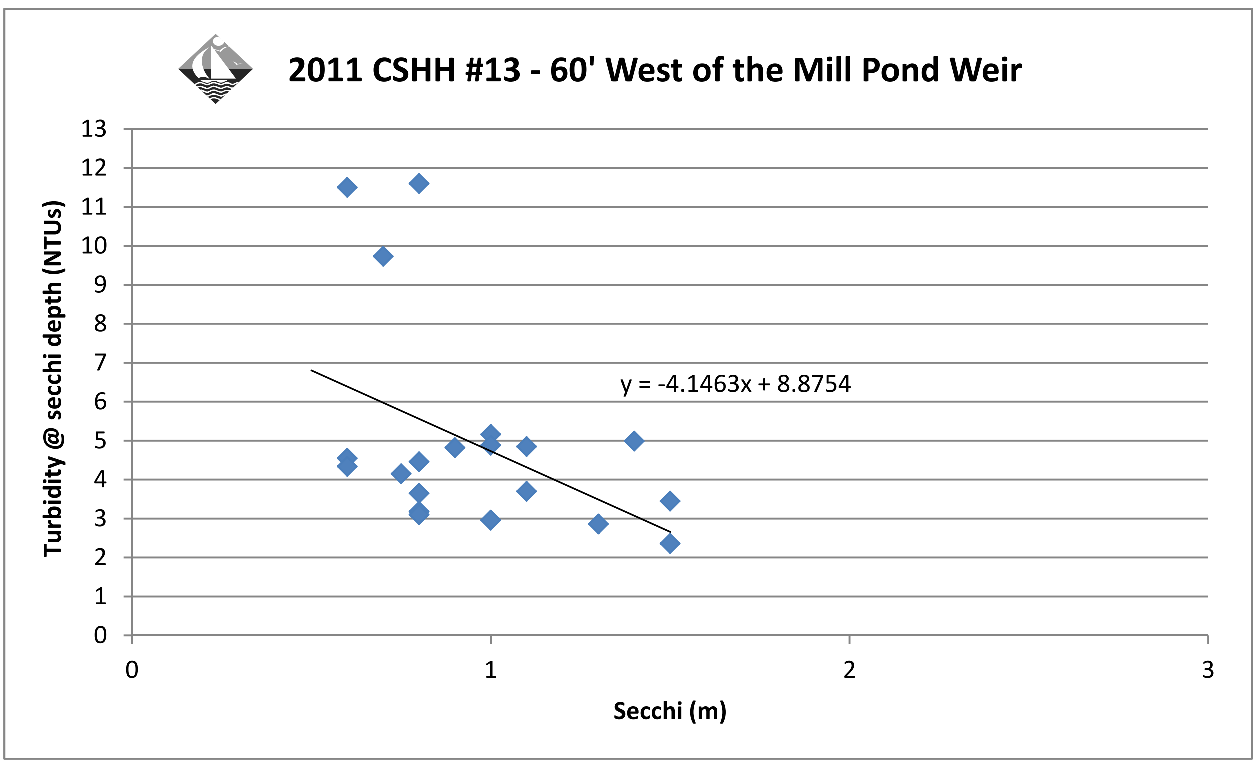
# 2011 Turbidity and Secchi Disk Transparency Graphs



# 2011 Turbidity and Secchi Disk Transparency Graphs



Coalition to Save Hempstead Harbor

FUSS & O'NEILL

# 2011 CSHH Field Monitoring Data

## CSHH Water-Monitoring Program 2011

| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp | Secchi | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Ave | Surface | Bottom | Ave | Surface | Bottom | Surface | Bottom | Ave | (°C) | (m) | | | (Bottom) | (AM) |
| **CSHH #1 - Beacon 11** | | | | | | | | | | | | | | | | | |
| 5/26/11 | 17.4 | 15.23 | 16.32 | 23.16 | 23.57 | 23.37 | 7.99 | 6.67 | 7.79 | 7.68 | 7.74 | 23.3 | 1.0 | 2.86 | 1.39 | 5.6 | 9:36 |
| 6/1/11 | 19.0 | 14.88 | 16.94 | 22.55 | 23.54 | 23.05 | 8.86 | 4.9 | 8.1 | 7.4 | 7.77 | 22.2 | 1.0 | 3.54 | 3.5 | 3.7 | 8:02 |
| 6/8/11 | 18.46 | 16.38 | 17.42 | 23.24 | 23.84 | 23.54 | 8.75 | 7.92 | 7.93 | 7.78 | 7.86 | 24.6 | 1 | 2.47 | 2.39 | 6.5 | 8:20 |
| 6/15/11 | 18.32 | 17.68 | 18.00 | 23.26 | 23.99 | 23.63 | 9.39 | 6.41 | 8.0 | 7.8 | 7.89 | 18.9 | 1.0 | 2.9 | 2.34 | 3.3 | 9:15 |
| 6/22/11 | 20.39 | 19.36 | 19.88 | 23.51 | 23.87 | 23.69 | 6.25 | 5.92 | 7.69 | 7.7 | 7.70 | 22.3 | 1 | 1.64 | 2.35 | 4.5 | 8:13 |
| 6/29/11 | 22.93 | 20.87 | 21.90 | 23.05 | 23.87 | 23.46 | 7.54 | 4.06 | 7.91 | 7.55 | 7.73 | 23.9 | 0.75 | 2.22 | 1.76 | 4.5 | 8:05 |
| 7/6/11 | 22.74 | 22.11 | 22.43 | 23.43 | 24.06 | 23.75 | 5.68 | 4.28 | 7.53 | 7.36 | 7.45 | 26.1 | 1.1 | 1.33 | 0.17 | 3.6 | 8:04 |
| 7/14/11 | 24.1 | 23.5 | 23.80 | 23.8 | 23.98 | 23.89 | 7.33 | 6.52 | 7.92 | 7.88 | 7.90 | 21.1 | 1 | 2.81 | 2.94 | 4.2 | 7:52 |
| 7/20/11 | 24.1 | 20.69 | 22.40 | 24.03 | 24.78 | 24.41 | 5.67 | 1.64 | 7.55 | 7.21 | 7.38 | 24.7 | 1.1 | | | 4.0 | 7:58 |
| 7/27/11 | 23.59 | 22.4 | 23.00 | 24.46 | 24.67 | 24.57 | 6.77 | 3.37 | 7.85 | 7.40 | 7.63 | 22.9 | 1.5 | 0.33 | 0.23 | 4.8 | 8:07 |
| 8/3/11 | 25.63 | 24.84 | 25.24 | 24.07 | 24.34 | 24.21 | 5.49 | 5.33 | 7.62 | 7.63 | 7.63 | 24.0 | 1.1 | 2.76 | 2.58 | 3.5 | 10:13 |
| 8/10/11 | No water monitoring. | | | | | | | | | | | | | | | | |
| 8/17/11 | 22.76 | 22.63 | 22.70 | 24.06 | 24.45 | 24.26 | 6.15 | 4.87 | 7.5 | 7.57 | 7.54 | 29.5 | 0.8 | 3.17 | 2.86 | 3.4 | 8:13 |
| 8/24/11 | 23.26 | 22.5 | 22.88 | 24.77 | 25.48 | 25.13 | 7.53 | 3.41 | 8.04 | 7.59 | 7.82 | 23.8 | 1.2 | 2.78 | 3.24 | 4.8 | 9:13 |
| 8/31/11 | 22.22 | 22.23 | 22.23 | 23.68 | 23.95 | 23.82 | 5.41 | 4.8 | 7.64 | 7.57 | 7.61 | 21.5 | 1 | 2.24 | 2.71 | 3.0 | 8:15 |
| 9/7/11 | No water monitoring. | | | | | | | | | | | | | | | | |
| 9/14/11 | 23.71 | 23.38 | 23.55 | 22.75 | 23.07 | 22.91 | 6.93 | 5.99 | 7.82 | 7.73 | 7.78 | 23.1 | 0.8 | 2.48 | 2.54 | 2.3 | 8:03 |
| 9/21/11 | 21.43 | 21.27 | 21.35 | 23.73 | 24.03 | 23.88 | 5.34 | 4.72 | 7.78 | 7.73 | 7.76 | 19.4 | 1 | 2.35 | 2.18 | 4.8 | 8:44 |
| 9/28/11 | 22.79 | 21.19 | 21.99 | 22.28 | 24.12 | 23.20 | 4.79 | 2.37 | 7.62 | 7.46 | 7.54 | 21.6 | 1.5 | 1.54 | 1.94 | 4.0 | 8:05 |
| 10/6/11 | 17.81 | 18.87 | 18.34 | 23.25 | 24.05 | 23.65 | 8.34 | 6.77 | 8.02 | 7.89 | 7.96 | 10.3 | 1 | 2.09 | 2.39 | 5.0 | 8:00 |
| 10/12/11 | 20.18 | 19.43 | 19.81 | 23.05 | 24.01 | 23.53 | 9.75 | 4.85 | 8.32 | 7.68 | 8.00 | 16.5 | 1 | 2.9 | 3.38 | 4.4 | 7:55 |
| 10/20/11 | 17.48 | 17.52 | 17.50 | 22.90 | 23.24 | 23.07 | 8.65 | 8.23 | 8.07 | 7.97 | 8.02 | 20.1 | 1 | 2.79 | 3.22 | 4.5 | 8:15 |
| 10/26/11 | 15.15 | 16.15 | 15.65 | 23.01 | 23.92 | 23.47 | 10.18 | 8.47 | 8.29 | 8.11 | 8.20 | 10.7 | 1 | 3.62 | 3.33 | 4.3 | 8:00 |
| 11/2/11 | 11.6 | 13.09 | 12.35 | 22.98 | 23.91 | 23.45 | 8.85 | 8.34 | 8.00 | 8.07 | 8.04 | 4.2 | 2 | 1.99 | 1.81 | 5.7 | 8:02 |
| 11/9/11 | 12.55 | 12.59 | 12.57 | 23.3 | 23.73 | 23.52 | 11.34 | 9.97 | 8.32 | 8.21 | 8.27 | 9.5 | 1.5 | 0.42 | 1.50 | 4.5 | 7:45 |
| *Average* | | | *19.92* | | | *23.71* | | *5.64* | | | *7.79* | *20.2* | | | | | |

# 2011 CSHH Field Monitoring Data

| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp | Secchi | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Ave | Surface | Bottom | Ave | Surface | Bottom | Surface | Bottom | Ave | (°C) | (m) | | | (Bottom) | (AM) |
| **CSHH #2 - Bell Marker 6** | | | | | | | | | | | | | | | | | |
| 5/26/11 | 16.46 | 14.70 | 15.58 | 22.59 | 23.34 | 22.97 | 9.40 | 7.64 | 8.0 | 7.8 | 7.85 | 19.6 | 1.6 | 0.57 | 0.40 | 7.0 | 10:30 |
| 6/1/11 | 18.46 | 14.35 | 16.41 | 22.85 | 23.82 | 23.34 | 13.30 | 6.12 | 8.4 | 7.6 | 8.01 | 22.4 | 1.3 | | | 8.0 | 8:56 |
| 6/8/11 | 19.17 | 14.57 | 16.87 | 23.54 | 24.23 | 23.89 | 12.25 | 4.57 | 8.3 | 7.4 | 7.87 | 25.5 | 1.3 | 0.92 | 1.35 | 8.7 | 8:48 |
| 6/15/11 | 18.05 | 17.76 | 17.91 | 24.14 | 24.27 | 24.21 | 8.38 | 6.72 | 8.1 | 7.9 | 7.97 | 19.9 | 2.0 | 1.64 | 1.43 | 8.9 | 9:44 |
| 6/22/11 | 20.00 | 18.06 | 19.03 | 23.82 | 24.22 | 24.02 | 10.67 | 3.37 | 8.2 | 7.4 | 7.82 | 22.3 | 1.5 | 0.69 | 0.90 | 8.2 | 8:45 |
| 6/29/11 | 22.52 | 20.01 | 21.27 | 23.59 | 23.99 | 23.79 | 9.15 | 3.99 | 8.2 | 7.6 | 7.88 | 23.8 | 1.0 | 1.48 | 1.87 | 9.6 | 8:35 |
| 7/6/11 | 22.18 | 18.06 | 20.12 | 23.82 | 24.55 | 24.19 | 7.15 | 2.42 | 7.88 | 7.31 | 7.60 | 26.0 | 1 | 0.11 | 0.11 | 7.8 | 8:30 |
| 7/14/11 | 22.95 | 21.07 | 22.01 | 24.48 | 24.63 | 24.56 | 7.83 | 4.94 | 8.06 | 7.6 | 7.83 | 22.8 | 1.2 | 2.07 | 1.99 | 8.8 | 8.25 |
| 7/20/11 | 22.99 | 18.94 | 20.97 | 24.49 | 25.07 | 24.78 | 8.35 | 1.56 | 7.98 | 7.26 | 7.62 | 25.3 | 1.2 | | | 7.7 | 8:30 |
| 7/27/11 | 23.65 | 21.45 | 22.55 | 24.81 | 24.92 | 24.87 | 8.78 | 4.62 | 8.6 | 7.56 | 8.08 | 25.2 | 1.6 | 0.32 | 0.57 | 8.9 | 10:10 |
| 8/3/11 | 24.53 | 22.41 | 23.47 | 24.73 | 25.22 | 24.98 | 7.48 | 4.37 | 7.93 | 7.54 | 7.74 | 24.0 | 1.2 | 1.6 | 1.84 | 6.2 | 8:40 |
| 8/10/11 | No water monitoring. | | | | | | | | | | | | | | | | |
| 8/17/11 | 22.69 | 22.11 | 22.40 | 25.39 | 25.57 | 25.48 | 7.68 | 2.87 | 7.98 | 7.47 | 7.73 | 22.8 | 1 | 2.41 | 2.82 | 7.4 | 8:53 |
| 8/24/11 | 23.19 | 21.52 | 22.36 | 24.93 | 26.39 | 25.66 | 8.77 | 0.14 | 8.22 | 7.35 | 7.79 | 24.3 | 1.2 | 2.13 | 2.51 | 9.7 | 9:55 |
| 8/31/11 | 22.14 | 22.07 | 22.11 | 24.58 | 25.19 | 24.89 | 6.09 | 4.05 | 7.73 | 7.56 | 7.65 | 22.2 | 1.2 | 1.56 | 1.38 | 7.5 | 8:48 |
| 9/7/11 | No water monitoring | | | | | | | | | | | | | | | | |
| 9/14/11 | 22.99 | 22.28 | 22.64 | 22.86 | 24.28 | 23.57 | 9.58 | 2.93 | 8.2 | 7.5 | 7.83 | 23.6 | 1.00 | 1.11 | 1.36 | 7.4 | 8:40 |
| 9/21/11 | 20.35 | 20.84 | 20.60 | 23.21 | 24.21 | 23.71 | 9.23 | 5.46 | 8.2 | 7.8 | 8.01 | 21.4 | 1.50 | 1.51 | 0.93 | 8.6 | 9:15 |
| 9/28/11 | 21.92 | 21.29 | 21.61 | 23.64 | 24.64 | 24.14 | 5.81 | 3.34 | 7.8 | 7.6 | 7.66 | 22.0 | 2.00 | 1.83 | 1.14 | 7.4 | 8:34 |
| 10/6/11 | 18.90 | 18.63 | 18.77 | 24.20 | 24.17 | 24.19 | 7.31 | 6.94 | 7.9 | 7.9 | 7.88 | 15.4 | 2.30 | 1.35 | 0.73 | 8.2 | 10:25 |
| 10/12/11 | 19.46 | 19.56 | 19.51 | 23.66 | 24.52 | 24.09 | 9.19 | 5.19 | 8.1 | 7.7 | 7.91 | 17.2 | 1.20 | 2.00 | 1.78 | 7.4 | 8:22 |
| 10/20/11 | 17.81 | 17.91 | 17.86 | 23.99 | 24.56 | 24.28 | 7.84 | 7.45 | 8.0 | 7.9 | 7.95 | 20.2 | 1.50 | 1.95 | 2.14 | 9.3 | 8:40 |
| 10/26/11 | 15.85 | 16.33 | 16.09 | 23.91 | 24.15 | 24.03 | 9.63 | 8.12 | 8.2 | 8.0 | 8.12 | 12.1 | 1.50 | 1.55 | 2.08 | 9.9 | 10:10 |
| 11/2/11 | 12.95 | 13.75 | 13.35 | 24.13 | 24.42 | 24.28 | 8.65 | 8.15 | 8.1 | 8.1 | 8.08 | 7.2 | 2.10 | | | 8.7 | 8:35 |
| 11/9/11 | Aborted station because of dense fog. | | | | | | | | | | | | | | | | |
| *Average* | | | *19.70* | | | *24.27* | | *4.77* | | | *7.86* | *21.15* | | | | | |

# 2011 CSHH Field Monitoring Data

| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp | Secchi | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Ave | Surface | Bottom | Ave | Surface | Bottom | Surface | Bottom | Ave | (°C) | (m) | | | (Bottom) | (AM) |
| **CSHH #3 - Glen Cove Creek, Red Marker** | | | | | | | | | | | | | | | | | |
| 5/26/11 | 17.54 | 15.51 | 16.53 | 22.87 | 23.28 | 23.08 | 9.48 | 8.16 | 8.0 | 7.7 | 7.84 | 23.7 | 1.8 | 0.16 | 0.24 | 4.1 | 10:55 |
| 6/1/11 | Water-monitoring interrupted--opening day for shellfish beds. | | | | | | | | | | | | | | | | |
| 6/8/11 | 19.21 | 17.44 | 18.33 | 23.43 | 23.72 | 23.58 | 12.38 | 10.29 | 8.3 | 8.1 | 8.18 | 26.3 | 1.2 | 1.44 | 1.63 | 3.2 | 9:45 |
| 6/15/11 | 18.85 | 18.17 | 18.51 | 23.59 | 24.04 | 23.82 | 10.58 | 9.27 | 8.1 | 8.1 | 8.11 | 22.1 | 1.3 | 1.95 | 2.05 | 3.3 | 11:06 |
| 6/22/11 | 20.92 | 19.20 | 20.06 | 23.47 | 23.99 | 23.73 | 10.40 | 7.54 | 8.21 | 7.6 | 7.91 | 27.3 | 1.3 | 1.36 | 1.53 | 3.6 | 9:15 |
| 6/29/11 | 22.69 | 21.21 | 21.95 | 23.57 | 23.85 | 23.71 | 7.64 | 5.58 | 8.12 | 7.7 | 7.92 | 24.3 | 1.2 | 0.80 | 1.05 | 4.7 | 9:07 |
| 7/6/11 | 23.55 | 19.51 | 21.53 | 23.55 | 24.22 | 23.89 | 8.66 | 5.79 | 8.10 | 7.5 | 7.79 | | 0.8 | 1.21 | 1.24 | 3.0 | 8:58 |
| 7/14/11 | 22.82 | 22.63 | 22.73 | 24.41 | 24.44 | 24.43 | 7.07 | 6.57 | 7.9 | 7.8 | 7.85 | 24.1 | 1.3 | 1.97 | 2.14 | 4.4 | 8:55 |
| 7/20/11 | 24.78 | 20.86 | 22.82 | 24.07 | 24.81 | 24.44 | 9.61 | 4.45 | 8.11 | 7.46 | 7.79 | 25.4 | 1.2 | 1.71 | 1.56 | 3.3 | 9:12 |
| 7/27/11 | 23.75 | 23.13 | 23.44 | 24.73 | 24.71 | 24.72 | 7.65 | 6.41 | 7.86 | 7.75 | 7.81 | 24.2 | 1.6 | 0.33 | 0.76 | 4.7 | 10:33 |
| 8/3/11 | 24.49 | 23.40 | 23.95 | 24.77 | 25.00 | 24.89 | 6.43 | 3.95 | 7.83 | 7.5 | 7.67 | 25.2 | 1.1 | 1.84 | 1.48 | 2.8 | 9:14 |
| 8/10/11 | No water monitoring. | | | | | | | | | | | | | | | | |
| 8/17/11 | 22.76 | 22.52 | 22.64 | 24.85 | 25.02 | 24.94 | 8.62 | 5.62 | 8.02 | 7.7 | 7.86 | 25.0 | 1.0 | 2.09 | 2.22 | 3.3 | 9:30 |
| 8/24/11 | 23.57 | 22.14 | 22.86 | 24.35 | 25.99 | 25.17 | 11.44 | 0.48 | 8.44 | 7.55 | 8.00 | 24.6 | 0.8 | 2.9 | 3.12 | 4.5 | 10:20 |
| 8/31/11 | 22.41 | 22.34 | 22.38 | 24.3 | 24.51 | 24.41 | 7.37 | 6.34 | 7.87 | 7.77 | 7.82 | 21.6 | 0.9 | 1.9 | 1.88 | 3.0 | 9:15 |
| 9/7/11 | No water monitoring. | | | | | | | | | | | | | | | | |
| 9/14/11 | 23.41 | 23.36 | 23.39 | 22.64 | 23.05 | 22.85 | 9.50 | 7.60 | 8.16 | 8.0 | 8.06 | 24.9 | 0.90 | 1.97 | 1.97 | 3.7 | 9:15 |
| 9/21/11 | 21.02 | 20.77 | 20.90 | 23.54 | 23.81 | 23.68 | 9.90 | 8.92 | 8.28 | 8.2 | 8.25 | 22.9 | 0.80 | 2.76 | 2.06 | 3.9 | 9:48 |
| 9/28/11 | 21.71 | 21.22 | 21.47 | 23.56 | 24.21 | 23.89 | 5.55 | 3.14 | 7.76 | 7.6 | 7.66 | 22.1 | 1.40 | 1.32 | 1.38 | 4.6 | 9:10 |
| 10/6/11 | 18.92 | 18.54 | 18.73 | 23.59 | 23.93 | 23.76 | 8.34 | 8.28 | 8.08 | 8.0 | 8.06 | 15.6 | 2.00 | 1.49 | 1.59 | 4.0 | 11:00 |
| 10/12/11 | 19.60 | 19.42 | 19.51 | 23.59 | 24.30 | 23.95 | 4.83 | 8.09 | 7.69 | 17.2 | | 1.5 | 1.65 | 1.86 | 4.37 | 8.0 | 8:55 |
| 10/20/11 | 17.75 | 17.68 | 17.72 | 23.58 | 23.68 | 23.63 | 8.23 | 7.42 | 8.04 | 7.9 | 7.97 | 20.0 | 2.00 | 1.66 | 1.87 | 1.3 | 9:20 |
| 10/26/11 | 15.48 | 16.00 | 15.74 | 23.41 | 23.92 | 23.67 | 10.51 | 8.85 | 8.43 | 8.2 | 8.29 | 14.1 | 1.00 | 2.84 | 1.59 | 5.8 | 10:43 |
| 11/2/11 | 12.80 | 13.48 | 13.14 | 23.78 | 24.22 | 24.00 | 9.52 | 8.46 | 8.18 | 8.1 | 8.13 | 8.3 | 1.80 | 0.85 | 0.56 | 4.3 | 9:02 |
| 11/9/11 | 12.57 | 12.60 | 12.59 | 23.56 | 23.84 | 23.70 | 11.22 | 9.94 | 8.34 | 8.2 | 8.27 | 10.3 | 2.00 | 0.97 | 0.76 | 5.0 | 8:15 |
| *Average* | | | *20.04* | | | *23.99* | | *6.87* | | | *7.96* | *20.64* | | | | | |

# 2011 CSHH Field Monitoring Data

| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp | Secchi | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Ave | Surface | Bottom | Ave | Surface | Bottom | Surface | Bottom | Ave | (°C) | (m) | | | (Bottom) | (AM) |
| **CSHH #8 - Glen Cove Sewage Treatment Plant Outfall** | | | | | | | | | | | | | | | | | |
| 5/26/11 | 17.83 | 16.64 | 17.24 | 22.56 | 22.95 | 22.76 | 9.02 | 8.22 | 7.9 | 7.8 | 7.83 | 26.1 | 1.6 | 0.26 | 1.0 | 3.0 | 11:20 |
| 6/1/11 | 17.83 | 16.64 | 17.24 | 22.56 | 22.95 | 22.76 | 9.02 | 8.22 | 7.9 | 7.8 | 7.83 | 26.1 | 1.6 | 0.26 | 1 | 3.0 | 11:20 |
| 6/8/11 | 19.83 | 18.07 | 18.95 | 22.75 | 23.5 | 23.13 | 15.22 | 9.11 | 8.5 | 8.0 | 8.22 | 27.7 | 0.6 | 3.74 | 3.74 | 2.4 | 10:14 |
| 6/15/11 | 18.45 | 18.15 | 18.30 | 23.05 | 23.53 | 23.29 | 10.7 | 9.33 | 8.1 | 8.0 | 8.07 | 22.5 | 1 | 2.71 | 2.14 | 3.3 | 10:31 |
| 6/22/11 | 21.24 | 19.06 | 20.15 | 22.48 | 23.87 | 23.18 | 10.24 | 5.64 | 8.1 | 7.5 | 7.80 | 26.0 | 1 | 1.72 | 1.72 | 3.3 | 9:40 |
| 6/29/11 | 23.33 | 21.82 | 22.58 | 23.06 | 23.68 | 23.37 | 9.19 | 5.51 | 8.1 | 7.6 | 7.84 | 25.3 | 0.75 | 1.96 | 2.76 | 4.0 | 9:38 |
| 7/6/11 | 23.79 | 20.79 | 22.29 | 23.2 | 23.93 | 23.57 | 3.2 | 1.55 | 8.1 | 7.3 | 7.72 | 27.5 | 0.8 | 1.92 | 1.83 | 2.2 | 9:25 |
| 7/14/11 | 24.21 | 23.18 | 23.70 | 23.2 | 24.21 | 23.71 | 9.24 | 7.01 | 8.08 | 7.9 | 7.99 | 24.4 | 1 | 2.69 | 2.59 | 4.1 | 9:25 |
| 7/20/11 | 24.32 | 21.54 | 22.93 | 22.5 | 24.64 | 23.57 | 8.62 | 2.62 | 8.01 | 7.34 | 7.68 | 26.8 | 1 | 2.64 | 3.07 | 2.5 | 9:30 |
| 7/27/11 | 24.08 | 22.33 | 23.21 | 21.42 | 24.73 | 23.08 | 7.89 | 3.47 | 7.82 | 7.42 | 7.62 | 25.3 | 1 | 1.94 | 1.92 | 4.1 | 11:00 |
| 8/3/11 | 25.08 | 23.77 | 24.43 | 24.25 | 24.69 | 24.47 | 7.73 | 2.95 | 7.91 | 7.41 | 7.66 | 26.6 | 1 | 1.74 | 1.26 | 2.2 | 9:47 |
| 8/10/11 | No water monitoring. | | | | | | | | | | | | | | | | |
| 8/17/11 | 22.98 | 22.32 | 22.65 | 24.54 | 25.13 | 24.84 | 8.24 | 3.58 | 7.97 | 7.49 | 7.73 | 25.0 | 0.8 | 3.24 | 2.81 | 3.0 | 10:10 |
| 8/24/11 | 24.08 | 23.25 | 23.67 | 19.36 | 24.92 | 22.14 | 13.89 | 2.98 | 8.43 | 7.54 | 7.99 | 25.0 | 0.8 | 3.01 | 3.22 | 3.6 | 10:50 |
| 8/31/11 | 22.98 | 22.61 | 22.80 | 21.05 | 24.38 | 22.72 | 6.88 | 4.48 | 7.74 | 7.58 | 7.66 | 22.9 | 0.8 | 2.48 | 2.33 | 2.9 | 9:40 |
| 9/7/11 | No water monitoring. | | | | | | | | | | | | | | | | |
| 9/14/11 | 23.91 | 23.51 | 23.71 | 21.89 | 22.84 | 22.37 | 11.2 | 6.57 | 8.3 | 7.8 | 8.05 | 25.2 | 0.8 | 3.62 | 3.00 | 3.5 | 9:55 |
| 9/21/11 | 21.28 | 21.27 | 21.28 | 22.49 | 23.82 | 23.16 | 12.15 | 4.86 | 8.4 | 7.8 | 8.08 | 22.8 | 0.9 | 1.6 | 1.60 | 3.0 | 10:15 |
| 9/28/11 | 21.84 | 21.72 | 21.78 | 23.13 | 23.55 | 23.34 | 5.7 | 5.0 | 7.8 | 7.7 | 7.73 | 22.9 | 1.0 | 2.56 | 3.01 | 4.4 | 9:40 |
| 10/6/11 | 19.42 | 18.87 | 19.15 | 21.25 | 23.96 | 22.61 | 7.96 | 7.06 | 8.0 | 7.9 | 7.93 | 16.4 | 1.4 | 2.47 | 1.76 | 3.6 | 11:17 |
| 10/12/11 | 20.16 | 19.68 | 19.92 | 23.21 | 23.68 | 23.45 | 10.18 | 7.44 | 8.1 | 8.0 | 8.04 | 17.9 | 1.2 | 2.39 | 3.18 | 3.9 | 9:15 |
| 10/20/11 | 17.7 | 17.64 | 17.67 | 22.81 | 23.72 | 23.27 | 8.11 | 6.92 | 7.9 | 7.9 | 7.90 | 19.1 | 1.2 | 1.34 | 1.58 | 2.8 | 9:45 |
| 10/26/11 | 15.55 | 15.86 | 15.71 | 22.46 | 23.6 | 23.03 | 11.09 | 9.3 | 8.4 | 8.2 | 8.31 | 15.4 | 1 | 2.14 | 2.33 | 5.0 | 11:10 |
| 11/2/11 | 13.49 | 13.62 | 13.56 | 21.38 | 24.1 | 22.74 | 8.97 | 7.76 | 8.0 | 8.0 | 7.98 | 6.9 | 1.6 | 0.91 | 1.1 | 3.5 | 9:30 |
| 11/9/11 | 13.15 | 12.65 | 12.90 | 21.67 | 23.61 | 22.64 | 12.38 | 11.64 | 8.4 | 8.4 | 8.41 | 11.9 | 1.1 | 2 | 1.66 | 4.7 | 8:45 |
| *Average* | | | *20.25* | | | *23.18* | | *6.14* | | | *7.91* | *22.42* | | | | | |

# 2011 CSHH Field Monitoring Data

| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp | Secchi | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Ave | Surface | Bottom | Ave | Surface | Bottom | Surface | Bottom | Ave | (°C) | (m) | | | (Bottom) | (AM) |
| **CSHH #13 - 60' West of the Mill Pond Weir** | | | | | | | | | | | | | | | | | |
| 5/26/11 | 17.42 | 16.76 | 17.09 | 21.38 | 22.63 | 22.01 | 6.50 | 5.58 | 7.5 | 7.4 | 7.45 | 27.5 | 1.0 | 2.85 | 2.96 | 1.2 | 11:40 |
| 6/1/11 | 17.42 | 16.76 | 17.09 | 21.38 | 22.63 | 22.01 | 6.5 | 5.58 | 7.5 | 7.4 | 7.45 | 27.5 | 1.0 | 2.9 | 2.96 | 1.2 | 11:40 |
| 6/8/11 | 19.06 | 17.90 | 18.48 | 22.60 | 23.12 | 22.86 | 9.35 | 6.32 | 8.0 | 7.4 | 7.70 | 31.4 | 0.80 | 5.53 | 11.6 | 1.1 | 10:40 |
| 6/15/11 | 19.29 | 18.56 | 18.93 | 22.59 | 23.34 | 22.97 | 10.98 | 10.07 | 8.3 | 7.9 | 8.09 | 23.5 | 1.10 | 3.70 | 3.7 | 1.4 | 11:47 |
| 6/22/11 | 20.43 | 20.46 | 20.45 | 22.93 | 23.08 | 23.01 | 7.08 | 6.39 | 7.6 | 7.5 | 7.55 | 28.0 | 0.8 | 3.59 | 3.65 | 0.7 | 10:05 |
| 6/29/11 | 22.79 | 21.64 | 22.22 | 20.95 | 23.28 | 22.12 | 8.79 | 3.21 | 8.1 | 7.3 | 7.71 | 25.4 | 0.50 | 3.32 | | 2.3 | 9:53 |
| 7/6/11 | 23.59 | 23.14 | 23.37 | 22.59 | 23.15 | 22.87 | 9.83 | 8.25 | 8.01 | 7.82 | 7.92 | 30.1 | 0.5 | 2.47 | | 1.0 | 9:45 |
| 7/14/11 | 24.26 | 23.69 | 23.98 | 23.54 | 23.95 | 23.75 | 7.02 | 6.52 | 7.82 | 7.72 | 7.77 | 24.3 | 0.75 | 4.04 | 4.15 | 2.5 | 9:43 |
| 7/20/11 | 22.64 | 21.82 | 22.23 | 19.01 | 24.61 | 21.81 | 9.47 | 3.31 | 8.0 | 7.34 | 7.67 | 26.3 | 1 | 4.34 | 5.16 | 1.8 | 9:50 |
| 7/27/11 | 24.14 | 23.09 | 23.62 | 22.08 | 24.45 | 23.27 | 8.64 | 2.78 | 7.92 | 7.31 | 7.62 | 25.8 | 0.8 | 3.07 | 3.18 | 2.5 | 11:14 |
| 8/3/11 | 24.36 | 24.17 | 24.27 | 23.38 | 24.3 | 23.84 | 5.48 | 1.59 | 7.62 | 7.29 | 7.46 | 27.0 | 0.6 | 12.45 | 11.5 | 1.1 | 10:00 |
| 8/10/11 | No water monitoring. | | | | | | | | | | | | | | | | |
| 8/17/11 | 22.8 | 22.42 | 22.61 | 24.15 | 24.86 | 24.51 | 7.68 | 4.38 | 7.85 | 7.48 | 7.67 | 26.1 | 0.6 | 4.74 | 4.55 | 2.0 | 10:25 |
| 8/24/11 | 24.02 | 24.18 | 24.10 | 20.5 | 24.36 | 22.43 | 19.40 | 11.56 | 8.68 | 8.22 | 8.45 | 25.2 | 1 | 3.79 | 4.88 | 1.4 | 11:15 |
| 8/31/11 | 21.82 | 22.59 | 22.21 | 20.8 | 23.39 | 22.10 | 4.65 | 3.5 | 7.49 | 7.38 | 7.44 | 24.3 | 0.7 | 5.35 | 9.73 | 1.4 | 9:57 |
| 9/7/11 | No water monitoring. | | | | | | | | | | | | | | | | |
| 9/14/11 | 22.95 | 23.57 | 23.26 | 19.48 | 22.30 | 20.89 | 9.40 | 6.56 | 7.9 | 7.7 | 7.82 | 25.5 | 0.90 | 4.59 | 4.82 | 1.6 | 10:25 |
| 9/21/11 | 21.24 | 21.47 | 21.36 | 22.30 | 23.14 | 22.72 | 7.12 | 6.53 | 7.9 | 7.8 | 7.85 | 23.6 | 0.60 | 6.28 | 4.34 | 0.8 | 10:33 |
| 9/28/11 | 21.75 | 21.75 | 21.75 | 21.99 | 23.46 | 22.73 | 6.01 | 2.32 | 7.7 | 7.4 | 7.58 | 23.4 | 0.80 | 4.58 | 4.46 | 2.7 | 10:00 |
| 10/6/11 | 18.98 | 19.54 | 19.26 | 17.84 | 23.92 | 20.88 | 7.63 | 5.61 | 7.8 | 7.7 | 7.78 | 16.7 | 1.40 | 2.45 | 4.99 | 1.4 | 11:30 |
| 10/12/11 | 20.32 | 19.92 | 20.12 | 22.72 | 23.49 | 23.11 | 13.23 | 6.58 | 8.4 | 7.9 | 8.15 | 17.8 | 1.10 | 2.77 | 4.85 | 3.0 | 9:40 |
| 10/20/11 | 17.48 | 17.61 | 17.55 | 21.46 | 22.90 | 22.18 | 7.07 | 6.78 | 7.7 | 7.7 | 7.68 | 19.0 | 0.80 | 2.32 | 3.1 | 0.7 | 10:01 |
| 10/26/11 | 16.26 | 15.93 | 16.10 | 22.00 | 23.49 | 22.75 | 9.81 | 9.15 | 8.2 | 8.2 | 8.18 | 16.1 | 1.30 | 1.71 | 2.86 | 3.8 | 11:27 |
| 11/2/11 | 13.15 | 13.39 | 13.27 | 22.98 | 23.52 | 23.25 | 7.38 | 6.73 | 7.8 | 7.8 | 7.81 | 8.8 | 1.50 | 2.65 | 2.36 | 1.1 | 9:45 |
| 11/9/11 | 12.91 | 12.49 | 12.70 | 22.10 | 23.50 | 22.80 | 9.96 | 11.27 | 8.2 | 8.3 | 8.24 | 11.7 | 1.50 | 2.17 | 3.45 | 2.4 | 9:00 |
| *Average* | | | *20.26* | | | *22.64* | *8.65* | *6.11* | | | *7.78* | *23.26* | | | | | |

# 2011 CSHH Field Monitoring Data

| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp | Secchi | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Ave | Surface | Bottom | Ave | Surface | Bottom | Surface | Bottom | Ave | (°C) | (m) | | | (Bottom) | (AM) |
| **CSHH #14 - 50 yds from Powerhouse Drain** | | | | | | | | | | | | | | | | | |
| 6/29/11 | 23.29 | 23.20 | 23.25 | 23.18 | 23.34 | 23.26 | 10.29 | 7.58 | 8.2 | 7.8 | 7.98 | 25.4 | 0.5 | 3.2 | | 2.2 | 10:48 |
| 7/14/11 | 23.20 | 23.31 | 23.26 | 24.01 | 24.00 | 24.01 | 7.49 | 7.22 | 7.9 | 8.0 | 7.94 | 24.0 | 1.0 | 4.0 | 3.30 | 2.3 | 10:28 |
| 7/27/11 | 22.90 | 22.91 | 22.91 | 24.24 | 24.28 | 24.26 | 4.94 | 4.75 | 7.6 | 7.5 | 7.54 | 22.9 | 1.5 | 0.8 | 0.90 | 2.2 | 6:43 |
| 8/24/11 | 23.01 | 22.96 | 22.99 | 24.07 | 24.12 | 24.10 | 8.01 | 7.77 | 8.1 | 8.1 | 8.08 | 23.9 | 1.0 | 3.4 | 3.25 | 1.6 | 9:05 |
| 9/28/11 | Ran out of time--no full survey. | | | | | | | | | | | | | | | | |
| 10/6/11 | 16.08 | 18.10 | 17.09 | 21.02 | 22.97 | 22.00 | 8.92 | 8.81 | 8.2 | 8.1 | 8.14 | 14.1 | 0.9 | 2.5 | 2.35 | 1.7 | 9:35 |
| 10/26/11 | 16.07 | 16.12 | 16.10 | 23.82 | 23.88 | 23.85 | 8.87 | 8.70 | 8.2 | 8.1 | 8.16 | 10.5 | 1.0 | 3.4 | 2.99 | 3.9 | 8:30 |
| 11/9/11 | 12.53 | 12.61 | 12.57 | 23.15 | 23.44 | 23.30 | 11.09 | 11.61 | 8.32 | 8.34 | 8.33 | 11.4 | 1.1 | 2.69 | 1.85 | 2.5 | 10:05 |
| *Average* | | | *19.74* | | | *23.54* | *8.52* | *8.06* | | | *8.02* | *18.89* | | | | | |

| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp | Secchi | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Ave | Surface | Bottom | Ave | Surface | Bottom | Surface | Bottom | Ave | (°C) | (m) | | | (Bottom) | (AM) |
| **CSHH #15 - 50 yds from Scudders Pond Outfall, North of Tappen Pool** | | | | | | | | | | | | | | | | | |
| 5/26/11 | 17.76 | 15.91 | 16.84 | 22.77 | 23.12 | 22.95 | 8.05 | 8.13 | 7.7 | 7.8 | 7.76 | 22.2 | 1.5 | 1.62 | 2.12 | 2.1 | 10:06 |
| 6/29/11 | 22.78 | 21.83 | 22.31 | 23.33 | 23.69 | 23.51 | 7.48 | 5.71 | 7.9 | 7.7 | 7.80 | 24.0 | 1.5 | 1.35 | 1.35 | 2.4 | 10:25 |
| 7/14/11 | 23.03 | 23.1 | 23.07 | 23.79 | 24.08 | 23.94 | 8.02 | 7.93 | 8.0 | 8.0 | 8.02 | 23.6 | 1 | 3.55 | 3.23 | 2.1 | 10:12 |
| 7/27/11 | 23.19 | 23.16 | 23.18 | 23.86 | 24.23 | 24.05 | 7.24 | 6.71 | 7.8 | 7.7 | 7.75 | 25.3 | 1.4 | 1.19 | 1.41 | 1.6 | 9:50 |
| 8/24/11 | 23.64 | 23.07 | 23.36 | 24.31 | 25.04 | 24.68 | 8.85 | 5.42 | 8.2 | 7.8 | 7.96 | 24.6 | 1 | 3.17 | 3.56 | 1.8 | 9:42 |
| 9/28/11 | Ran out of time--no full survey. | | | | | | | | | | | | | | | | |
| 10/6/11 | 17.99 | 18.29 | 18.14 | 22.75 | 23.36 | 23.06 | 8.99 | 9.59 | 8.2 | 8.2 | 8.20 | 14.5 | 1 | 3.18 | 3.33 | 2.0 | 10:05 |
| 10/26/11 | 15.26 | 15.56 | 15.41 | 23.30 | 23.45 | 23.38 | 10.87 | 11.06 | 8.4 | 8.4 | 8.40 | 12.1 | 0.9 | 3.71 | 3.13 | 2.5 | 10:00 |
| 11/9/11 | 12.65 | 12.81 | 12.73 | 23.25 | 23.54 | 23.40 | 11.68 | 12.54 | 8.4 | 8.4 | 8.39 | 10.5 | 1.1 | 1.32 | 1.26 | 2.3 | 9:50 |
| *Average* | | | *19.38* | | | *23.62* | *8.90* | *8.39* | | | *8.03* | *19.60* | | | | | |

# 2011 CSHH Field Monitoring Data

| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp | Secchi | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Ave | Surface | Bottom | Ave | Surface | Bottom | Surface | Bottom | Ave | (°C) | (m) | | | (Bottom) | (AM) |
| **CSHH #4 - Bar Beach Spit** | | | | | | | | | | | | | | | | | |
| 6/29/11 | 23.48 | 21.55 | 22.52 | 23.24 | 23.72 | 23.48 | 9.74 | 5.59 | 8.20 | 7.7 | 7.97 | 24.5 | 0.5 | 2.73 | | 4.0 | 10:55 |
| 7/14/11 | 23.93 | 23.68 | 23.81 | 24.06 | 24.15 | 24.11 | 7.09 | 6.97 | 7.97 | 7.97 | 7.97 | 24.3 | 0.8 | 3.7 | 3.92 | 2.2 | 10:37 |
| 7/27/11 | 23.45 | 23.35 | 23.40 | 24.26 | 24.33 | 24.30 | 6.93 | 6.69 | 7.81 | 7.79 | 7.80 | 23.8 | 1.5 | 0.7 | 0.84 | 2.2 | 9:35 |
| 8/24/11 | 23.00 | 22.76 | 22.88 | 24.15 | 25.16 | 24.66 | 8.41 | 4.80 | 8.16 | 7.74 | 7.95 | 22.9 | 0.9 | 3.6 | 9.14 | 3.9 | 8:50 |
| 9/28/11 | Ran out of time--no full survey. | | | | | | | | | | | | | | | | |
| 10/6/11 | 17.99 | 18.52 | 18.26 | 23.00 | 23.46 | 23.23 | 8.39 | 8.23 | 8.12 | 8.06 | 8.09 | 14.3 | 1.0 | 2.8 | 3.44 | 2.0 | 9:48 |
| 10/26/11 | 15.32 | 15.35 | 15.34 | 23.15 | 23.19 | 23.17 | 11.14 | 11.21 | 8.42 | 8.42 | 8.42 | 11.2 | 0.9 | 4.1 | 3.91 | 2.0 | 8:45 |
| 11/9/11 | 12.86 | 12.68 | 12.77 | 23.34 | 23.57 | 23.46 | 11.84 | 11.25 | 8.39 | 8.34 | 8.37 | 12.6 | 1.3 | 1.37 | 1.75 | 2.3 | 11:06 |
| *Average* | | | *19.85* | | | *23.77* | *9.08* | *7.82* | | | *8.08* | *19.09* | | | | | |

| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp | Secchi | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Ave | Surface | Bottom | Ave | Surface | Bottom | Surface | Bottom | Ave | (°C) | (m) | | | (Bottom) | (AM) |
| **CSHH #5 - Mott's Cove** | | | | | | | | | | | | | | | | | |
| 6/29/11 | 22.90 | 22.54 | 22.72 | 23.05 | 23.45 | 23.25 | 5.72 | 5.65 | 7.7 | 7.7 | 7.69 | 26.3 | 1.2 | 1.5 | 1.54 | 1.9 | 11:12 |
| 7/14/11 | 23.76 | 23.72 | 23.74 | 23.77 | 23.96 | 23.87 | 7.55 | 7.55 | 7.9 | 7.9 | 7.94 | 25.4 | 1.0 | 3.6 | 3.13 | 2.1 | 10:50 |
| 7/27/11 | 23.09 | 23.22 | 23.16 | 24.04 | 24.31 | 24.18 | 7.06 | 4.46 | 7.4 | 7.5 | 7.45 | 22.8 | 1.4 | 1.2 | 1.26 | 1.6 | 8:40 |
| 8/24/11 | 23.03 | 22.96 | 23.00 | 24.23 | 24.71 | 24.47 | 5.94 | 5.25 | 7.8 | 7.8 | 7.80 | 23.0 | 0.8 | 4.7 | 4.27 | 1.5 | 8:35 |
| 9/28/11 | 22.12 | 21.56 | 21.84 | 23.39 | 23.90 | 23.65 | 3.77 | 3.23 | 7.6 | 7.5 | 7.54 | 23.7 | 1.2 | 2.1 | 2.28 | 2.6 | 11:10 |
| 10/6/11 | 17.38 | 18.30 | 17.84 | 21.89 | 22.99 | 22.44 | 9.33 | 8.97 | 8.2 | 8.1 | 8.13 | 13.3 | 0.90 | 3.12 | 3.12 | 1.7 | 9:15 |
| 10/26/11 | 15.36 | 15.64 | 15.50 | 22.65 | 23.29 | 22.97 | 9.99 | 9.89 | 8.3 | 8.3 | 8.32 | 11.1 | 0.80 | 4.92 | 3.93 | 1.6 | 9:00 |
| 11/9/11 | 13.01 | 12.74 | 12.88 | 22.58 | 23.39 | 22.99 | 11.54 | 11.64 | 8.4 | 8.3 | 8.35 | 16.7 | 1.00 | 2.25 | 2.55 | 2.0 | 10:55 |
| *Average* | | | *20.08* | | | *23.48* | *7.61* | *7.08* | | | *7.90* | *20.29* | | | | | |

# 2011 CSHH Field Monitoring Data

| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp | Secchi | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Ave | Surface | Bottom | Ave | Surface | Bottom | Surface | Bottom | Ave | (°C) | (m) | | | (Bottom) | (AM) |
| **CSHH #6 - East of Former Incinerator Site** | | | | | | | | | | | | | | | | | |
| 6/29/11 | 23.88 | 23.35 | 23.62 | 23.22 | 23.28 | 23.25 | 6.78 | 5.94 | 7.8 | 7.7 | 7.76 | 25.8 | 1.0 | 1.54 | 2.15 | 2.1 | 11:30 |
| 7/14/11 | 24.27 | 24.25 | 24.26 | 23.08 | 23.71 | 23.40 | 7.52 | 7.62 | 7.9 | 7.9 | 7.88 | 25.0 | 0.8 | 4.72 | 4.75 | 2.4 | 11:05 |
| 7/27/11 | 23.55 | 23.37 | 23.46 | 24.10 | 24.34 | 24.22 | 4.31 | 3.23 | 7.4 | 7.3 | 7.39 | 23.3 | 1.0 | 1.77 | 2.17 | 2.1 | 8:55 |
| 8/24/11 | 23.79 | 23.18 | 23.49 | 23.98 | 24.70 | 24.34 | 7.14 | 6.09 | 8.0 | 7.9 | 7.93 | 22.4 | 0.50 | 4.27 | | 1.9 | 8:15 |
| 9/28/11 | 22.61 | 22.32 | 22.47 | 23.38 | 23.53 | 23.46 | 5.37 | 4.22 | 7.7 | 7.6 | 7.66 | 23.6 | 1.10 | 2.70 | 2.23 | 3.8 | 11:20 |
| 10/6/11 | 17.96 | 18.25 | 18.11 | 22.38 | 23.04 | 22.71 | 9.09 | 8.58 | 8.2 | 8.1 | 8.13 | 12.3 | 0.80 | 3.35 | 3.02 | 2.5 | 8:50 |
| 10/26/11 | 15.16 | 15.21 | 15.19 | 22.84 | 22.91 | 22.88 | 11.36 | 11.27 | 8.5 | 8.5 | 8.47 | 10.9 | 0.60 | 5.11 | 5.00 | 2.5 | 9:17 |
| 11/9/11 | 12.99 | 12.72 | 12.86 | 22.77 | 23.20 | 22.99 | 13.14 | 12.34 | 8.5 | 8.4 | 8.45 | 17.1 | 1.00 | 2.56 | 2.58 | 2.6 | 10:40 |
| *Average* | | | *20.43* | | | *23.40* | *8.09* | *7.41* | | | *7.96* | *20.05* | | | | | |

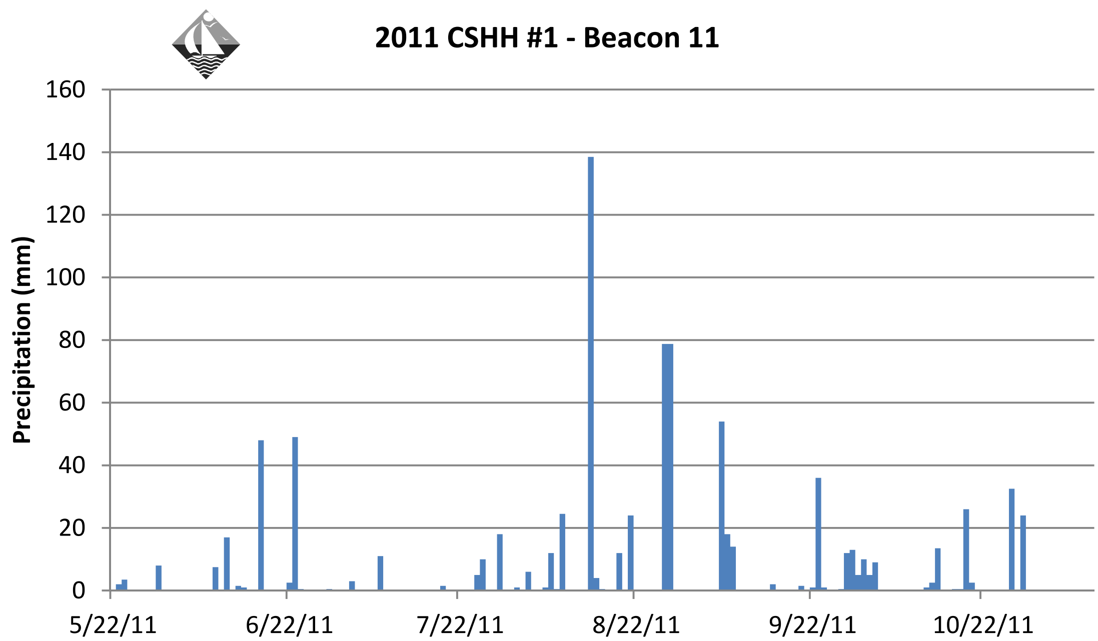
| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp | Secchi | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Ave | Surface | Bottom | Ave | Surface | Bottom | Surface | Bottom | Ave | (°C) | (m) | | | (Bottom) | (AM) |
| **CSHH #7 - West of Bryant Landing (formerly site of oil dock)** | | | | | | | | | | | | | | | | | |
| 6/29/11 | 23.88 | 23.34 | 23.61 | 22.44 | 22.99 | 22.72 | 8.9 | 5.3 | 7.9 | 7.45 | 7.65 | 26.50 | 0.5 | 3.8 | | 1.4 | 11:40 |
| 7/14/11 | 24.35 | 24.40 | 24.38 | 23.08 | 23.20 | 23.14 | 8.1 | 8.1 | 7.9 | 7.90 | 7.90 | 25.40 | 0.5 | 4.9 | | 1.7 | 11:12 |
| 7/27/11 | 23.20 | 23.37 | 23.29 | 23.41 | 24.03 | 23.72 | 4.6 | 3.4 | 7.4 | 7.30 | 7.34 | 23.30 | 1.0 | 3.2 | 2.65 | 1.5 | 9:08 |
| 8/24/11 | 23.47 | 23.52 | 23.50 | 23.86 | 24.07 | 23.97 | 4.1 | 4.1 | 7.6 | 7.62 | 7.63 | 22.10 | 0.40 | 7.32 | 7.14 | 1.4 | 8:00 |
| 9/28/11 | 23.15 | 23.11 | 23.13 | 22.52 | 23.13 | 22.83 | 6.6 | 4.6 | 7.8 | 7.62 | 7.72 | 23.50 | 0.90 | 4.06 | 3.33 | 2.7 | 11:38 |
| 10/6/11 | 17.94 | 18.10 | 18.02 | 21.91 | 22.42 | 22.17 | 8.43 | 8.55 | 8.1 | 8.1 | 8.12 | 10.6 | 0.60 | 5.15 | 4.59 | 1.9 | 8:25 |
| 10/26/11 | 14.88 | 15.06 | 14.97 | 22.37 | 22.61 | 22.49 | 11.65 | 11.83 | 8.5 | 8.5 | 8.46 | 11.8 | 0.50 | 5.35 | | 2.0 | 9:35 |
| 11/9/11 | 12.41 | 12.84 | 12.63 | 21.11 | 23.19 | 22.15 | 12.66 | 12.84 | 8.4 | 8.4 | 8.42 | 14.9 | 1.00 | 2.20 | 2.25 | 1.9 | 10:25 |
| *Average* | | | *20.44* | | | *22.90* | *8.13* | *7.33* | | | *7.90* | *19.76* | | | | | |

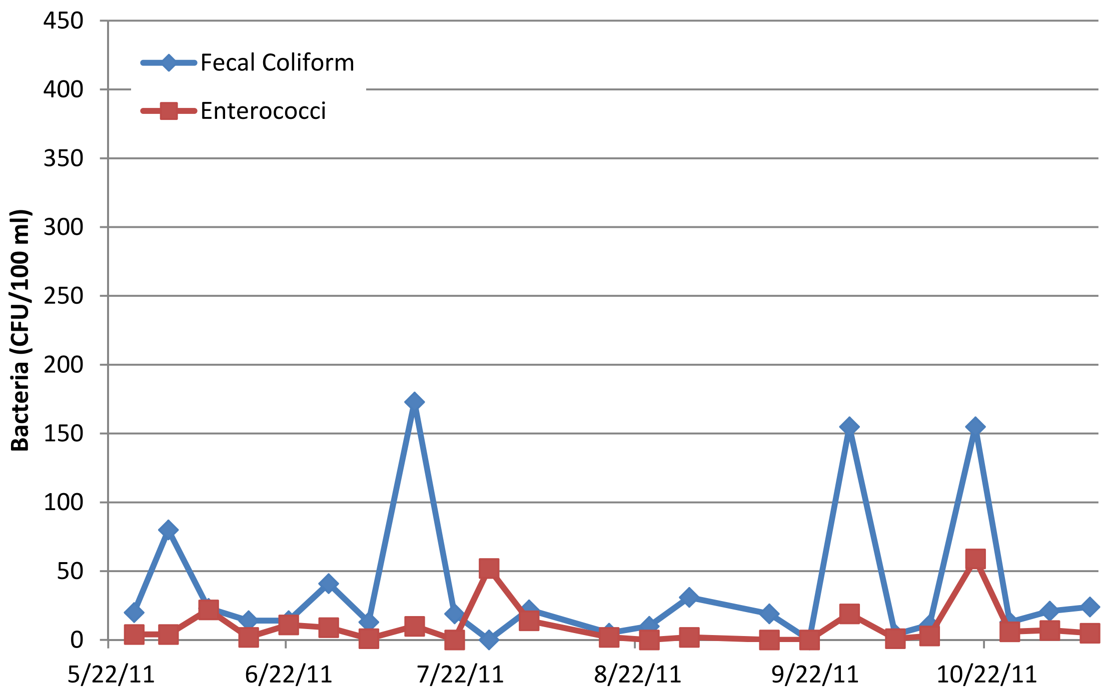
# Appendix B

## 2011 Bacteria and Precipitation Data

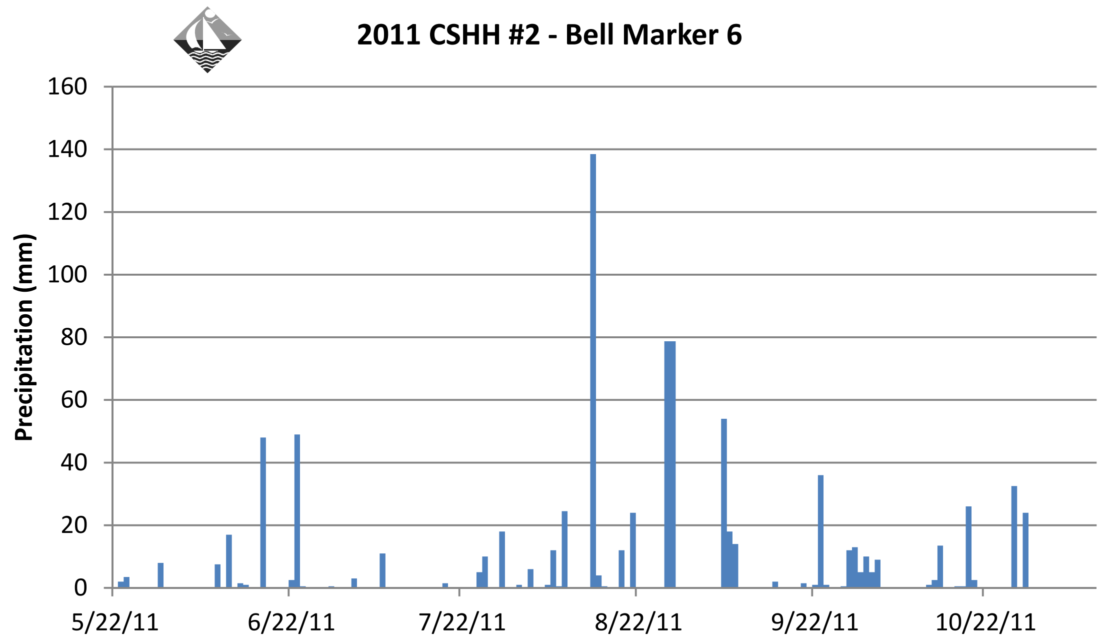
# 2011 In-Harbor Precipitation and Bacteria Graphs

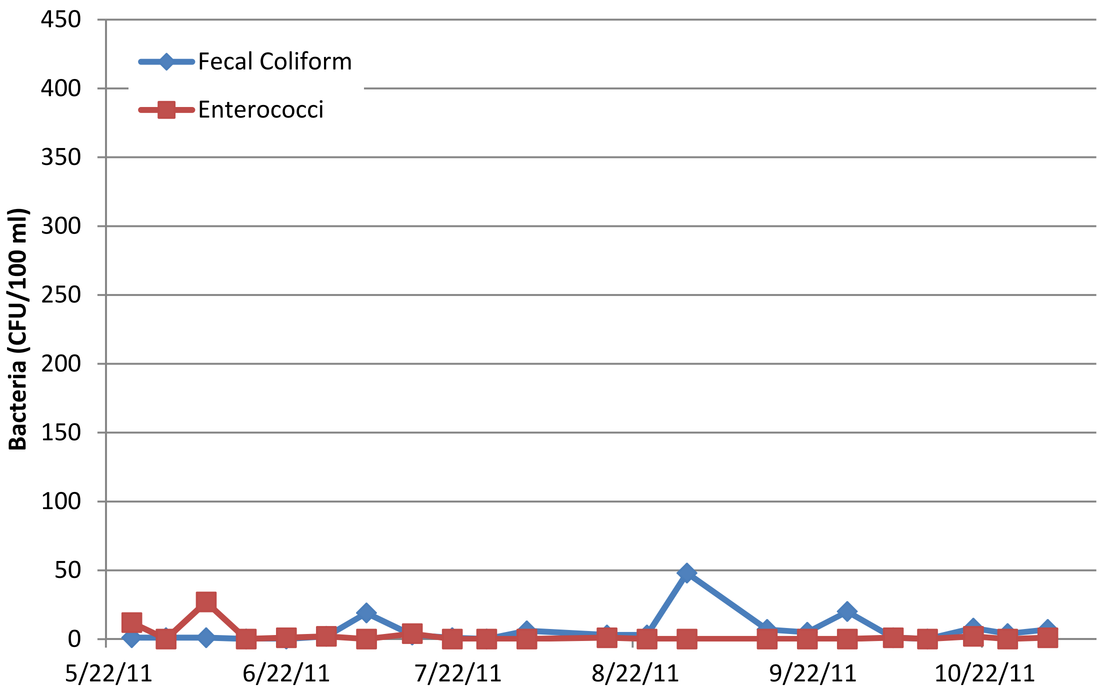
2011 CSHH #1 - Beacon 11



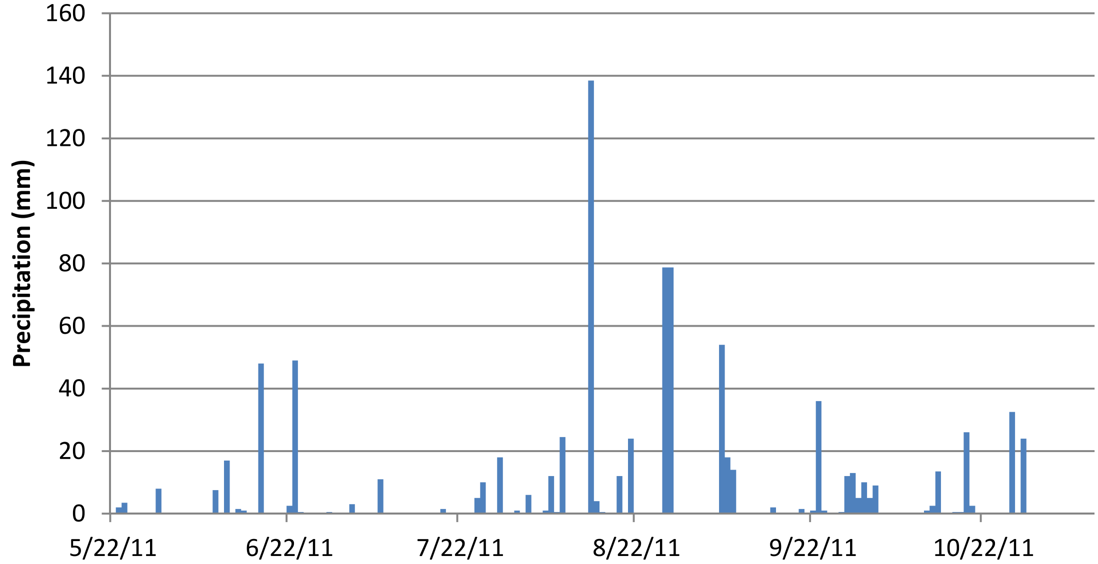
# 2011 In-Harbor Precipitation and Bacteria Graphs

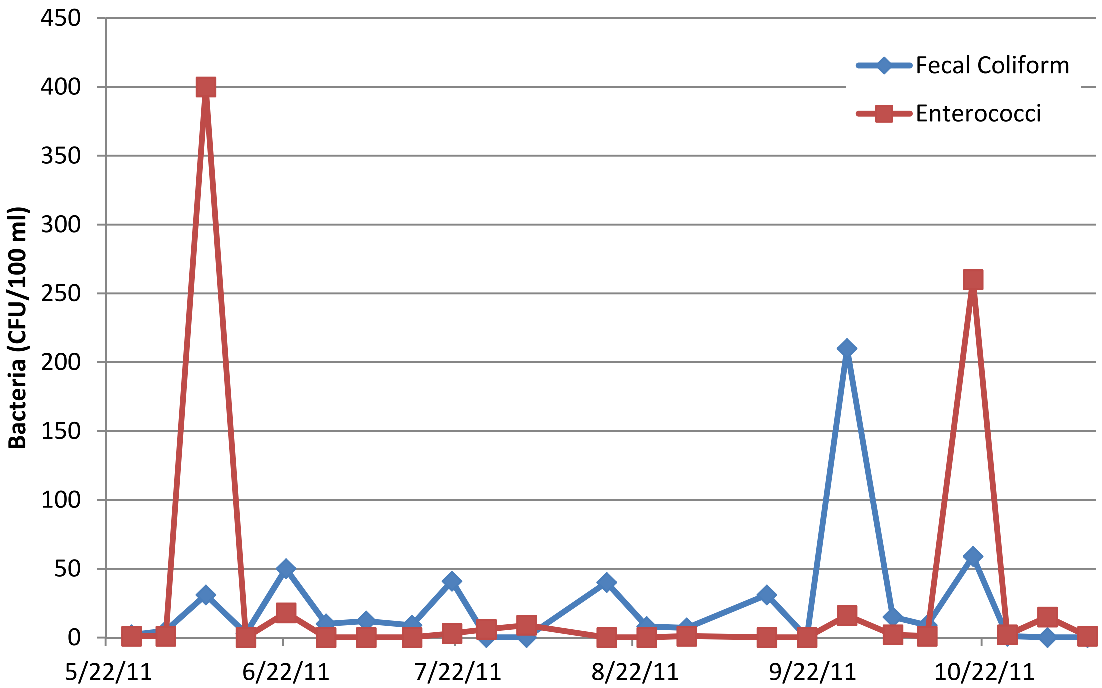


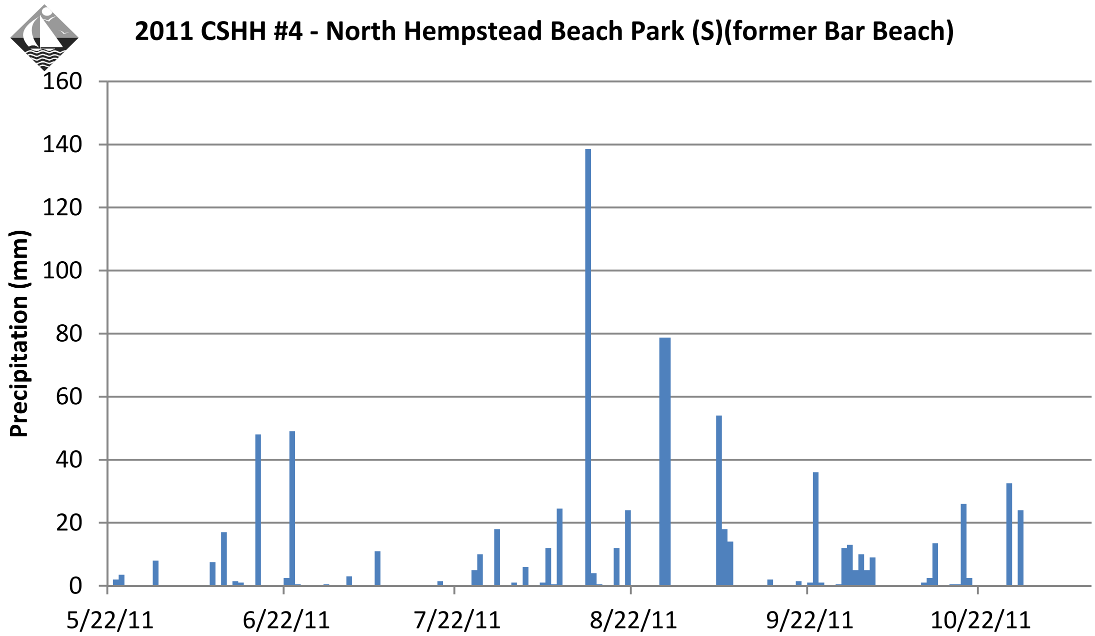
# 2011 In-Harbor Precipitation and Bacteria Graphs

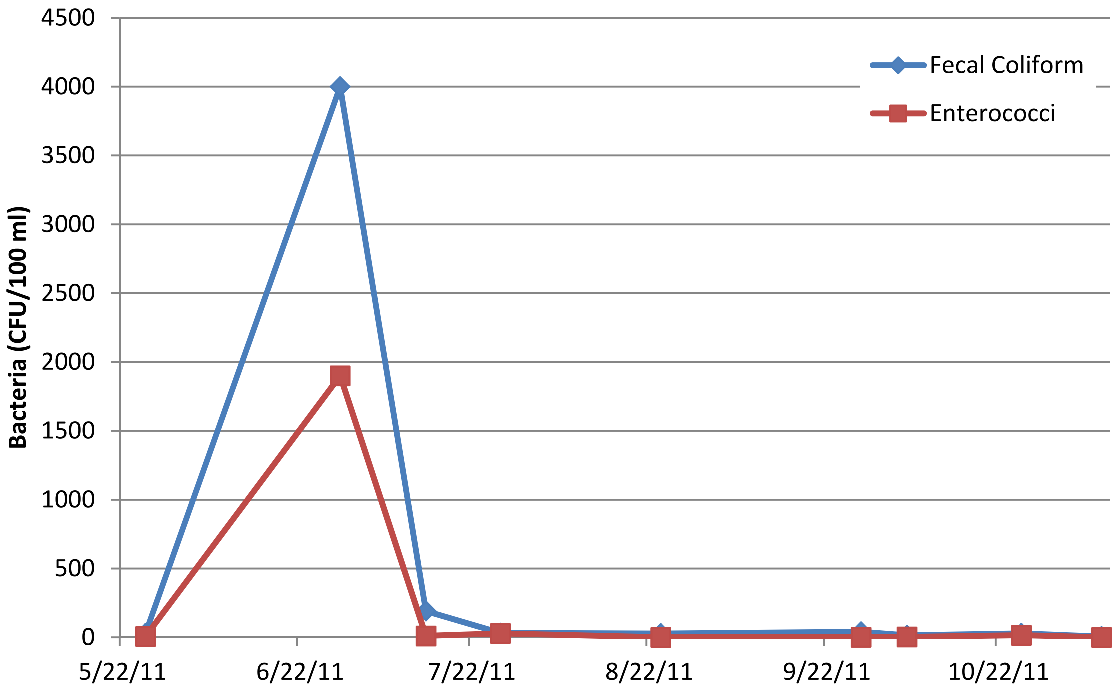
## 2011 CSHH #3 - Glen Cove Creek, Red Marker



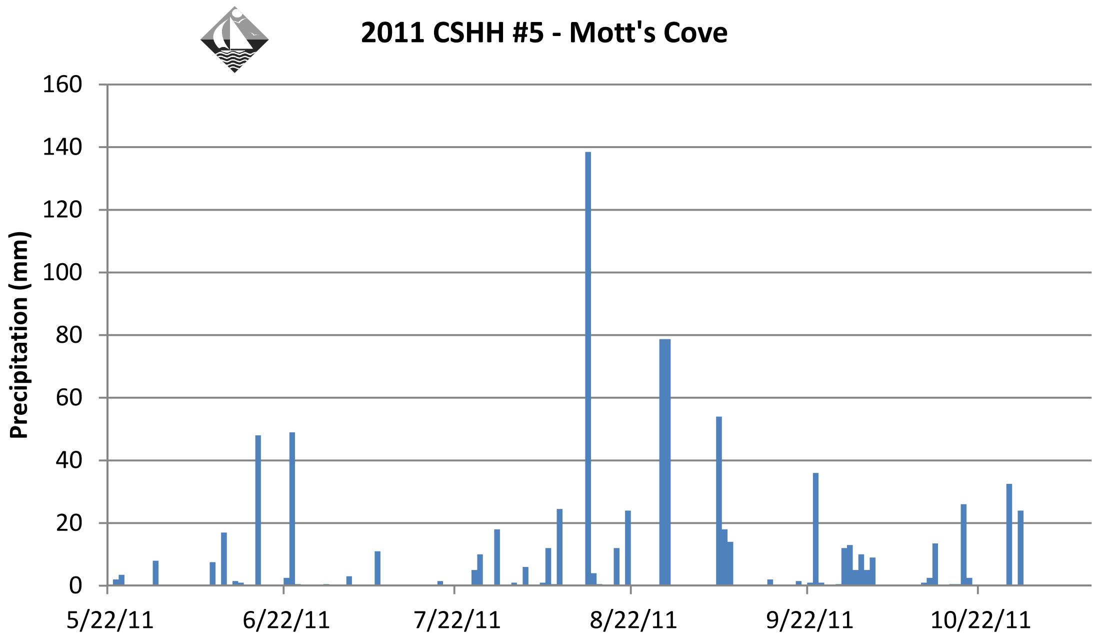



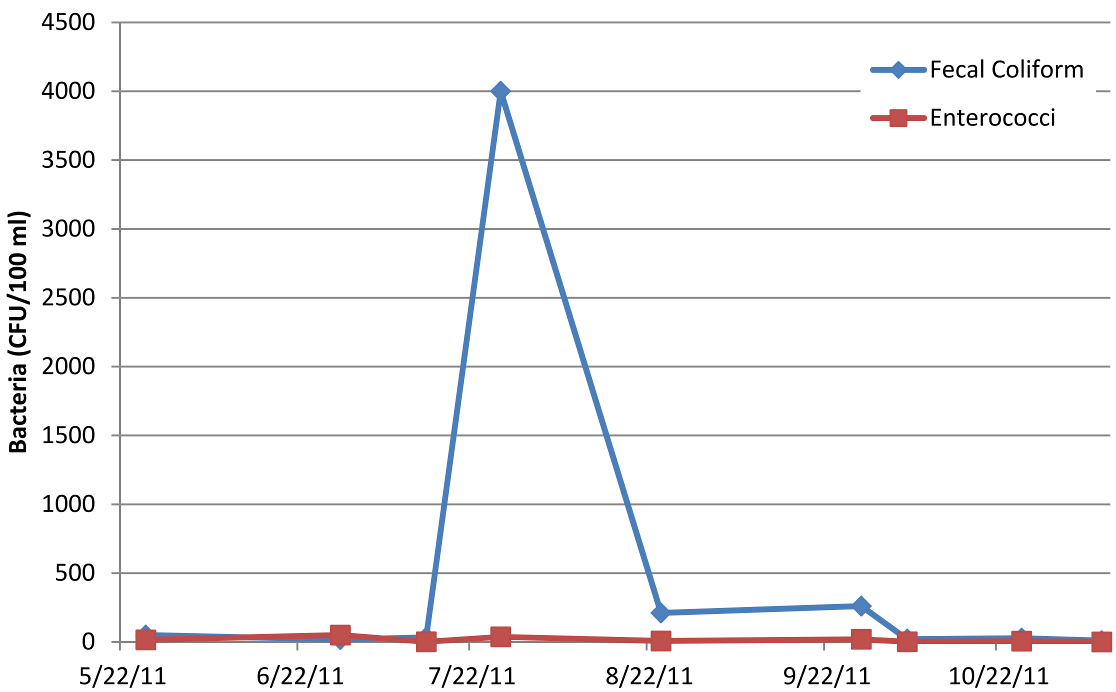
# 2011 In-Harbor Precipitation and Bacteria Graphs



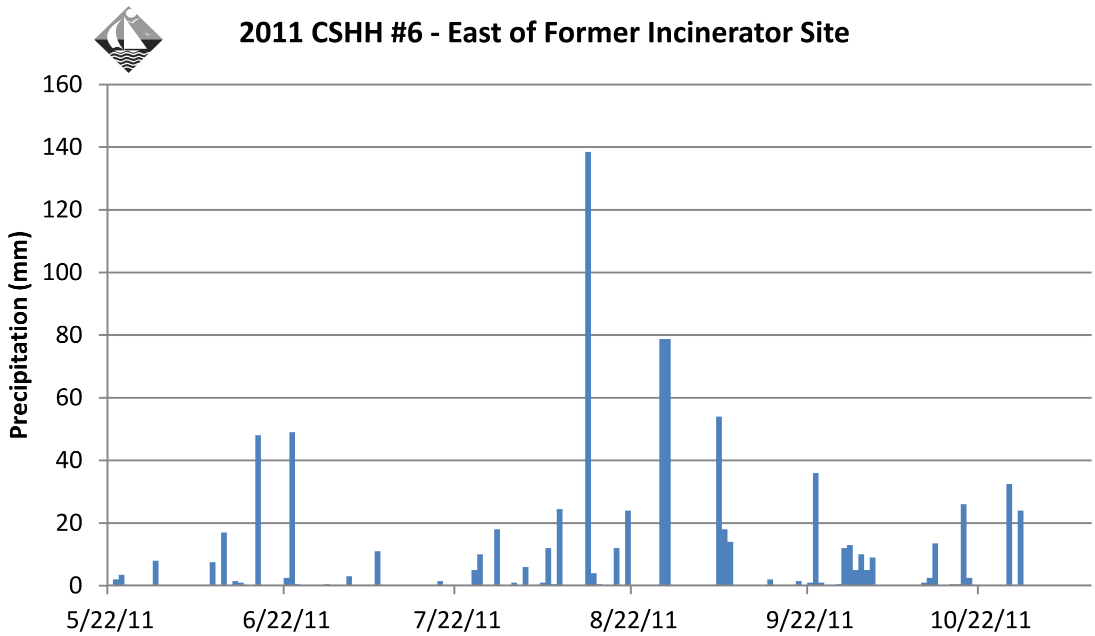



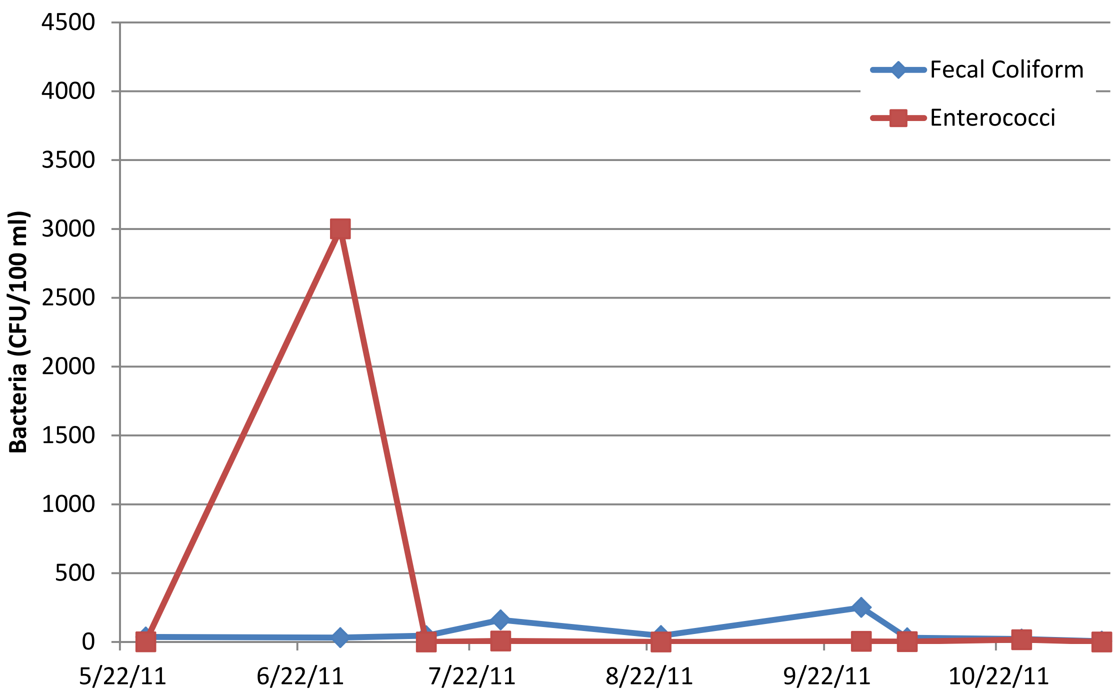
# 2011 In-Harbor Precipitation and Bacteria Graphs



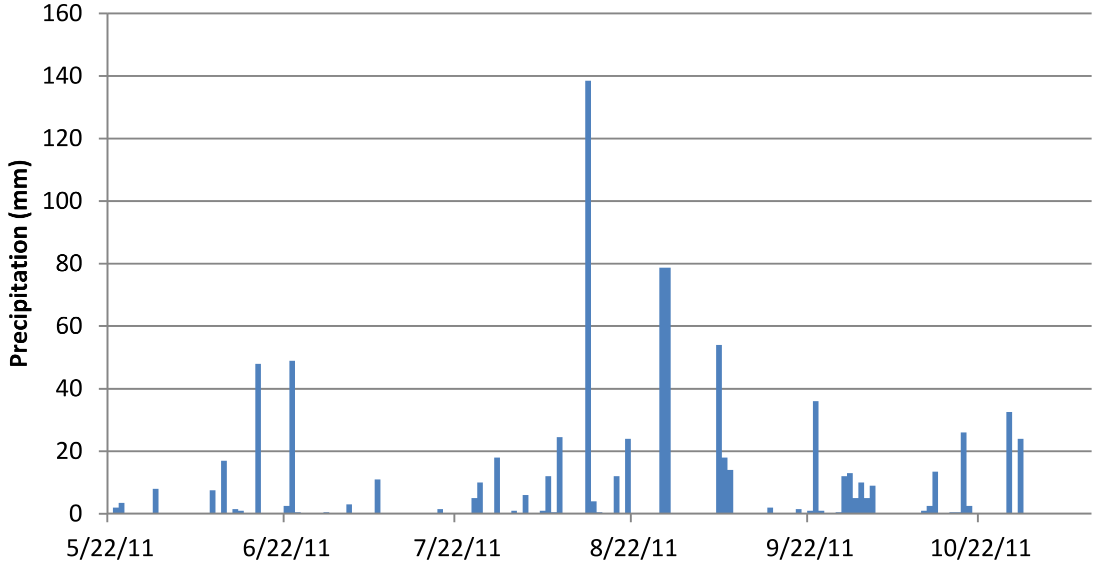
# 2011 In-Harbor Precipitation and Bacteria Graphs

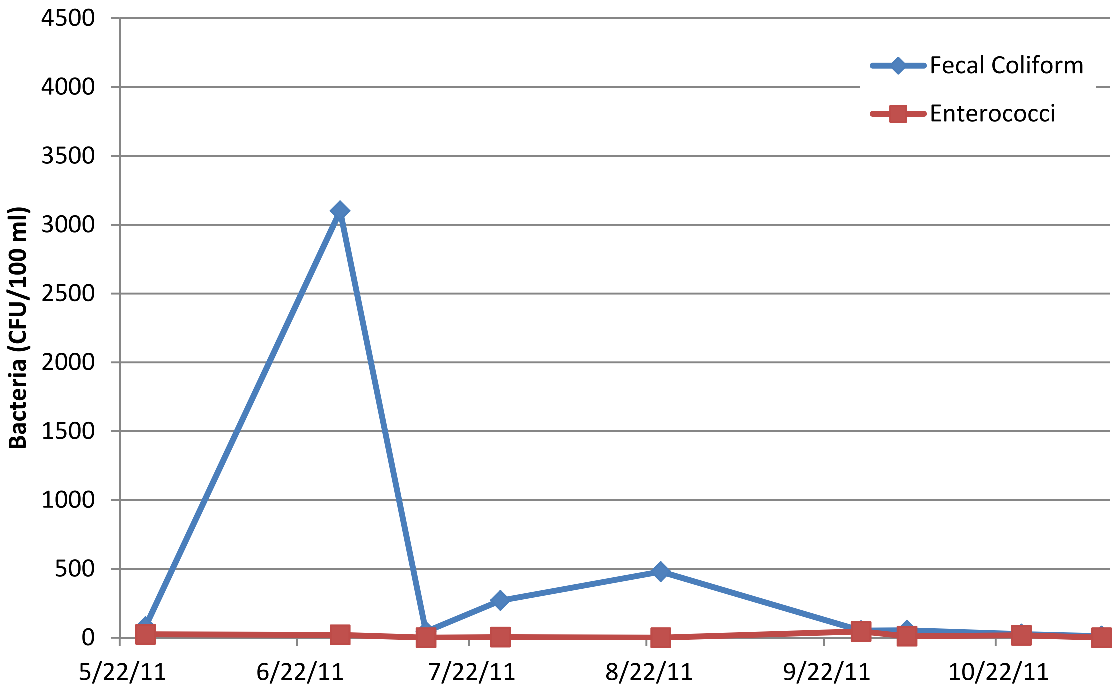


# 2011 In-Harbor Precipitation and Bacteria Graphs

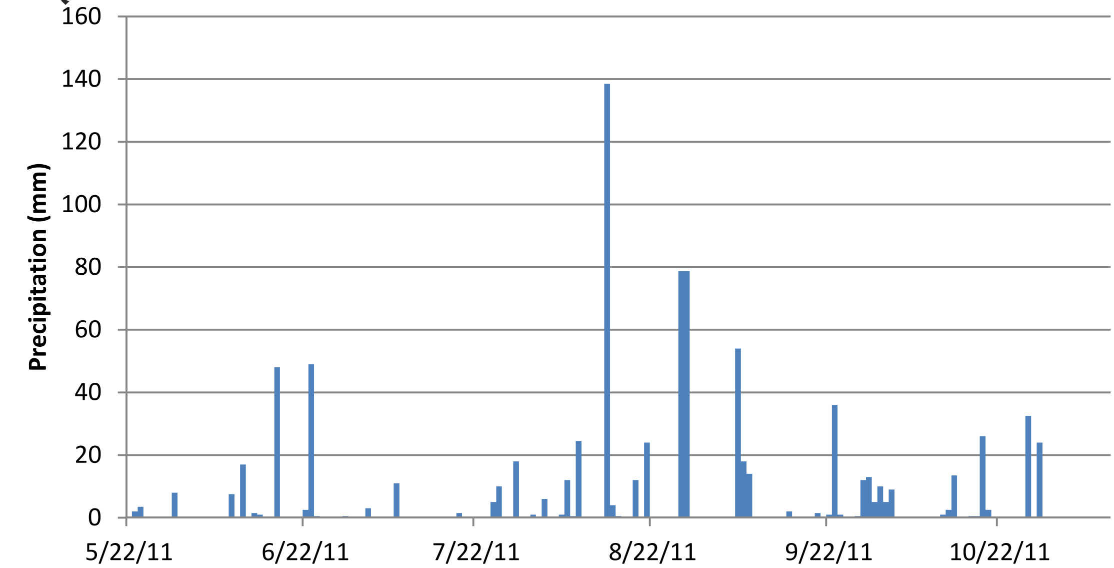
## 2011 CSHH #7 - West of Bryant Landing (former site of oil dock)

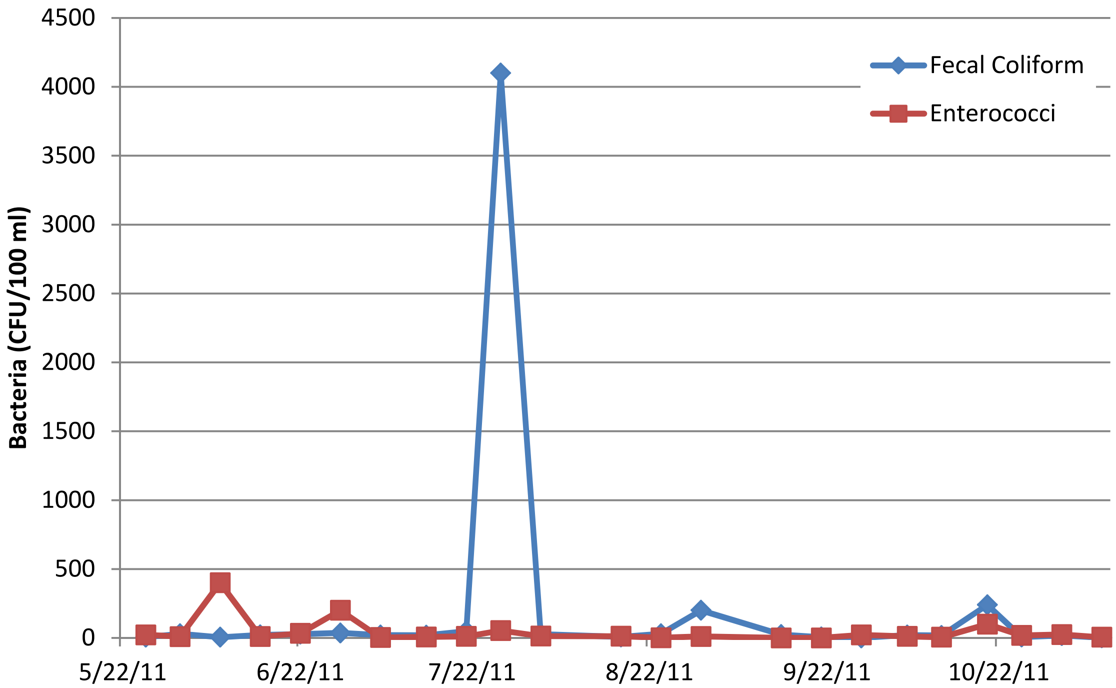


# 2011 In-Harbor Precipitation and Bacteria Graphs

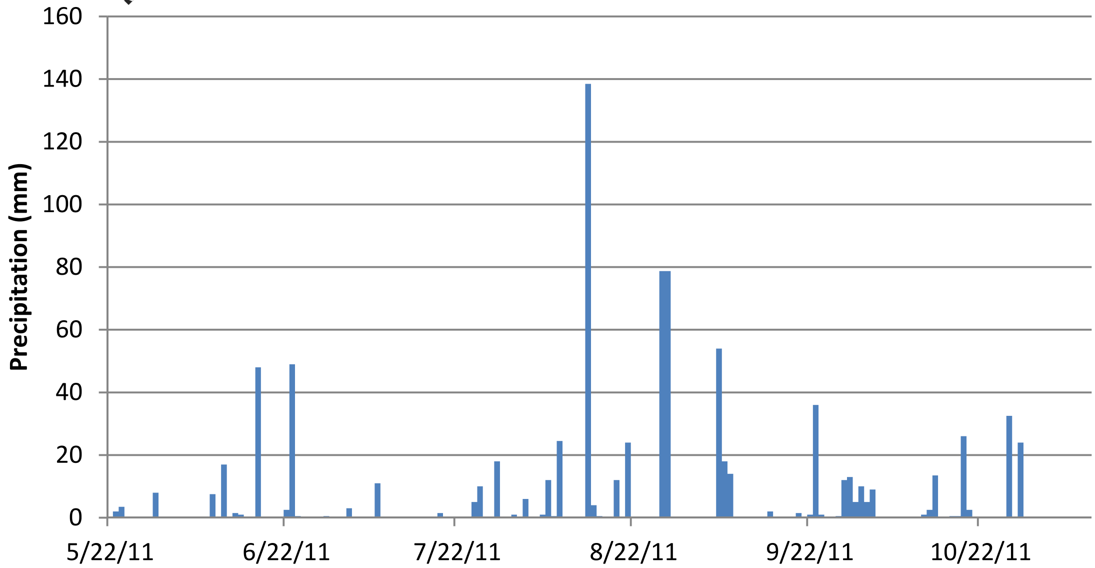
## 2011 CSHH #8 - Glen Cove Sewage Treatment Plant Outfall

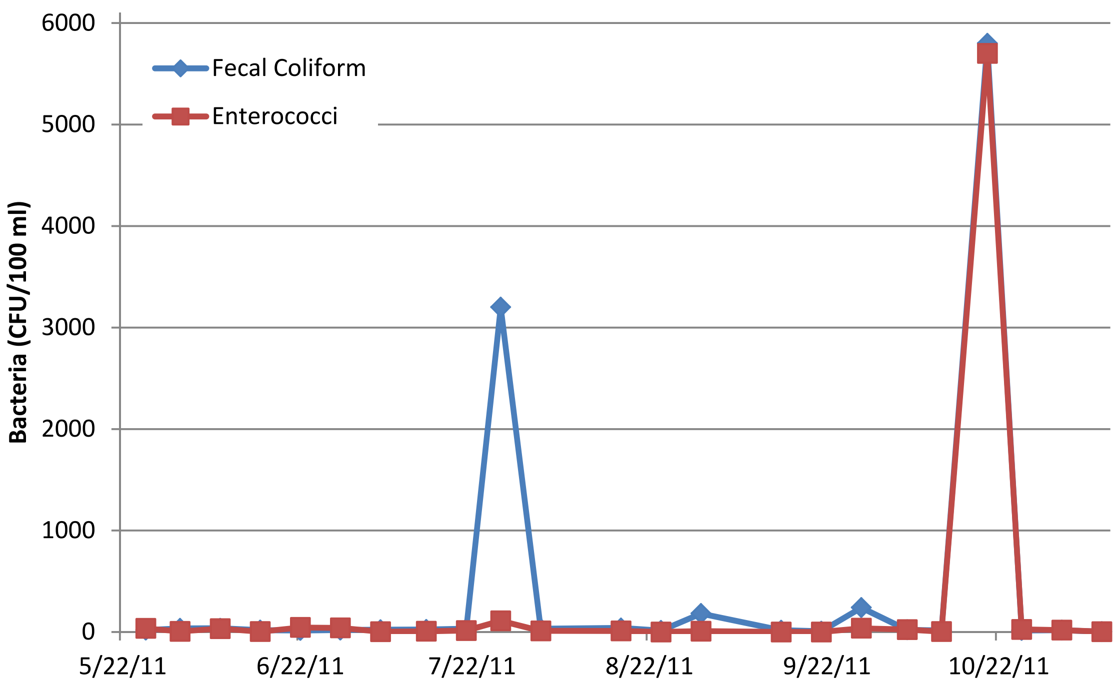


# 2011 In-Harbor Precipitation and Bacteria Graphs

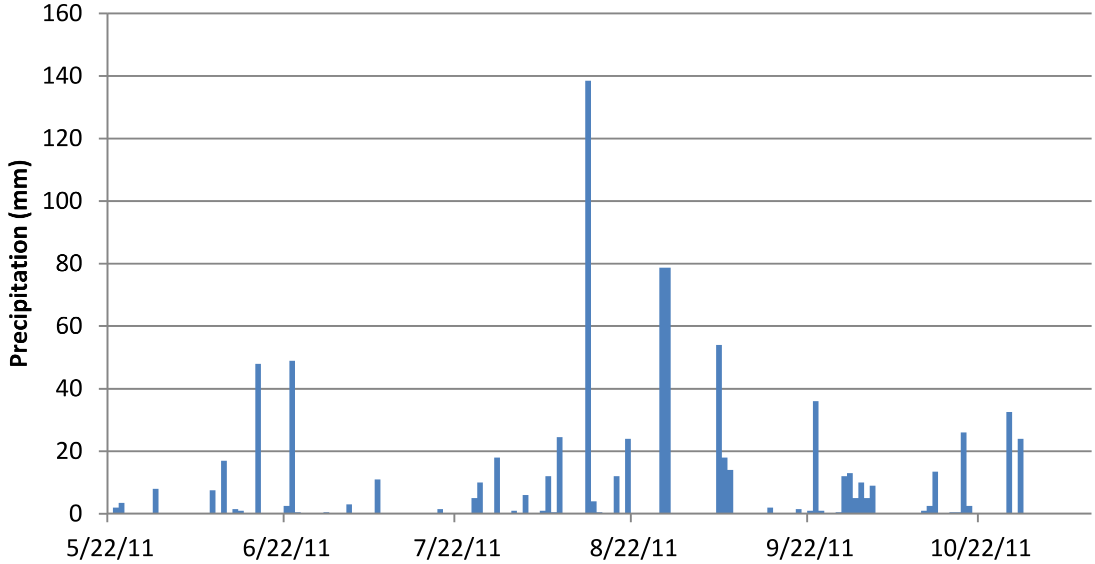
## 2011 CSHH #9 - First Pipe West of STP Outfall

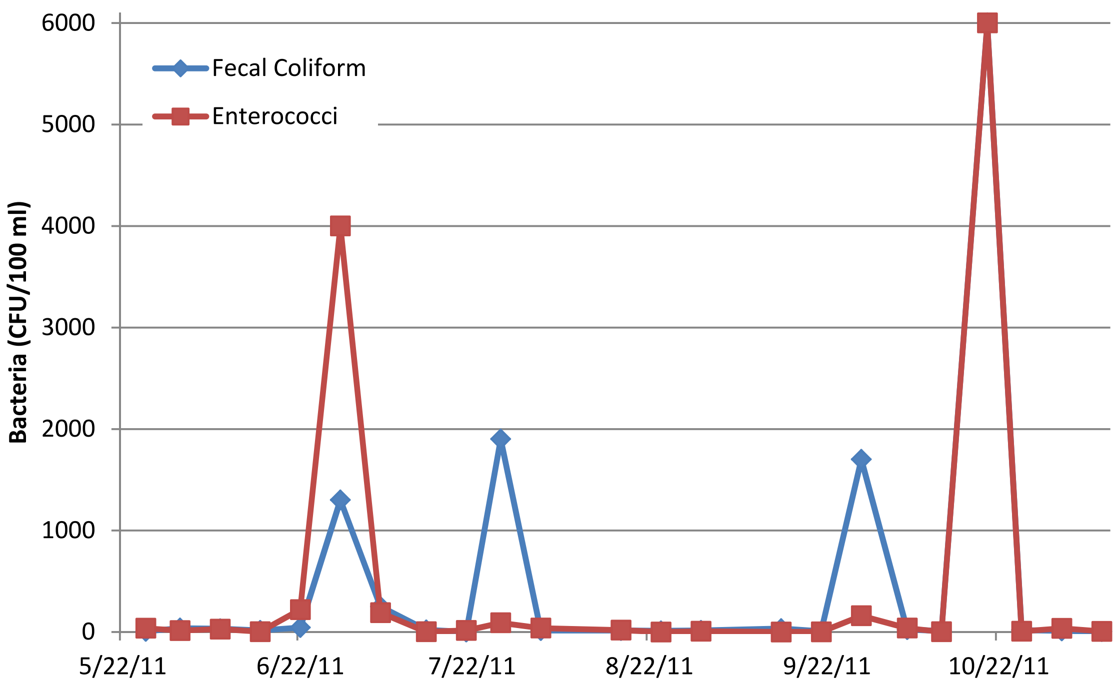


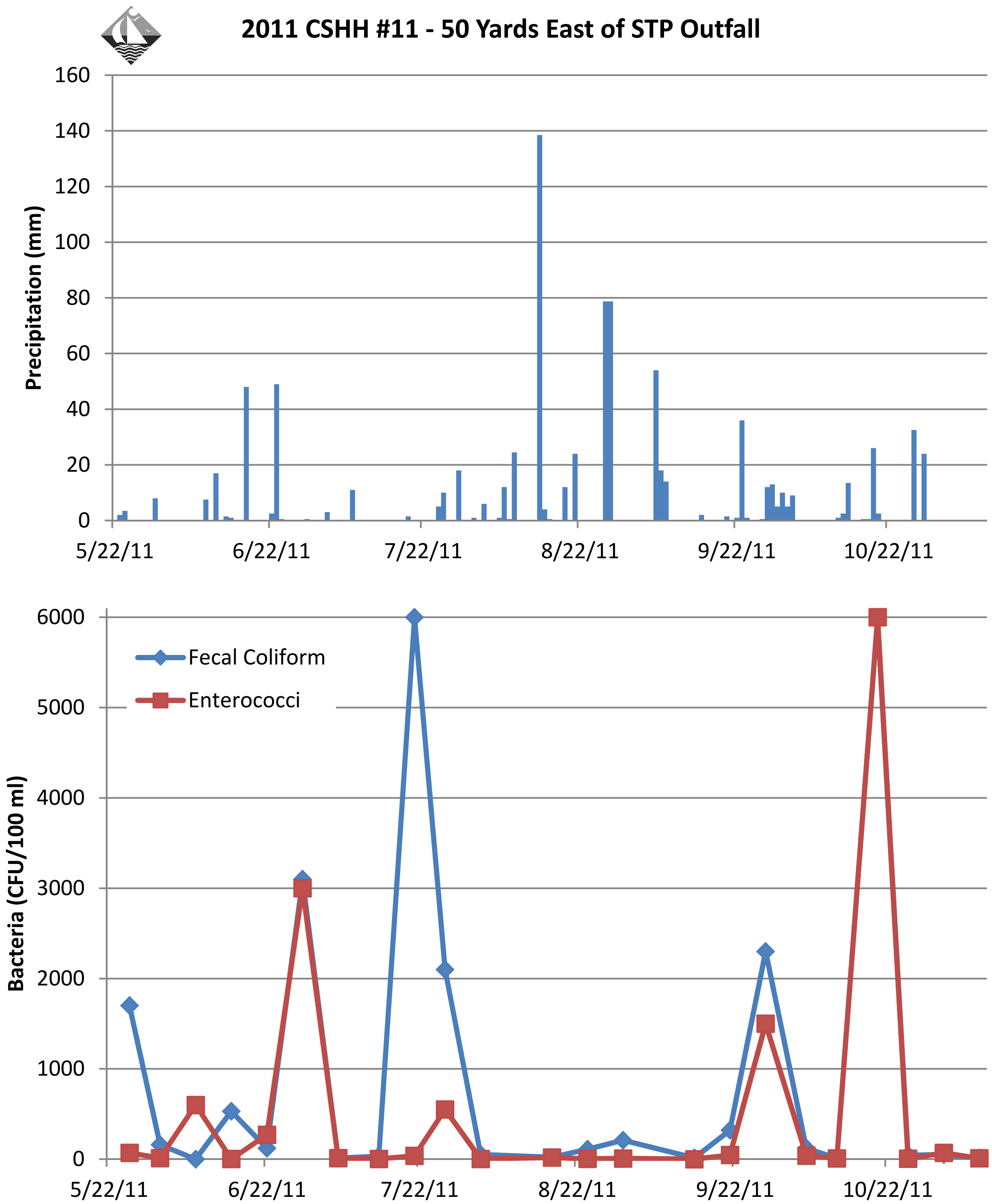
# 2011 In-Harbor Precipitation and Bacteria Graphs

## 2011 CSHH #10 - Pipe at Corner of Seawall, West of STP Outfall



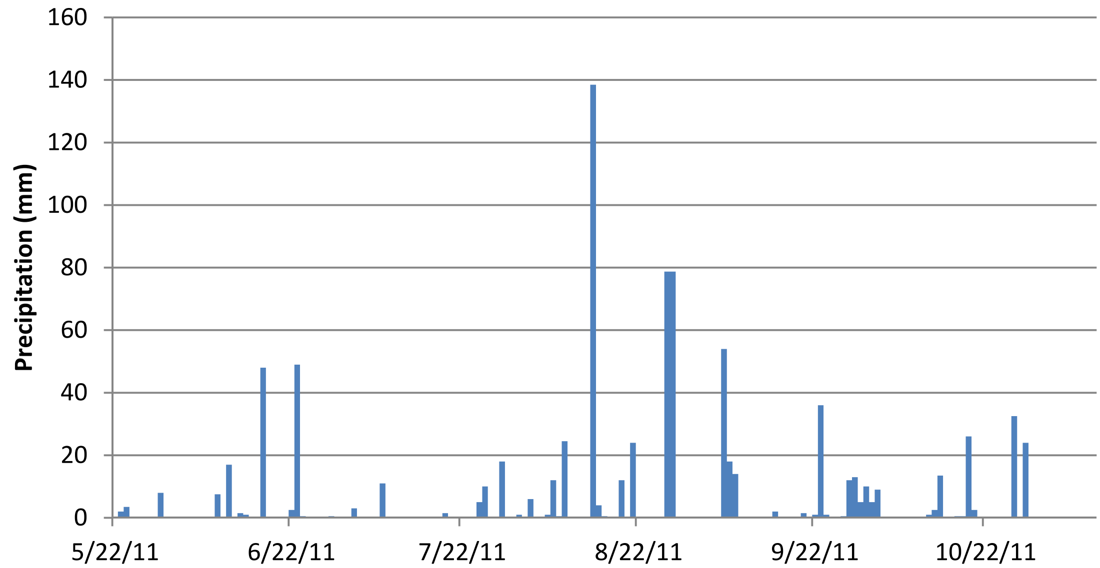



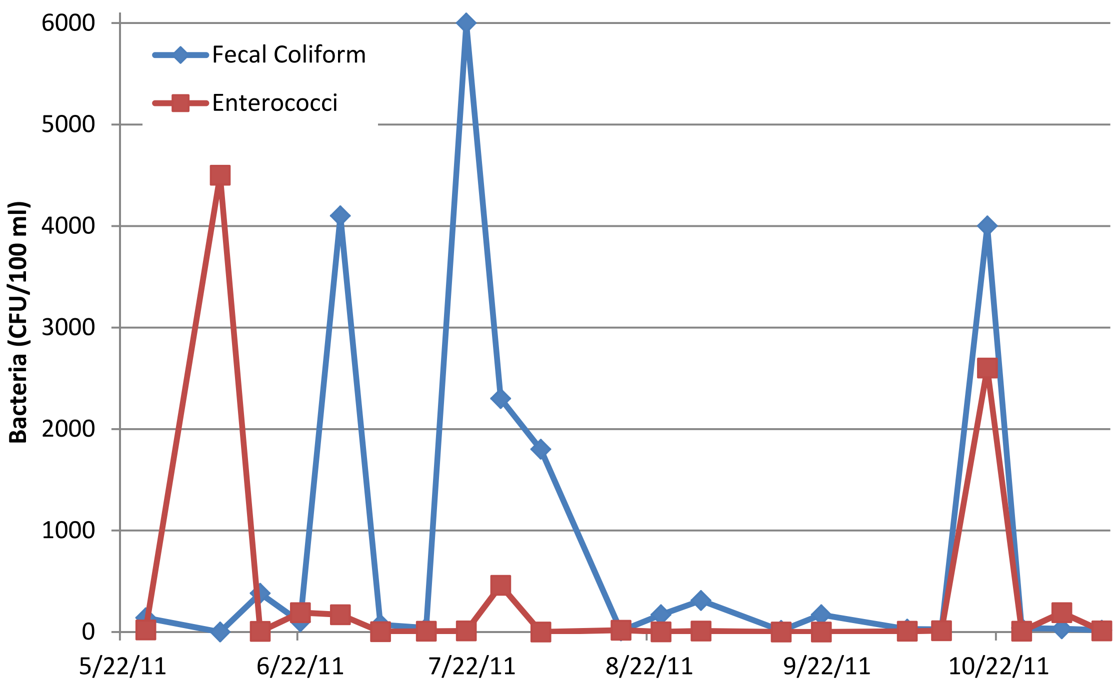
# 2011 In-Harbor Precipitation and Bacteria Graphs



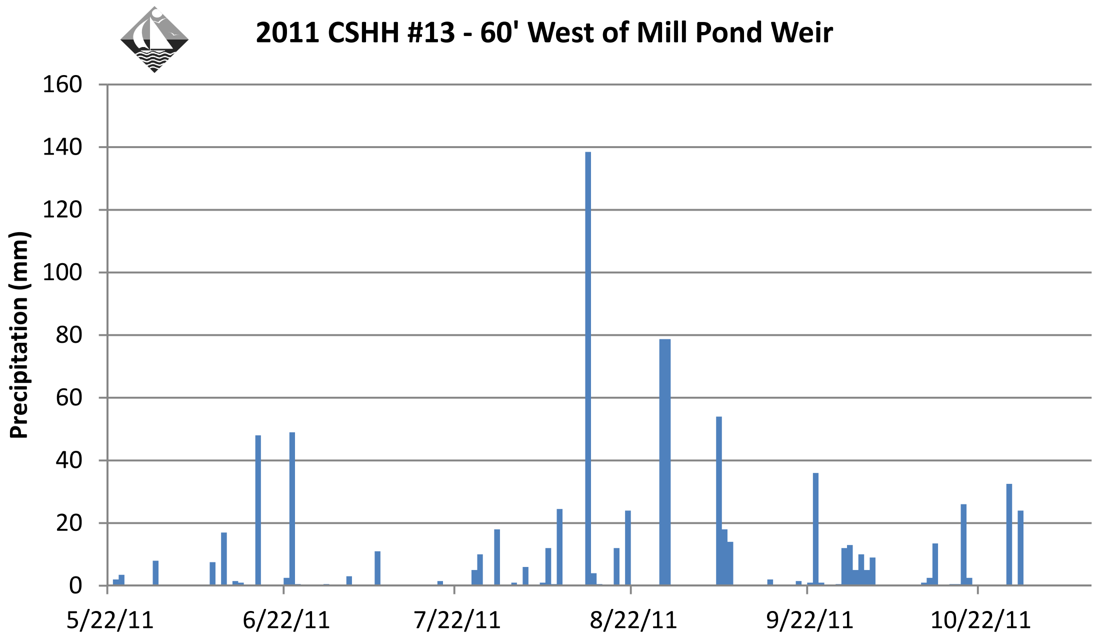
# 2011 In-Harbor Precipitation and Bacteria Graphs

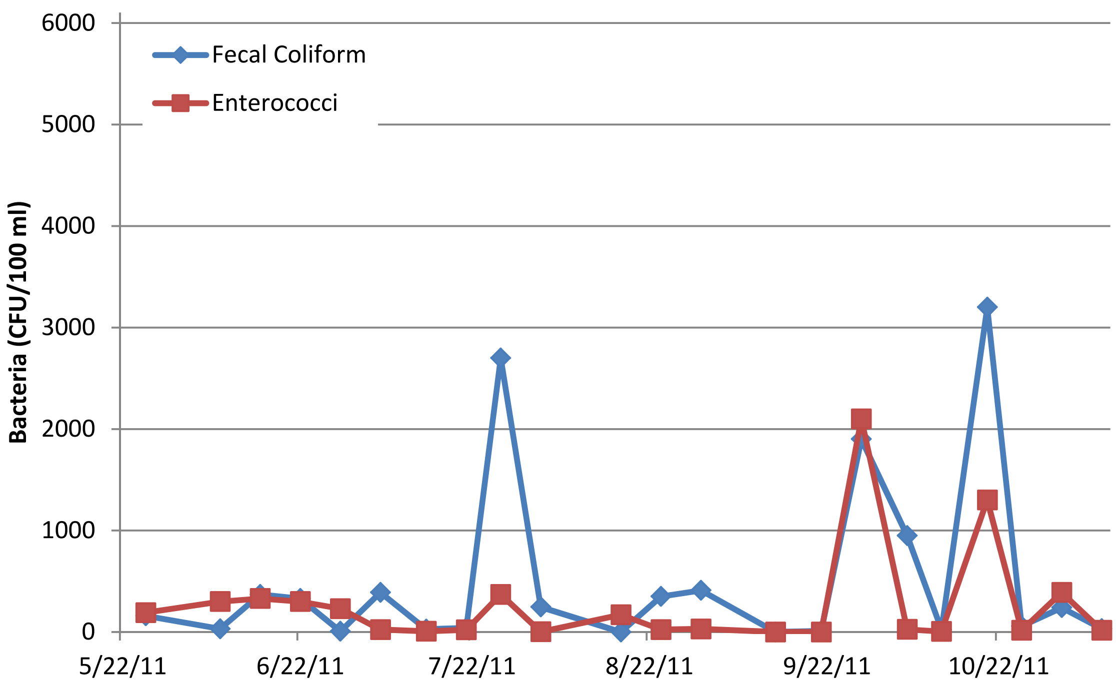
## 2011 CSHH #12 - East of STP Outfall, By Bend in Seawall



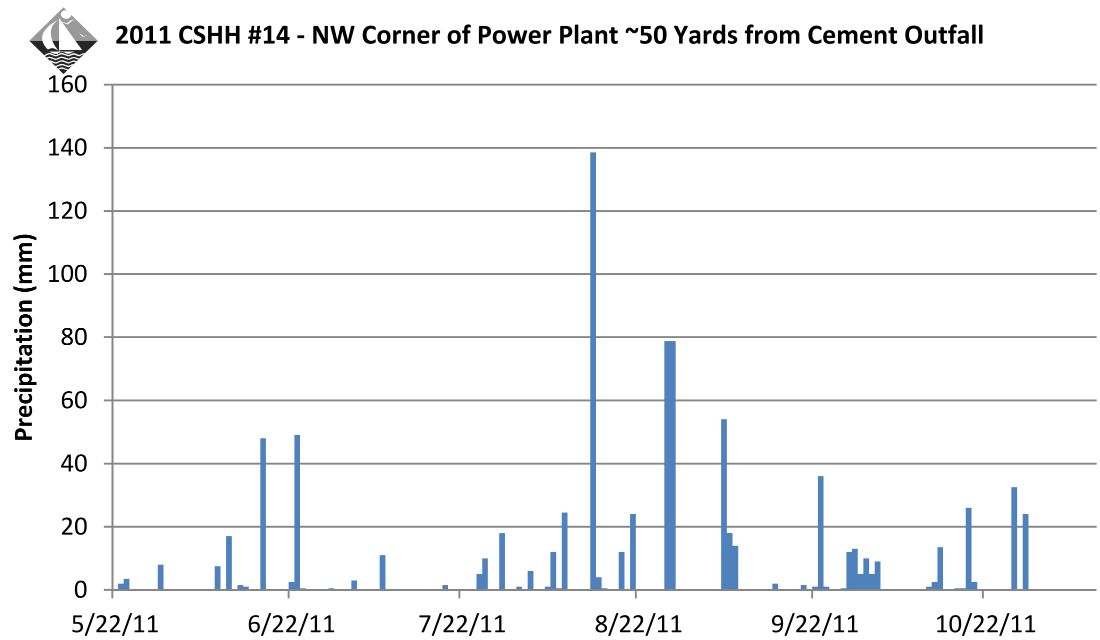



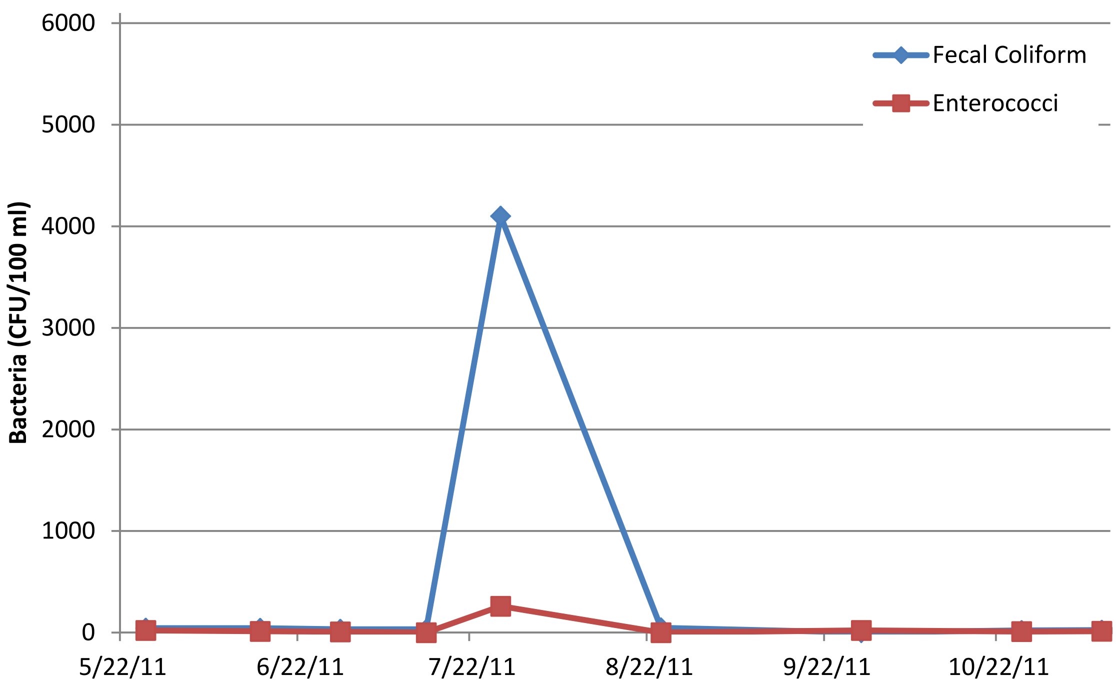
# 2011 In-Harbor Precipitation and Bacteria Graphs



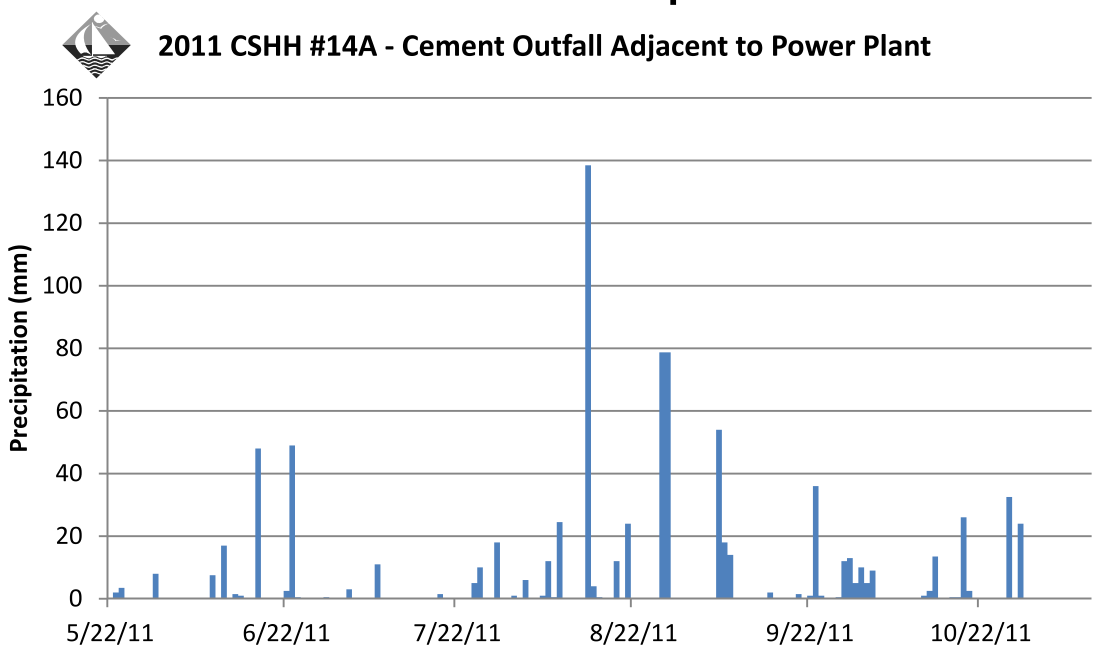



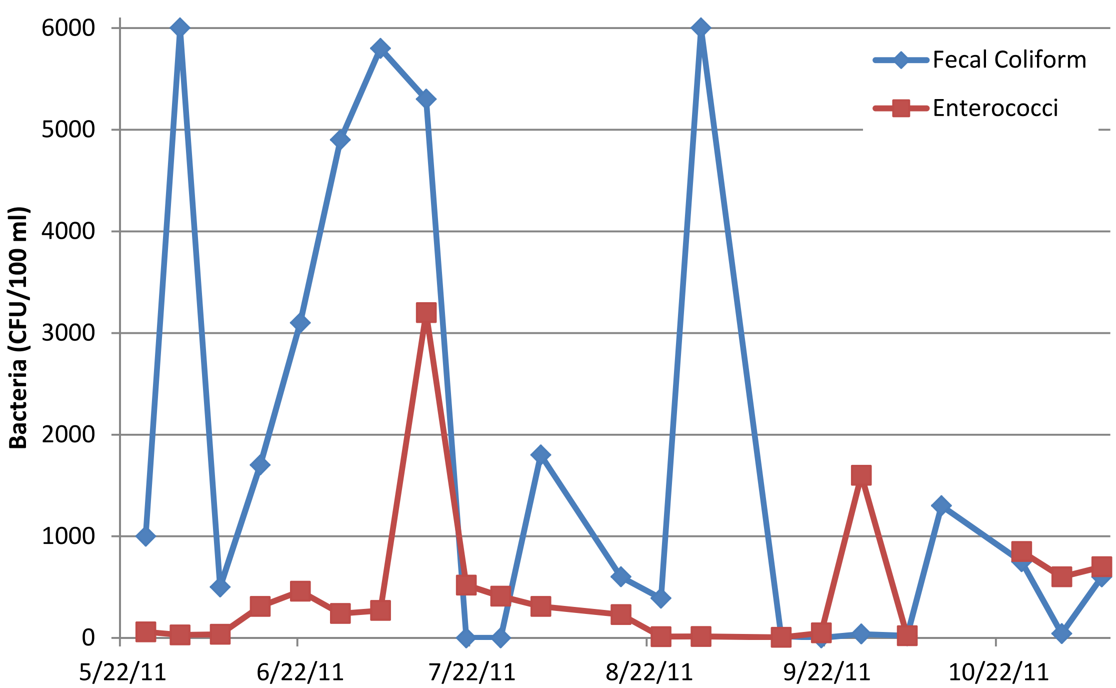
# 2011 In-Harbor Precipitation and Bacteria Graphs



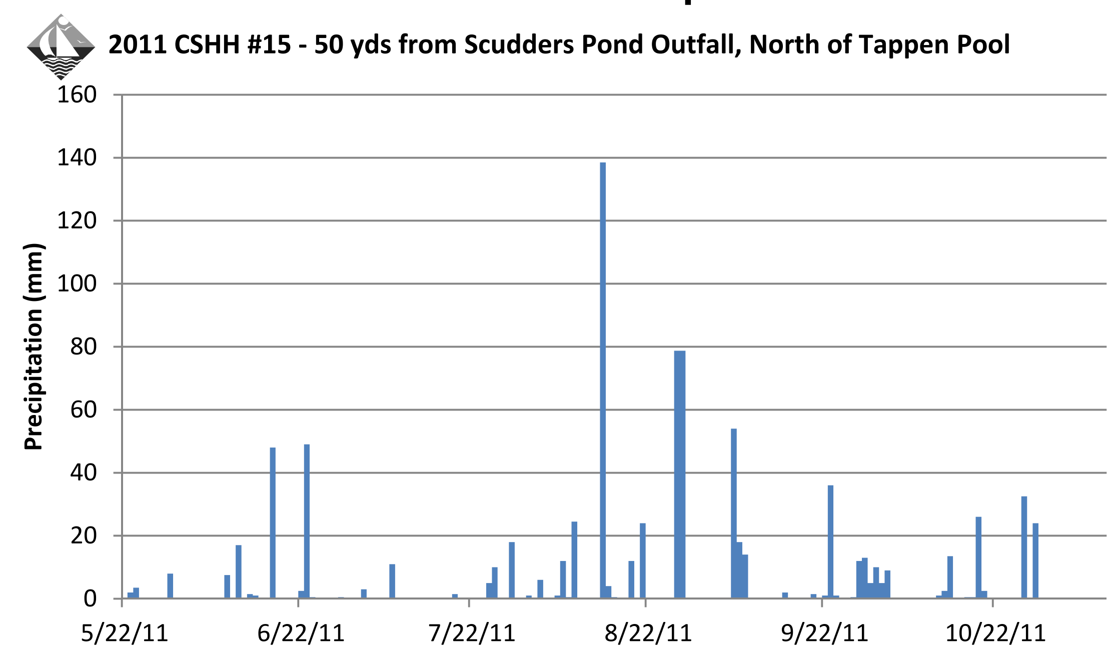



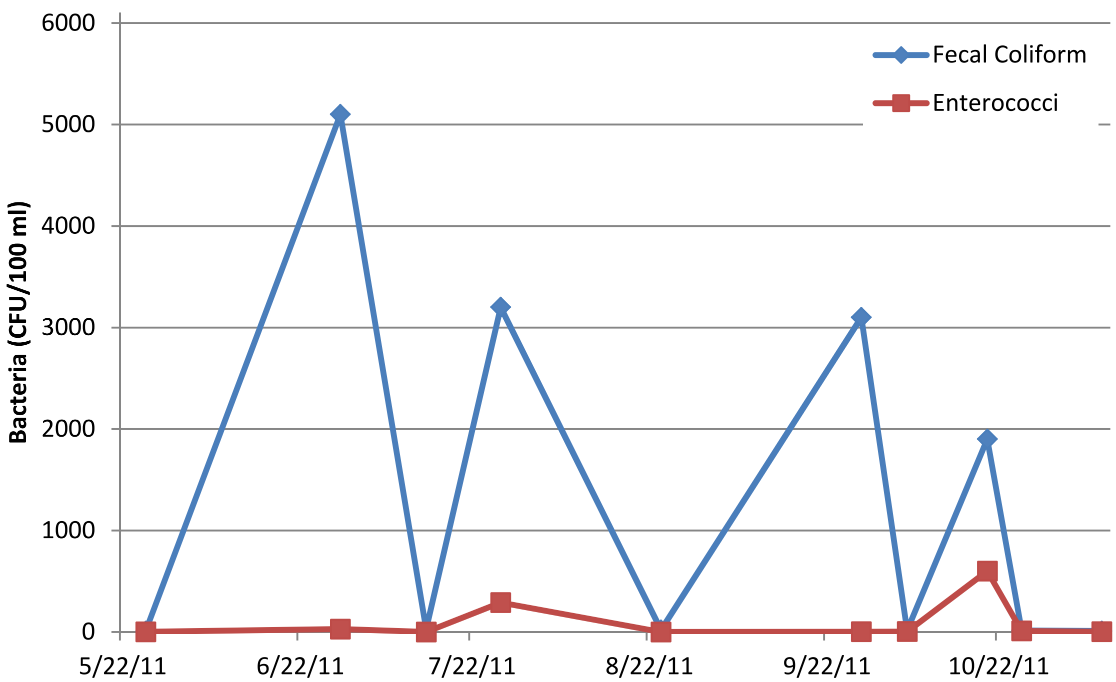
# 2011 In-Harbor Precipitation and Bacteria Graphs



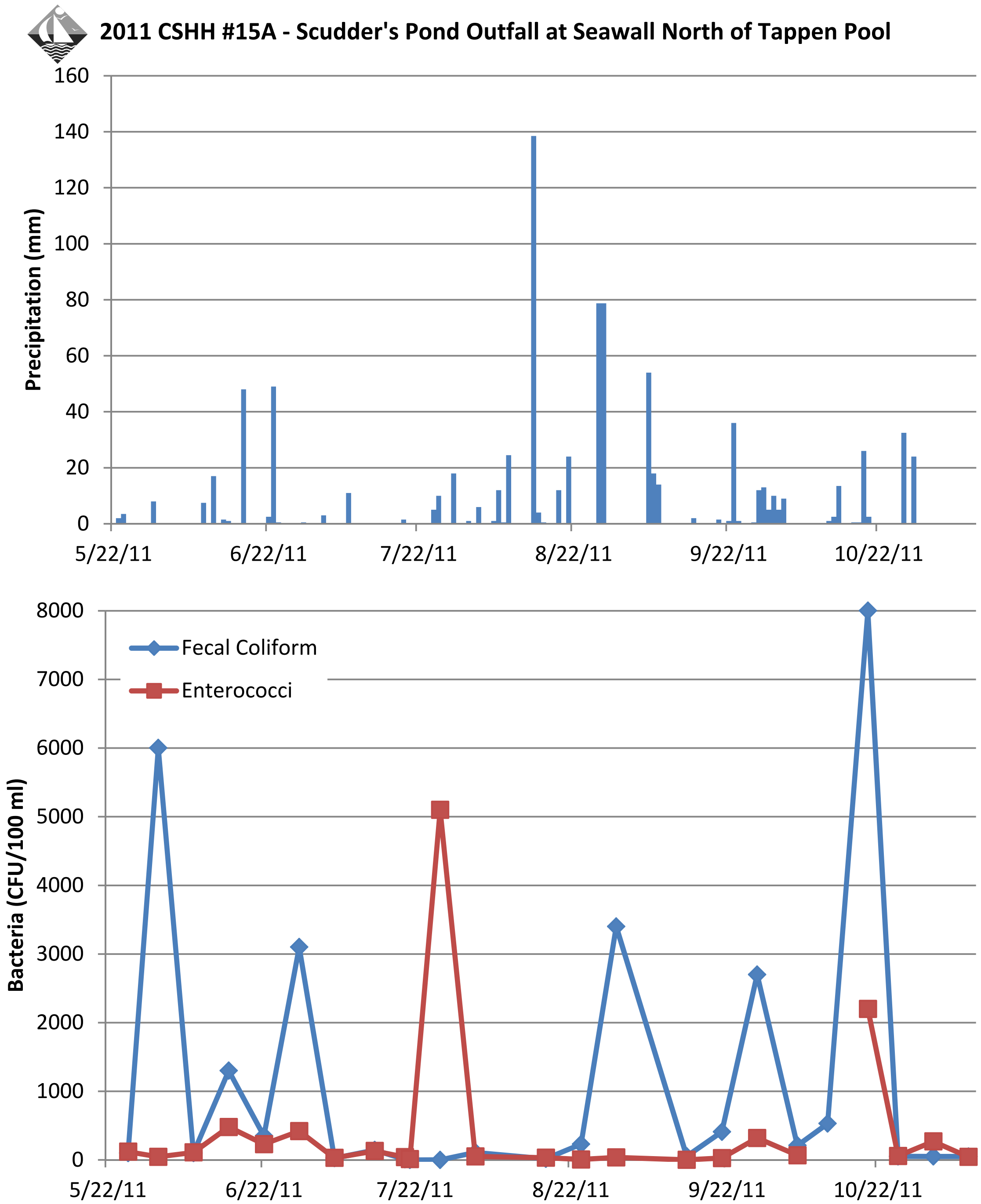



# 2011 In-Harbor Precipitation and Bacteria Graphs

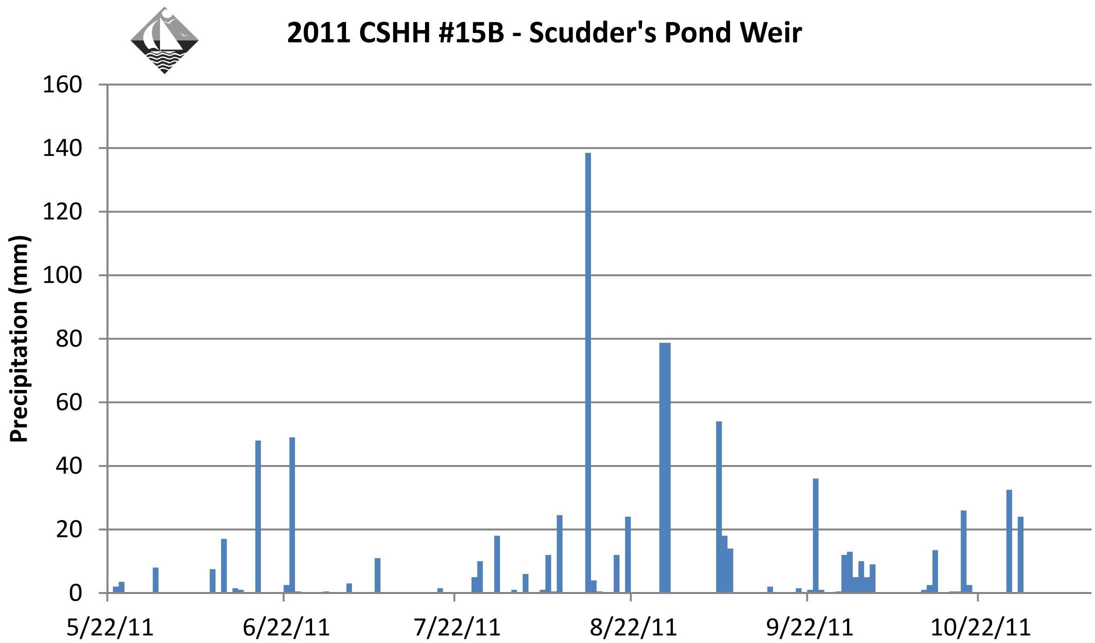


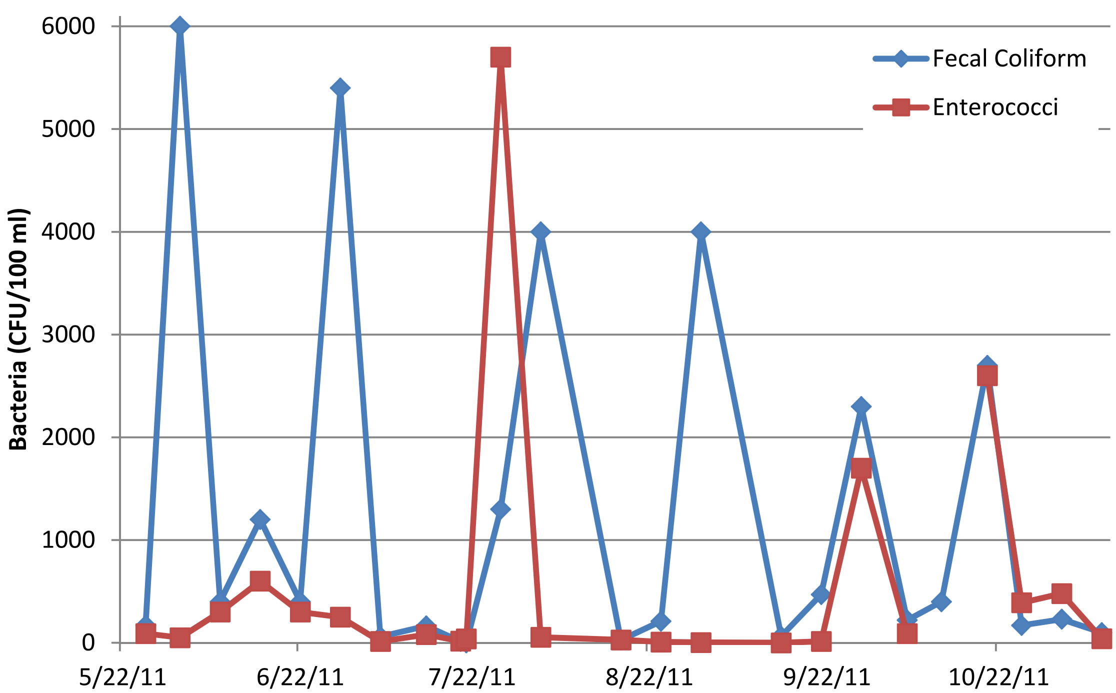



# 2011 In-Harbor Precipitation and Bacteria Graphs



# 2011 In-Harbor Precipitation and Bacteria Graphs



# 2011 In-Harbor Bacteria Data

## CSHH #1 - Beacon 11

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| Date | CFU/100ml. | Log AvgFC | CFU/100ml. | Log AvgEnt |
| 05/26/11 | 20.00 | 0.00 | 4.00 | 0.00 |
| 06/01/11 | 80.00 | 40.00 | 4.00 | 4.00 |
| 06/08/11 | 23.00 | 33.26 | 22.00 | 7.06 |
| 06/15/11 | 14.00 | 26.79 | 2.00 | 5.15 |
| 06/22/11 | 14.00 | 23.53 | 11.00 | 6.00 |
| 06/29/11 | 41.00 | 27.16 | 9.00 | 7.05 |
| 07/06/11 | 13.00 | 18.89 | 1.00 | 5.34 |
| 07/14/11 | 173.00 | 28.28 | 10.00 | 4.56 |
| 7/21/11 | 19.00 | 30.06 | 0.10 | 2.51 |
| 7/27/11 | 0.10 | 11.19 | 52.00 | 3.42 |
| 8/3/11 | 22.00 | 9.88 | 14.00 | 3.74 |
| 8/17/11 | 5.00 | 3.80 | 2.00 | 3.47 |
| 8/24/11 | 10.00 | 3.24 | 0.10 | 3.47 |
| 8/31/11 | 31.00 | 13.59 | 2.00 | 1.54 |
| 9/14/11 | 19.00 | 13.10 | 0.10 | 0.45 |
| 9/21/11 | 0.10 | 4.93 | 0.10 | 0.21 |
| 9/28/11 | 155.00 | 9.77 | 19.00 | 0.79 |
| 10/6/11 | 4.00 | 5.86 | 1.00 | 0.66 |
| 10/12/11 | 11.00 | 6.65 | 3.00 | 0.89 |
| 10/20/11 | 155.00 | 10.11 | 59.00 | 3.20 |
| 10/26/11 | 13.00 | 26.77 | 6.00 | 7.26 |
| 11/2/11 | 21.00 | 17.95 | 7.00 | 5.95 |
| 11/9/11 | 24.00 | 25.68 | 5.00 | 8.20 |

*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/100 ml.*

# 2011 In-Harbor Bacteria Data

**CSHH #2 - Bell Marker 6**

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 05/26/11 | 1.00 | 0.00 | 12.00 | 0.00 |
| 06/01/11 | 1.00 | 1.00 | 0.10 | 1.10 |
| 06/08/11 | 1.00 | 1.00 | 27.00 | 3.19 |
| 06/15/11 | 0.10 | 0.56 | 0.10 | 1.34 |
| 06/22/11 | 0.10 | 0.40 | 1.00 | 1.27 |
| 06/29/11 | 2.00 | 0.46 | 2.00 | 0.88 |
| 07/06/11 | 19.00 | 0.82 | 0.10 | 0.88 |
| 07/14/11 | 3.00 | 1.03 | 4.00 | 0.60 |
| 07/21/11 | 1.00 | 1.63 | 0.10 | 0.60 |
| 07/27/11 | 0.10 | 1.63 | 0.10 | 0.38 |
| 08/03/11 | 6.00 | 2.03 | 0.10 | 0.21 |
| 08/17/11 | 3.00 | 1.16 | 1.00 | 0.18 |
| 08/24/11 | 3.00 | 1.52 | 0.10 | 0.18 |
| 08/31/11 | 48.00 | 7.14 | 0.10 | 0.18 |
| 09/14/11 | 7.00 | 7.42 | 0.10 | 0.18 |
| 09/21/11 | 5.00 | 8.43 | 0.10 | 0.10 |
| 09/28/11 | 20.00 | 13.54 | 0.10 | 0.10 |
| 10/06/11 | 1.00 | 5.14 | 1.00 | 0.18 |
| 10/12/11 | 0.10 | 2.34 | 0.10 | 0.16 |
| 10/20/11 | 8.00 | 2.40 | 2.00 | 0.29 |
| 10/26/11 | 4.00 | 2.30 | 0.10 | 0.29 |
| 11/02/11 | 7.00 | 1.86 | 1.00 | 0.46 |

*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/100 ml.*

# 2011 In-Harbor Bacteria Data

## CSHH #3 - Glen Cove Creek

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 05/26/11 | 2.00 | 0.00 | 1.00 | 0.00 |
| 06/01/11 | 5.00 | 3.16 | 1.00 | 1.00 |
| 06/08/11 | 31.00 | 6.77 | ***400.00*** | 7.37 |
| 06/15/11 | 3.00 | 5.52 | 0.10 | 2.51 |
| 06/22/11 | 50.00 | 8.58 | 18.00 | 3.73 |
| 06/29/11 | 10.00 | 11.84 | 0.10 | 2.35 |
| 07/06/11 | 12.00 | 14.10 | 0.10 | 1.48 |
| 07/14/11 | 9.00 | 11.01 | 0.10 | 0.28 |
| 07/21/11 | 41.00 | 18.58 | 3.00 | 0.56 |
| 07/27/11 | 0.10 | 5.36 | 6.00 | 0.45 |
| 08/03/11 | 0.10 | 2.13 | 9.00 | 1.10 |
| 08/17/11 | 40.00 | 2.01 | 0.10 | 2.01 |
| 08/24/11 | 8.00 | 1.34 | 0.10 | 0.86 |
| 08/31/11 | 7.00 | 3.87 | 1.00 | 0.55 |
| 09/14/11 | 31.00 | 16.23 | 0.10 | 0.18 |
| 09/21/11 | 0.10 | 3.63 | 0.10 | 0.18 |
| 09/28/11 | 210.00 | 8.22 | 16.00 | 0.63 |
| 10/06/11 | 15.00 | 9.94 | 2.00 | 0.75 |
| 10/12/11 | 9.00 | 9.75 | 1.00 | 0.80 |
| 10/20/11 | 59.00 | 11.08 | ***260.00*** | 3.84 |
| 10/26/11 | 1.00 | 17.57 | 2.00 | 6.99 |
| 11/02/11 | 0.10 | 3.80 | 15.00 | 6.90 |
| 11/09/11 | 0.10 | 1.40 | 1.00 | 6.00 |

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

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 5/26/11 | 28.00 | 0.00 | 6.00 | 0.00 |
| 6/29/11 | **4000.00** | 0.00 | **1900.00** | 0.00 |
| 7/14/11 | 191.00 | **874.07** | 10.00 | **137.84** |
| 7/27/11 | 31.00 | **287.18** | 28.00 | **81.03** |
| 8/24/11 | 27.00 | 28.93 | 0.10 | 1.67 |
| 9/28/11 | 40.00 | 0.00 | 1.00 | 0.00 |
| 10/6/11 | 15.00 | 24.49 | 3.00 | 1.73 |
| 10/26/11 | 28.00 | 25.61 | 15.00 | 3.56 |
| 11/9/11 | 5.00 | 11.83 | 0.10 | 1.22 |

*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/100 ml.*

# 2011 In-Harbor Bacteria Data

## CSHH #5 - Mott's Cove

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| Date | CFU/100ml. | Log AvgFC | CFU/100ml. | Log AvgEnt |
| 5/26/11 | 50.00 | 0.00 | 15.00 | 0.00 |
| 6/29/11 | 17.00 | 0.00 | 50.00 | 0.00 |
| 7/14/11 | 33.00 | 23.69 | 1.00 | 7.07 |
| 7/27/11 | **4000.00** | 130.92 | 37.00 | 12.28 |
| 8/24/11 | 210.00 | **916.52** | 7.00 | 16.09 |
| 9/28/11 | 260.00 | 0.00 | 19.00 | 0.00 |
| 10/6/11 | 20.00 | 72.11 | 1.00 | 4.36 |
| 10/26/11 | 27.00 | 51.97 | 5.00 | 4.56 |
| 11/9/11 | 9.00 | 15.59 | 0.10 | 0.71 |

## CSHH #6 - East of the Former Incinerator Site

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| Date | CFU/100ml. | Log AvgFC | CFU/100ml. | Log AvgEnt |
| 5/26/11 | 36.00 | 0.00 | 1.00 | 0.00 |
| 6/29/11 | 31.00 | 0.00 | **3000.00** | 0.00 |
| 7/14/11 | 45.00 | 37.35 | 0.10 | 17.32 |
| 7/27/11 | 160.00 | 60.66 | 7.00 | 12.81 |
| 8/24/11 | 46.00 | 85.79 | 0.10 | 0.84 |
| 9/28/11 | 250.00 | 0.00 | 4.00 | 0.00 |
| 10/6/11 | 30.00 | 86.60 | 2.00 | 2.83 |
| 10/26/11 | 21.00 | 54.00 | 16.00 | 5.04 |
| 11/9/11 | 5.00 | 10.25 | 0.10 | 1.26 |

## CSHH #7 - West of Old Oil Dock

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| Date | CFU/100ml. | Log AvgFC | CFU/100ml. | Log AvgEnt |
| 5/26/11 | 80.00 | 0.00 | 24.00 | 0.00 |
| 6/29/11 | **3100.00** | 0.00 | 20.00 | 0.00 |
| 7/14/11 | 44.00 | **369.32** | 0.10 | 1.41 |
| 7/27/11 | 270.00 | **332.71** | 4.00 | 2.00 |
| 8/24/11 | 480.00 | **360.00** | 0.10 | 0.63 |
| 9/28/11 | 51.00 | 0.00 | 45.00 | 0.00 |
| 10/6/11 | 54.00 | 52.48 | 11.00 | 22.25 |
| 10/26/11 | 26.00 | 41.53 | 17.00 | 20.34 |
| 11/9/11 | 11.00 | 16.91 | 0.10 | 1.30 |

*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/100 ml.*

# 2011 In-Harbor Bacteria Data

## CSHH #8 - Glen Cove STP Outfall

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 05/26/11 | 5.00 | 0.00 | 22.00 | 0.00 |
| 06/01/11 | 30.00 | 12.25 | 9.00 | 14.07 |
| 06/08/11 | 5.00 | 9.09 | **400.00** | **42.94** |
| 06/15/11 | 22.00 | 11.33 | 10.00 | 29.83 |
| 06/22/11 | 27.00 | 13.48 | 33.00 | 30.44 |
| 06/29/11 | 36.00 | 20.01 | **200.00** | **47.33** |
| 07/06/11 | 20.00 | 18.45 | 3.00 | **38.00** |
| 07/14/11 | 19.00 | 24.10 | 7.00 | 16.92 |
| 07/21/11 | 49.00 | 28.28 | 11.00 | 17.24 |
| 07/27/11 | **4100.00** | 77.23 | 53.00 | 18.96 |
| 08/03/11 | 27.00 | 72.92 | 13.00 | 10.97 |
| 08/17/11 | 7.00 | 78.50 | 12.00 | 17.37 |
| 08/24/11 | 30.00 | 69.44 | 1.00 | 9.54 |
| 08/31/11 | 200.00 | 32.63 | 10.00 | 6.28 |
| 09/14/11 | 24.00 | 31.69 | 0.10 | 1.86 |
| 09/21/11 | 6.00 | 30.49 | 0.10 | 0.56 |
| 09/28/11 | 0.10 | 7.33 | 22.00 | 1.22 |
| 10/06/11 | 21.00 | 4.17 | 11.00 | 1.25 |
| 10/12/11 | 17.00 | 5.52 | 5.00 | 1.65 |
| 10/20/11 | 240.00 | 8.75 | 100.00 | 6.55 |
| 10/26/11 | 6.00 | 8.75 | 18.00 | 18.52 |
| 11/02/11 | 17.00 | 24.45 | 24.00 | 18.84 |
| 11/09/11 | 1.00 | 13.30 | 5.00 | 16.09 |

*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/100 ml.*

# 2011 In-Harbor Bacteria Data

## CSHH#9 - First Pipe West of STP Outfall

| Date | *Fecal Coliform* CFU/100ml. | Log AvgFC | *Enterococci* CFU/100ml. | Log AvgEnt |
|---|---|---|---|---|
| 05/26/11 | 18.00 | 0.00 | 35.00 | 0.00 |
| 06/01/11 | 35.00 | 25.10 | 6.00 | 14.49 |
| 06/08/11 | 36.00 | 28.31 | 33.00 | 19.07 |
| 06/15/11 | 18.00 | 25.28 | 4.00 | 12.90 |
| 06/22/11 | 15.00 | 22.77 | 45.00 | 16.57 |
| 06/29/11 | 19.00 | 23.02 | 40.00 | 17.01 |
| 07/06/11 | 22.00 | 20.98 | 3.00 | 14.81 |
| 07/14/11 | 24.00 | 19.34 | 7.00 | 10.86 |
| 07/21/11 | 31.00 | 21.57 | 14.00 | 13.95 |
| 07/27/11 | **3200.00** | 63.03 | ***110.00*** | 16.69 |
| 08/03/11 | 32.00 | 69.96 | 11.00 | 12.89 |
| 08/17/11 | 39.00 | 105.48 | 10.00 | 20.29 |
| 08/24/11 | 15.00 | 87.98 | 0.10 | 5.90 |
| 08/31/11 | 182.00 | 42.96 | 8.00 | 3.06 |
| 09/14/11 | 17.00 | 36.68 | 0.10 | 0.95 |
| 09/21/11 | 7.00 | 23.87 | 0.10 | 0.30 |
| 09/28/11 | 240.00 | 47.75 | 37.00 | 1.31 |
| 10/06/11 | 21.00 | 27.83 | 23.00 | 1.71 |
| 10/12/11 | 14.00 | 24.26 | 4.00 | 2.02 |
| 10/20/11 | ***5800.00*** | 77.88 | ***5700.00*** | 18.10 |
| 10/26/11 | 15.00 | 90.70 | 25.00 | ***54.60*** |
| 11/02/11 | 18.00 | 54.03 | 18.00 | ***47.27*** |
| 11/09/11 | 2.00 | 33.76 | 3.00 | 31.45 |

*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/100 ml.*

# 2011 In-Harbor Bacteria Data

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

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 05/26/11 | 6.00 | 0.00 | 37.00 | 0.00 |
| 06/01/11 | 38.00 | 15.10 | 14.00 | 22.76 |
| 06/08/11 | 31.00 | 19.19 | 28.00 | 24.39 |
| 06/15/11 | 15.00 | 18.04 | 3.00 | 14.44 |
| 06/22/11 | 44.00 | 21.57 | **220.00** | 24.90 |
| 06/29/11 | **1300.00** | 63.23 | **4000.00** | ***63.53*** |
| 07/06/11 | 250.00 | 92.16 | **190.00** | ***107.03*** |
| 07/14/11 | 20.00 | 84.43 | 2.00 | ***63.14*** |
| 07/21/11 | 0.10 | 30.99 | 15.00 | ***87.11*** |
| 07/27/11 | **1900.00** | 65.82 | 90.00 | ***72.85*** |
| 08/03/11 | 14.00 | 26.59 | 38.00 | 28.71 |
| 08/17/11 | 14.00 | 13.89 | 18.00 | 31.00 |
| 08/24/11 | 11.00 | 44.99 | 0.10 | 8.86 |
| 08/31/11 | 15.00 | 13.41 | 7.00 | 4.68 |
| 09/14/11 | 33.00 | 16.62 | 0.10 | 1.06 |
| 09/21/11 | 8.00 | 14.45 | 1.00 | 0.51 |
| 09/28/11 | ***1700.00*** | 50.94 | ***160.00*** | 3.25 |
| 10/06/11 | 23.00 | 56.68 | 38.00 | 4.97 |
| 10/12/11 | 9.00 | 39.23 | 2.00 | 4.14 |
| 10/20/11 | ***6001.00*** | 111.06 | ***6001.00*** | ***37.38*** |
| 10/26/11 | 18.00 | 130.61 | 7.00 | ***55.16*** |
| 11/02/11 | 11.00 | 47.66 | 36.00 | ***40.93*** |
| 11/09/11 | 4.00 | 33.59 | 6.00 | 28.30 |

*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/100 ml.*

# 2011 In-Harbor Bacteria Data

## CSHH #11 - 50 Yards East of STP Outfall

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 05/26/11 | **1700.00** | 0.00 | 70.00 | 0.00 |
| 06/01/11 | 160.00 | 521.54 | 12.00 | 28.98 |
| 06/08/11 | 0.10 | 30.07 | **600.00** | ***79.58*** |
| 06/15/11 | 530.00 | 61.62 | 2.00 | 31.69 |
| 06/22/11 | 120.00 | 70.41 | **270.00** | ***48.64*** |
| 06/29/11 | **3100.00** | 79.39 | **3000.00** | ***103.13*** |
| 07/06/11 | 11.00 | 46.48 | 12.00 | ***103.13*** |
| 07/14/11 | 32.00 | 147.32 | 3.00 | ***35.74*** |
| 07/21/11 | **6000.00** | **239.36** | 37.00 | ***64.06*** |
| 07/27/11 | **2100.00** | **424.28** | **550.00** | ***73.86*** |
| 08/03/11 | 51.00 | 186.59 | 3.00 | 18.55 |
| 08/17/11 | 21.00 | **340.83** | 18.00 | 32.38 |
| 08/24/11 | 110.00 | 125.42 | 4.00 | 18.57 |
| 08/31/11 | 209.00 | 70.44 | 8.00 | 6.45 |
| 09/14/11 | 14.00 | 50.99 | 0.10 | 2.75 |
| 09/21/11 | 320.00 | 100.74 | 46.00 | 3.48 |
| 09/28/11 | ***2300.00*** | ***215.42*** | ***1500.00*** | 15.33 |
| 10/06/11 | 120.00 | 187.52 | 39.00 | 22.78 |
| 10/12/11 | 9.00 | 102.16 | 9.00 | 18.92 |
| 10/20/11 | ***6001.00*** | ***343.32*** | ***6001.00*** | ***170.80*** |
| 10/26/11 | 43.00 | ***229.81*** | 5.00 | ***109.58*** |
| 11/02/11 | 51.00 | 107.28 | 70.00 | ***59.36*** |
| 11/09/11 | 13.00 | 68.78 | 10.00 | ***45.22*** |

*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/100 ml.*

# 2011 In-Harbor Bacteria Data

## CSHH #12 - Bend in Seawall East of STP Outfall

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 05/26/11 | 140.00 | 0.00 | 20.00 | 0.00 |
| 06/08/11 | 0.10 | 3.74 | **4500.00** | **300.00** |
| 06/15/11 | 380.00 | 17.46 | 5.00 | **76.63** |
| 06/22/11 | 100.00 | 27.01 | **190.00** | **96.16** |
| 06/29/11 | **4100.00** | 62.83 | **170.00** | **164.19** |
| 07/06/11 | 73.00 | 64.74 | 3.00 | **73.74** |
| 07/14/11 | 41.00 | **215.64** | 7.00 | 20.23 |
| 07/21/11 | **6000.00** | **374.46** | 10.00 | 23.24 |
| 07/27/11 | **2300.00** | **701.06** | **460.00** | 27.74 |
| 08/03/11 | **1800.00** | **594.64** | 0.10 | 6.27 |
| 08/17/11 | 11.00 | **723.00** | 17.00 | 9.40 |
| 08/24/11 | 170.00 | **296.63** | 1.00 | 5.29 |
| 08/31/11 | 310.00 | 179.73 | 9.00 | 1.98 |
| 09/14/11 | 15.00 | 54.30 | 0.10 | 1.98 |
| 09/21/11 | 170.00 | 107.67 | 0.10 | 0.55 |
| 10/06/11 | 28.00 | 41.49 | 7.00 | 0.41 |
| 10/12/11 | 25.00 | 36.55 | 12.00 | 0.96 |
| 10/20/11 | ***4000.00*** | 147.71 | ***2600.00*** | 12.16 |
| 10/26/11 | 38.00 | 101.56 | 8.00 | ***36.36*** |
| 11/02/11 | 31.00 | 80.11 | ***190.00*** | ***50.61*** |
| 11/09/11 | 17.00 | 72.50 | 11.00 | ***55.40*** |

*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/100 ml.*

# 2011 In-Harbor Bacteria Data

## CSHH #13 – 60 Feet Downstream of Mill Pond Weir

| | Fecal Coliform | | Enterococci | |
|---|---|---|---|---|
| Date | CFU/100ml. | Log AvgFC | CFU/100ml. | Log AvgEnt |
| 5/26/11 | 160.00 | 0.00 | **190.00** | 0.00 |
| 6/8/11 | 31.00 | 70.43 | **300.00** | **238.75** |
| 6/15/11 | 370.00 | 122.43 | **330.00** | **265.95** |
| 6/22/11 | 330.00 | 156.87 | **300.00** | **274.08** |
| 6/29/11 | 7.00 | 71.75 | **230.00** | **287.49** |
| 7/6/11 | 390.00 | 100.66 | 23.00 | **173.48** |
| 7/14/11 | 27.00 | 97.91 | 7.00 | **81.82** |
| 7/21/11 | 40.00 | 62.75 | 21.00 | **47.16** |
| 7/27/11 | **2700.00** | 95.54 | **370.00** | **49.18** |
| 8/3/11 | 246.00 | 194.70 | 2.00 | 19.04 |
| 8/17/11 | 0.10 | 40.37 | **170.00** | **40.32** |
| 8/24/11 | 350.00 | 69.44 | 23.00 | **41.24** |
| 8/31/11 | 410.00 | 43.35 | 30.00 | 22.01 |
| 9/13/11 | 0.10 | 6.15 | 0.10 | 10.41 |
| 9/21/11 | 10.00 | 19.46 | 0.10 | 1.62 |
| 9/28/11 | ***1900.00*** | 29.71 | ***2100.00*** | 5.01 |
| 10/6/11 | 950.00 | 36.65 | 26.00 | 4.83 |
| 10/12/11 | 23.00 | 33.39 | 5.00 | 4.87 |
| 10/20/11 | ***3200.00*** | ***265.87*** | ***1300.00*** | 32.36 |
| 10/26/11 | 58.00 | ***377.88*** | 16.00 | ***89.30*** |
| 11/2/11 | 240.00 | ***249.83*** | ***390.00*** | ***63.77*** |
| 11/9/11 | 32.00 | 126.80 | 16.00 | ***57.87*** |

## CSHH #14 – NW Corner of Power Plant ~50 yards from Cement Outfall

| | Fecal Coliform | | Enterococci | |
|---|---|---|---|---|
| Date | CFU/100ml. | Log AvgFC | CFU/100ml. | Log AvgEnt |
| 5/26/11 | 43.00 | 0.00 | 21.00 | 0.00 |
| 6/15/11 | 42.00 | 42.50 | 12.00 | 15.87 |
| 6/29/11 | 32.00 | 36.66 | 8.00 | 9.80 |
| 7/14/11 | 31.00 | 34.67 | 0.10 | 2.13 |
| 7/27/11 | **4100.00** | 159.62 | **260.00** | 5.92 |
| 8/24/11 | 46.00 | **434.28** | 0.10 | 5.10 |
| 9/28/11 | 0.10 | 0.00 | 21.00 | 0.00 |
| 10/6/12 | 25.00 | 0.00 | 7.00 | 0.00 |
| 10/26/11 | 20.00 | 3.68 | 10.00 | 11.37 |
| 11/9/11 | 23.00 | 22.57 | 13.00 | 9.69 |

*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/100 ml.*

# 2011 Beach Monitoring Precipitation and Bacterial Graphs

## CSHH #14A – Cement Outfall Adjacent to Power Plant

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 5/26/2011 | **1000.00** | 0.00 | 60.00 | 0.00 |
| 6/1/2011 | **6001.00** | **2449.69** | 30.00 | **42.43** |
| 6/8/2011 | 500.00 | **1442.33** | 35.00 | **39.79** |
| 6/15/2011 | **1700.00** | **1502.83** | **310.00** | **66.48** |
| 6/22/2011 | **3100.00** | **1737.00** | **460.00** | **97.88** |
| 6/29/2011 | **4900.00** | **2386.93** | **240.00** | **129.15** |
| 7/6/2011 | **5800.00** | **2370.72** | **270.00** | **200.43** |
| 7/14/2011 | **5300.00** | **3801.39** | **3200.00** | **494.50** |
| 7/21/2011 | 0.10 | **541.82** | **520.00** | **548.40** |
| 7/27/2011 | 0.10 | 68.48 | **410.00** | **535.92** |
| 8/3/2011 | **1800.00** | 56.05 | **310.00** | **564.07** |
| 8/17/2011 | 601.00 | 10.20 | **230.00** | **351.13** |
| 8/24/2011 | 390.00 | 80.59 | 12.00 | **136.86** |
| 8/31/2011 | **6001.00** | **1261.42** | 14.00 | **58.83** |
| 9/14/2011 | 17.00 | **393.24** | 5.00 | 20.97 |
| 9/21/2011 | 0.10 | 44.66 | 49.00 | 14.24 |
| 9/28/2011 | 38.00 | 24.95 | **1600.00** | **48.40** |
| 10/6/2011 | 20.00 | 6.00 | 21.00 | **53.56** |
| 10/12/2011 | **1300.00** | 17.58 | No entero analysis | |
| 10/26/2011 | 750.00 | 164.99 | **850.00** | **438.96** |
| 11/2/2011 | 42.00 | 169.17 | **601.00** | **343.65** |
| 11/9/2011 | 600.00 | **395.91** | **700.00** | **825.72** |

## CSHH #15 – NW Corner of Tappen Pool

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 5/26/11 | 9.00 | 0.00 | 1.00 | 0.00 |
| 6/29/11 | **5100.00** | 0.00 | 28.00 | 0.00 |
| 7/14/11 | 27.00 | **371.08** | 0.10 | 1.67 |
| 7/27/11 | **3200.00** | **760.96** | **290.00** | 9.33 |
| 8/24/11 | 20.00 | **252.98** | 0.10 | 5.39 |
| 9/28/11 | **3100.00** | 0.00 | 2.00 | 0.00 |
| 10/6/11 | 16.00 | **222.71** | 4.00 | 2.83 |
| 10/20/11 | **1900.00** | **455.07** | **600.00** | 16.87 |
| 10/26/11 | 15.00 | 193.90 | 10.00 | 14.80 |
| 11/9/11 | 9.00 | 63.54 | 2.00 | 22.89 |

*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/100 ml.*

# 2011 Beach Monitoring Precipitation and Bacterial Graphs

## CSHH #15A – Scudder's Pond Outfall at Seawall N. of Tappen Pool

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 5/26/11 | 100.00 | 0.00 | **120.00** | 0.00 |
| 6/1/11 | **6001.00** | **774.66** | 45.00 | **73.48** |
| 6/8/11 | 100.00 | **391.51** | **110.00** | **84.06** |
| 6/15/11 | **1300.00** | **528.50** | **480.00** | **129.94** |
| 6/22/11 | 350.00 | **486.68** | **230.00** | **145.66** |
| 6/29/11 | **3100.00** | **967.21** | **420.00** | **187.14** |
| 7/6/11 | 26.00 | **325.74** | 30.00 | **172.56** |
| 7/14/11 | 145.00 | **350.87** | **130.00** | **178.43** |
| 7/20/11 | 10.00 | 132.54 | 41.00 | **109.09** |
| 7/21/11 | 0.10 | 39.99 | 13.00 | **76.52** |
| 7/27/11 | 0.10 | 10.26 | **5100.00** | **128.26** |
| 8/3/11 | 110.00 | 5.88 | 51.00 | **90.26** |
| 8/17/11 | 17.00 | 2.85 | 32.00 | **85.00** |
| 8/24/11 | 230.00 | 14.40 | 7.00 | **87.37** |
| 8/31/11 | **3400.00** | 195.55 | 36.00 | 25.32 |
| 9/14/11 | 54.00 | 163.69 | 1.00 | 9.48 |
| 9/21/11 | 410.00 | **362.74** | 27.00 | 9.08 |
| 9/28/11 | **2700.00** | **671.44** | **320.00** | 23.62 |
| 10/6/11 | 210.00 | **334.73** | **68.00** | 27.69 |
| 10/12/11 | 530.00 | **366.95** | No entero analysis | |
| 10/20/11 | **8000.00** | **997.12** | **2200.00** | **232.89** |
| 10/26/11 | 52.00 | **659.77** | 58.00 | **271.37** |
| 11/2/11 | 51.00 | **298.29** | **270.00** | **262.30** |
| 11/9/11 | 50.00 | **223.86** | 44.00 | **240.43** |

*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/100 ml.*

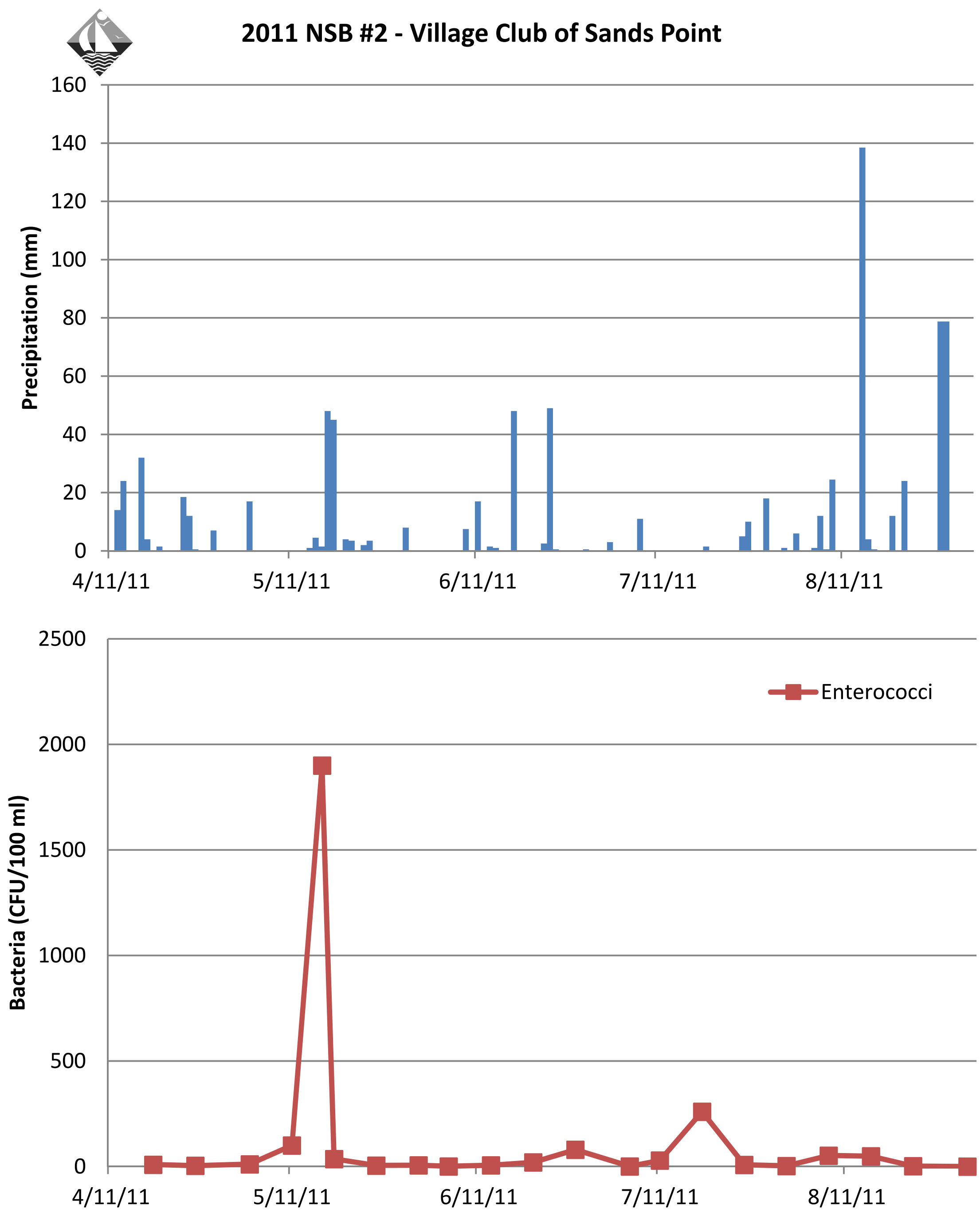
# 2011 Beach Monitoring Precipitation and Bacterial Graphs

## CSHH #15B – Scudder's Pond Weir

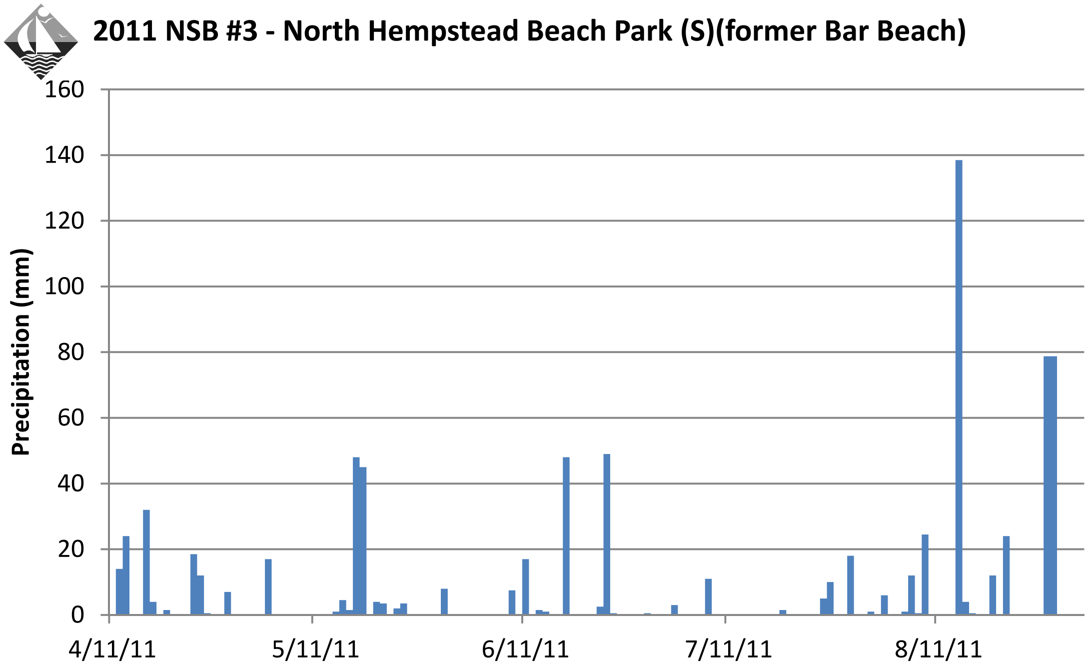
| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 5/26/11 | 170.00 | 0.00 | 90.00 | 0.00 |
| 6/1/11 | **6001.00** | **1010.03** | 50.00 | **67.08** |
| 6/8/11 | 400.00 | **741.73** | **300.00** | **110.52** |
| 6/15/11 | **1200.00** | **836.52** | **600.00** | **168.70** |
| 6/22/11 | 400.00 | **721.76** | **300.00** | **189.29** |
| 6/29/11 | **5400.00** | **1441.40** | **250.00** | **232.20** |
| 7/6/11 | 59.00 | **571.89** | 13.00 | **177.36** |
| 7/14/11 | 164.00 | **478.48** | 80.00 | **136.16** |
| 7/20/11 | 13.00 | 193.56 | 16.00 | **65.95** |
| 7/21/11 | 0.10 | 54.83 | 38.00 | **60.16** |
| 7/27/11 | **1300.00** | 66.73 | **5700.00** | **98.28** |
| 8/3/11 | **4000.00** | 63.48 | 54.00 | **76.13** |
| 8/17/11 | 27.00 | 44.90 | 28.00 | **87.88** |
| 8/24/11 | 210.00 | **414.38** | 8.00 | **91.12** |
| 8/31/11 | **4000.00** | **548.81** | 3.00 | 13.80 |
| 9/14/11 | 64.00 | 195.19 | 0.10 | 2.86 |
| 9/21/11 | 470.00 | **398.69** | 13.00 | 2.36 |
| 9/28/11 | **2300.00** | **725.30** | **1700.00** | 9.02 |
| 10/6/11 | 220.00 | **351.24** | 90.00 | 21.12 |
| 10/12/11 | 400.00 | **360.49** | No entero analysis | |
| 10/20/11 | **2700.00** | **761.96** | **2600.00** | **290.49** |
| 10/26/11 | 170.00 | **621.73** | **390.00** | **573.53** |
| 11/2/11 | 230.00 | **392.29** | **480.00** | **445.37** |
| 11/9/11 | 100.00 | **335.06** | 40.00 | **378.69** |

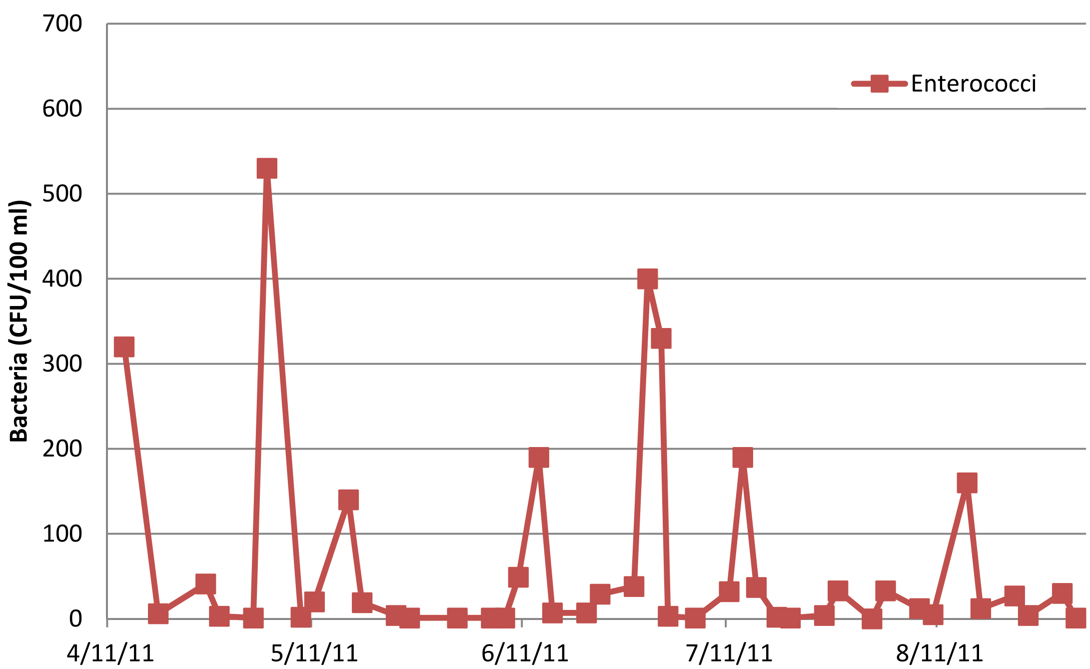
*Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgFC (log average for fecal coliform) and Log AvgEnt (log average for enterococci) refer to the running seasonal average of bacteria results at each location. Boldfaced, italicized values 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/100 ml.*

# 2011 Beach Monitoring Precipitation and Bacterial Graphs

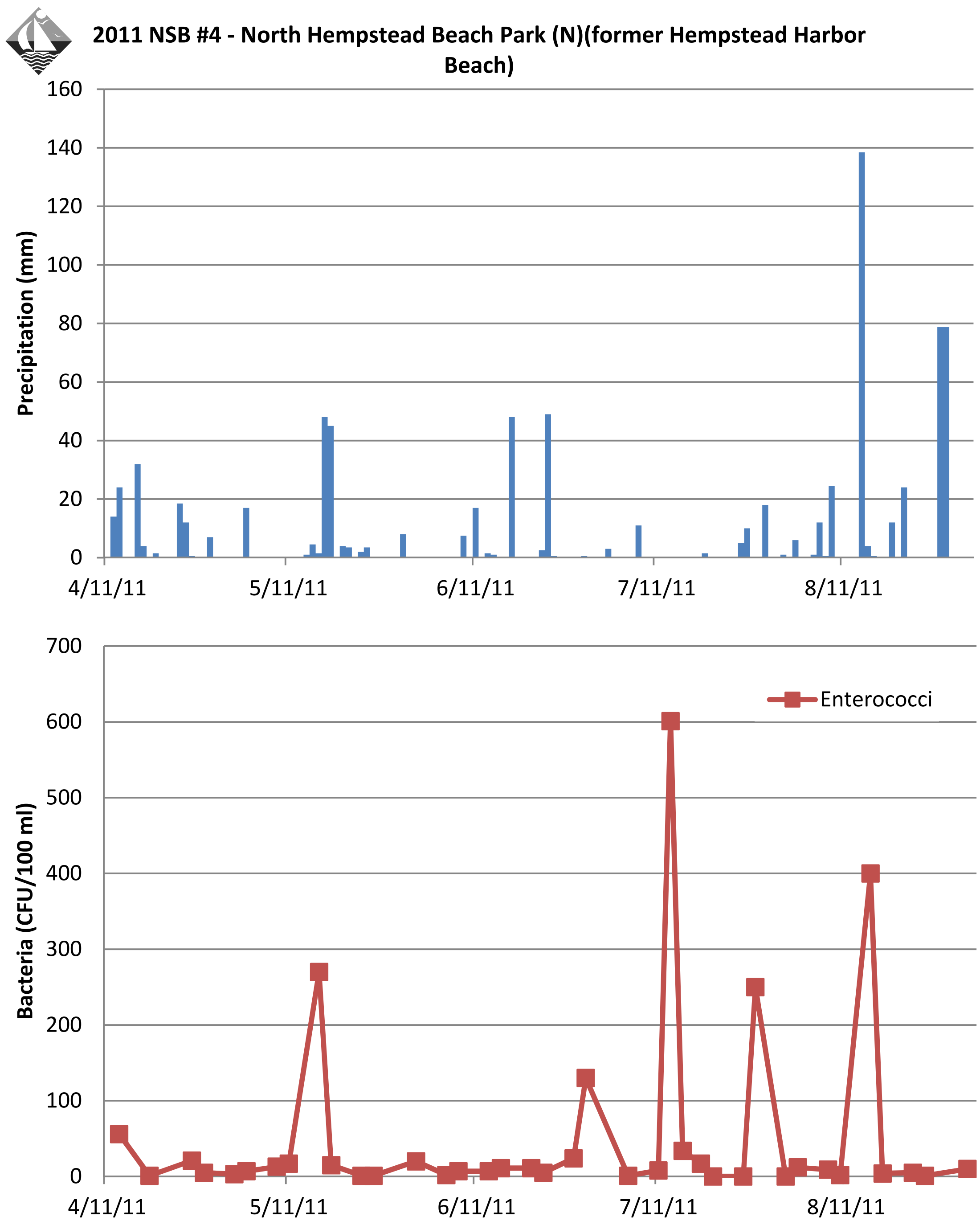


# 2011 Beach Monitoring Precipitation and Bacterial Graphs



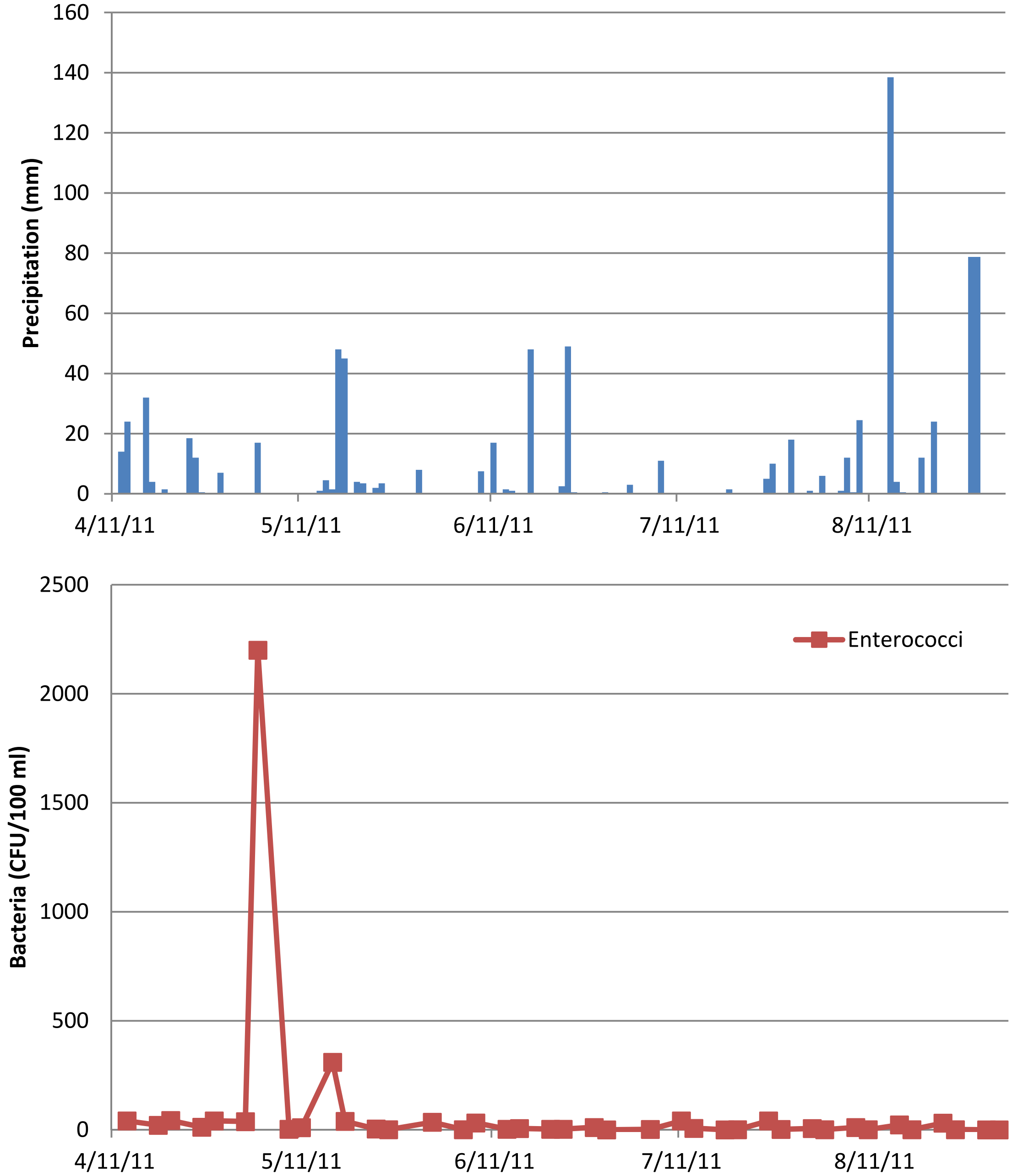



# 2011 Beach Monitoring Precipitation and Bacterial Graphs

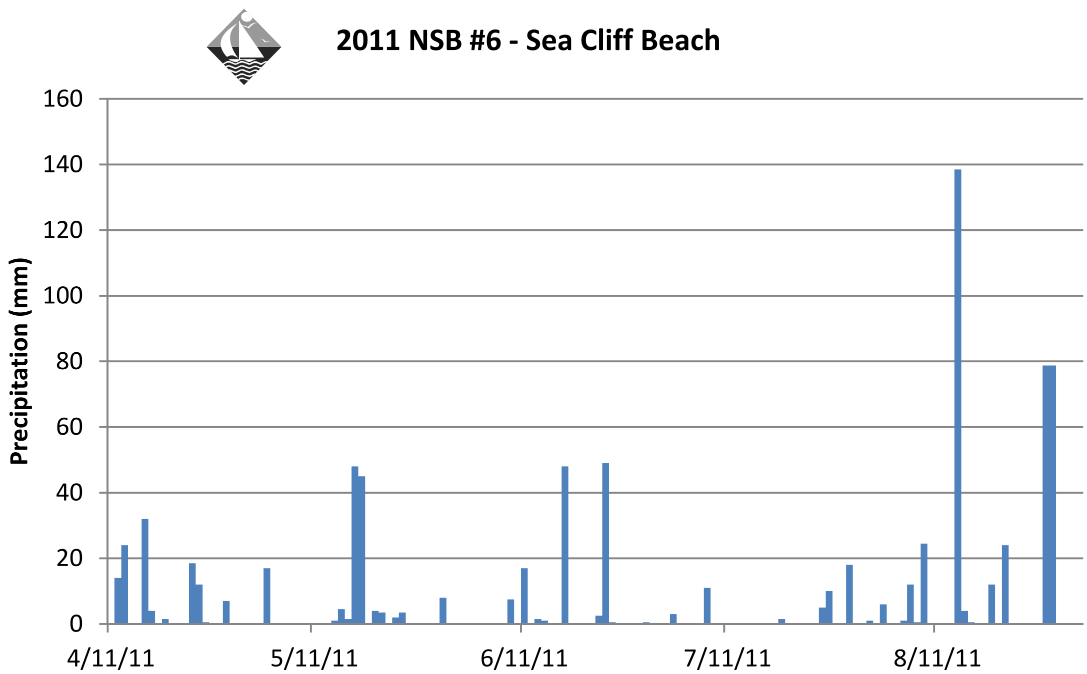


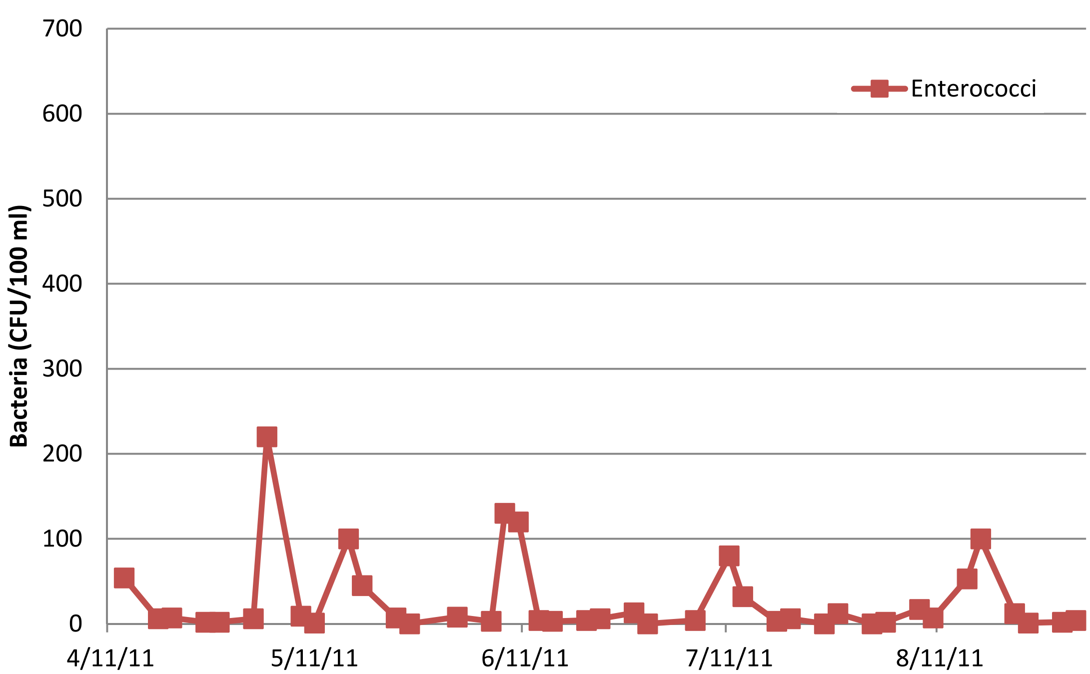
# 2011 Beach Monitoring Precipitation and Bacterial Graphs

## 2011 NSB #5 - Tappen Beach



# 2011 Beach Monitoring Precipitation and Bacterial Graphs



# 2011 Beach Monitoring Bacteria Data

## NSB#2 - Village Club of Sands Point (Formerly IBM Beach)

| | *Enterococci* | |
|---|---|---|
| Date | CFU/100ml. | Log AvgEnt |
| 4/18/11 | 9.00 | 0.00 |
| 4/25/11 | 4.00 | 6.00 |
| 5/4/11 | 11.00 | 7.34 |
| 5/11/11 | 100.00 | 14.11 |
| 5/16/11 | ***1900.00*** | ***37.61*** |
| 5/18/11 | 36.00 | ***37.34*** |
| 5/25/11 | 5.00 | 33.85 |
| 6/1/11 | 6.00 | ***36.22*** |
| 6/6/11 | 1.00 | 24.29 |
| 6/13/11 | 6.00 | 15.20 |
| 6/20/11 | 20.00 | 5.14 |
| 6/27/11 | 80.00 | 8.96 |
| 7/6/11 | 1.00 | 6.26 |
| 7/11/11 | 29.00 | 12.27 |
| 7/18/11 | ***260.00*** | 26.08 |
| 7/25/11 | 8.00 | 21.71 |
| 8/1/11 | 3.00 | 11.26 |
| 8/8/11 | 52.00 | 24.82 |
| 8/15/11 | 49.00 | 27.56 |
| 8/22/11 | 2.00 | 10.41 |
| 8/31/11 | 0.10 | 4.33 |

*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.*

# 2011 Beach Monitoring Bacteria Data

## NSB#4 - North Hempstead Beach Park (N) (Formerly Hempstead Harbor Beach)

| | ***Enterococci*** | |
|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgEnt** |
| 04/13/11 | 56.00 | 0.00 |
| 04/18/11 | 1.00 | 7.48 |
| 04/25/11 | 21.00 | 10.56 |
| 04/27/11 | 5.00 | 8.76 |
| 05/02/11 | 3.00 | 7.07 |
| 05/04/11 | 7.00 | 7.06 |
| 05/09/11 | 13.00 | 7.70 |
| 05/11/11 | 17.00 | 8.50 |
| 05/16/11 | ***270.00*** | 10.35 |
| 05/18/11 | 15.00 | 10.78 |
| 05/23/11 | 1.00 | 10.78 |
| 05/25/11 | 1.00 | 8.50 |
| 06/01/11 | 20.00 | 8.97 |
| 06/06/11 | 2.00 | 8.80 |
| 06/08/11 | 7.00 | 8.57 |
| 06/13/11 | 7.00 | 7.29 |
| 06/15/11 | 11.00 | 7.63 |
| 06/20/11 | 11.00 | 4.70 |
| 06/22/11 | 5.00 | 4.73 |
| 06/27/11 | 24.00 | 8.55 |
| 06/29/11 | ***130.00*** | 11.56 |
| 07/06/11 | 1.00 | 8.29 |
| 07/11/11 | 8.00 | 10.07 |
| 07/13/11 | ***601.00*** | 15.86 |
| 07/15/11 | 34.00 | 18.91 |
| 07/18/11 | 17.00 | 19.84 |
| 07/20/11 | 0.10 | 11.69 |
| 07/25/11 | 0.10 | 7.62 |
| 07/27/11 | ***250.00*** | 10.80 |
| 08/01/11 | 0.10 | 4.46 |
| 08/03/11 | 12.00 | 4.92 |
| 08/08/11 | 9.00 | 6.13 |
| 08/10/11 | 2.00 | 5.54 |
| 08/15/11 | ***400.00*** | 4.15 |
| 08/17/11 | 4.00 | 4.14 |
| 08/22/11 | 5.00 | 5.46 |
| 08/24/11 | 1.00 | 4.61 |
| 08/31/11 | 10.00 | 4.93 |

*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.*

# 2011 Beach Monitoring Bacteria Data

## NSB#3 - North Hempstead Beach Park (S) (Formerly Bar Beach)

| | ***Enterococci*** | |
|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgEnt** |
| 4/13/11 | 320.00 | 0.00 |
| 4/18/11 | 6.00 | 43.82 |
| 4/25/11 | 41.00 | 42.86 |
| 4/27/11 | 3.00 | 22.04 |
| 5/2/11 | 1.00 | 11.88 |
| 5/4/11 | ***530.00*** | 22.37 |
| 5/9/11 | 2.00 | 15.84 |
| 5/11/11 | 20.00 | 16.31 |
| 5/16/11 | ***140.00*** | 14.71 |
| 5/18/11 | 19.00 | 15.13 |
| 5/23/11 | 4.00 | 14.47 |
| 5/25/11 | 1.00 | 11.07 |
| 6/1/11 | 1.00 | 8.48 |
| 6/6/11 | 1.00 | 5.05 |
| 6/8/11 | 1.00 | 4.22 |
| 6/10/11 | 49.00 | 6.02 |
| 6/13/11 | ***190.00*** | 7.73 |
| 6/15/11 | 7.00 | 7.66 |
| 6/20/11 | 7.00 | 4.96 |
| 6/22/11 | 29.00 | 5.92 |
| 6/27/11 | 38.00 | 9.26 |
| 6/29/11 | ***400.00*** | 13.50 |
| 7/1/11 | ***330.00*** | 18.05 |
| 7/2/11 | 3.00 | 19.95 |
| 7/6/11 | 1.00 | 15.54 |
| 7/11/11 | 32.00 | 25.79 |
| 7/13/11 | ***190.00*** | 30.92 |
| 7/15/11 | 37.00 | 26.65 |
| 7/18/11 | 2.00 | 23.78 |
| 7/20/11 | 1.00 | 18.26 |
| 7/25/11 | 4.00 | 16.64 |
| 7/27/11 | 33.00 | 17.62 |
| 8/1/11 | 0.10 | 5.31 |
| 8/3/11 | 33.00 | 6.75 |
| 8/8/11 | 12.00 | 8.65 |
| 8/10/11 | 5.00 | 8.23 |
| 8/15/11 | ***160.00*** | 5.88 |
| 8/17/11 | 12.00 | 6.31 |
| 8/22/11 | 27.00 | 10.34 |
| 8/24/11 | 4.00 | 9.41 |
| 8/29/11 | 30.00 | 10.23 |
| 8/31/11 | 1.00 | 8.11 |

*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.*

# 2011 Beach Monitoring Bacteria Data

## NSB#5 - Tappen Beach

| Date | *Enterococci* CFU/100ml. | Log AvgEnt |
|---|---|---|
| 04/13/11 | 41.00 | 0.00 |
| 04/18/11 | 21.00 | 29.34 |
| 04/20/11 | 43.00 | 33.33 |
| 04/25/11 | 12.00 | 25.82 |
| 04/27/11 | 41.00 | 28.32 |
| 05/02/11 | 38.00 | 29.74 |
| 05/04/11 | ***2200.00*** | ***55.00*** |
| 05/09/11 | 3.00 | ***38.24*** |
| 05/11/11 | 10.00 | 32.94 |
| 05/16/11 | ***310.00*** | ***41.25*** |
| 05/18/11 | 39.00 | ***41.01*** |
| 05/23/11 | 4.00 | 33.93 |
| 05/25/11 | 1.00 | 23.85 |
| 06/01/11 | 35.00 | 25.30 |
| 06/06/11 | 1.00 | 9.19 |
| 06/08/11 | 32.00 | 10.55 |
| 06/13/11 | 3.00 | 10.63 |
| 06/15/11 | 6.00 | 9.97 |
| 06/20/11 | 3.00 | 4.71 |
| 06/22/11 | 3.00 | 4.48 |
| 06/27/11 | 11.00 | 6.13 |
| 06/29/11 | 0.10 | 3.88 |
| 07/06/11 | 2.00 | 2.82 |
| 07/11/11 | 41.00 | 3.32 |
| 07/13/11 | 7.00 | 3.60 |
| 07/18/11 | 0.10 | 2.21 |
| 07/20/11 | 1.00 | 2.02 |
| 07/25/11 | 41.00 | 2.67 |
| 07/27/11 | 2.00 | 2.59 |
| 08/01/11 | 6.00 | 3.60 |
| 08/03/11 | 1.00 | 3.12 |
| 08/08/11 | 11.00 | 3.77 |
| 08/10/11 | 1.00 | 3.30 |
| 08/15/11 | 23.00 | 2.85 |
| 08/17/11 | 1.00 | 2.57 |
| 08/22/11 | 31.00 | 5.39 |
| 08/24/11 | 1.00 | 4.56 |
| 08/29/11 | 0.10 | 2.56 |
| 08/31/11 | 0.10 | 1.85 |

*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.*

# 2011 Beach Monitoring Bacteria Data

## NSB#6 - Sea Cliff Village Beach

| | *Enterococci* | |
|---|---|---|
| Date | CFU/100ml. | Log AvgEnt |
| 04/13/11 | 54.00 | 0.00 |
| 04/18/11 | 6.00 | 18.00 |
| 04/20/11 | 7.00 | 13.14 |
| 04/25/11 | 2.00 | 8.21 |
| 04/27/11 | 2.00 | 6.19 |
| 05/02/11 | 6.00 | 6.16 |
| 05/04/11 | ***220.00*** | 10.26 |
| 05/09/11 | 9.00 | 10.09 |
| 05/11/11 | 1.00 | 7.81 |
| 05/16/11 | 100.00 | 8.36 |
| 05/18/11 | 45.00 | 9.89 |
| 05/23/11 | 7.00 | 10.46 |
| 05/25/11 | 0.10 | 6.57 |
| 06/01/11 | 8.00 | 8.75 |
| 06/06/11 | 3.00 | 5.36 |
| 06/08/11 | ***130.00*** | 7.64 |
| 06/10/11 | ***120.00*** | 10.18 |
| 06/13/11 | 4.00 | 11.88 |
| 06/15/11 | 3.00 | 10.35 |
| 06/20/11 | 4.00 | 6.15 |
| 06/22/11 | 6.00 | 6.13 |
| 06/27/11 | 13.00 | 10.38 |
| 06/29/11 | 0.10 | 6.53 |
| 07/06/11 | 4.00 | 6.09 |
| 07/11/11 | 80.00 | 4.31 |
| 07/13/11 | 32.00 | 5.39 |
| 07/18/11 | 3.00 | 5.59 |
| 07/20/11 | 6.00 | 5.64 |
| 07/25/11 | 0.10 | 3.53 |
| 07/27/11 | 12.00 | 4.04 |
| 08/01/11 | 0.10 | 3.49 |
| 08/03/11 | 2.00 | 3.28 |
| 08/08/11 | 17.00 | 3.85 |
| 08/10/11 | 7.00 | 4.09 |
| 08/15/11 | 53.00 | 3.11 |
| 08/17/11 | 100.00 | 4.40 |
| 08/22/11 | 12.00 | 4.96 |
| 08/24/11 | 1.00 | 4.23 |
| 08/29/11 | 2.00 | 5.25 |
| 08/31/11 | 4.00 | 5.11 |

*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.*

# 2011 Sea Cliff Rainfall Data

## CSHH 2011 RAINFALL DATA FOR SEA CLIFF

| MO/DAY | AMT(MM)* | MO/DAY | AMT(MM) | MO/DAY | AMT(MM) | MO/DAY | AMT(MM) | MO/DAY | AMT(MM) |
|---|---|---|---|---|---|---|---|---|---|
| **MAR** | | **MAY** | | **JULY** | | **SEPTEMBER** | | **NOVEMBER** | |
| 10,11 | 35 | 4 | 17 | 3 | 3 | 6 | 54A | 16-17 | 20 |
| 16 | 17 | 14 | 1 | 8 | 11C | 7 | 18C | 21 | 3 |
| 21 | 12 | 15 | 4.5A | 18 | trace | 8 | 14A | 23 | 9.5 |
| 22 | snow | 16 | 1.5 | 19 | 1.5 | 15 | 2 | 28 | 2 |
| 23 | snow | 17 | 48A | 25 | 5 | 20 | 1.5 | 29 | 8.5 |
| 31 | 10 | 18 | 45A | 26 | 10 | 22 | 1 | **Total** | **43** |
| **Total** | **74 +** | 20 | 4 | 29 | 18A | 23 | 36B | | |
| | | 21 | 3.5 | **Total** | **48.5** | 24 | 1 | **DECEMBER** | |
| | | 22 | trace | | | 27 | 0.5 | 6 | 7 |
| | | 23 | 2 | | | 28 | 12C | 7 | 39 |
| **APRIL** | | 24 | 3.5 | **AUGUST** | | 29 | 13 | 8 | 9 |
| 1 | 3 | 30 | 8 | 1 | 1 | 30-10/1 | 10 | 20-30 | 53.5 |
| 4 | 3 | **Total** | **138** | 3 | 6 | **Total** | **163** | **Total** | **108.5** |
| 5 | 4 | | | 6 | 1 | | | | |
| 6 | trace | | | 7 | 12A | | | | |
| 7 | 4 | | | 8 | 0.5 | | | | |
| 11 | trace | **JUNE** | | 9 | 24.5C** | **OCTOBER** | | | |
| 12 | 14 | 9 | 7.5 | 14 | 138.5A** | 1,2 | 10 | | |
| 13 | 24 | 11 | 17B** | 15 | 4** | 3 | 9 | | |
| 16 | 32 | 13 | 1.5 | 16 | 0.5 | 12 | 1 | | |
| 17 | 4 | 14 | 1 | 18 | trace | 13 | 2.5 | | |
| 19 | 1.5 | 17 | 48** | 19 | 12 | 14 | 13.5 | | |
| 23 | 18.5 | 22 | 2.5 | 21 | 24A** | 17 | 0.5 | | |
| 24 | 12 | 23 | 49B | 27-28 | 157.5**† | 18 | 0.5 | | |
| 25 | 0.5 | 24 | 0.5** | **Total** | **381.5** | 19 | 26 | | |
| 28 | 7 | 29 | 0.5 | | | 20 | 2.5 | | |
| **Total** | **127.5** | **Total** | **127.5** | | | 27 | 32.5 | | |
| | | | | | | 29 | 24†† | | |
| | | | | | | **Total** | **122** | | |

*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. (This is meaningful during beach season.)

# 2011 Sea Cliff Rainfall Data

**Beach closures: 8 days of preemptive closures because of rain events for Sea Cliff and Tappen Beaches; 10 days of preemptive closures for North Hempstead Beach Park (which opens earlier in the season than other beaches). North Hempstead Beach Park was closed 1 additional day for elevated bacteria levels on 7/2, and Sea Cliff Beach was closed 5 additional days for elevated bacteria levels on 6/11-6/15.

†Tropical Storm Irene

††Snow and sleet

# Appendix C

## Summary Tables for 2011 and Previous Seasons

# Comparison of Averaged Indicator Bacteria Data

## 2011

| | Units in CFU/100 ml | Village Club of Sands Point | North Hempstead Beach Park (N) (former Hempstead Harbor Beach) | North Hempstead Beach Park (S)(former Bar Beach) | Tappen Beach | Sea Cliff Beach |
|---|---|---|---|---|---|---|
| **April** | Enterococci | 6.50 | 20.75 | 92.50 | 31.60 | 14.20 |
| **May** | Enterococci | 410.40 | 40.88 | 89.63 | 325.63 | 48.51 |
| **June** | Enterococci | 22.60 | 24.11 | 72.30 | 10.46 | 29.11 |
| **July** | Enterococci | 74.50 | 113.90 | 63.30 | 13.44 | 19.59 |
| **August** | Enterococci | 21.22 | 49.23 | 28.41 | 7.52 | 19.81 |
| ***Season Average **** | *Enterococci* | *122.96* | *52.14* | *64.93* | *77.60* | *27.14* |

*The "Season Averages" are the averages of all of the data points collected during the monitoring season.

## 2010

| | Units in CFU/100 ml | Village Club of Sands Point | North Hempstead Beach Park (N) (former Hempstead Harbor Beach) | North Hempstead Beach Park (S)(former Bar Beach) | Tappen Beach | Sea Cliff Beach |
|---|---|---|---|---|---|---|
| **April** | Enterococci | 6.82 | 9.42 | 12.44 | 22.60 | 2.24 |
| **May** | Enterococci | 17.88 | 14.50 | 8.14 | 30.89 | 23.65 |
| **June** | Enterococci | 94.37 | 12.48 | 17.02 | 14.01 | 56.85 |
| **July** | Enterococci | 65.00 | 19.22 | 14.11 | 88.23 | 54.55 |
| **August** | Enterococci | 104.34 | 89.23 | 77.12 | 44.13 | 159.64 |
| **September*** | Enterococci | na | 7.00 | 13.00 | 1.00 | 11.00 |
| ***Season Average ***** | *Enterococci* | *65.22* | *29.61* | *26.22* | *40.19* | *67.48* |

na = not analyzed
* Only one data point collected in September.
**The "Season Averages" are the averages of all of the data points collected during the monitoring season.

# Comparison of Averaged Indicator Bacteria Data

## 2009

| | Units in CFU/100 ml | Village Club of Sands Point | North Hempstead Beach Park (N) (former Hempstead Harbor Beach) | North Hempstead Beach Park (S)(former Bar Beach) | Tappen Beach | Sea Cliff Beach |
|---|---|---|---|---|---|---|
| **April** | Enterococci | 2.20 | 1.52 | 1.53 | 2.52 | 9.70 |
| **May** | Enterococci | 6.78 | 5.16 | 4.14 | 4.03 | 5.78 |
| **June** | Enterococci | 104.24 | 47.22 | 290.88 | 247.31 | 21.46 |
| **July** | Enterococci | 31.03 | 102.89 | 206.46 | 23.24 | 26.62 |
| **August** | Enterococci | 84.00 | 86.24 | 16.82 | 7.37 | 70.36 |
| **September*** | Enterococci | 4.00 | 120 | 90.00 | 0.10 | 11.00 |
| ***Season Average ***** | *Enterococci* | *48.69* | *54.70* | *109.23* | *65.02* | *29.97* |

* Only one data point collected in September.
**The "Season Averages" are the averages of all of the data points collected during the monitoring season.

## 2008*

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

*First Year in which enterococci was the only indicator bacteria monitored.

# Comparison of Averaged Indicator Bacteria Data

## 2007

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

## 2006

| | Units in CFU/100 ml | Village Club of Sands Point | North Hempstead Beach Park (N) (former Hempstead Harbor Beach) | North Hempstead Beach Park (S)(former Bar Beach) | Tappen Beach | Sea Cliff Beach |
|---|---|---|---|---|---|---|
| **April** | Enterococci | 0.1 | 0.1 | 0.1 | 2 | 0.1 |
| | **Fecal** | **7** | **0.6** | **1** | **5** | **0.6** |
| **May** | Enterococci | 7 | 16 | 35 | 333 | 73 |
| | **Fecal** | **16** | **9** | **100** | **20** | **14** |
| **June** | Enterococci | 6 | 27 | 30 | 33 | 12 |
| | **Fecal** | **9** | **98** | **107** | **73** | **68** |
| **July** | Enterococci | 68 | 46 | 40 | 35 | 47 |
| | **Fecal** | **259** | **567** | **154** | **150** | **277** |
| **August** | Enterococci | 120 | 46 | 76 | 11 | 65 |
| | **Fecal** | **106** | **97** | **100** | **94** | **51** |
| ***Season Average*** | *Enterococci* | *40* | *27* | *36* | *83* | *39* |
| | ***Fecal*** | ***79*** | ***151*** | ***92*** | ***69*** | ***82*** |

# Comparison of Averaged Indicator Bacteria Data

## 2005

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

## 2004

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

# Comparison of Averaged Indicator Bacteria Data

## 2003

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

## 2002

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

# Comparison of Averaged Indicator Bacteria Data

## 2001

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

# 1995-2011 Water Quality Data Summary

## CSHH #1 - Beacon 11

| | 2011 | | | | |
|---|---|---|---|---|---|
| | Avg. Water Temp. (°C) (Bottom) | Avg. DO (ppm) (Bottom) | Avg. Salinity (ppt) (Bottom) | Avg. Air Temp. (°C) | Avg. Turbidity (NTUs) (0.5 m) |
| May | 15.23 | 6.67 | 23.57 | 23.3 | 2.86 |
| June | 17.83 | 5.84 | 23.82 | 22.4 | 2.55 |
| July | 22.18 | 3.95 | 24.37 | 23.7 | 1.49 |
| Aug. | 23.05 | 4.60 | 24.56 | 24.7 | 2.74 |
| Sept. | 21.95 | 4.36 | 23.74 | 21.4 | 2.12 |
| Oct. | 17.99 | 7.08 | 23.81 | 14.4 | 2.85 |
| Nov | 12.84 | 9.16 | 23.82 | 6.9 | 1.21 |
| **Average** | 18.72 | 5.95 | 23.95 | 19.5 | 2.26 |

| | 2010 | | | | | 2009 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 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) | Avg. Turbidity (NTUs) (0.5 m) |
| May | 13.02 | 8.50 | 24.11 | 18.10 | 1.50 | 14.15 | 8.33 | 24.54 | 14.37 | 1.95 |
| June | 18.21 | 6.68 | 24.94 | 21.46 | 2.70 | 17.93 | 7.29 | 24.00 | 18.73 | 2.11 |
| July | 22.13 | 3.48 | 26.06 | 27.43 | 2.35 | 21.06 | 5.67 | 23.99 | 23.30 | 1.88 |
| Aug. | 22.58 | 2.96 | 27.00 | 24.03 | 2.19 | 23.40 | 3.71 | 24.55 | 25.68 | 2.81 |
| Sept. | 21.81 | 5.45 | 26.65 | 22.30 | 2.19 | 21.33 | 5.31 | 24.80 | 19.24 | 3.46 |
| Oct. | 17.14 | 7.05 | 26.47 | 13.88 | 1.04 | 14.60 | 7.07 | 24.75 | 11.53 | 2.93 |
| Nov. | 12.83 | 8.33 | 27.25 | 4.00 | 1.17 | - | - | - | - | - |
| **Average** | 18.25 | 6.06 | 26.07 | 18.74 | 1.88 | 18.74 | 6.23 | 24.44 | 18.81 | 2.52 |

# 1995-2011 Water Quality Data Summary

## 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 |

# 1995-2011 Water Quality Data Summary

## 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 |

# 1995-2011 Water Quality Data Summary

## CSHH #1 - Beacon 11

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

# 1995-2011 Water Quality Data Summary

## CSHH #2 - Bell Marker 6

| | 2011 | | | | |
|---|---|---|---|---|---|
| | Avg. Water Temp. (°C) (Bottom) | Avg. DO (ppm) (Bottom) | Avg. Salinity (ppt) (Bottom) | Avg. Air Temp. (°C) | Avg. Turbidity (NTUs) (0.5 m) |
| May | 14.70 | 7.64 | 23.34 | 19.6 | 0.57 |
| June | 16.95 | 4.95 | 24.11 | 22.8 | 1.18 |
| July | 19.88 | 3.39 | 24.79 | 24.8 | 0.83 |
| Aug. | 22.03 | 2.86 | 25.59 | 23.3 | 1.93 |
| Sept. | 21.47 | 3.91 | 24.38 | 22.3 | 1.48 |
| Oct. | 18.11 | 6.93 | 24.35 | 16.2 | 1.71 |
| Nov. | 13.75 | 8.15 | 24.42 | 7.2 | - |
| **Average** | 18.13 | 5.40 | 24.43 | 19.5 | 1.28 |

| | 2010 | | | | | 2009 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 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) | Avg. Turbidity (NTUs) (0.5 m) |
| May | 13.07 | 8.76 | 24.34 | 23.80 | 1.21 | 12.90 | 7.94 | 25.16 | 16.40 | 1.88 |
| June | 16.88 | 5.89 | 25.51 | 21.60 | 1.78 | 16.79 | 6.58 | 24.73 | 19.50 | 2.45 |
| July | 20.21 | 1.84 | 26.59 | 27.95 | 1.54 | 18.93 | 3.80 | 24.90 | 23.84 | 1.39 |
| Aug. | 22.09 | 2.66 | 27.21 | 24.70 | 1.54 | 21.43 | 1.34 | 25.28 | 25.78 | 1.94 |
| Sept. | 21.69 | 5.39 | 27.07 | 23.22 | 2.37 | 21.70 | 6.17 | 25.16 | 21.53 | 2.38 |
| Oct. | 16.82 | 7.54 | 27.06 | 15.00 | 0.78 | 14.66 | 7.90 | 25.64 | 12.47 | 1.58 |
| Nov. | 12.66 | 10.14 | 27.43 | 9.6 | 1.05 | - | - | - | - | - |
| **Average** | 17.63 | 6.03 | 26.46 | 20.84 | 1.47 | 17.73 | 5.62 | 25.15 | 19.92 | 1.93 |

# 1995-2011 Water Quality Data Summary

## 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 |

# 1995-2011 Water Quality Data Summary

## 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 |

# 1995-2011 Water Quality Data Summary

## 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 |

# 1995-2011 Water Quality Data Summary

## CSHH #3 - Glen Cove Creek

| | 2011 | | | | |
|---|---|---|---|---|---|
| | Avg. Water Temp. (°C) (Bottom) | Avg. DO (ppm) (Bottom) | Avg. Salinity (ppt) (Bottom) | Avg. Air Temp. (°C) | Avg. Turbidity (NTUs) (0.5 m) |
| May | 15.51 | 8.16 | 23.28 | 23.7 | 0.16 |
| June | 19.01 | 8.17 | 23.90 | 25.0 | 1.39 |
| July | 21.53 | 5.81 | 24.55 | 24.6 | 1.31 |
| Aug. | 22.60 | 4.10 | 25.13 | 24.1 | 2.18 |
| Sept. | 21.78 | 6.55 | 23.69 | 23.3 | 2.02 |
| Oct. | 17.91 | 8.16 | 23.96 | 12.8 | 1.96 |
| Nov. | 13.04 | 9.20 | 24.03 | 9.3 | 0.91 |
| **Average** | 18.77 | 7.16 | 24.08 | 20.4 | 1.42 |

| | 2010 | | | | | 2009 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 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) | Avg. Turbidity (NTUs) (0.5 m) |
| May | 13.39 | 8.91 | 24.18 | 24.70 | 0.70 | 14.10 | 9.22 | 24.71 | 17.40 | 2.00 |
| June | 18.52 | 7.60 | 25.25 | 22.68 | 1.85 | 17.60 | 7.83 | 24.38 | 20.40 | 1.68 |
| July | 21.60 | 3.98 | 26.29 | 29.30 | 1.61 | 20.50 | 5.56 | 24.46 | 24.54 | 1.80 |
| Aug. | 22.82 | 4.62 | 26.80 | 25.30 | 1.64 | 23.13 | 5.62 | 24.76 | 26.83 | 2.64 |
| Sept. | 21.83 | 5.96 | 26.88 | 23.56 | 2.09 | 21.27 | 5.54 | 25.10 | 19.64 | 3.13 |
| Oct. | 16.80 | 8.26 | 26.62 | 15.90 | 0.59 | 14.98 | 7.76 | 25.27 | 13.80 | 2.28 |
| Nov. | 12.72 | 10.25 | 27.29 | 9.10 | 0.80 | - | - | - | - | - |
| **Average** | 18.24 | 7.08 | 26.18 | 21.51 | 1.32 | 18.60 | 6.92 | 24.78 | 20.43 | 2.25 |

# 1995-2011 Water Quality Data Summary

## 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 |

# 1995-2011 Water Quality Data Summary

## 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 |

# 1995-2011 Water Quality Data Summary

## CSHH #3 - Glen Cove Creek

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

# 1995-2011 Water Quality Data Summary

## CSHH #8- Glen Cove Creek STP Outfall

| | 2011 | | | | |
|---|---|---|---|---|---|
| | Avg. Water Temp. (°C) (Bottom) | Avg. DO (ppm) (Bottom) | Avg. Salinity (ppt) (Bottom) | Avg. Air Temp. (°C) | Avg. Turbidity (NTUs) (0.5 m) |
| May | 16.64 | 8.22 | 22.95 | 26.1 | 0.26 |
| June | 18.75 | 7.56 | 23.51 | 25.5 | 2.08 |
| July | 21.96 | 3.66 | 24.38 | 26.0 | 2.30 |
| Aug. | 22.99 | 3.50 | 24.78 | 24.9 | 2.62 |
| Sept. | 22.17 | 5.48 | 23.40 | 23.6 | 2.59 |
| Oct. | 18.01 | 7.68 | 23.74 | 17.2 | 2.09 |
| Nov. | 13.14 | 9.70 | 23.86 | 9.4 | 1.46 |
| **Average** | 19.09 | 6.54 | 23.80 | 21.8 | 1.91 |

| | 2010 | | | | | 2009 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 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) | Avg. Turbidity (NTUs) (0.5 m) |
| May | 14.40 | 8.87 | 23.67 | 26.10 | 2.07 | 14.49 | 8.46 | 24.62 | 19.37 | 2.78 |
| June | 19.11 | 8.14 | 25.06 | 23.90 | 2.54 | 18.08 | 7.71 | 24.22 | 20.85 | 1.74 |
| July | 22.78 | 4.22 | 26.07 | 29.90 | 2.28 | 21.12 | 5.23 | 24.26 | 25.86 | 2.58 |
| Aug. | 23.35 | 3.78 | 26.68 | 26.10 | 2.34 | 24.01 | 6.65 | 24.44 | 28.20 | 4.27 |
| Sept. | 22.25 | 5.67 | 26.47 | 23.90 | 2.40 | 21.38 | 6.21 | 24.74 | 20.46 | 3.15 |
| Oct. | 16.68 | 7.88 | 26.29 | 16.40 | 1.66 | 15.14 | 7.03 | 25.00 | 14.08 | 2.88 |
| Nov. | 12.85 | 9.82 | 26.96 | 10.00 | 1.22 | - | - | - | - | - |
| **Average** | 18.77 | 6.91 | 25.89 | 22.33 | 2.07 | 19.04 | 6.88 | 24.55 | 21.47 | 2.90 |

# 1995-2011 Water Quality Data Summary

## 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 |

# 1995-2011 Water Quality Data Summary

## 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 |

# Seasonal Averages for Selected Water-Quality Parameters

***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 |
|---|---|---|---|---|
| **2011** | 23.71 ppt | 24.27 ppt | 23.99 ppt | 23.18 ppt |
| **2010** | 25.77 | 26.32 | 26.00 | 24.94 |
| **2009** | 24.22 | 24.87 | 24.54 | 23.68 |
| **2008** | 25.01 | 25.78 | 25.28 | 24.29 |
| **2007** | 25.41 | 26.07 | 25.62 | 24.30 |
| **2006** | 25.3 | 26.0 | 25.6 | 24.3 |
| **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 |
|---|---|---|---|---|---|
| **2011** | 127.5 mm | 48.5 mm | 381.5 mm | 163 mm | 122 mm |
| **2010** | 50.5 | 103.5 | 61.5 | 97 | 146 |
| **2009** | 294 | 150.5 | 83 | 69 | 175 |
| **2008** | 9.5 | 91 | 205.5 | 177.5 | 118 |
| **2007** | 159.5 | 198.5 | 132.5 | 36.5 | 136 |
| **2006** | 262 | 148 | 89 | 105 | 166.5 |
| **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) |

# Seasonal Averages for Selected Water-Quality Parameters

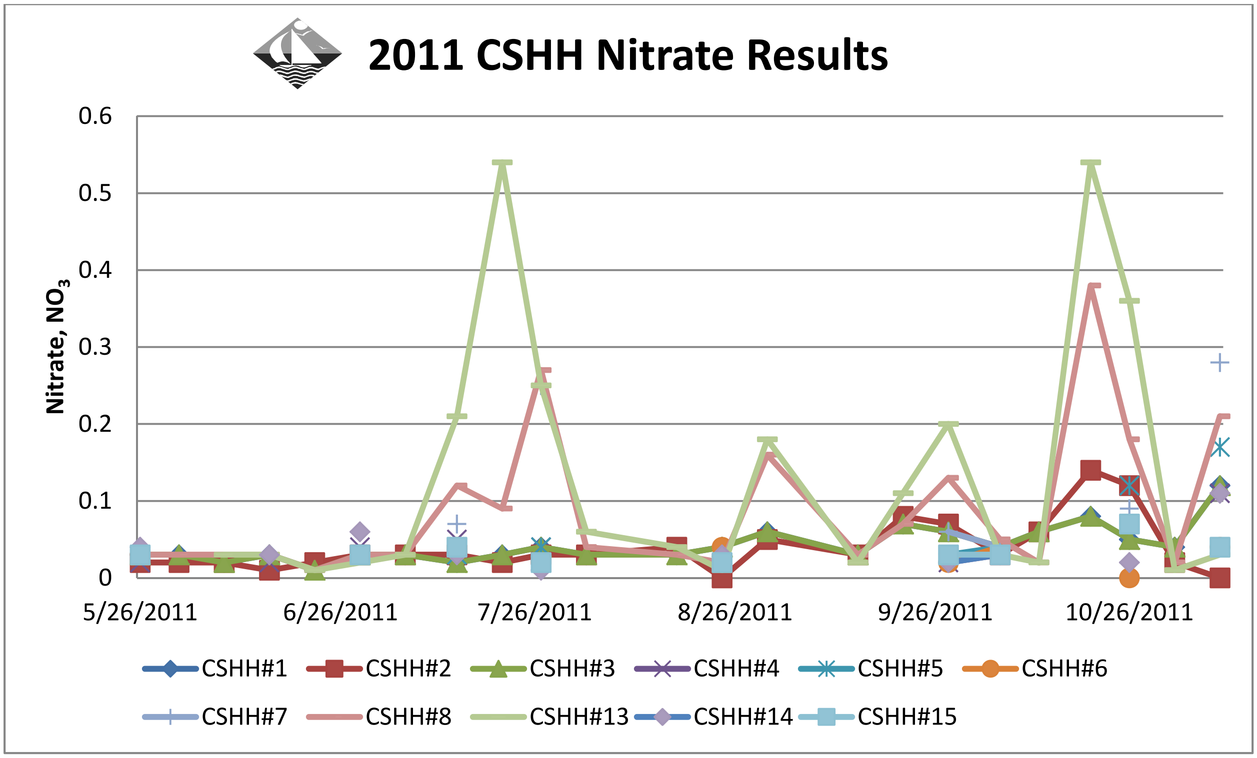
***Bottom Dissolved Oxygen Averages***

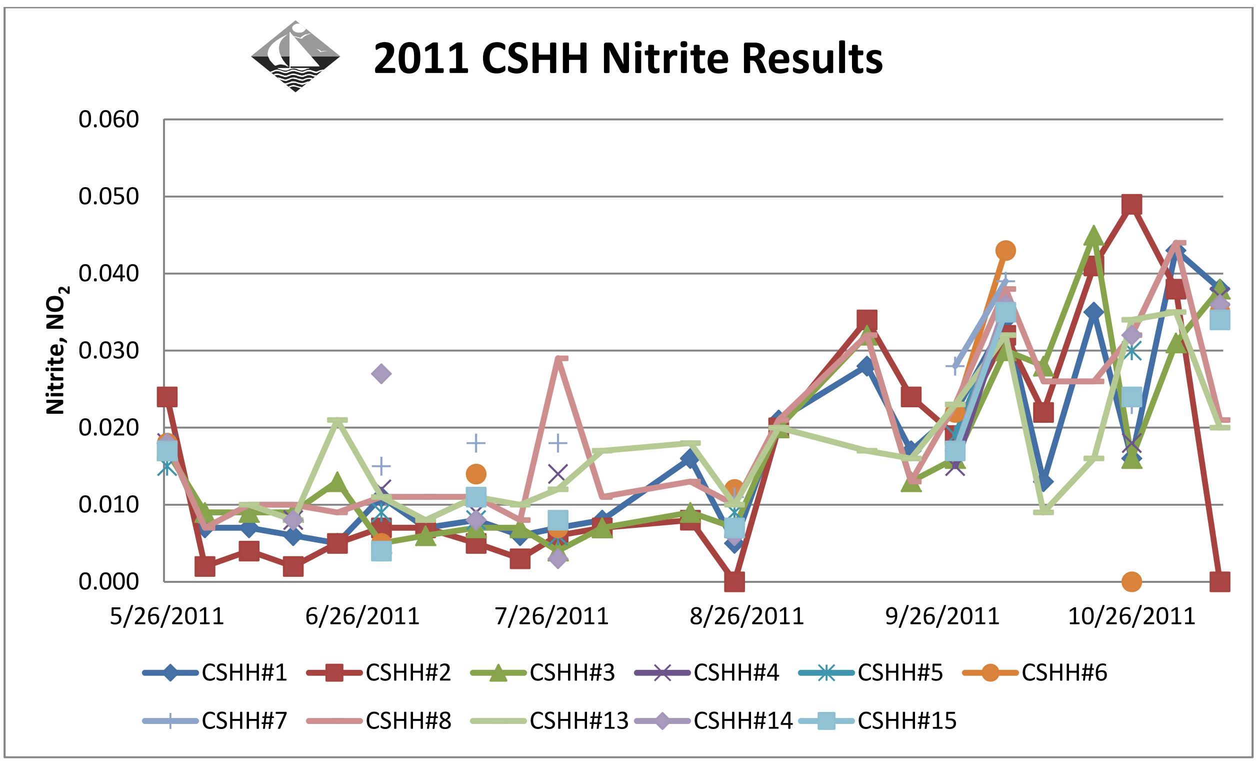
| ***Averages for Bottom DO*** | ***2011*** | ***2010*** | ***2009*** | ***2008*** | ***2007*** |
|---|---|---|---|---|---|
| **Beacon 11, CSHH #1** | 5.64 ppm | 5.55 ppm | 6.09 ppm | 5.50 ppm | 4.99 ppm |
| **Bell Buoy 6, CSHH #2** | 4.77 | 5.16 | 5.30 | 5.31 | 5.37 |
| **Glen Cove Creek, Red Channel Marker, CSHH #3** | 6.87 | 6.41 | 6.72 | 6.35 | 6.02 |
| **Glen Cove STP Outfall, CSHH #8** | 6.14 | 6.26 | 6.73 | 5.73 | 5.93 |

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

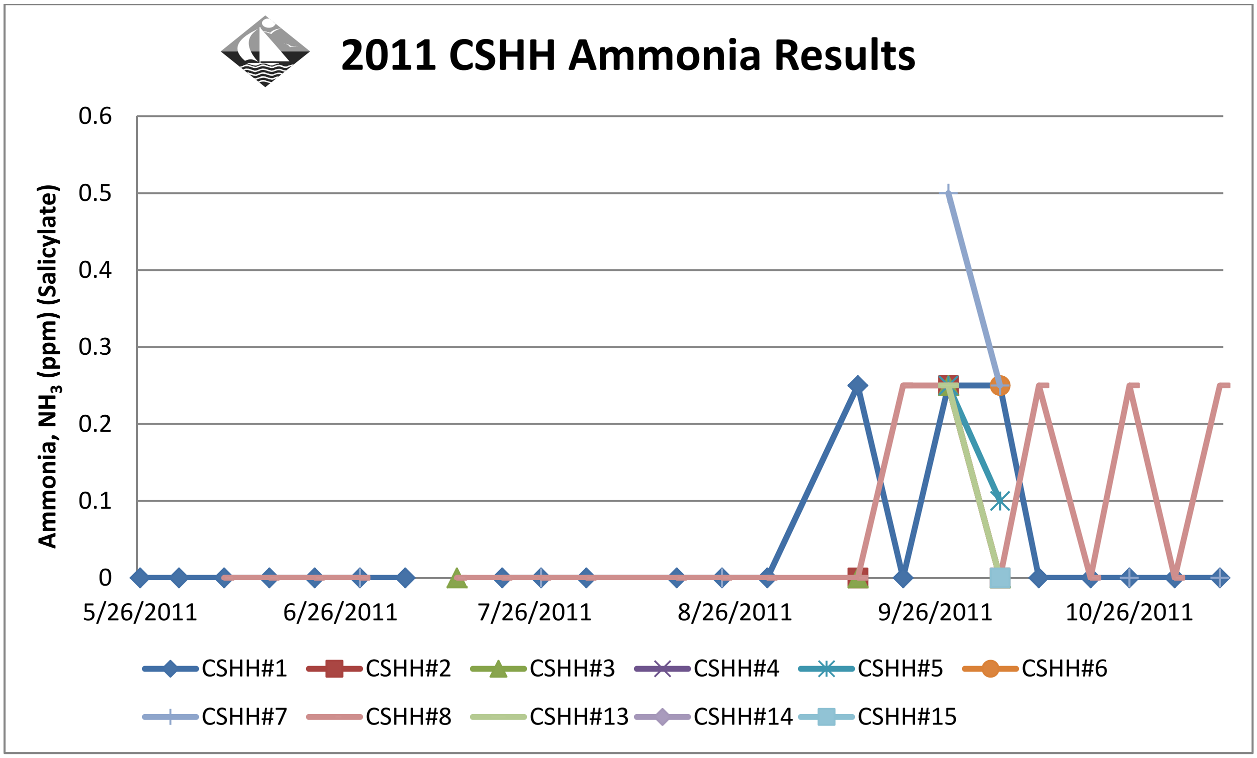
| ***Averages for Bottom DO*** | ***2000*** | ***1999*** | ***1998*** | ***1997*** | ***1996*** |
|---|---|---|---|---|---|
| **Beacon 11, CSHH #1** | 5.64 ppm | 5.85 ppm | 5.17 ppm | 4.39 ppm | 5.90 ppm |
| **Bell Buoy 6, CSHH #2** | 6.10 | 5.44 | 5.45 | 4.54 | 7.11 |
| **Glen Cove Creek, Red Channel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

## *2008-2011 Nitrogen Data*



## 2008-2011 Nitrogen Data



# 2008-2011 Nitrogen Data

CSHH Water-Monitoring Program

| Collection Date | Sample No. | Nitrate, $NO_3$ (mg/L) | Nitrite, $NO_2$ (mg/L) | $NH_3$ (ppm) (Nessler) | $NH_3$ (ppm) (Salicylate) |
|---|---|---|---|---|---|
| 5/26/2011 | CSHH#1 | 0.03 | 0.018 | 0 | 0 |
| | CSHH#2 | 0.02 | 0.024 | | |
| | CSHH#3 | 0.03 | 0.017 | | |
| | CSHH#4 | 0.02 | 0.018 | | |
| | CSHH#5 | 0.03 | 0.015 | | |
| | CSHH#6 | 0.03 | 0.018 | | |
| | CSHH#7 | 0.03 | 0.017 | | |
| | CSHH#8 | 0.03 | 0.018 | | |
| | CSHH#13 | 0.02 | 0.016 | | |
| | CSHH#14 | 0.04 | 0.018 | | |
| | CSHH#15 | 0.03 | 0.017 | | |
| 6/1/2011 | CSHH#1 | 0.04 | 0.007 | 0 | 0 |
| | CSHH#2 | 0.02 | 0.002 | 0 | |
| | CSHH#3 | 0.03 | 0.009 | | |
| | CSHH#8 | 0.03 | 0.007 | | |
| 6/8/2011 | CSHH#1 | 0.02 | 0.007 | 0 | 0 |
| | CSHH#2 | 0.02 | 0.004 | | |
| | CSHH#3 | 0.02 | 0.009 | | |
| | CSHH#8 | 0.03 | 0.010 | 0 | 0 |
| | CSHH#13 | 0.03 | 0.010 | | |
| 6/15/2011 | CSHH#1 | 0.03 | 0.006 | 0 | 0 |
| | CSHH#2 | 0.01 | 0.002 | | |
| | CSHH#3 | 0.03 | 0.009 | | |
| | CSHH#4 | 0.02 | 0.008 | | |
| | CSHH#8 | 0.03 | 0.010 | 0 | 0 |
| | CSHH#13 | 0.03 | 0.008 | | |
| | CSHH#14 | 0.03 | 0.008 | | |
| 6/22/2011 | CSHH#1 | 0.02 | 0.005 | 0 | 0 |
| | CSHH#2 | 0.02 | 0.005 | | |
| | CSHH#3 | 0.01 | 0.013 | | |
| | CSHH#8 | 0.01 | 0.009 | 0 | 0 |
| | CSHH#13 | 0.01 | 0.021 | | |
| 6/29/2011 | CSHH#1 | 0.05 | 0.011 | 0 | 0 |
| | CSHH#2 | 0.03 | 0.007 | | |
| | CSHH#3 | 0.03 | 0.005 | | |

## *2008-2011 Nitrogen Data*

| Collection Date | Sample No. | Nitrate, $NO_3$ (mg/L) | Nitrite, $NO_2$ (mg/L) | $NH_3$ (ppm) (Nessler) | $NH_3$ (ppm) (Salicylate) |
|---|---|---|---|---|---|
| | CSHH#4 | 0.04 | 0.012 | | |
| | CSHH#5 | 0.03 | 0.009 | | |
| | CSHH#6 | 0.03 | 0.005 | | |
| | CSHH#7 | 0.06 | 0.015 | 0 | 0 |
| | CSHH#8 | 0.03 | 0.011 | 0 | 0 |
| | CSHH#13 | 0.02 | 0.011 | | |
| | CSHH#14 | 0.06 | 0.027 | | |
| | CSHH#15 | 0.03 | 0.004 | | |
| 7/6/2011 | CSHH#1 | 0.03 | 0.007 | 0 | 0 |
| | CSHH#2 | 0.03 | 0.007 | | |
| | CSHH#3 | 0.03 | 0.006 | | |
| | CSHH#8 | 0.03 | 0.011 | 0 | |
| | CSHH#13 | 0.03 | 0.008 | | |
| 7/14/2011 | CSHH#1 | 0.03 | 0.008 | | |
| | CSHH#2 | 0.03 | 0.005 | | |
| | CSHH#3 | 0.02 | 0.007 | 0 | 0 |
| | CSHH#4 | 0.05 | 0.009 | | |
| | CSHH#5 | 0.03 | 0.008 | | |
| | CSHH#6 | 0.04 | 0.014 | | |
| | CSHH#7 | 0.07 | 0.018 | | |
| | CSHH#8 | 0.12 | 0.011 | 0 | 0 |
| | CSHH#13 | 0.21 | 0.011 | | |
| | CSHH#14 | 0.03 | 0.008 | | |
| | CSHH#15 | 0.04 | 0.011 | | |
| 7/21/2011 | CSHH#1 | 0.02 | 0.006 | 0 | 0 |
| | CSHH#2 | 0.02 | 0.003 | | |
| | CSHH#3 | 0.03 | 0.007 | | |
| | CSHH#8 | 0.09 | 0.008 | 0 | 0 |
| | CSHH#13 | >0.55 | 0.010 | | |
| 7/27/2011 | CSHH#1 | 0.03 | 0.007 | 0 | 0 |
| | CSHH#2 | 0.03 | 0.006 | | |
| | CSHH#3 | 0.04 | 0.004 | | |
| | CSHH#4 | 0.04 | 0.014 | | |
| | CSHH#5 | 0.04 | 0.006 | | |
| | CSHH#6 | 0.02 | 0.007 | | |
| | CSHH#7 | 0.25 | 0.018 | 0 | 0 |
| | CSHH#8 | 0.27 | 0.029 | 0 | 0 |
| | CSHH#13 | 0.25 | 0.012 | | |
| | CSHH#14 | 0.01 | 0.003 | | |
| | CSHH#15 | 0.02 | 0.008 | | |

## 2008-2011 Nitrogen Data

| Collection Date | Sample No. | Nitrate, $NO_3$ (mg/L) | Nitrite, $NO_2$ (mg/L) | $NH_3$ (ppm) (Nessler) | $NH_3$ (ppm) (Salicylate) |
|---|---|---|---|---|---|
| 8/3/2011 | CSHH#1 | 0.02 | 0.008 | 0 | 0 |
| | CSHH#2 | 0.03 | 0.007 | | |
| | CSHH#3 | 0.03 | 0.007 | | |
| | CSHH#8 | 0.04 | 0.011 | 0 | 0 |
| | CSHH#13 | 0.06 | 0.017 | | |
| 8/17/2011 | CSHH#1 | 0.05 | 0.016 | 0 | 0 |
| | CSHH#2 | 0.04 | 0.008 | | |
| | CSHH#3 | 0.03 | 0.009 | | |
| | CSHH#8 | 0.03 | 0.013 | 0 | 0 |
| | CSHH#13 | 0.04 | 0.018 | | |
| 8/24/2011 | CSHH#1 | 0.03 | 0.005 | 0 | 0 |
| | CSHH#2 | NA | NA | | |
| | CSHH#3 | 0.04 | 0.007 | | |
| | CSHH#4 | 0.02 | 0.007 | | |
| | CSHH#5 | 0.03 | 0.009 | | |
| | CSHH#6 | 0.04 | 0.012 | | |
| | CSHH#7 | 0.03 | 0.011 | 0 | 0 |
| | CSHH#8 | 0.02 | 0.010 | 0 | 0 |
| | CSHH#13 | 0.01 | 0.010 | | |
| | CSHH#14 | 0.03 | 0.006 | | |
| | CSHH#15 | 0.02 | 0.007 | | |
| 8/31/2011 | CSHH#1 | 0.08 | 0.021 | 0 | 0 |
| | CSHH#2 | 0.05 | 0.020 | | |
| | CSHH#3 | 0.06 | 0.020 | | |
| | CSHH#8 | 0.16 | 0.021 | 0 | 0 |
| | CSHH#13 | 0.18 | 0.020 | | |
| 9/14/2011 | CSHH#1 | 0.03 | 0.028 | 0 | 0.25 |
| | CSHH#2 | 0.03 | 0.034 | 0 | 0 |
| | CSHH#3 | 0.03 | 0.032 | 0 | 0 |
| | CSHH#8 | 0.03 | 0.032 | 0 | 0 |
| | CSHH#13 | 0.02 | 0.017 | | |
| 9/21/2011 | CSHH#1 | 0.04 | 0.017 | 0 | 0 |
| | CSHH#2 | 0.08 | 0.024 | | |
| | CSHH#3 | 0.07 | 0.013 | | |
| | CSHH#8 | 0.07 | 0.013 | 0 | 0.25 |
| | CSHH#13 | 0.11 | 0.016 | | |
| 9/28/2011 | CSHH#1 | 0.07 | 0.022 | 0 | 0.25 |
| | CSHH#2 | 0.07 | 0.019 | 0 | 0.25 |
| | CSHH#3 | 0.06 | 0.016 | 0 | 0.25 |
| | CSHH#4 | 0.02 | 0.015 | | |

# 2008-2011 Nitrogen Data

| Collection Date | Sample No. | Nitrate, $NO_3$ (mg/L) | Nitrite, $NO_2$ (mg/L) | $NH_3$ (ppm) (Nessler) | $NH_3$ (ppm) (Salicylate) |
|---|---|---|---|---|---|
| | CSHH#5 | 0.03 | 0.019 | 0 | 0.25 |
| | CSHH#6 | 0.02 | 0.022 | | |
| | CSHH#7 | 0.06 | 0.028 | 0 | 0.5 |
| | CSHH#8 | 0.13 | 0.023 | 0 | 0.25 |
| | CSHH#13 | 0.20 | 0.023 | 0 | 0.25 |
| | CSHH#14 | 0.02 | 0.017 | | |
| | CSHH#15 | 0.03 | 0.017 | | |
| 10/6/2011 | CSHH#1 | 0.04 | 0.034 | 0 | 0.25 |
| | CSHH#2 | 0.03 | 0.032 | 0 | 0 |
| | CSHH#3 | 0.04 | 0.030 | 0 | 0 |
| | CSHH#4 | 0.03 | 0.035 | 0 | 0 |
| | CSHH#5 | 0.04 | 0.035 | 0 | 0.1 |
| | CSHH#6 | 0.04 | 0.043 | 0 | 0.25 |
| | CSHH#7 | 0.04 | 0.039 | 0 | 0.25 |
| | CSHH#8 | 0.05 | 0.038 | 0 | 0 |
| | CSHH#13 | 0.03 | 0.032 | 0 | 0 |
| | CSHH#14 | 0.03 | 0.036 | 0 | |
| | CSHH#15 | 0.03 | 0.035 | 0 | 0 |
| 10/12/2011 | CSHH#1 | 0.04 | 0.013 | 0 | 0 |
| | CSHH#2 | 0.06 | 0.022 | | |
| | CSHH#3 | 0.06 | 0.028 | | |
| | CSHH#8 | 0.02 | 0.026 | 0 | 0.25 |
| | CSHH#13 | 0.02 | 0.009 | | |
| 10/20/2011 | CSHH#1 | 0.08 | 0.035 | 0 | 0 |
| | CSHH#2 | 0.14 | 0.041 | | |
| | CSHH#3 | 0.08 | 0.045 | | |
| | CSHH#8 | 0.38 | 0.026 | 0 | 0 |
| | CSHH#13 | >0.55 | 0.016 | | |
| 10/26/2011 | CSHH#1 | 0.05 | 0.016 | 0 | 0 |
| | CSHH#2 | 0.12 | 0.049 | | |
| | CSHH#3 | 0.05 | 0.016 | | |
| | CSHH#4 | 0.07 | 0.018 | | |
| | CSHH#5 | 0.12 | 0.030 | | |
| | CSHH#6 | NA | NA | | |
| | CSHH#7 | 0.09 | 0.023 | 0 | 0 |
| | CSHH#8 | 0.18 | 0.032 | 0 | 0.25 |
| | CSHH#13 | 0.36 | 0.034 | | |
| | CSHH#14 | 0.02 | 0.032 | | |
| | CSHH#15 | 0.07 | 0.024 | | |

# 2008-2011 Nitrogen Data

| Collection Date | Sample No. | Nitrate, $NO_3$ (mg/L) | Nitrite, $NO_2$ (mg/L) | $NH_3$ (ppm) (Nessler) | $NH_3$ (ppm) (Salicylate) |
|---|---|---|---|---|---|
| 11/2/2011 | CSHH#1 | 0.02 | 0.043 | 0 | 0 |
| | CSHH#2 | 0.02 | 0.038 | | |
| | CSHH#3 | 0.04 | 0.031 | | |
| | CSHH#8 | 0.02 | 0.044 | 0 | 0.25 |
| | CSHH#13 | 0.01 | 0.035 | | |
| 11/9/2011 | CSHH#1 | 0.17 | 0.038 | 0 | 0 |
| | CSHH#2 | NA | NA | | |
| | CSHH#3 | 0.12 | 0.038 | | |
| | CSHH#4 | 0.11 | 0.037 | | |
| | CSHH#5 | 0.17 | 0.035 | | |
| | CSHH#6 | 0.04 | 0.035 | | |
| | CSHH#7 | 0.28 | 0.035 | 0 | 0 |
| | CSHH#8 | 0.21 | 0.021 | 0 | 0 |
| | CSHH#13 | 0.03 | 0.020 | | |
| | CSHH#14 | 0.11 | 0.036 | | |
| | CSHH#15 | 0.04 | 0.034 | | |

# 2008-2011 Nitrogen Data

**CSHH Water-Monitoring Program**

**2010 Nitrate & Nitrite Sample Results** **2010 Ammonia Data**

| Collection Date | Station No. | Nitrate, $NO_3$ | Nitrite, $NO_2$ | Collection Date | Station No. | $NH_3$ (ppm) (Nessler) | $NH_3$ (ppm) (Salicylate) |
|---|---|---|---|---|---|---|---|
| 5/20/2010 | CSHH#1 | 0.01 | 0.017 | 5/20/2010 | CSHH#1 | 0 | 0 |
| | CSHH#2 | 0.01 | 0.024 | | CSHH#2 | | 0.2 |
| | CSHH#3 | 0.09 | 0.015 | | CSHH#3 | | 0 |
| | CSHH#8 | 0.01 | 0.019 | | CSHH#8 | | 0 |
| 5/26/2010 | CSHH#1 | 0.02 | 0.030 | 5/26/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.02 | 0.010 | | CSHH#2 | | 0 |
| | CSHH#3 | 0.03 | 0.010 | | CSHH#3 | | 0 |
| | CSHH#8 | 0.02 | 0.015 | | CSHH#8 | | 0 |
| 6/2/2010 | CSHH#1 | 0.03 | 0.011 | 6/2/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.02 | 0.007 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.03 | 0.008 | | CSHH#3 | | 0 |
| | CSHH#8 | 0.05 | 0.011 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.04 | 0.012 | | CSHH#13 | | 0 |
| 6/9/2010 | CSHH#1 | 0.04 | 0.008 | 6/9/2010 | CSHH#1 | | 0 |
| | CSHH#2 | na | na | | CSHH#3 | 0 | |
| | CSHH#3 | 0.03 | 0.007 | | CSHH#8 | | 0 |
| | CSHH#8 | 0.04 | 0.005 | | CSHH#4 | 0 | |
| | CSHH#13 | 0.04 | 0.007 | | CSHH#5 | 0 | |
| | | | | | CSHH#7 | 0 | 0 |
| | | | | | electronic equipment trouble | | |
| 6/16/2010 | CSHH#1 | 0.02 | 0.008 | 6/16/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.01 | 0.003 | | CSHH#2 | | 0 |
| | CSHH#3 | 0.01 | 0.007 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.06 | 0.006 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.02 | 0.010 | | CSHH#13 | na | |
| 6/23/2010 | CSHH#1 | 0.03 | 0.008 | 6/23/2010 | CSHH#1 | | 1.0 |
| | CSHH#2 | 0.02 | 0.003 | | CSHH#2 | | 0 |
| | CSHH#3 | 0.03 | 0.005 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.01 | 0.012 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.55 | 0.019 | | CSHH#13 | | 0 |
| 6/30/2010 | CSHH#1 | 0.03 | 0.009 | 6/30/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.03 | 0.013 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.03 | 0.002 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.02 | 0.008 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.01 | 0.012 | | CSHH#13 | na | na |

# 2008-2011 Nitrogen Data

| Collection Date | Station No. | Nitrate, $NO_3$ | Nitrite. $NO_2$ | Collection Date | Station No. | $NH_3$ (ppm) (Nessler) | $NH_3$ (ppm) (Salicylate) |
|---|---|---|---|---|---|---|---|
| 7/7/2010 | CSHH#1 | 0.02 | 0.005 | 7/7/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.02 | 0.005 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.02 | 0.002 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.02 | 0.007 | | CSHH#8 | | 0.10 |
| | CSHH#13 | 0.02 | 0.004 | | CSHH#13 | | 0.05 |
| 7/15/2010 | CSHH#1 | 0.03 | 0.007 | 7/15/2010 | CSHH#1 | | 0.10 |
| | CSHH#2 | 0.03 | 0.025 | | CSHH#2 | | 0 |
| | CSHH#3 | 0.03 | 0.004 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.03 | 0.005 | | CSHH#8 | | 0 |
| 7/21/2010 | CSHH#1 | 0.03 | 0.005 | 7/21/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.02 | 0.004 | | CSHH#2 | | 0 |
| | CSHH#3 | 0.03 | 0.005 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.03 | 0.007 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.03 | 0.010 | | CSHH#13 | | 0 |
| | | | | | CSHH#4 | 0 | |
| | | | | | CSHH#5 | 0 | |
| | | | | | CSHH#6 | 0 | |
| | | | | | CSHH#7 | 0 | 0 |
| 7/28/2010 | CSHH#1 | 0.07 | 0.007 | 7/28/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.02 | 0.005 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.03 | 0.005 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.04 | 0.011 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.02 | 0.011 | | CSHH#13 | 0 | |
| 8/4/2010 | CSHH#1 | 0.02 | 0.008 | 8/4/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.02 | 0.004 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.01 | 0.005 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.02 | 0.009 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.03 | 0.005 | | CSHH#13 | 0 | |
| 8/11/2010 | CSHH#1 | 0.04 | 0.012 | 8/11/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.02 | 0.007 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.04 | 0.007 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.02 | 0.009 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.04 | 0.015 | | CSHH#13 | na | na |
| | | | | | CSHH#14 | 0 | |
| | | | | | CSHH#15 | na | na |
| | | | | | CSHH#4 | 0 | |
| | | | | | CSHH#5 | 0 | |
| | | | | | CSHH#6 | 0 | |
| | | | | | CSHH#7 | | 0 |

# 2008-2011 Nitrogen Data

| Collection Date | Station No. | Nitrate, $NO_3$ | Nitrite, $NO_2$ | Collection Date | Station No. | $NH_3$ (ppm) (Nessler) | $NH_3$ (ppm) (Salicylate) |
|---|---|---|---|---|---|---|---|
| 8/18/2010 | CSHH#1 | 0.04 | 0.013 | 8/18/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.04 | 0.005 | | CSHH#2 | | 0 |
| | CSHH#3 | 0.05 | 0.008 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.05 | 0.008 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.05 | 0.012 | | CSHH#13 | | 0 |
| 8/26/2010 | CSHH#1 | 0.02 | 0.030 | 8/26/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.02 | 0.018 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.02 | 0.021 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.02 | 0.018 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.01 | 0.017 | | CSHH#13 | 0 | |
| 9/2/2010 | CSHH#1 | 0.05 | 0.012 | 9/2/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.03 | 0.020 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.04 | 0.011 | | CSHH#3 | | 0 |
| | CSHH#8 | 0.04 | 0.018 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.02 | 0.011 | | CSHH#13 | 0 | |
| 9/8/2010 | CSHH#1 | 0.03 | 0.043 | 9/8/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.01 | 0.033 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.02 | 0.039 | | CSHH#3 | 0 | |
| | CSHH#4 | 0.02 | 0.038 | | CSHH#4 | 0 | |
| | CSHH#5 | 0.02 | 0.040 | | CSHH#5 | 0 | |
| | CSHH#6 | 0.02 | 0.042 | | CSHH#6 | 0 | |
| | CSHH#7 | 0.03 | 0.044 | | CSHH#7 | | 0 |
| | CSHH#8 | 0.02 | 0.037 | | CSHH#8 | na | na |
| | CSHH#14 | 0.05 | 0.035 | | CSHH#13 | na | na |
| | CSHH#15 | 0.02 | 0.038 | | CSHH#14 | 0 | |
| | | | | | CSHH#15 | 0 | |
| 9/15/2010 | CSHH#1 | 0.03 | 0.039 | 9/15/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.01 | 0.061 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.03 | 0.039 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.03 | 0.023 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.02 | 0.015 | | CSHH#13 | 0 | |
| 9/22/2010 | CSHH#1 | 0.02 | 0.024 | 9/22/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.02 | 0.029 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.01 | 0.021 | | CSHH#3 | 0 | |
| | CSHH#8 | 0 | 0.013 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.01 | 0.018 | | CSHH#13 | | 0 |
| | | | | | CSHH#14 | 0 | |
| | | | | | CSHH#15 | | |
| | | | | | CSHH#4 | 0 | |
| | | | | | CSHH#5 | 0 | |
| | | | | | CSHH#6 | 0 | |

# 2008-2011 Nitrogen Data

| Collection Date | Station No. | Nitrate, $NO_3$ | Nitrite, $NO_2$ | Collection Date | Station No. | $NH_3$ (ppm) (Nessler) | $NH_3$ (ppm) (Salicylate) |
|---|---|---|---|---|---|---|---|
| | | | | | CSHH#7 | 0 | |
| 9/29/2010 | CSHH#1 | 0.01 | 0.027 | 9/29/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0 | 0.024 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.01 | 0.025 | | CSHH#3 | 0 | |
| | CSHH#8 | na | na | | CSHH#8 | | 0 |
| | CSHH#13 | 0 | 0.013 | | CSHH#13 | | 0 |
| 10/13/2010 | CSHH#1 | 0.03 | 0.058 | 10/13/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.03 | 0.058 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.02 | 0.056 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.02 | 0.035 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.03 | 0.042 | | CSHH#13 | na | na |
| 10/20/2010 | CSHH#1 | 0.03 | 0.075 | 10/20/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.02 | 0.069 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.02 | 0.070 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.02 | 0.059 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.04 | 0.051 | | CSHH#13 | | 0 |
| | | | | | CSHH#14 | 0 | |
| | | | | | CSHH#15 | 0 | |
| | | | | | CSHH#4 | 0 | |
| | | | | | CSHH#5 | 0 | |
| | | | | | CSHH#6 | 0 | |
| | | | | | CSHH#7 | 0 | |
| 10/28/2010 | CSHH#1 | 0.03 | 0.053 | 10/28/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.01 | 0.051 | | CSHH#2 | 0 | |
| | CSHH#3 | 0.01 | 0.056 | | CSHH#3 | 0 | |
| | CSHH#8 | 0.03 | 0.031 | | CSHH#8 | na | na |
| | CSHH#13 | 0.01 | 0.013 | | CSHH#13 | na | na |
| 11/3/2010 | CSHH#1 | 0.02 | 0.053 | 11/3/2010 | CSHH#1 | | 0 |
| | CSHH#2 | 0.02 | 0.050 | | CSHH#2 | na | na |
| | CSHH#3 | 0.01 | 0.052 | | CSHH#3 | na | na |
| | CSHH#4 | 0.03 | 0.054 | | CSHH#4 | 0 | |
| | CSHH#5 | 0.02 | 0.050 | | CSHH#5 | na | na |
| | CSHH#6 | 0.01 | 0.052 | | CSHH#6 | na | na |
| | CSHH#7 | 0.02 | 0.049 | | CSHH#7 | | 0 |
| | CSHH#8 | 0.02 | 0.047 | | CSHH#8 | | 0 |
| | CSHH#13 | 0.01 | 0.024 | | CSHH#13 | 0 | |
| | CSHH#14 | 0.02 | 0.051 | | CSHH#14 | 0 | |
| | CSHH#15 | 0.02 | 0.050 | | CSHH#15 | 0 | |

# 2008-2011 Nitrogen Data

**CSHH Water-Monitoring Program**

## 2008 Nitrite & Nitrate Results

| 5/21/2008 | Nitrite | Nitrate |
|---|---|---|
| CSHH#1 | 0.14 | 0.02 |
| CSHH#2 | na | na |
| CSHH#3 | 0.012 | 0.03 |
| CSHH#4 | 0.016 | 0.04 |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | na | na |
| **6/11/2008** | **Nitrite** | **Nitrate** |
| CSHH#1 | N/A | N/A |
| CSHH#2 | 0.011 | 0.03 |
| CSHH#3 | 0.009 | 0.04 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.008 | 0.03 |
| **6/19/2008** | **Nitrite** | **Nitrate** |
| CSHH#1 | 0.014 | 0.03 |
| CSHH#2 | 0.009 | 0.04 |
| CSHH#3 | 0.008 | 0.04 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.017 | 0.04 |
| **6/25/2008** | **Nitrite** | **Nitrate** |
| CSHH#1 | 0.009 | 0.04 |
| CSHH#2 | 0.009 | 0.04 |
| CSHH#3 | 0.009 | 0.03 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.008 | 0.15 |
| **7/2/2008** | **Nitrite** | **Nitrate** |
| CSHH#1 | 0.008 | 0.05 |
| CSHH#2 | 0.010 | 0.05 |

## 2009 Nitrogen Sample Results

| 5/13/2009 | Nitrite | Nitrate | Ammonia |
|---|---|---|---|
| CSHH#1 | 0.003 | 0.00 | **N**essler: 0; **S**alycilate:0 |
| CSHH#2 | 0.000 | 0.00 | N: 0 |
| CSHH#3 | 0.000 | 0.00 | N: 0 |
| CSHH#8 | 0.000 | 0.00 | N: 0 |
| CSHH#13 | 0.001 | 0.00 | na |
| **5/20/2009** | **Nitrite** | **Nitrate** | **Ammonia** |
| CSHH#1 | 0.009 | 0.04 | N:0; S:0 |
| CSHH#2 | 0.006 | 0.03 | N:0 |
| CSHH#3 | 0.008 | 0.04 | N:0 |
| CSHH#8 | 0.008 | 0.03 | S:0.25 |
| CSHH#13 | 0.014 | 0.02 | na |
| **5/27/2009** | **Nitrite** | **Nitrate** | **Ammonia** |
| CSHH#1 | 0.012 | 0.06 | N:0; S:0.25 |
| CSHH#2 | 0.02 | 0.05 | S: 0.10 |
| CSHH#3 | 0.009 | 0.05 | S: 0.10 |
| CSHH#8 | 0.01 | 0.04 | S: 0.10 |
| CSHH#13 | 0.008 | 0.04 | S: 0.25 |
| **6/3/2009** | **Nitrite** | **Nitrate** | **Ammonia** |
| CSHH#1 | 0.031 | 0.03 | S:0 |
| CSHH#2 | 0.01 | 0.03 | N:0 S: 0.05 |
| CSHH#3 | 0.011 | 0.04 | N: 0 |
| CSHH#8 | 0.018 | 0.03 | S: 0 |
| CSHH#13 | 0.016 | 0.03 | na |
| **6/10/2009** | **Nitrite** | **Nitrate** | **Ammonia** |
| CSHH#1 | 0.01 | 0.05 | S: 0 |
| CSHH#2 | 0.009 | 0.03 | N: 0 |
| CSHH#3 | 0.008 | 0.04 | N: 0 |
| CSHH#8 | 0.012 | 0.02 | S: 0.25* |
| CSHH#13 | 0.016 | 0.02 | S: 0.25 |
| **6/17/2009** | **Nitrite** | **Nitrate** | **Ammonia** |
| CSHH#1 | 0.006 | 0.03 | S:0 |
| CSHH#2 | 0.006 | 0.02 | N: 0 |
| CSHH#3 | 0.005 | 0.02 | N: 0 |
| CSHH#8 | 0.008 | 0.03 | S: 0 |
| CSHH#13 | 0.015 | 0.03 | S: 0 |
| **6/24/2009** | **Nitrite** | **Nitrate** | **Ammonia** |
| CSHH#1 | 0.009 | 0.03 | N:0 |
| CSHH#2 | 0.005 | 0.03 | N:0 |

# 2008-2011 Nitrogen Data

| | | |
|---|---|---|
| CSHH#3 | 0.008 | 0.04 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.011 | 0.04 |
| 7/9/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.006 | 0.03 |
| CSHH#2 | 0.007 | 0.03 |
| CSHH#3 | 0.009 | 0.04 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.006 | 0.02 |
| 7/17/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.008 | 0.05 |
| CSHH#2 | 0.004 | 0.03 |
| CSHH#3 | 0.006 | 0.02 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.010 | 0.03 |
| 7/30/2008 | Nitrite | Nitrate |
| CSHH#1 | N/A | N/A |
| CSHH#2 | 0.009 | 0.06 |
| CSHH#3 | 0.007 | 0.03 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.006 | 0.04 |
| 8/6/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.011 | 0.05 |
| CSHH#2 | 0.011 | 0.03 |
| CSHH#3 | 0.011 | 0.04 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |

| | | | |
|---|---|---|---|
| CSHH#3 | 0.012 | 0.03 | N:0 |
| CSHH#8 | 0.014 | 0.02 | S:0 |
| CSHH#13 | 0.016 | 0.02 | N:0 |
| 7/1/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.008 | 0.02 | S: 1.0** |
| CSHH#2 | 0.004 | 0.02 | S: 0 |
| CSHH#3 | 0.005 | 0.02 | na |
| CSHH#8 | 0.009 | 0.03 | S: 1.0 |
| CSHH#13 | 0.007 | 0.01 | na |
| 7/8/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.005 | 0.03 | S: 0 |
| CSHH#2 | 0.010 | 0.03 | N: 0 |
| CSHH#3 | 0.005 | 0.03 | N: 0 |
| CSHH#8 | 0.031 | 0.06 | S:0 |
| CSHH#13 | 0.018 | 0.04 | na |
| 7/15/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.008 | 0.04 | S:0 |
| CSHH#2 | 0.003 | 0.03 | N: 0 |
| CSHH#3 | 0.014 | 0.03 | N: 0 |
| CSHH#8 | 0.013 | 0.04 | S: 6.10*** |
| CSHH#10A | 0.014 | 0.03 | S: 0.5 |
| CSHH#13 | 0.012 | 0.02 | S:0 |
| 7/22/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.006 | 0.03 | S:0 |
| CSHH#2 | 0.005 | 0.02 | N:0 |
| CSHH#3 | 0.006 | 0.02 | N:0 |
| CSHH#8 | 0.005 | 0.02 | na |
| CSHH#13 | 0.008 | 0.00 | N: 0 |
| 7/29/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.006 | 0.01 | S:0 |
| CSHH#2 | 0.004 | 0.02 | N:0 |
| CSHH#3 | 0.006 | 0.02 | N:0 |
| CSHH#8 | 0.011 | 0.01 | S:0 |
| CSHH#13 | 0.013 | 0.01 | N:0 |
| 8/5/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.008 | 0.03 | S:0 |
| CSHH#2 | 0.003 | 0.02 | N:0 |
| CSHH#3 | 0.004 | 0.04 | N:0 |
| CSHH#8 | 0.010 | 0.01 | S:0 |
| CSHH#13 | 0.008 | 0.02 | N:0 |

# 2008-2011 Nitrogen Data

| | | |
|---|---|---|
| CSHH#7 | na | na |
| CSHH#8 | 0.007 | 0.03 |
| CSHH#13 | 0.017 | 0.02 |
| 8/13/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.012 | 0.05 |
| CSHH#2 | 0.005 | 0.03 |
| CSHH#3 | 0.007 | 0.03 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.011 | 0.03 |
| CSHH#13 | 0.013 | 0.03 |
| 8/20/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.011 | 0.06 |
| CSHH#2 | 0.008 | 0.04 |
| CSHH#3 | 0.007 | 0.05 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.009 | 0.03 |
| CSHH#13 | 0.008 | 0.04 |
| 8/27/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.01 | 0.04 |
| CSHH#2 | 0.005 | 0.03 |
| CSHH#3 | N/A | N/A |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.008 | 0.03 |
| CSHH#13 | 0.007 | 0.03 |
| 9/3/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.011 | 0.05 |
| CSHH#2 | 0.008 | 0.03 |
| CSHH#3 | 0.008 | 0.04 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.008 | 0.03 |

| 8/12/2009 | Nitrite | Nitrate | Ammonia |
|---|---|---|---|
| CSHH#1 | 0.016 | 0.03 | S:0 |
| CSHH#2 | 0.004 | 0.03 | N:0 |
| CSHH#3 | 0.014 | 0.04 | N:0 |
| CSHH#8 | 0.013 | 0.03 | S:0 |
| CSHH#13 | na | na | S:0 |
| 8/19/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.010 | 0.04 | S:0 |
| CSHH#2 | 0.006 | 0.04 | S:0 |
| CSHH#3 | 0.009 | 0.03 | S:0 |
| CSHH#8 | 0.011 | 0.05 | S:0 |
| CSHH#13 | 0.014 | 0.05 | S: 0.25 |
| 8/26/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.003 | 0.04 | S:0 |
| CSHH#2 | 0.005 | 0.02 | S:0 |
| CSHH#3 | 0.007 | 0.02 | Not available |
| CSHH#8 | 0.006 | 0.03 | S:0 |
| CSHH#13 | 0.016 | 0.03 | S:0 |
| 9/2/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.006 | 0.04 | S:0 |
| CSHH#2 | 0.010 | 0.02 | N:0 |
| CSHH#3 | 0.004 | 0.03 | N:0 |
| CSHH#8 | 0.010 | 0.02 | S:0 |
| CSHH#13 | 0.010 | 0.03 | na |
| CSHH#14 | 0.007 | 0.04 | N:0 |
| CSHH#15 | 0.009 | 0.04 | N:0 |
| 9/9/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.019 | 0.05 | S:0 |
| CSHH#2 | 0.015 | 0.04 | N:0 |
| CSHH#3 | 0.008 | 0.05 | N:0 |
| CSHH#8 | 0.008 | 0.05 | S: 0.25 |
| CSHH#13 | 0.011 | 0.06 | na |
| 9/16/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.032 | 0.02 | S:0 |
| CSHH#2 | NA | NA | High winds--no samples |
| CSHH#3 | 0.025 | 0.01 | na |
| CSHH#8 | 0.017 | 0.02 | S: 0.25 |
| CSHH#13 | 0.017 | 0.02 | na |
| CSHH#14 | 0.025 | 0.02 | na |
| CSHH#15 | 0.017 | 0.02 | N:0 |
| 9/23/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.064 | 0.02 | S:0 |

# 2008-2011 Nitrogen Data

| | | |
|---|---|---|
| CSHH#13 | 0.013 | 0.02 |
| 9/10/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.01 | 0.03 |
| CSHH#2 | 0.006 | 0.03 |
| CSHH#3 | 0.009 | 0.03 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.008 | 0.03 |
| CSHH#13 | 0.012 | 0.04 |
| 9/17/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.02 | 0.03 |
| CSHH#2 | 0.016 | 0.03 |
| CSHH#3 | 0.016 | 0.04 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.006 | 0.03 |
| CSHH#13 | 0.011 | 0.03 |
| 9/24/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.006 | 0.04 |
| CSHH#2 | 0.007 | 0.07 |
| CSHH#3 | 0.006 | 0.04 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.010 | 0.04 |
| CSHH#13 | 0.009 | 0.04 |
| 10/2/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.035 | 0.03 |
| CSHH#2 | N/A | N/A |
| CSHH#3 | 0.009 | 0.04 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.015 | 0.04 |
| CSHH#13 | N/A | N/A |

| | | | |
|---|---|---|---|
| CSHH#2 | 0.068 | 0.02 | N:0 |
| CSHH#3 | 0.038 | 0.02 | N: 0 |
| CSHH#8 | 0.021 | 0.01 | S: 0.10 |
| CSHH#13 | 0.020 | 0.03 | S: 0 |
| 9/30/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.037 | 0.01 | S:0 |
| CSHH#2 | NA | NA | High winds--no samples |
| CSHH#3 | 0.044 | 0.03 | N:0 |
| CSHH#8 | 0.020 | 0.01 | S:0 |
| CSHH#13 | 0.012 | 0.01 | S:0 |
| 10/8/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.046 | 0.03 | s: 0.25 |
| CSHH#2 | NA | NA | High winds--no samples |
| CSHH#3 | 0.052 | 0.02 | N: 0 |
| CSHH#8 | 0.017 | 0.02 | S: 0.25 |
| CSHH#13 | 0.014 | 0.01 | S: 0.25 |
| 10/14/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.037 | 0.05 | S:0 |
| CSHH#2 | 0.048 | 0.02 | S:0 |
| CSHH#3 | 0.051 | 0.03 | N:0 |
| CSHH#8 | 0.043 | 0.06 | S:0 |
| CSHH#13 | 0.046 | 0.07 | S:0.10 |
| 10/21/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.034 | 0.07 | S: 0.25 |
| CSHH#2 | 0.036 | 0.02 | s: 0 |
| CSHH#3 | 0.030 | 0.07 | S:0 |
| CSHH#8 | 0.033 | 0.01 | S:0 |
| CSHH#13 | 0.025 | 0.01 | S:0 |
| 10/30/2009 | Nitrite | Nitrate | Ammonia |
| CSHH#1 | 0.045 | 0.02 | S:0 |
| CSHH#2 | 0.036 | 0.02 | S: 0.05 |
| CSHH#3 | 0.042 | 0.03 | S: 0.10 |
| CSHH#8 | 0.036 | 0.02 | S: 0 |
| CSHH#13 | 0.041 | 0.02 | S: 0 |
| CSHH#15 | na | na | S: 0.25 |

*6/12/09: Called STP plant manager re: NH3 levels at outfall and was told that the plant was running a 24-hour composite sampling and were within limits.
**7/1/09: NH3 also at CSHH #4 (S: 0.10) and CSHH #5 (S: 0.25). Large numbers of geese, cormorants, swans, and other birds noted.

# 2008-2011 Nitrogen Data

| 10/8/2008 | Nitrite | Nitrate |
|---|---|---|
| CSHH#1 | 0.043 | 0.02 |
| CSHH#2 | 0.065 | 0.02 |
| CSHH#3 | 0.049 | 0.02 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.039 | 0.02 |
| CSHH#13 | 0.015 | 0.02 |
| 10/16/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.069 | 0.04 |
| CSHH#2 | 0.075 | 0.02 |
| CSHH#3 | 0.073 | 0.03 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.035 | 0.02 |
| CSHH#13 | 0.031 | 0.02 |
| 10/22/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.049 | 0.05 |
| CSHH#2 | N/A | N/A |
| CSHH#3 | 0.046 | 0.04 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.024 | 0.03 |
| CSHH#13 | 0.015 | 0.02 |
| 10/31/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.035 | 0.03 |
| CSHH#2 | 0.038 | 0.02 |
| CSHH#3 | 0.038 | 0.03 |
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.037 | 0.02 |
| CSHH#13 | 0.012 | 0.01 |
| 11/5/2008 | Nitrite | Nitrate |
| CSHH#1 | 0.036 | 0.02 |
| CSHH#2 | 0.039 | 0.02 |
| CSHH#3 | 0.033 | 0.03 |

***7/15/09: Large opaque flow from CSHH #10--discolored area into marina (w); called City DPW and NCDH; source undetermined.

# 2008-2011 Nitrogen Data

| | | |
|---|---|---|
| CSHH#4 | na | na |
| CSHH#5 | na | na |
| CSHH#6 | na | na |
| CSHH#7 | na | na |
| CSHH#8 | 0.025 | 0.02 |
| CSHH#13 | 0.026 | 0.02 |