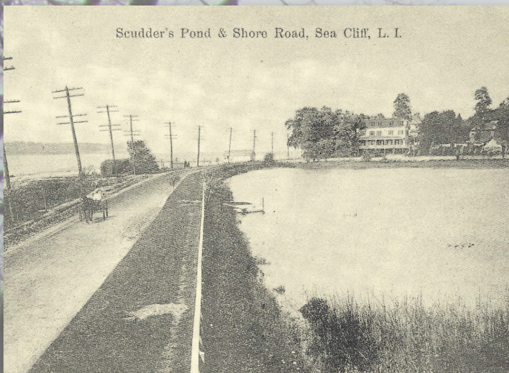
Hempstead Harbor Protection Committee

Long Island, New York



2013
Water-Monitoring Program
Hempstead Harbor

2013 Water-Monitoring Report
(Full Report, Including Appendices)

prepared by

Coalition to Save Hempstead Harbor

FUSS & O'NEILL

Cover photos, top left to right: old postcard, with original photograph (early 1900s) by Henry Otto Korten, reprinted by the Sea Cliff Civic Association in 198O; Scudder's Pond before (12/3/13) and during final phase of phragmites removal (2/20/14), and (large photo) at sunset with dredge markers (3/4/14)(photos by Carol DiPaolo)

Program Overview

About 30 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 State Department of Environmental Conservation’s (DEC’s) data on the level of pathogens in Hempstead Harbor and to determine 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 wastewater 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, at the same time that 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) were the same priorities that had to be addressed for Hempstead Harbor, perhaps to a different extent. These priorities were low dissolved oxygen (hypoxia), toxic-substance contamination, pathogen contamination, habitat degradation, and floatable debris. At the start, Hempstead Harbor's water-quality monitoring program, therefore, included dissolved oxygen as a critical monitoring parameter (among others).

CSHH worked hard to develop a credible water-testing program that could be relied on to indicate the health of the harbor. However, the 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 in 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.

Program Expansion

Over the years, the scope of the water-monitoring program has expanded, as has the network of partners that have supported it. The number of testing parameters and stations has increased.

Scudder's Pond prior to construction work (12/3/13) and after start of phragmites removal (12/24/13) (photos by Carol DiPaolo)

As described in later sections of this report, Scudder's Pond has been identified as a major contributor of bacteria to Hempstead Harbor through stormwater runoff. In 2009, in anticipation of restoration work planned for the pond to mitigate the effects of stormwater runoff, two new monitoring stations were established. The stations are located at the weir that drains water from the pond directly to the harbor and at the outfall across the road that carries pond water as well as runoff from the larger area around the pond. At the same time, a new station was also established at the powerhouse drain outfall, which had been identified as the second largest contributor of bacteria to the harbor.

The years of monitoring these stations established a baseline of bacteria levels that occur from May to November. The purpose of monitoring the pond outfalls during the winter is to help us understand what happens to bacteria levels during cold winter months as well as to see changes in bacteria levels as construction work at the pond proceeded from late autumn and through the following spring. The next phase will be to monitor these stations following completion of the structural changes to the pond to help determine their efficacy in diminishing bacteria loading to Hempstead Harbor.

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 intermunicipal organization, specifically formed to protect and improve the water quality of Hempstead Harbor. CSHH became the first environmental organization to join the committee—as 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). 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.)

Local efforts for the International Coastal Cleanup at Tappen Beach (l) and Sea Cliff Beach (photos by Carol DiPaolo, 9/29/12 and Karen Papasergiou, 9/13/13, respectively)

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 US 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 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. It also considered 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 (HHPC, 2013) 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 was charged with addressing climate change and ways to measure the impacts on Long Island Sound. (This was part of a bistate—New York and Connecticut—approach to understanding climate-change indicators for Long Island Sound and selecting appropriate sites to measure them. In 2011, the *Sentinel Monitoring for Climate Change in the Long Island Sound Estuarine and Coastal Ecosystems of New York and Connecticut* was completed; in 2013 a pilot program was implemented to monitor key climate change indices (sentinels) at locations within Long Island Sound.)

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 convince 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 2013, 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; the site had been used as part of the National Status and Trends Mussel Watch program since 1986 (a project sponsored by the National Oceanic and Atmospheric Administration (NOAA)). In March 2012, CSHH was asked to scope out the density of ribbed mussels in Hempstead Harbor as part of another NOAA project. 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.

In 2013, CSHH and HHPC were invited to participate in a project that would establish a report-card system to communicate the health of Long Island Sound. Hempstead Harbor and Norwalk Harbor were selected to have the first report cards designed that will act as pilot projects to launch the larger, soundwide report-card system. Both harbors were selected for because of their longstanding and credible water-quality monitoring that can provide the necessary water-quality data. The project will be developed by scientists from the University of Maryland and is being funded by a 2013 Long Island Sound Futures Fund grant award that will benefit both New York and Connecticut.

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 harborwide 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 intermunicipal 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 cooperative effort saves each municipality expenses, provides for a 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, which began in November 2013. This subwatershed (located in Sea Cliff) has been identified as one of the most significant contributors of bacteria-laden stormwater runoff to the harbor. A similar study for the **Powerhouse Drain subwatershed** in Glenwood Landing was completed in December 2013.

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 US 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 website (www.HempsteadHarbor.org) and a Facebook page to serve as harbor resources. **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 New York State 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 Audubon New York's

"Important Bird Areas of New York State." The Hempstead Harbor Protection Committee has been a great 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 has also assisted with similar efforts in Northport Harbor and the Peconic Estuary.

Since 1995, the HHPC has received over 23 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 dues received from the nine member municipalities.

HHPC receives Environmental Achievement Award—at center Eric Swenson (HHPC), Kay Bromberg (CSHH), and William Clemency (HHPC) joined by Camden, NJ, Mayor Dana Redd (l) and US EPA Region 2 Regional Administrator Judith Enck (r) (photo by EPA, 4/27/12)

In 2012, the HHPC received an Environmental Quality Award from the US EPA Region 2 for its efforts in improving water quality in Hempstead Harbor to the point where 2,500 acres of the harbor were reopened to shellfish harvesting for the first time in 45 years. Since the standards for water quality to support shellfish harvesting are the highest possible of all water-quality standards, this achievement unquestionably demonstrated the water-quality improvements that the HHPC was created to seek. In so doing, Hempstead Harbor also became the first waterbody in New York State to achieve this status in several decades. The HHPC continues to work to achieve this for the remaining portions of the harbor.

For more information or to request another copy of this report contact:

Carol DiPaolo, Programs Director and
Water-Monitoring Program Coordinator
Coalition to Save Hempstead Harbor
P.O. Box 159, Sea Cliff, NY 11579
Phone: 516-801-6792
E-mail: cshh@optonline.net

Eric Swenson, Executive Director
Hempstead Harbor Protection Committee
150 Miller Place, Syosset, NY 11791
Phone: 516-677-5921; Fax: 516-677-5875
E-mail: e.swenson@hempsteadharbor.org
www.HempsteadHarbor.org

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 2011-2013 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; the town of North Hempstead’s Department of Public Safety for staff assistance and use of the Harbor Patrol 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
- US Environmental Protection Agency, Long Island Sound Study Office
- The United Civic Council of Glen Head and Glenwood Landing

The 2013 Hempstead Harbor Water-Monitoring Program was awarded a grant by the National Fish and Wildlife Foundation through the Long Island Sound Futures Fund at a ceremony held at the Norwalk Aquarium (10/24/13)

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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.)

The Roslyn viaduct renamed to honor William Cullen Bryant, the prominent 19th century poet and journalist who resided at the Cedarmere Estate on the eastern shore of Hempstead Harbor (photo by Carol DiPaolo, 9/12/12)

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 (l) and in 2005 (r)(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.

Gladsky marine salvage operation in Glenwood Landing (l) and young sailors from the Sea Cliff Yacht Club (photos by Carol DiPaolo, 11/6/13 and 7/31/13, respectively)

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

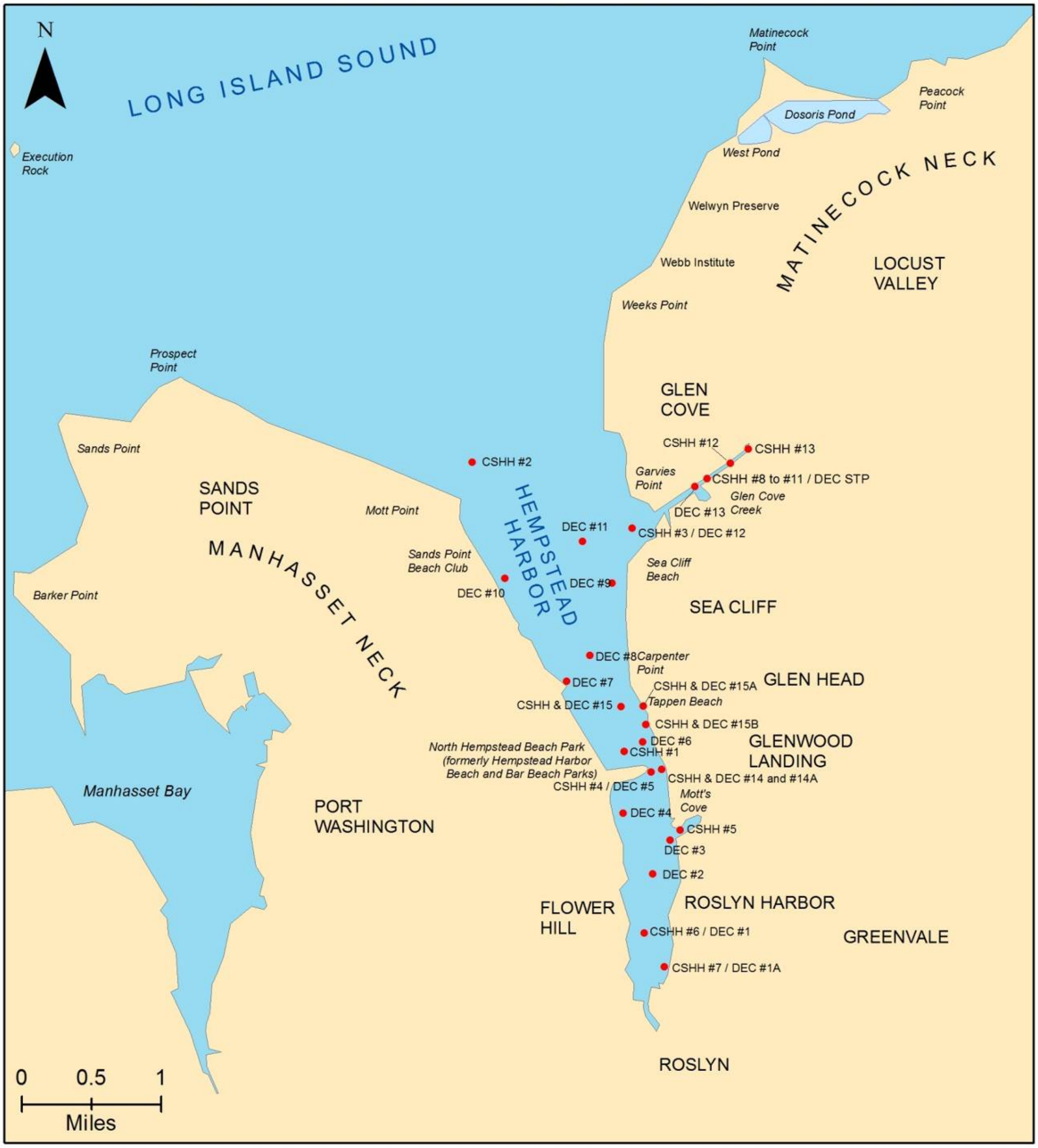
In 2006, a Quality Assurance Project Plan (QAPP) was prepared by the consulting engineering firm of Fuss & O'Neill, Inc., for the Hempstead Harbor Water-Monitoring Program, on behalf of the Coalition to Save Hempstead Harbor (CSHH) and the Hempstead Harbor Protection Committee. The QAPP documents the quality assurance and quality control (QA/QC) procedures implemented in the CSHH program. QAPP revisions were approved by EPA to reflect changes in the program in 2011 and 2014.

The approval of the QAPP by the US 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.

Autumn view of west shore of Hempstead Harbor (photo by Carol DiPaolo, 11/6/13)

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.



Location of current CSHH stations along with the DEC stations that were sampled in 2009

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 Scudder's 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 Port 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 outfall	40	49.706	73	38.916
CSHH #14A, At powerhouse 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 to avoid shifting the sampling location as access to the weir varied due to tidal cycles. 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 by CSHH and then analyzed 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 outfall (l); detergent suds from powerhouse 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 ft west of CSHH #8
- CSHH #10, about 20 ft west of CSHH #8, at the end of the seawall
- CSHH #11, about 50 ft east of CSHH #8, at the end of the floating dock
- CSHH #12, about 100 ft 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 Scudder's 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 (every three to four weeks, depending on the tide). 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 outfall
- CSHH #14A, directly from the powerhouse 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 for the regular monitoring season, 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). Beginning in 2013, a new component of the program was added to include weekly collection of water samples during the winter, from November through March, at CSHH #15A and #15B. Water samples from CSHH #15A (outfall that drains from Scudder's Pond and Littleworth Lane, north of Tappen Pool) and #15B (Scudder's Pond weir) were delivered to Nassau County Department of Health for bacteria analysis (fecal coliform and enterococci).

Because Scudder's Pond was identified as one of the largest contributors of bacteria to Hempstead Harbor, plans were made to restore the pond. After many years of planning, work began in November 2013. The changes at the pond include phragmites removal, dredging of the pond bottom, installation of a new storm-water basin at Littleworth Lane to curtail future sedimentation of the pond, and planting of native plants around the pond. In 2014, a new weir will be constructed where the pond drains directly out to Hempstead Harbor. All of the changes are intended to diminish bacteria loading to Hempstead Harbor.

The purpose of the winter water-sample collection at the pond is to (1) determine what happens to bacteria levels in the pond in cold temperatures during the winter season and (2) assess the efficacy of construction work to reduce bacteria levels. The winter monitoring was later expanded to mid-May to avoid a data gap between the winter and spring sampling seasons. It was also expanded to include CSHH #14A (powerhouse outfall) to address similar problems of bacteria loading to Hempstead Harbor.

For the regular monitoring season, CSHH collects water 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 (weather and tidal cycles permitting) from 18 testing stations for bacterial analysis by the NCDH. In addition, tests for dissolved oxygen (DO), salinity, water temperature, and pH are conducted weekly at CSHH #1, #2, #3, #8, and #13 and every three to four weeks 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 every three to four weeks 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

Parameter	Location	Analyzer or Method	Location of Analysis
Ammonia	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 used to measure ammonia. (Because previous years' test results using both the Nessler and salicylate methods indicated that the Nessler method is less reliable for detecting ammonia in the harbor, beginning in 2012 only the salicylate is used.) Technicians at the Town of Oyster Bay Laboratory use an electronic kit (Hach) for measuring nitrite and nitrate levels. Periodically, samples are also collected for plankton analysis by the Nassau County Department of Health.

Mark Ring with YSI 600

Jim Moriarty lowering sonde on platform

Carol DiPaolo doing Winkler titration

3 Monitoring Results

This section summarizes results of the CSHH sampling program. Where possible, data from the CSHH program from 1995-2012 is compared with 2013 data. *Appendices A, B, C,* and *D* include graphs and tables 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

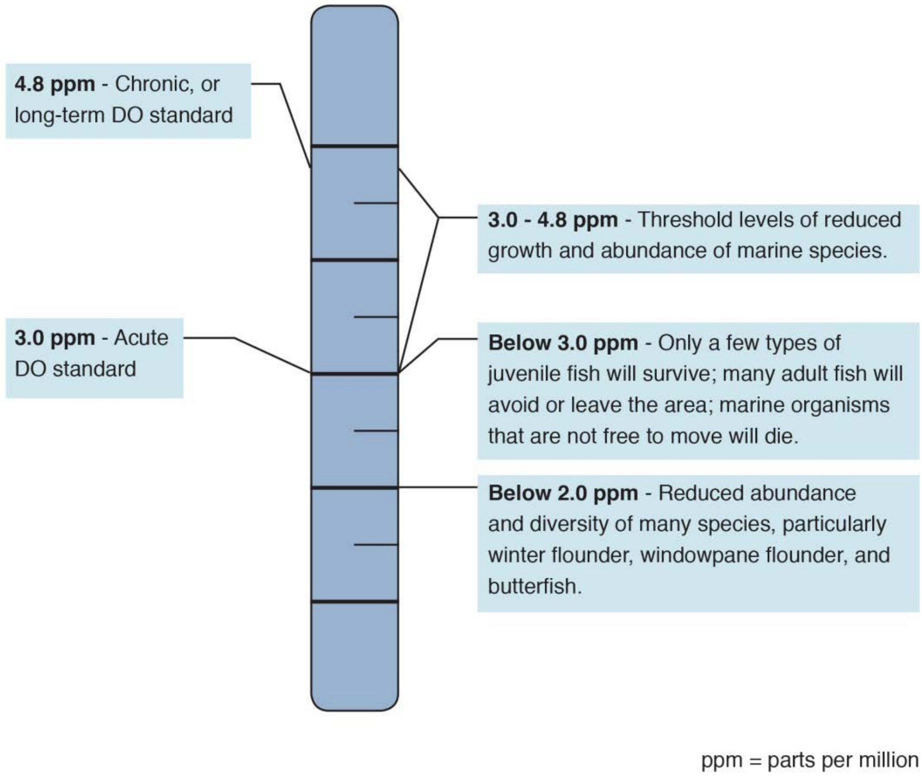
Hempstead Harbor and in other areas in and around Long Island Sound, particularly in the western sound. DO is indirectly affected by nutrient enrichment, particularly nitrogen, which can enter Hempstead Harbor through stormwater runoff, discharges from sewage treatment plants, or leaching from failing 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. Because 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 revised 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 2013.

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. DO levels at all three locations were noticeably higher than the average of the previous five years (not including the current year) at each of the three locations (~18%, ~26%, and ~18% higher, respectively). The average DO level was above the 4.8 ppm standard at all locations. DO levels at CSHH #1 and CSHH#3 were the highest seen since monitoring began in 1995 and levels at CSHH #2 were the second highest seen. The pattern of dissolved oxygen levels is mixed and does not appear to show collective improvement or degradation.

Looking south in the harbor at Sunset--Tilley's boat house on the east shore (photo by Carol DiPaolo, 3/4/14)

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

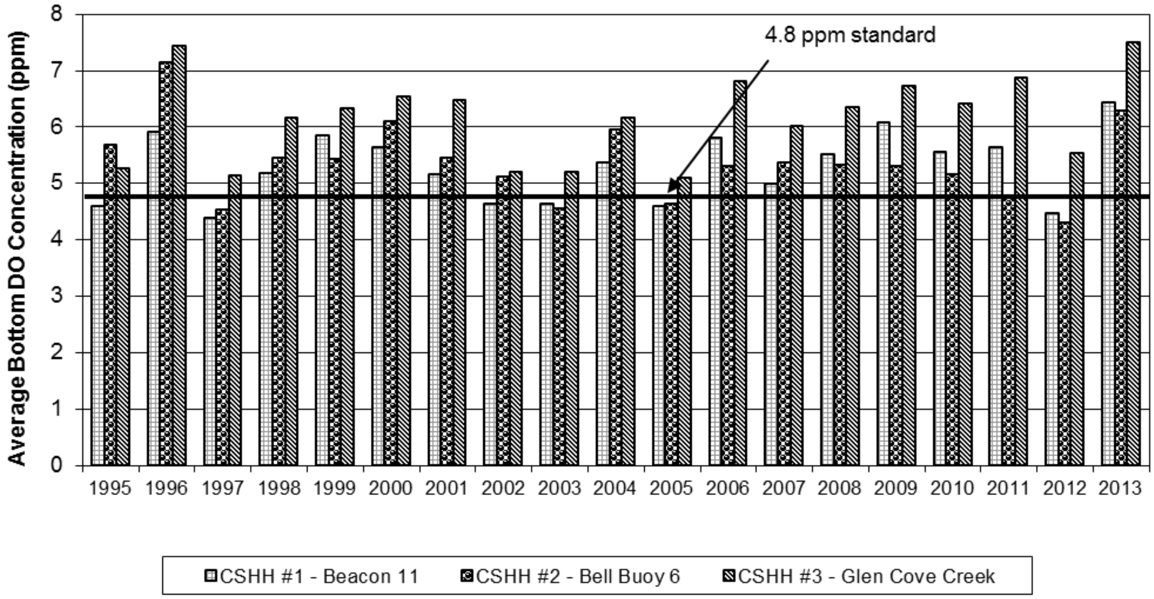


Table 3
Average Monitoring-Season DO Levels in Hempstead Harbor

Average Bottom DO (ppm)	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
CSHH #1	6.42	4.46	5.64	5.55	6.09	5.50	4.99	5.76	4.59	5.36
CSHH #2	6.28	4.31	4.77	5.16	5.30	5.31	5.37	5.27	4.63	5.96
CSHH #3	7.49	5.54	6.87	6.41	6.72	6.35	6.02	6.80	5.09	6.17
CSHH #8	7.29	5.28	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 number of hypoxic measurements, below 3.0 ppm, in 2013 was low (11 total hypoxic readings, averaging 6% of all samples collected). Hypoxic conditions were recorded three days in July: July 3 at CSHH #13 (2.78 ppm), July 24 at CSHH #2 and #13 (1.45 ppm and 2.80 ppm, respectively); and July 31 at CSHH #2 (1.41 ppm). Hypoxic conditions were recorded two days in August: on August 8 at CSHH #1, #2, #8, #13 and #14 (2.56 ppm, 2.93 ppm, 2.94 ppm, 1.68 ppm, and 1.89 ppm, respectively); and August 15 at CSHH #1 and #8 (1.86 ppm and 2.91 ppm, respectively).

Anoxic levels, below 1 ppm, were not recorded during the 2013 monitoring season.

The percentage of DO measurements in the high DO range (> 6.0 ppm) significantly increased in 2013 at all stations compared with levels in 2012 (see *Table 4)*. The percentage of DO measurements in the mid- to low-level ranges (3 to 5 ppm) in 2013, compared with the percentage in 2012, also decreased at all locations. The percentage of DO measurements in the hypoxic range decreased at all of the sampling locations.

Although higher DO levels are encouraging, continued sampling is needed to determine whether the improvement is a trend or an anomaly. The cause of significantly higher levels is difficult to discern. It 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 other factors 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.

Beacon Hill beach colony on western shore of Hempstead Harbor
(photo by Carol DiPaolo, 11/6/13)

Similarly, low DO levels at the bottom of Hempstead Harbor and Long Island Sound may be the result of a mix of factors, including anthropogenic influences such as 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.

Table 4
DO Readings 1996-2013: 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
2012	7	32	3	14	7	32	5	23
2013	13	57	4	17	4	17	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
2012	5	21	4	17	7	29	8	33
2013	12	57	4	19	2	10	3	14

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
2012	11	46	2	8	6	25	5	21
2013	18	78	3	13	2	9	0	0
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
2012	8	35	5	22	7	30	3	13
2013	21	84	1	4	1	4	2	8

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 water temperature 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 previously. 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 a naturally occurring condition whereby water at the surface is warmer while water at the bottom stays cold. Because 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.

Bar Beach pier surrounded by floating ice (photo by Carol DiPaolo, 1/28/14)

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

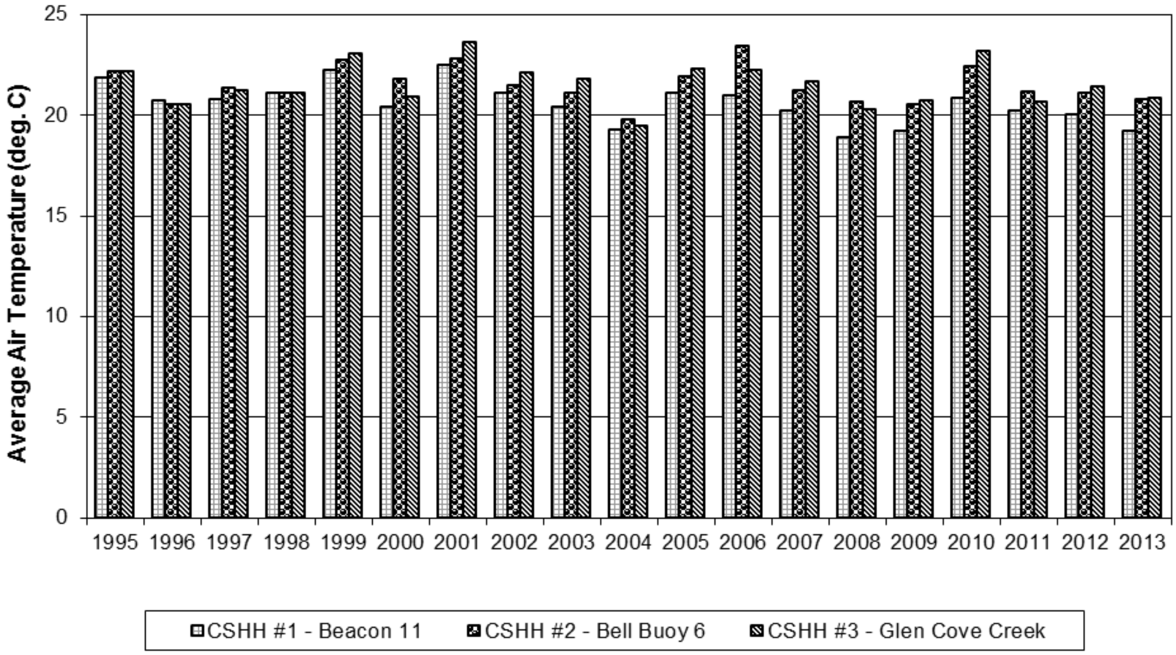
Water temperatures at CSHH #2 were slightly lower than at the other monitoring locations during each year, although the temperature difference is generally less than 1ºC. CSHH #2 is located at the mouth of the harbor and is more significantly influenced by Long Island Sound's deeper and, thus, cooler water. In 2013, water temperature was cooler than in 2012 but similar to the average temperature at all locations in past years (average water temperatures for CSHH stations #1-3 for years 1995-2012 are 20.0ºC, 19.5ºC, and 19.9ºC, respectively). See *Appendix A* for additional air and water temperature monitoring data.

Figure 3
Average Water Temperature Recorded During Seasonal Monitoring Events

Air temperature affects aquatic temperature, which affects both DO 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. However, because monitoring events began at similar times each season and have similar durations, 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-#3 for each year since 1995. Average air temperatures vary by approximately 5 degrees during the period of record. The 2004 monitoring season was the coolest on record, with an average temperature of 19.5ºC recorded at the three stations, whereas average air temperatures for 1995-2003, 2005, 2006, and 2010 were 2ºC or more warmer. In 2013, the average air temperature was similar to that recorded in 2011 and 2012. The average temperature in 2013 was less than 0.5ºC higher than in 2008 and 2009 (the second and third coolest monitoring season on record, respectively) and less than 1ºC higher than in 2004 (the coldest). The average air temperature recorded at CSHH #1 in 2013 was the third lowest on record.

Figure 4
Average Air Temperature Recorded During Seasonal Monitoring Events



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

Sea Isle at high tide (photo by Carol DiPaolo, 4/17/12)

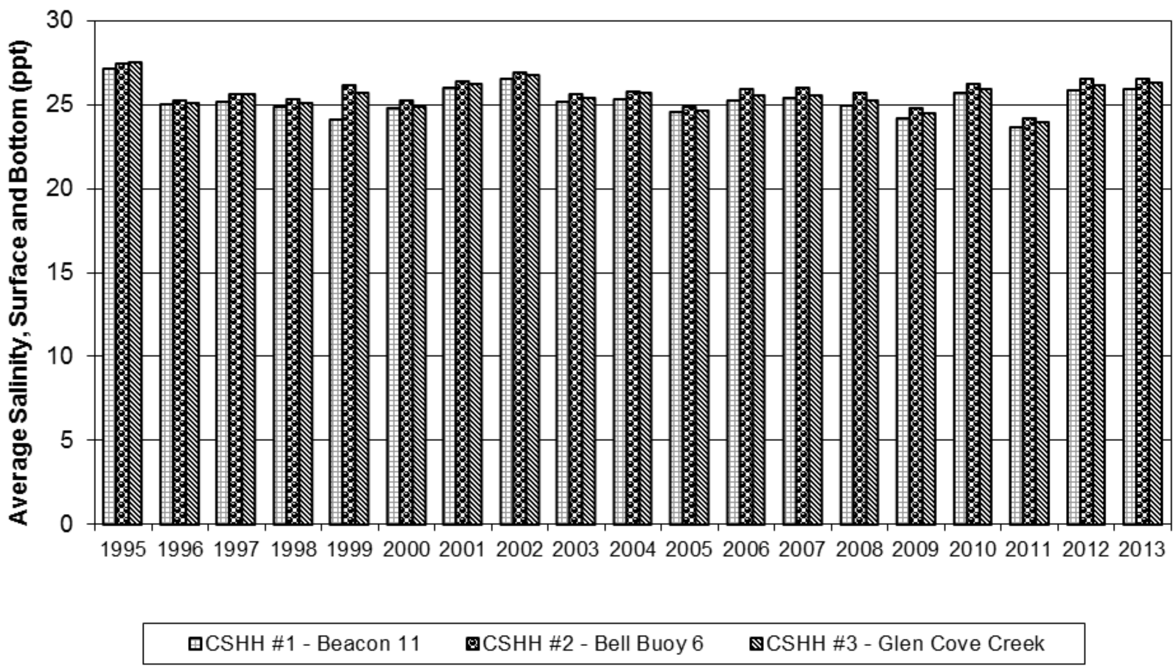
3.3 Salinity

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 DO 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 discharges from sewage treatment plants, 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 typically 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

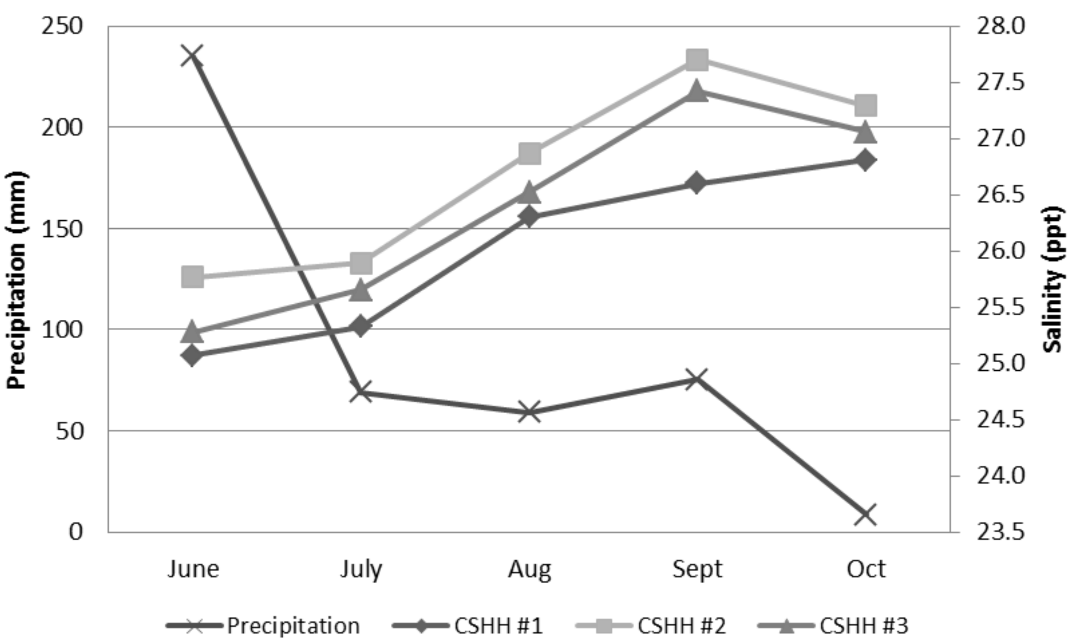


Additionally, salinity levels measured at the bottom of the harbor are generally higher than those near the surface, because high-salinity water is denser and tends to sink. Surface salinity levels are often approximately 1 ppt lower than those at the bottom, suggesting that slight stratification is 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 2013 (26.31 ppt) were slightly higher than average levels recorded in the previous five years (25.23 ppt). 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 24.46 ppt to 26.67 ppt, whereas readings in October for each station ranged from 26.07 ppt to 27.93 ppt – slightly higher. As shown in *Figure 6*, average salinity at each station (CSHH #1-3) appears to increase with stable precipitation in July through September. In general, there may be some effect on salinity (particularly surface salinity) in areas influenced (diluted) by stormwater discharges. This is particularly noticeable at CSHH #8 (near the discharge from the sewage treatment plant) and CSHH #13 (the large pipe that discharges a mix of stormwater and freshwater into Glen Cove Creek), where salinity measurements at the surface and 1 meter depth frequently varied significantly. Also, the most open harbor sampling location, CSHH #2, consistently had the highest measured salinity levels of those shown. (Note that the three stations covered in *Figure 6* are not in the immediate vicinity of stormwater outfalls.)

Figure 6
2013 Average Monthly Salinity and Monthly Precipitation



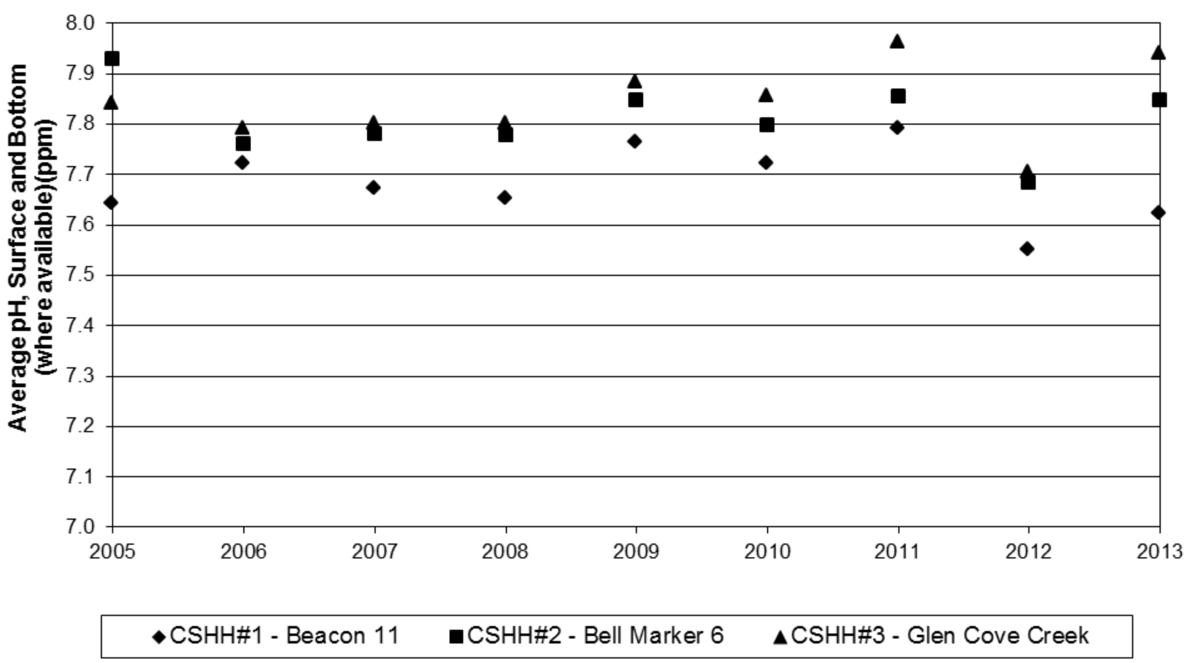
3.4 pH

Figure 7 presents averaged surface and bottom pH for CSHH #1-#3 for years 2005-2013.

Monitoring pH (a measure of acidity or alkalinity) helps in following 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. Also, recent research has linked the combination of both low pH and low DO levels with having a more detrimental impact on marine life than low DO alone (see Gobler, C.J., et al. (8 January 2014). Hypoxia and acidification have additive and synergistic negative effects on the growth, survival, and metamorphosis of early life stage bivalves. http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0083648).

Measured average pH during the 2013 season was higher than that seen in 2012 but similar to that seen in the previous eight monitoring seasons. In 2013, CSHH #1 continued to be lower than the range of levels recorded from 2005 to 2011.

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 (or white and black) 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 may range from 0.25 to 3 meters during the monitoring season. For 2013, the range for the monitoring season was 0.5 to 2.0 meters (for CSHH #1-#3), as compared with a range of 0.5 to 3.2 meters for 2012. 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 US 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: • 5 NTU above background levels when the background is 50 NTU or less • 0% increase if the background is greater than 50 NTU "Good and fair quality" waters – Not to exceed: • 10 NTU above the background levels when it is less than 50 NTU • 20% increase if the background is more than 50 NTU	WAC 173-201A-210(1)(e)
Oregon	Not to exceed a 10% increase from background levels	OAR 340-041-0036
British Columbia	• Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters • Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters • Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters • Change from background of 10% when background is >50 NTU at any time during high flows or in turbid waters	www.env.gov.bc.ca/wat/wq/BCguidelines/turbidity/turbidity.html

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 2013, the turbidity ranged from 0.34 to 5.72 NTUs at the sampling depth of one-half meter (CSHH #1-#3); for the preceding year, the range was 0.14 to 3.52 NTUs, and since 2008 (when turbidity monitoring began), the range has been 0.11 to 5.54 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. Other nitrogen-based compounds 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 and human or animal wastes that can end up in the harbor from old or failing septic systems and wastewater treatment plants and from stormwater runoff. Nitrate is also a product of properly functioning treatment plants, which convert ammonia to nitrate.

Webb Institute on the east shore of Hempstead Harbor (photo by Carol DiPaolo, 11/6/13)

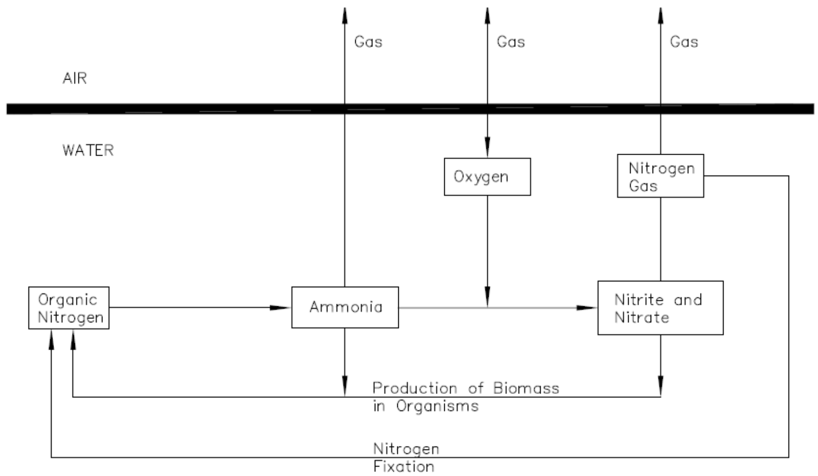
Ammonia and nitrate are important for organisms, which require nitrogen for growth and reproduction. Nitrogen forms amino acids, proteins, urea, and other compounds that are needed for life. These forms of nitrogen are referred to as organic nitrogen.

Many forms of organic nitrogen are quickly converted to ammonia in water. One form of ammonia can form a gas and be released into the atmosphere. Some forms are toxic to marine life in high concentrations.

Ammonia can also be converted to nitrite in the presence of oxygen as part of the nitrification process, but as more oxygen is added, nitrite (which is highly unstable) quickly transforms to nitrate. When anoxic conditions form, certain bacteria convert nitrate into nitrogen gas, which is released to the atmosphere.

Figure 8
Nitrogen in Marine Environments

(Adapted from: Surface Water Quality Modeling, Steven Chapra, McGraw-Hill, 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 2013, as in 2008-2011, 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. Beginning in 2012, only the LaMotte testing kit for the salicylate method is used (rather than both the Nessler and salicylate methods as was used in previous years).

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. Ammonia is measured using 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. 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 2013, ammonia was detected throughout the monitoring season at various sampling locations. Unlike past years, but similar to 2012, CSHH #8 did not have the most occurrences of detected ammonia; in 2013, CSHH #1 had the most detections.

The nitrite and nitrate monitoring data was analyzed at all sampling locations for the 2011 to 2013 monitoring seasons. A LOWESS (smoothing) line was added to the raw data to evaluate any possible trends, at some stations, there may be an upward trend (CSHH #8 and #9 may have more than just seasonal changes). In order to confirm any possible trends, nitrogen data should continue to be collected and additional prior years' data should be analyzed with the more recent data. See *Appendix C* for additional nitrogen data and graphs.

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

For Hempstead Harbor, Nassau County Department of Health and New York State Department of Environmental Conservation are the agencies that have jurisdiction in opening or closing swimming beaches and shellfish beds, respectively. Both agencies use ***bacteria levels*** and other factors to determine whether beaches or shellfish beds require temporary or extended closures.

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

Coliform and **enterococci bacteria** are the types that are measured and used as indicators for water-quality standards. They are typically found in human and warm-blooded animals and are, therefore, used as the indicators of fecal contamination and the potential for the existence of other organisms that may have an adverse impact on human health. **Total coliform bacteria** is widely present in the environment, whereas **fecal coliform** is most commonly found in the intestines of warm-blooded animals and birds, and **enterococci** are most prevalent in the human digestive system.

3.8.1 Beach-Closure Standards

In October 2000, Congress enacted the Beaches Environmental Assessment and Coastal Act of 2000 (BEACH Act), which gave US 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. Although coliform and enterococci are present in the human intestine and also in the intestines of warm-blooded animals and birds, EPA considers the enterococcal standard to be more closely correlated with human gastrointestinal illnesses and, therefore, more protective of human health. Also, a primary advantage in switching to the enterococcal standard is that it takes only 24 hours to obtain results, whereas it took 48 hours to obtain results using the coliform standard.

In response to these changes, 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 currently include the following:

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.

In 2002, NCDH anticipated the changes to the beach-closure standards and began parallel testing using the state's then-current indicators (both total and fecal coliform) along with the then-proposed indicator—enterococcus. In 2008, NCDH discontinued analyzing beach water samples for fecal coliform, because enterococcus became the sole indicator organism recommended by the US EPA 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.

EPA has proposed additional changes to the beach-closure standards, which may be implemented by the 2015 beach season.

3.8.2 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. (Although, NCDH discontinued the analysis of fecal coliform for beach closures in 2008, it continued both fecal coliform and enterococci analyses for the midharbor samples collected by CSHH to allow for more consistency in the comparison of data.)

During the 1980s, chronic raw sewage spills into Hempstead Harbor 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. In addition to beach closings based on bacteria sample results, NCDH instituted **preemptive, or administrative, beach closings** following rain events that exceed a threshold level and duration of precipitation. That threshold is established at the beginning of each season based on previous sample results (typically, the threshold is ½ inch or more of rain). Therefore, even though water quality has improved remarkably, beach closures started to increase because of the preemptive closures. In 2013, area beaches were preemptively closed on 11 days (based on threshold of ½-inch of precipitation over a 24-hour period). The dates of closure included: 5/25, 6/3, 6/7, 6/8, 6/11, 6/14, 6/28, 7/1, 7/2, 7/23, and 8/14. (Note that in calculating total beach-closure days for each season, NCDH totals the number of days that each beach is closed, even if several beaches around the harbor are closed for the same rain event. Also, NCDH continues to monitor a private beach in Glen Cove, Crescent Beach, which has been closed since 2009 due to high bacteria levels.)

In addition to the monthly average beach data presented in *Table 6*, 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 for determining whether certain monitoring locations have consistently higher or lower bacteria concentrations or whether a monitoring location is particularly influenced by rainfall, wind, and currents.

Table 6
Monthly Average for Beach Enterococci Data for 2013

	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	2.55	1.30	22.80	8.03	6.80
May	Enterococci	20.03	10.57	38.76	23.90	20.38
June	Enterococci	36.38	6.65	73.12	79.33	20.88
July	Enterococci	63.00	21.75	5.11	10.42	5.00
August	Enterococci	4.13	7.13	16.13	19.01	15.75
Season Average	Enterococci	29.85	11.00	31.78	30.61	14.03

**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.*

3.8.3 Monitoring CSHH Stations for Bacterial Levels

CSHH collects samples for bacteria analysis at 18 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.


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

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, Glen Cove 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, a follow-up meeting prompted further testing by NCDPW and NCDH, but there were no definitive answers as to the source of the bacteria. In 2008, NCDPW further investigated the discharge pipes in question using a camera, and NCDH did dye testing at a possible source, but efforts by both county departments and the City of Glen Cove provided inconclusive results.

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

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 in June 2010 (900,000 gallons) and March 2011 (89,373 gallons). Corrective actions were taken to prevent future incidents. Also, 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.

Other areas of concern that CSHH regularly monitors for bacteria levels are the outfalls draining Scudder's Pond (CSHH #15A and #15B) and the Powerhouse Drain Subwatershed (CSHH #14A).These stations have been monitored since 2009 during the regular monitoring season, but were focus of the first winter monitoring conducted for the Hempstead Harbor water-monitoring program. As mentioned previously, both sites are major contributors of bacteria to Hempstead Harbor.


CSHH #15A during phragmites removal at Scudder's Pond (l) and CSHH #14A and ice below outfall at center of seawall (r) (photos by Carol DiPaolo, 1/28/14)

In 2013, years of planning finally culminated into the implementation of the Scudder's Pond Subwatershed Plan (2006). The winter monitoring of CSHH #15A and #15B was intended to help determine what happens to bacteria levels from the pond during cold winter months as well as observing levels during the construction period at the pond. Monitoring will continue after construction is completed to help determine whether the structural changes made to restore the pond and diminish stormwater runoff are effective in decreasing bacteria loading to Hempstead Harbor. The data from earlier monitoring of the sites has established a benchmark for comparison. See *Section 3.8.4* below.

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.

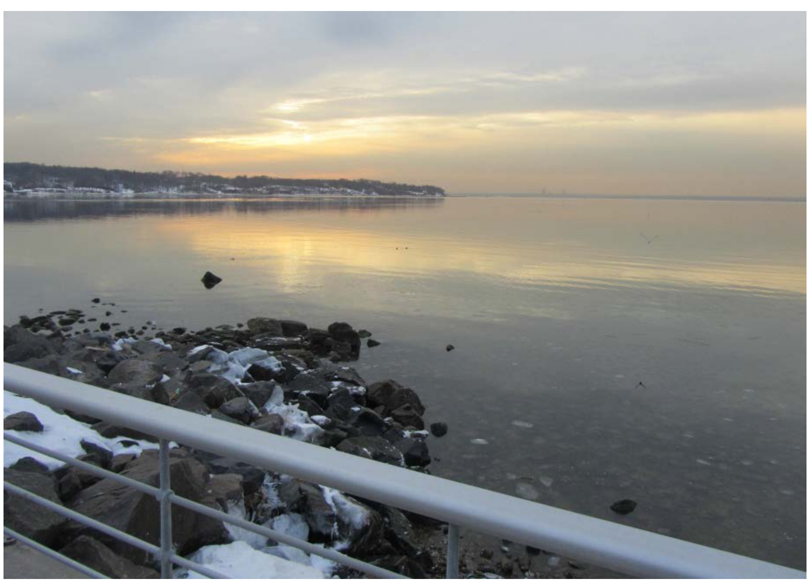
In 2013, monthly average bacteria results for enterococci at the area beaches ranged from 1.30 CFU (colony forming units)/100 ml at North Hempstead Beach (N) (former Hempstead Harbor Beach) in April to 79.33 CFU/100 ml at Tappen Beach in June. Overall, in 2013, North Hempstead Beach (S) (former Bar Beach) had the highest average bacteria levels, whereas North Hempstead Beach (N) (former Hempstead Harbor Beach) had the lowest (see *Table 6,* also in *Appendix D* with previous years).

The time series plots in *Appendix B* also show bacteria results for CSHH monitoring stations and indicate that elevated bacteria concentrations at CSHH #8, #9, #12, #13, #15A, and #15B typically occur following precipitation events, whereas elevated levels at the other monitoring locations do not appear to correlate as well to precipitation. CSHH #8-#13 are located within Glen Cove Creek, which has several stormwater outfalls along the north and south seawalls. There were only 7-10 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 July 11 at CSHH #11 and CSHH #12 and August 16 at CSHH #3). Although 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.

The Hempstead Harbor water-monitoring program has established levels of bacteria at various stations during the regular season. The winter monitoring, however, specifically targeted Scudder's Pond stations—CSHH #15A and #15B—for comparison of preconstruction (prior to pond restoration changes) bacteria levels and bacteria levels during cold weather, as well as during construction of pond improvements. The results of the analysis for winter water samples from pond outfalls showed that the levels for bacteria continue to be high through the winter months. Although there was some expectation that bacteria levels would decline in the colder temperatures, there are factors that may have contributed to the continued higher numbers during the winter. First, winter lower temperatures and UV



Sands Point at sunset—view from Sea Cliff Park (photo by Carol DiPaolo, 3/4/14) conditions promote slower decay and longer survival rates of the bacteria species. Second, bacteria-laden sediment released during the construction work, which included dredging the pond bottom, may have increased levels of bacteria. The results, however, were similar for CSHH #14A, a non-Scudder's Pond location that was included in the winter monitoring. See *Table 7* below and the time series plots in *Appendix B*.

Table 7
Stations Exceeding Bacteria Standards – Summer and Winter Monitoring

CSHH Stations	#15A		#15B		#14A	
% of CFU* Exceedances	FC**	EC***	FC	EC	FC	EC
5/5 - 11/13/13	17%	45%	29%	69%	32%	68%
11/18/13 - 5/14/14	13%	58%	13%	58%	50%	85%

*CFU: colony-forming units
**FC: fecal coliform
***EC: enterococci

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. It 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 3.8.1* 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, which contradicted DEC test results that 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.

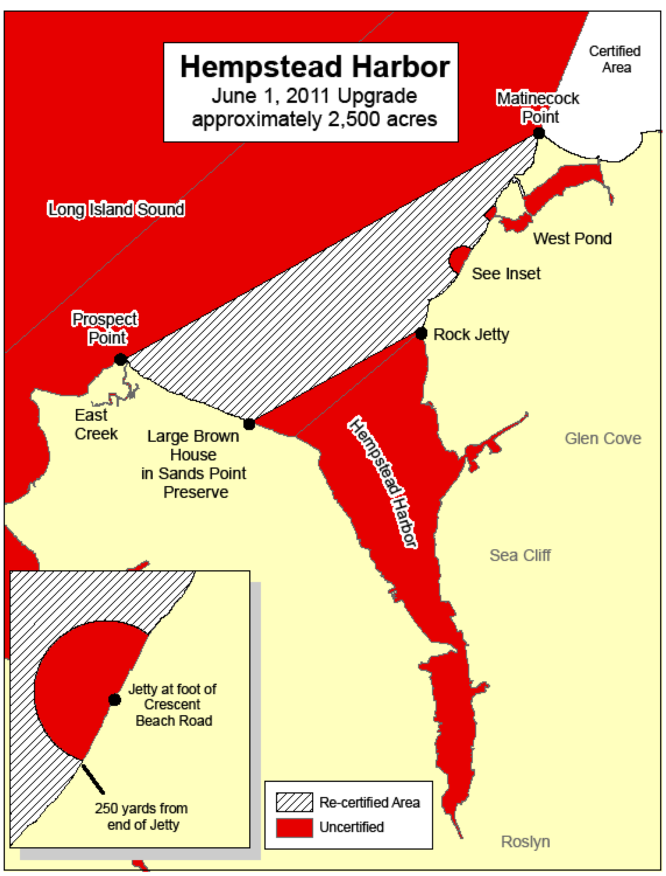
3.8.6 Monitoring Shellfish Growing Area #50

In 2009, in an attempt to assess 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 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 2010-2013. 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 Certified Shellfish Beds 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 shellfishing. (Crescent Beach has been closed for swimming since 2009 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.)



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

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

On the opening day, over 50 boats with clammers were busy off of the eastern shore of the harbor, pulling up clams in a variety of sizes. 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.

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. In 2013, such a closure occurred in Hempstead Harbor June 8-15, following over 4 inches of rainfall in two days preceding the closure.

Since the opening of the shellfish beds in 2011, CSHH has visited the area during weekly water monitoring to record the number of boats harvesting clams throughout the season. Our vantage point is generally from outside of Crescent Beach. In 2013, five to eight clam boats were seen in the area weekly, with more visible at a distance at the outer boundary of the certified area near Matinecock Point. An increased number of clam boats—up to 28—were in Hempstead Harbor when shellfish beds in Oyster Bay and other eastern bays were closed last July and August because of vibrio *parahaemolyticus*, a naturally occurring marine bacteria that can be more prevalent during warm summer months.

Clam boats in upper harbor (photo by Carol DiPaolo, 7/24/13)

According to a NYDEC report, the 2013 haul of hard clams from Hempstead Harbor totaled 6,253 bushels. That is the fourth largest harvest of hard clams out of eight shellfish areas along the north shore and the fifth largest out of 30 harvest areas that are all around Long Island.

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 midharbor 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 are 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 (which falls directly on the harbor surface) and through stormwater runoff. Both of these inputs can reduce the harbor's salinity. Direct precipitation tends to also dilute the quantity of pollutants within the harbor, although it can carry airborne pollutants. Stormwater runoff increases 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 8* presents monthly total precipitation for June through October, 1997 through 2013.

The total precipitation that fell in June through October 2013 (447 mm) was well below the average quantity that fell in previous years (659 mm) – slightly more than in 2010, for which there was the lowest seasonal total rainfall for the 15 years recorded. Typically, the distribution of precipitation varies from month to month. In 2013, October was very dry, whereas June was the wettest month of the monitoring season.

Table 8
Monthly Rainfall Totals for the 1997-2013 Monitoring Seasons, in mm

	June	July	August	September	October	Total
2013	235	69	59	75.5	8.5	447
2012	175.5	140.5	140.5	117.5	92.5	666.5
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

Throughout 2013 and even into 2014, the effects of Superstorm Sandy (October 29, 2012) reverberated in the New York metropolitan area. Although the impacts of the storm around Hempstead Harbor had generally faded, many residents were still not able to return to their damaged homes on the south shore of Long Island. Fortunately, from January to March of 2013, there were only two significant snowfalls (one in February and one in March, with 8 inches of snow accumulation for each), and there was no hurricane activity in this area during the 2013 season.

We began our regular monitoring season with a reconnaissance trip on May 6 to check out the condition and accessibility of monitoring stations. We also use the early reconnaissance trip to check on the number of active osprey nests in the lower harbor. Ospreys were seen flying over the harbor shoreline in March, so we expected to see the usual number of nests occupied, but only four of the six nesting sites we had been monitoring were active. The small blue sailboat that had been used as a nest for many years had been moved in 2012 to the western shore of the lower harbor and remained unoccupied, as did the nearby duck blind.

While our regular monitoring season seemed relatively quiet with no major weather events, our first winter monitoring component of the water program (November 2013 to May 2014)—to monitor bacteria levels of Scudder's Pond and the outfall by the power plant—

was marked by frequent snowfalls and colder-than-usual temperatures. The accumulation of snow in February had prevented access to monitoring stations for two consecutive weeks. Scudder's Pond had frozen, which caused some delay in restoration work.

The harsh weather also created difficulty in locating a leak that was discovered in an electrical cable that was discovered on January 6. The damaged cable is one of four cables that run under the harbor and sound. The tear in the cable was caused by a barge that had been anchored in the area. The cable was leaking dielectric fluid at a rate of 5 gallons per hour and then dropped to about 3 gallons per hour. The fluid, described as being light and the consistency of mineral oil, is considered nontoxic. The work crews brought in trailers and equipment to Tappen Beach and worked through snow and ice to locate the leak, monitor possible adverse effects to marine life and the shoreline, and cap the damaged cable. By late March all work was suspended, and the cable ends were laid back down. By late April, work was staged near the mouth of the harbor to begin splicing in a new piece of cable.

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.

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

For example from 2011 to 2014, we received several reports (and photos) of red foxes in the area. It seemed clear that the fox population had recovered and was thriving. We also had reports of deer population was moving westward across the north shore of Long Island and that deer had been seen in 2013 near the west shore of Hempstead Harbor.

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 was used in a "once-through cooling water system" to cool steam electric-generating units, and marine life would 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.

Demolition stages of the Glenwood Landing power plant from May to November 2013 (photos by Carol DiPaolo)

On December 21, 2011, the Long Island Power Authority (LIPA) and National Grid submitted an Environmental Assessment Form for **plans to relocate transmission lines and demolish two substations of the Glenwood Landing power plant**, which has dominated the view of the waterfront in the lower harbor since the early 1900s.

In June 2012, LIPA and National Grid released the Environmental Impact Statement (EIS) for the demolition project (see http://www.hempsteadharbor.org/applications/DocumentLibraryManager/HHPCupload/Glenwood_EIA_Final%20June%202012%20.pdf). It stated that once Substation No. 3 ceases operation, "All withdrawals and discharges of water from Hempstead Harbor, including the plant's once-through cooling water thermal discharge will cease and water quality will be improved. The use of freshwater from on-site wells and the municipal system, estimated to total about 11 to 18.5 million gallons annually (2010 and 2011 data, respectively) will also be eliminated."

With regard to impacts to the "aquatic ecosystem," the EIS states: "With the cessation of Power Station operations, water from Hempstead Harbor will no longer be needed for the once-through cooling system. Therefore, the **impingement and entrainment of aquatic organisms will be eliminated**. Based on the most recent aquatic impact modeling, **that would result in the elimination of about 5,300 fish impinged and about 190 million fish eggs, larvae, and early juveniles entrained annually**."

By the end of the 2012, the transmission lines that crossed the lower harbor from the southern beach of the Town of North Hempstead Beach Park (formerly Bar Beach) to one of the brick buildings were relocated to new poles installed on Shore Road. Asbestos removal for Substation 3 began in November 2012. In 2013, the two sand-colored stacks south of the brick building were taken down, and demolition of the brick building is scheduled to be completed by the end of 2014.

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 2013 catch totals for the harbor are included in the table below and were provided by Julia Socrates, Marine Biologist at the NYSDEC Bureau of Marine Resources, Diadromous Fisheries Unit. Columns 5-10 of the table represent months May-October. Seines were conducted May 14, June 25, July 9, August 6, September 19, and October 16 of 2013.

NYSDEC Western Long Island Sound Beach-Seine Survey

Hempstead Harbor 2013 Catch

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

Common name	AGE	5	6	7	8	9	10	Total Of COUNT
ASIAN SHORE CRAB	99		3	1	2			6
ATLANTIC HERRING	99	46						46
ATLANTIC NEEDLEFISH	99						1	1
BAY ANCHOVY	99	2		11	58	39	493	603
BLACKFISH	0				2			2

Common name	AGE	5	6	7	8	9	10	Total Of COUNT
(TAUTOG)								
BLACKFISH (TAUTOG)	1	10						10
BLUE CRAB	0	1						1
BLUE CRAB	1			1				1
BLUEFISH	0		24	1068	109	3	270	1474
CALICO (LADY) CRAB	99		4	6	9	1	5	25
COWNOSE RAY	99				1			1
GREEN CRAB	99		2	2				4
HORSESHOE CRAB	99		4		1			5
KILLIFISH SPP.	99	2	1	1	29	96	44	173
MUD CRAB	99	7	24	19	3	1		54
NAKED GOBY	99		1	1				2
NORTHERN KINGFISH	99				1	1		2
NORTHERN PIPEFISH	99	26	2		2			30
NORTHERN PUFFER	99				1			1
OYSTER	99	1						1
SAND LANCE SPP.	99		2					2
SEA STAR	99	7	15	19	4	1		46
SEABOARD GOBY	99	3	2					5
SILVERSIDE SPP.	99	420	316	1155	2646	1397	830	6764
SKILLETFISH	99					1		1
SPIDER CRAB	99	5	4	7				16
STRIPED BASS	1	3	1	1	10		1	16
STRIPED SEAROBIN	99				1	2		3
THREESPINE STICKLEBACK	99	1						1
WINDOWPANE FLOUNDER	99	1	1					2
WINTER FLOUNDER	0		234	135	34	2		405

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 midharbor stations. Often, however, schools of fish also can be seen 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. Even before the season starts, we receive reports from local residents, as we did 2013 regarding two seal sightings: one on April 27 (a seal was seen in the upper harbor on the west shore) and on April 29 (a seal was seen off the jetty at Morgan Park).

The description below summarizes our monitoring observations and includes reports from local fishing enthusiasts who regularly fish in Hempstead Harbor and near neighboring bays.

Brandt geese are often seen around Hempstead Harbor in the spring and fall (photo by Carol DiPaolo, 4/6/12)

May

As mentioned previously, we conducted a reconnaissance trip on May 6 and saw that four of the six osprey nests usually observed in the lower harbor were occupied. We also noted that a nesting box had been erected on a telephone pole south of the power plant. The box was placed there to attract a pair of **peregrine falcons** that had been seen often on the stacks of the power plant. The **nesting box** remained unoccupied for the entire season. We also saw the usual birds that are attracted to the harbor—ducks (mallards), cormorants, Canada geese, egrets, and swans. We also saw about six dozen brant geese in the lower harbor and another dozen near the Hempstead Harbor Club. We had a report that there were a lot of jellies on Sea Cliff Beach the day before, but we saw only one moon jelly while out in the harbor on May 6.

Our first full survey was conducted on May 10 for five upper-harbor stations only; the tidal cycle prevented access to lower-harbor stations, as was the case for the other monitoring dates in May (May 15 and 31). Also, our usual Wednesday schedule was altered due to weather and equipment problems. On May 10, we were surprised that Tappen Beach marina was loaded with all kinds of jellies. Comb jellies were present—too numerous to count—along with a few lion's mane and moon jellies. Also, something unfamiliar was present in large numbers—oval or barrel-shaped jellies, each encasing a white, thin, wormlike feature about ¾-1 inch long. We collected samples, and the unfamiliar jelly was identified as a **salp**, which is generally found in ocean waters and frequently in chainlike colonies. (The threadlike feature inside the jelly is the salp's digestive tract.) We saw salps again in large numbers on May 31 by CSHH #2 (Bell 6), along with some comb jellies and moon jellies at different stations.

We didn't notice any fish activity until May 31 when we saw large schools of bunker (Atlantic menhaden) near CSHH stations 1 and 2. We noted the large numbers of mussels and oysters on the bulkhead by the sewage treatment plant outfall, which is largely covered with barnacles, and a sea star by the power plant. On May 31, local fisherman Paul Boehm commented:

> *HH seems to have picked up where it left off last year. Lot of stripers and blues. Again big bunker in the harbor, not in the numbers seen last year, but it's early yet. To my amateur eye harbor seems healthy.*
>
> *Fish I've caught have been pretty big so far; smallest striper I've caught was 32", largest 40"--26 lbs (belly full of mantis shrimp plus a whole crab). Unusual because you usually get… smaller fish mixed in…blues have been from 4-11 lbs. Bunker are also big. I've seen the jellies also.*

In May, we saw the usual variety of birds that inhabit the harbor during the spring and summer: cormorants, mallards, egrets, Canada geese (by the dozens) and about 10 goslings, ospreys, and swans. We saw **brant geese** on May 10 and 15 and were surprised when a **turkey vulture** landed nearby on a piling in Glen Cove Creek on May 15.


Goose peering from a nest on the other side of the bulkhead in Glen Cove Creek and one of the resident goose families (photos by Carol DiPaolo, 5/22/13 and 5/31/13)

June

During our June water-monitoring surveys (June 5, 12, 19, 26), comb jellies and bunker were present on most dates. This was in contrast to conditions in June 2012, when there were few jellies but large, crowded schools of bunker, which could be seen "finning" not only in June but throughout the season. Bunker (members of the herring family) are filter feeders, and as they feed on phytoplankton and zooplankton at the surface, their dorsal fins can be seen breaking the surface of the water. We wondered whether the large schools of bunker were responsible for the low number of jellies in 2012. Bunker are also important prey for larger fish such as blue fish and striped bass, as well as for birds such as herons and ospreys.


Large schools of bunker finning (photos by Carol DiPaolo, 10/5/12)

During the June 12 monitoring survey, winds were up to 18 mph, so little could be seen in the middle and outer harbor because of the whitecaps. On June 26, the comb jellies were too numerous to count at CSHH #1 and #2 in the middle of the harbor. On this date also, we began to see the small variety of comb jelly (sea gooseberry), not just the larger sea walnut. We also saw bunker breaking the surface along with larger fish—possibly striped bass--doing the same. Two sea stars were among the large numbers of mussels and oysters on the bulkhead near CSHH #8 in Glen Cove Creek, and a large horseshoe crab was by the outfall north of Tappen Beach pool. It was interesting that the DEC seines in Hempstead Harbor had the largest number of sea stars in June and July. We received a report that a large **diamondback terrapin** was swimming near Sea Isle on June 18 at about 5PM.

During the June monitoring surveys, we saw the usual variety and numbers of birds that we see around the harbor: cormorants, mallards, egrets, Canada geese (still by the dozens), ospreys, and swans. We also saw two red-wing blackbirds and five terns. On June 24, two turkey vultures were seen flying over the eastern shore of the lower harbor.

A female mallard and her large brood in Glen

Diamondback terrapin (photo by

Cove Creek (photo by Jim Moriarty, 6/5/13) *Carol DiPaolo, 6/20/12*

Pete Emmerich, a local fishermen and member of the Hempstead Harbor Anglers who regularly reports to us on catches in the harbor, provided details on his fishing in Hempstead Harbor in May and June:

> *We had another great spring striped bass season in Hempstead Harbor. Once again we were blessed by the presence of bunker early and they stayed in the harbor all season. This year, the bunker returned to a more normal behavior. They swam in the entire water column while breaking the surface giving away their location. As you remember, last year the bunker "finned" in great schools on the surface, which was strange behavior and made it difficult to snag the bait.*
>
> *Bluefish made their appearance early, which also helped school the bunker and made snagging all that much easier. Several fishing trips resulted in a mixed bag of blues and bass. While targeting the bass, sometimes you just need to fish around the blues, and it helps to get the bait down below them to the bottom where the bass feed. The blues sure make a mess of your tackle, which if bass fishing is not normally rigged with wire to protect against the ferocious teeth of the bluefish….*
>
> *Last winter I had made up my mind that I would fish all the local spots inside Hempstead Harbor….. My fishing logs reminded me of outstanding bass catches in "skinny" water throughout the inner harbor in the 1980s. So I fished most of those old locations with great success. Every area I fished produced results of multiple bass and the occasional bluefish.*


Pete Emmerich with striped bass on 5/31/12 (l) and with friends and fish (r) on the evening of 6/21/13 (photos provided by Pete Emmerich)

On June 21, Pete said the night's catch for June 21 included six fish that were 15 to 30 pounds.

July
We had four surveys in July (July 3, 17, 24, 31). (We were unable to monitor stations on July 10 because of problems with boat availability.) Bunker and comb jellies were observed

on all but one of the monitoring dates in July along with schools of baitfish. The highlight of the month was the return of **bottlenose dolphins** to the harbor. For the third time in recent years (July 19), we were visited by dolphins. We were told that eight dolphins were back in the harbor earlier that morning and then again around 11AM, when they swam past Sea Cliff Beach. Also in July, the DEC seine catch in Hempstead Harbor included the largest number of bluefish for the season—1,068, all young-of-the-year.

The usual variety of birds we see around the harbor was observed on all monitoring dates in July; they included cormorants, mallards, egrets, and Canada geese (still in large numbers and mostly at the beaches—about 90 at Bar Beach on July 3 and about seven dozen almost evenly split between the sand spit at Bar Beach and flying over Glen Cove Creek), ospreys, swans, terns, herons, and one belted kingfisher (on July 3 and 24), and two terns and a killdeer on July 31. On July 3, a night heron was observed at Scudder's Pond, and the three osprey chicks we heard in the nest at Beacon 11 earlier in the season were ready to fledge.

Osprey watching over nest at Beacon 11
(photo by Pete Emmerich, 4/27/13)

On July 24, we observed 11 blue herons in different parts of the harbor. On the same day, while near CSHH #8 in Glen Cove Creek, we were surprised by a gray hawk or falcon aggressively chasing a belted kingfisher and a gull chasing a duckling, in quick succession and very close to the monitoring boat. On July 31, we saw 10 great egrets, mostly in the lower harbor, and 2 terns and killdeer in Glen Cove Creek.

August

In August, we had four sampling trips (August 8, 14, 21, and 28) and difficulties scheduling these because of problems with boat availability. Comb jellies—both sea walnuts and sea gooseberries—were observed in large numbers on all of the August monitoring dates except August 14, when high winds and waves made it difficult to see anything below the surface of the water. We saw our first blue-claw crab of the season on August 28 (only two showed up in 2013 DEC seines in Hempstead Harbor, one in May and one in July).

The fishing season seemed quieter than usual, and we noticed that fewer boats were out on the water. Although we saw schools of bunker and bait fish, we didn't observe anything striking. The DEC's seine catch for August, which included the largest number of silversides for the season—2,646 out of a seasonal total of 6,764—had more diversity than was evident at the surface. Even our usual fishing contacts were out fewer times and had less to report.

We observed the usual variety of birds on all monitoring dates in August, but with the highest numbers observed on August 8 because we were able to do a full-harbor survey that included lower-harbor stations. We saw cormorants, ducks, Canada geese (with the largest number—seven dozen—seen on the Hempstead Harbor Beach Park shoreline), egrets (15 great egrets and 1 snowy), ospreys (up to 7 observed on August 8), swans (up to 14 observed with 3 cygnets on August 8), and 1 blue heron. On August 28, at the head of Glen Cove Creek, we saw two plover-type birds that appeared to be piping plovers—very light in color, small, and with no distinct neck-ring markings.

September

During September, we had only three monitoring dates (September 4, 18, 13), due to problems with boat availability. Large numbers of comb jellies were observed on all monitoring dates in September. Bait fish were observed on September 4 and 25. The DEC seine catch in Hempstead Harbor for September included the largest number of killifish—96 out of a seasonal total of 173—with a large number—1,397—of silversides.

Local fisherman Paul Boehm reported the following:

> *Summer was pretty slow. Last week or so* [late September], *things picked up. I've been getting big blues, essentially in mid-sound. The fish are 10-14 lbs with a few smaller blues thrown in. Last night got ten of the big ones before I ran out of bait. Also lots sea robins and smooth dogfish. Got the biggest dogfish I have seen in the sound last night, must have been around 40 inches, although I couldn't really measure him as he was twisting around so much, I had all I could handle just getting him back in the water. Bunker have been sparse. I've only seen a few pods over the last month, the biggest pod was living in the Tappen marina; there were guys snagging them in the marina. Interesting thing was that one of the blues regurgitated half of what looked like a butterfish, although I'm not sure on that one. I released everything as I don't really care for bluefish. You're right about boat traffic, very slow as well. There wasn't another boat within a few miles of me last night, and that's pretty much been the rule all summer. Apparently huge numbers of porgies around, but I don't fish for them, so that's second hand. Blackfish season starts Saturday* [October 5]; *that will get a lot of guys on the water.*

The usual variety of birds we see around the harbor were observed on monitoring dates in September, and they included cormorants, mallards, egrets, and Canada geese (in fewer numbers than in previous months), blue herons, ospreys, swans, and one belted kingfisher.

October

During all of our monitoring dates in October (October 1, 8, 15, 18, 22, and 29), comb jellies were observed. And although the fish were out of our view, local fishermen were seeing quite a bit of activity. On October 6, Paul Boehm reported the following from a fishing trip he and his brother Paul went out on:

> *Went out yesterday for the opening of the blackfish season. Ran across to the other side of the sound to a spot outside of Milton Harbor. Did pretty well using green crabs as bait. Caught 3 keeper blackfish, two of which were good sized (6 & 7lbs), 4-5 short blackfish, 5 porgies, and 2 oyster toadfish. The toadfish were by far the most interesting catch, very cool. In attempting to unhook the little devils I learned that they carry quite a bite. Anyway got my hook, and finger, back, and let them go to bite someone else's finger another day. There had to be 100 boats out there for the start of the season.*

Oyster toadfish (photo by Rich Boehme, 10/5/13)

For the last DEC seine of the season in Hempstead Harbor, the catch included the largest number of bay anchovies—493 out of a seasonal total of 603.

The birds we noted while sampling included cormorants, mallards, Canada geese, egrets, blue herons, swans (higher numbers on October 1 and 29—16 and 15, respectively). We saw one belted kingfisher on October 1. We saw only two ospreys—on October 1. We were surprised to see that the osprey nest at the top of Beacon 11 had been completely removed, and it looked as though humans had been involved—not a stick remained.

November

In November we had only two monitoring dates for in-harbor stations (November 6 and 13). The comb jellies were around on November 6, but none were observed on November 13. On November 13, we were able to monitor only lower-harbor stations; high winds and 2-3 foot waves prevented us from sampling at CSHH stations #1, 2, and 3. As the season drew to a close, we saw fewer birds in the harbor; they included cormorants, mallards, Canada geese, and swans. On November 16, we received a report that **seals** were in spotted in the harbor—one by the barges in the middle of the harbor, two by Crescent Beach, and one near Matinecock Point.

The regular monitoring includes collecting water samples at areas that drain Scudder's Pond as well as the outfall that drains what is referred to as the Powerhouse Drain Subwatershed. However, in November 2013, we started the first **winter monitoring** for the program, specifically to monitor bacteria levels from Scudder's Pond during the cold winter months as well as during the construction period for the restoration of the pond. The primary purpose in restoring the pond was to make it more efficient in filtering out bacteria, thus diminishing the bacteria flowing into Hempstead Harbor. Other changes structural changes to the pond were intended to diminish the amount of sediment that ends up in the pond through stormwater runoff. The winter monitoring began on November 18 and extended to May 14. Opportunities arose to also monitor the outfall by the powerhouse during the same period; this was important, because a plan was just completed at the end of 2013 to address the bacteria loading to Hempstead Harbor that results from the subwatershed area above the outfall.

4.3 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 in 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 2011-2012 monitoring dates, but the DEC seine crew for the striped-bass survey caught four in 2011 and seven in 2012. In 2013 we saw one blue-claw crab, and the DEC seine catch for Hempstead Harbor included two—one in May and one in July.

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.

A rarely seen crustacean around the shorelines of Hempstead Harbor and Long Island Sound is the **mantis shrimp**. That's because mantis shrimp hide at the bottom in rock formations or burrow several feet into the bottom of the harbor or sound. They have been nicknamed thumb-splitters because of their strong front claws, and they should be approached cautiously. We saw one many years ago during a low DO event that drove mantis shrimp and other bottom-dwelling creatures to the surface for air. In 2007, four small mantis shrimp were raked from the bottom during a shellfish survey. In 2012, a mantis shrimp was found in the belly of a striped bass. In 2013, a large mantis shrimp was brought up from the bottom during a shellfish survey that was conducted in November.

Mantis shrimp found in the belly of a 16-lb striped bass that was caught and cleaned (photo by Rich Boehm, 5/26/12)

4.4 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.

Comb jellies usually appear in large numbers in Hempstead Harbor in late June and through mid-October. Over the last couple of seasons, however, there has been some variation in the timing of their appearance. In 2011, they were noted a little earlier in the season, in May, and were seen during monitoring dates for the last time on October 6. In 2012, we observed only a few comb jellies on each of two monitoring dates—the first on August 22 and the second and last time on September 7. The large population of bunker in the harbor and around the sound may have had an impact on the comb-jelly population. The comb jellies were back in 2013 and were noted throughout the entire season.

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. In 2011, we saw about a dozen moon jellies in Hempstead Harbor on May 26 but no moon jellies or lion's mane in 2012. In 2013, we saw both lion's mane jellyfish and moon jellies in Hempstead Harbor, but the lion's mane had an orange coloring to them. Mixed among these, we saw hundreds of unfamiliar jellies that were identified as **salps**. The DEC seine hauls usually include a lot of jellies, but they are not noted in the total counts.

Lion's mane jellyfish seen in Tappen Marina; the thin white lines visible at left are the internal structures in barrel-shaped salps (photos by Carol DiPaolo, 5/22/13)

4.5 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 (r) (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 a means of informing the public about the importance of local marine resources and the need to 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 US 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)

4.5.1 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 a posting for area closed to shellfishing at Tappen Marina (r)(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 following 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. In 2012, the shellfish beds were closed April 23-30, following heavy rain on April 22-23.

4.5.2 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, the Nassau County Executive at the time, 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 later help in gauging the survival rate of the seeds.)

Two years later, on October 15, 2009, Nassau County 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.

4.5.3 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). A few seed clams of both types of clams used in the seeding project—*Mercenaria mercenaria* and *M. mercenaria notata*— were found, but 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 considered unsuitable 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.)

In October 2013, a shellfish survey was conducted by the Town of Oyster Bay over a two-week period. The survey involved collecting about 120 bottom grabs at about 60 predesignated locations throughout the harbor. The samples were washed through a series of culling grids (the finest was about a quarter-inch square). All of the shellfish were measured, and other species were recorded. The results of the survey are scheduled to be released in July 2014.

The shellfish data is used to calculate shellfish density at each location. Data is also collected on sediment type, salinity, and depth. The results of the survey can be compared with previous surveys to see whether the population of shellfish has changed with respect to abundance, size, and age of the clams.

Crane and barge used for 2013 shellfish survey (photos by Carol DiPaolo, 10/8/13)

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 for 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 the 2011 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—during warmer weather—when chowder clams are not in high demand. By 2013, reportedly there was a good mix of sizes.

4.5.4 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, 11/5/11)

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 at this and other sites in the project. In early November 2011, CSHH scoped out the site prior to the scheduled collection date to determine access and current mussel-population density. CSHH 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 2011. The collection took place on November 21, 2011, but because of budget constraints, sample and data analyses have been delayed; the data was not available by the end of 2013.

In March 2012, CSHH was contacted about another NOAA mussel-collection program—this time for **ribbed mussels**. Lynn Dwyer, Assistant Director, Northeast, Eastern Partnership Office of National Fish and Wildlife, asked us to help locate potential sites to collect ribbed mussels in Hempstead Harbor.


Ribbed-mussel colonies on the eastern shore of Hempstead Harbor (l) and close-up of mussels around spartina roots (photos by Carol DiPaolo, 3/30/12)

There has been a very healthy population of ribbed mussels on the eastern shore of Hempstead Harbor, just south of Rum Point (north of the Tappen Beach Park and Pool). The mussels are in colonies around spartina roots and densely packed with no blue mussels nearby. It was interesting that the two types of mussels didn't seem to create colonies near one another.

4.6 Birds

As has been the case over the last 15-20 years or so, during 2012 we saw a variety of birds that have become regular visitors to Hempstead Harbor. **Belted kingfishers, 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 **brants**, **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. Although the adult Canada goose population remains high, over the last couple of years, we have seen fewer numbers of young for these birds. We have also observed fewer adult swans than in previous years. In 2010, for example, 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. In 2012, we saw swans throughout the season, but never counted more than 8 at one time. In 2013, the highest number counted during a water-monitoring date was 17.

A pair of Foster terns on an old piling (l) in the lower harbor and one of four sanderlings at Sea Isle (r) (photos by Jim Moriarty, 5/16/12

Osprey populations**,** once threatened because of the effects of widely used pesticides that were banned in the 1970s, have made a remarkable comeback to Hempstead Harbor and Long Island Sound. These beautiful "fish hawks" can be seen diving for prey in harbor waters. As the harbor's ecosystem improved, the ospreys and other water birds have been able to find plenty of food for them to thrive. The ospreys migrate long distances, to South America, in the fall and return in March—generally to the same nesting places they had been to previously. On March 3, 2012, two ospreys were seen over St. Mary's Church in Roslyn.

There have been six easily visible osprey nests in Hempstead Harbor that have been established over more than 15 years. Over the last ten years 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 and on August 11saw the three fledglings fly off the nest as we approached it.

Osprey on nest on pilings near Bar Beach boat ramp
(photos by Carol DiPaolo (l) and Jim Moriarty (r), 4/17/12)

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. Although the chick didn't look like it would survive, in time it recovered and was 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.

In 2012, the blue sailboat was moved to the western shore of the harbor, and no ospreys claimed it. The duck blind used by ospreys in 2011 remained unoccupied in 2012, as did the old tug at Gladsky Marine Salvage. However, the dock in the lower harbor on the eastern shore, old pilings and a platform on the western shore in the lower harbor, as well as the navigational light between Tappen Marina and Bar Beach, were occupied by ospreys in 2012, as they had been previously.

In 2013, the blue sailboat remained unoccupied. Ospreys returned to Beacon 11, one of the first nests visible in Hempstead Harbor, between Tappen Beach marina and the southern section of the Town of North Hempstead Beach Park (formerly, Bar Beach). We saw three fledglings preparing to leave the beacon nest on July 31. We were surprised to see that the entire nest had been removed by late September.

Over the last few years, a pair of **peregrine falcons,** protected species, 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, but we saw one flying by the power plant on October 10, 2012. In 2013, a special nesting box had been erected south of the Glenwood Landing power plant, to try to attract the falcons away from the top of the brick building that was slated for demolition.

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, 2010, three red-tailed hawks with striking coloration circled over the head of Glen Cove Creek. On July 8, 2010, we received a report that a red-tailed hawk was seen flying over a house in the Greenvale-Mott's Cove area chasing a turkey vulture. Two red-tailed hawks were seen flying east of Tappen Beach on March 3, 2012. In 2013, red-tailed hawks and turkey vultures were seen or reported throughout the year.

Red-tailed hawk flying over Glen Cove Creek (11/3/10) (l) and osprey in flight (c)(9/11/10)(photos by Jim Moriarty; turkey-vulture photo posted at en.wikipedia.org/wiki/Turkey_Vulture, retrieved 6/17/12, showing the bird's distinctive two-tone feather pattern underneath its wings

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, Roslyn Harbor, 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. Early in 2012, there were several reports of turkey vultures flying over the Greenvale railroad station; 8 were seen on February 2, 2012, at about 11:30 am, and 3 were seen on February 5, near the intersection of Glen Cove Road and Glenwood Road, and two turkey vultures were seen over Sea Cliff on September 20, 2012. In 2013, we had a surprise close-up view of a turkey vulture that landed on a piling in Glen Cove Creek on May 15.

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 and 2012, similar instances occurred, and the swallows often used the railing of the monitoring boat as a perch.

Barn swallows at Tappen Marina on the railing of the monitoring boat (l) and on a nest under the marina bulkhead (r) (photos by Jim Moriarty, 5/16/12)

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.**

4.7 Diamondback Terrapins

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.


A diamondback terrapin below the outfall north of Tappen Beach Pool
(photos by Carol DiPaolo, 6/27/12)

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. The diamondback pictured above was seen on June 27, 2012, north of the Tappen Beach pool and was more than a foot long.

Occasionally, large sea turtles have made their way into Long Island Sound and have been spotted in local bays. On August 2, 2011, we had a report that a large sea turtle was seen at the Shelter Bay Yacht Club in Manhasset Bay. On October 24, 2011, we received a report from Paul Boehm, 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**

4.8 Algal Blooms

Color and turbidity of water within the harbor in 2013 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 Secchi reading ranged from 0.5-3.0 m; in 2011, the range was 0.4-2.3 m; and in 2012, the range was 0.5-3.2 m; in 2013, the range was 0.5-2.0. Lower 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 of 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 2012, the water color was judged to be a normal brown or green on most sampling dates, except for the following:

- June 20, water in parts of Tappen Marina had turned reddish brown
- July 18, water in parts of Tappen Marina and parts of the lower harbor appeared to be a thick, mossy green
- September 7, half way up Glen Cove Creek and to its head, the water appeared very green and very different from the rest of the harbor
- September 16 (not a sampling date), a red tide was reported at the mouth of the harbor, with a blood-red color from Matinecock Point to the Webb Institute

After notifying NYS DEC staff and others of the September 16 report, Bill Hastback (NYSDEC Marine Resources) responded that the DEC had received a report a couple of weeks before this from the Connecticut shellfish program of "red tide" blooms in mid-Long

Island Sound side that was identified as *Cochlodinium polykrikoides* (Cp). Typically, Cp is distributed in narrow bands or streaks and has a dark red or mahogany color. It is potentially harmful to nonmotile marine organisms and fish larvae but is not known to be harmful to humans.

During the 2013 monitoring season, the water at monitoring stations was judged to be within the normal range of color from green to brown throughout the season. However, August 20, we received a report of a very localized, bright green discoloration of the water near the Bar Beach boat ramp and some bright green liquid that looked like antifreeze in the parking lot near the boat ramp. There were no other reports of discoloration in the harbor.

October 3, 2013, a local resident reported very brown water by Sea Cliff Beach that looked like it might be from a sewage spill. The manager of the Glen Cove STP said that no spills had occurred. Nassau County Department of Health collected a sample of the water for bacteria analysis, but the levels were very low. On October 4, on an outgoing tide, the southern portion of the harbor looked browner than Sea Cliff Beach, and Paul Boehm reported that he saw very brown water out in the sound. We concluded that the brown water was the result of an algal bloom, particularly because on October 1, during monitoring we had supersaturated levels of DO near the surface, which usually indicates a bloom in progress, and we had noted that on the data sheet.

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

% Clo d 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____

Cal. Constants ____________

Water Monitoring Data Sheet

Air Temperature : ________ °C

Station :

Time : ________________

Date: ____________

Wind _______

Air °C _____

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

DO cal. ck.

_____% sat.

Station :

Time : ________________

Wind _______

Air °C _____

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

DO cal. ck.

_____% sat.

Station :

Time : ________________

Wind _______

Air °C _____

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

DO cal. ck.

_____% sat.

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 209 Main Street Hempstead, NY 11550	FORM NAME: □ QC □ Equip Maint □ Training □ Comp Doc □ Other	
LABORATORY SECTION □ Chemistry □ Environmental Microbiology □ Clinical Microbiology	Form. No.: Date:	Rev: 0 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 Air	Temperature Water	Wind	Weather	Wave Height	Laboratory Use Only: Lab Number	Fecal Coliforms	Enterococci	Comments
CSHH-1	10		5	BEACON ELEVEN										
CSHH-2	10		5	BELL BUOY 6										
CSHH-3	10		5	RED MARKER GLEN 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 209 Main Street Hempstead, NY 11550	FORM NAME: □ QC □ Equip Maint □ Training □ Comp Doc □ Other	
LABORATORY SECTION □ Chemistry □ Environmental Microbiology □ 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

2013 CSHH Field Monitoring Data
2013 Weekly Results Graphs for Water-Quality Parameters
2013 Turbidity and Secchi-Disk Transparency Graphs

Coalition to Save Hempstead Harbor

FUSS & O'NEILL

2013 CSHH Field Monitoring Data

CSHH Water-Monitoring Program 2013

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH			Air Temp (°C)	Secchi (m)	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																	
11/13/13	No sampling because of high wind and waves.																
11/6/13	11.79	12.04	11.92	26.09	26.29	26.19	8.55	7.61	7.36	7.59	7.48	9.5	1.75	1.24	1.12	3.2	8:05
10/29/13	13.13	13.66	13.40	26.43	26.56	26.50	9.09	8.45	7.70	7.77	7.74	7.4	1.25	0.66	0.70	5.2	8:00
10/22/13	16.27	16.46	16.37	26.07	26.29	26.18	6.86	6.60	7.47	7.52	7.50	13.4	1.0	1.37	1.64	4.0	8:11
10/15/13	17.47	18.27	17.87	26.39	27.31	26.85	6.49	5.71	7.52	7.59	7.56	11.7	1.25	1.46	1.31	5.5	8:00
10/8/13	19.61	19.61	19.61	27.00	27.14	27.07	7.59	7.15	7.01	7.30	7.16	15.5	1.2	1.93	1.39	2.9	8:10
10/1/13	19.65	19.82	19.74	27.01	27.90	27.46	8.41	6.23	7.68	7.60	7.64	15.4	1.0	2.05	2.03	4.7	8:00
9/25/13	18.51	18.58	18.55	25.92	26.02	25.97	10.67	10.38	7.64	7.89	7.77	14.0	0.5	3.17	N/A	3.9	8:06
9/18/13	19.54	20.44	19.99	26.56	27.37	26.97	6.90	5.08	7.44	7.48	7.46	12.2	0.75	3.89	N/A	4.2	8:05
9/4/13	23.74	23.70	23.72	26.84	26.90	26.87	7.45	6.80	7.68	7.68	7.68	21.5	0.75	2.51	2.63	4.9	9:38
8/28/13	23.66	23.43	23.55	26.12	26.58	26.35	9.87	8.37	7.6	7.77	7.69	24.7	0.5	3.88	N/A	3.3	9:15
8/21/13	23.17	22.27	22.72	26.27	27.09	26.68	8.68	3.59	7.55	7.34	7.45	25.1	0.75	1.58	1.96	5.1	10:10
8/15/13	22.22	22.27	22.25	26.34	26.35	26.35	2.33	1.86	7.19	7.13	7.16	18.3	1.75	0.34	0.27	4.2	8:35
8/8/13	22.21	21.91	22.06	25.46	26.23	25.85	5.22	2.56	6.78	7.02	6.90	23.4	1.0	1.99	2.12	2.9	8:02
7/31/13	24.04	23.98	24.01	25.40	25.82	25.61	8.58	6.53	7.94	7.76	7.85	22.2	0.75	2.43	2.80	5.0	8:05
7/24/13	23.55	23.46	23.51	25.22	25.43	25.33	4.72	4.40	7.11	7.16	7.14	24.8	1.2	1.49	1.93	2.6	8:03
7/17/13	25.44	22.19	23.82	25.03	25.73	25.38	9.51	3.83	7.87	7.74	7.81	29.1	0.75	1.86	2.31	4.9	8:20
7/10/13	Boat not available.																
7/3/13	20.60	19.48	20.04	24.38	25.60	24.99	6.51	4.15	7.40	7.29	7.35	24.6	1.0	1.09	1.28	5.1	8.22
6/26/13	21.24	20.97	21.11	24.67	25.02	24.85	6.47	5.92	7.67	7.68	7.68	25.8	1.1	1.72	1.49	2.8	8:12
6/19/13	20.80	20.53	20.67	24.84	25.00	24.92	10.31	8.10	8.32	8.08	8.20	21.1	0.75	2.27	2.91	4.6	9:33
6/12/13	18.44	18.46	18.45	24.59	24.64	24.62	8.62	8.90	7.34	7.69	7.52	20.0	0.5	5.72	N/A	3.3	8:05

Coalition to Save Hempstead Harbor

FUSS & O'NEILL

2013 CSHH Field Monitoring Data

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH			Air Temp (°C)	Secchi (m)	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)
6/5/13	18.20	17.30	17.75	25.68	26.12	25.90	12.58	8.81	7.80	7.90	7.85	17.5	0.8	2.78	2.77	5.1	8:10
5/31/13	16.29	16.11	16.20	26.34	26.44	26.39	9.50	9.32	7.93	7.93	7.93	25.7	0.75	3.00	2.99	3.7	8:00
5/15/13	14.62	14.22	14.42	24.58	25.83	25.21	6.75	5.42	8.29	8.24	8.27	16.2	0.5	3.54	N/A	3.9	9:10
5/10/13	14.35	13.17	13.76	25.39	26.35	25.87	8.16	8.38	8.23	8.11	8.17	21.6	0.75	3.75	4.18	4.1	8:18
CSHH #2 - Bell Marker 6																	
11/13/13	No sampling because of high wind and waves.																
11/6/13	12.75	12.87	12.81	27.24	27.29	27.27	7.41	7.05	7.90	7.89	7.90	12.4	1.75	0.87	1.11	7.2	9:50
10/29/13	14.22	14.25	14.24	27.14	27.14	27.14	8.04	7.91	7.86	7.86	7.86	9.5	1.5	0.38	0.38	7.3	10:28
10/22/13	16.65	16.74	16.70	27.03	27.06	27.05	7.95	7.87	7.74	7.74	7.74	16.7	1.5	0.74	0.61	7.5	9:55
10/15/13	18.12	17.98	18.05	27.06	27.15	27.11	6.98	7.00	7.73	7.74	7.74	16.1	1.5	0.89	1.08	8.9	9:53
10/8/13	Abandoned--bacteria sample only--high wind and waves.																
10/1/13	19.78	19.63	19.71	27.83	27.92	27.88	9.15	7.75	8.02	7.93	7.98	18.9	1.2	1.88	1.18	9.7	9:18
9/25/13	19.33	19.73	19.53	27.60	27.91	27.76	9.70	8.13	8.00	7.86	7.93	16.4	0.75	2.63	2.13	7.2	8:43
9/18/13	20.68	21.21	20.95	27.90	28.13	28.02	7.11	5.85	7.66	7.66	7.66	16.2	0.75	2.35	3.38	8.9	8:43
9/4/13	23.83	23.71	23.77	27.30	27.35	27.33	7.07	6.60	7.86	7.80	7.83	22.2	0.75	2.52	2.62	8.8	10:15
8/28/13	23.72	22.69	23.21	27.17	27.33	27.25	9.68	5.42	8.04	7.67	7.86	29.4	1.0	1.48	1.62	6.7	9:55
8/21/13	Boat problems.																
8/15/13	Abandoned because of wind and waves.																
8/8/13	22.11	21.53	21.82	26.38	26.59	26.49	7.33	2.93	7.58	7.26	7.42	23.5	1.00	1.17	1.17	7.5	8:35
7/31/13	24.24	22.45	23.35	25.85	26.18	26.02	7.69	1.41	8.01	7.33	7.67	23.2	0.75	1.86	2.46	8.2	9:40
7/24/13	24.23	22.28	23.26	25.83	26.24	26.04	8.50	1.45	7.77	7.20	7.49	25.3	1.0	1.11	1.39	7.9	8:57
7/17/13	25.55	21.18	23.37	25.56	25.98	25.77	11.58	5.52	8.07	7.56	7.82	31.0	1.0	0.53	2.90	9.1	8:57
7/10/13	Boat not available.																
7/3/13	20.88	19.07	19.98	25.57	25.94	25.76	8.55	4.02	7.81	7.42	7.62	25.8	0.75	0.84	0.27	9.3	10:30
6/26/13	20.60	18.60	19.60	25.51	25.84	25.68	8.58	4.81	8.04	7.56	7.80	25.4	1.20	1.08	0.63	6.8	9:00
6/19/13	19.41	17.72	18.57	25.23	25.93	25.58	9.71	6.35	8.24	7.72	7.98	19.5	1.0	2.11	1.53	9.2	10:10
6/12/13	17.96	17.19	17.58	25.35	25.55	25.45	8.88	7.64	7.95	7.88	7.92	20.4	1.2	1.79	2.18	8.2	8:40

2013 CSHH Field Monitoring Data

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH			Air Temp (°C)	Secchi (m)	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)
6/5/13	18.05	14.11	16.08	26.07	26.67	26.37	10.11	7.25	8.28	7.79	8.04	18.2	0.8	1.94	1.31	9.7	10:20
5/31/13	16.75	14.33	15.54	26.43	26.78	26.61	12.23	8.43	7.98	7.71	7.85	25.3	0.75	2.64	2.19	7.6	8:55
5/15/13	14.10	12.56	13.33	26.06	26.87	26.47	5.54	5.56	8.30	8.13	8.22	16.7	1.0	2.23	2.03	7.6	9:55
5/10/13	14.83	13.56	14.20	25.20	25.63	25.42	13.96	12.93	8.53	8.49	8.51	24.8	0.75	2.69	3.62	9.3	10:18
CSHH #3 - Glen Cove Creek, Red Marker																	
11/13/13	No sampling because of high wind and waves.																
11/6/13	12.44	12.69	12.57	26.64	27.02	26.83	6.84	6.77	7.89	7.89	7.89	13.4	2.0	0.74	0.76	3.9	9:14
10/29/13	13.90	14.07	13.99	26.54	26.99	26.77	8.00	7.74	7.88	7.86	7.87	9.5	1.5	0.67	0.97	4.6	10:44
10/22/13	16.68	16.96	16.82	26.60	26.85	26.73	8.15	7.88	7.80	7.77	7.79	16.8	0.75	0.98	1.16	3.4	9:20
10/15/13	17.89	18.08	17.99	26.44	27.17	26.81	6.88	6.58	7.70	7.71	7.71	16.5	1.2	1.19	0.98	5.5	10:15
10/8/13	19.02	19.71	19.37	26.93	27.82	27.38	7.32	7.75	7.68	7.68	7.68	16.3	1.0	1.57	0.72	2.9	9:05
10/1/13	20.04	19.81	19.93	27.34	27.93	27.64	10.17	6.90	8.15	7.85	8.00	19.5	1.0	1.29	1.66	5.3	9:41
9/25/13	19.62	19.72	19.67	27.36	27.74	27.55	9.17	7.40	7.97	7.82	7.90	16.0	0.75	3.38	3.67	3.8	9:10
9/18/13	19.78	20.84	20.31	27.04	27.78	27.41	6.95	5.59	7.73	7.65	7.69	16.1	1.0	2.12	1.55	5.0	9.07
9/4/13	23.80	23.76	23.78	27.28	27.32	27.30	7.21	6.88	7.89	7.84	7.87	22.1	0.75	2.55	3.70	5.2	10:50
8/28/13	24.10	23.37	23.74	26.26	26.91	26.59	10.76	9.46	8.14	8.05	8.10	30.7	0.75	2.49	3.06	3.6	10:22
8/21/13	23.21	22.23	22.72	26.63	27.19	26.91	7.83	4.24	7.81	7.6	7.71	27.0	0.5	1.18	N/A	5.9	10:50
8/15/13	Abandoned because of wind and waves.																
8/8/13	22.27	22.04	22.16	25.90	26.24	26.07	6.04	4.25	7.55	7.36	7.46	23.6	1.0	1.67	1.35	3.6	9:02
7/31/13	24.70	23.90	24.30	25.54	25.97	25.76	9.86	7.99	7.98	7.89	7.94	25.3	0.75	2.19	2.81	4.1	10:26
7/24/13	24.68	24.53	24.61	25.61	25.73	25.67	8.04	7.99	7.82	7.84	7.83	26.1	1.5	0.98	1.23	3.6	9:42
7/17/13	26.31	22.06	24.19	25.52	26.01	25.77	12.20	6.32	8.19	7.72	7.96	30.9	1.0	1.31	1.01	4.4	9:41
7/10/13	Boat not available.																
7/3/13	21.43	19.37	20.40	25.09	25.74	25.42	9.61	5.43	7.88	7.59	7.74	26.4	0.5	0.80	N/A	4.6	11:05
6/26/13	23.25	22.23	22.74	24.46	25.22	24.84	10.22	9.85	8.34	8.29	8.32	26.8	1.2	0.88	0.70	2.7	9:35
6/19/13	20.35	18.78	19.57	24.55	25.46	25.01	8.82	8.00	8.20	7.96	8.08	21.5	1.0	2.04	2.55	3.9	10:35
6/12/13	18.38	18.32	18.35	25.01	25.07	25.04	8.68	10.02	8.04	8.07	8.06	20.2	1.2	1.78	2.23	3.1	9:21

2013 CSHH Field Monitoring Data

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH			Air Temp (°C)	Secchi (m)	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)
6/5/13	18.85	17.39	18.12	26.05	26.39	26.22	13.35	11.07	8.34	8.20	8.27	9.3	0.75	2.04	2.61	5.2	10:48
5/31/13	17.10	15.57	16.34	26.01	26.61	26.31	12.22	11.24	8.04	7.95	8.00	26.1	0.75	2.53	3.07	3.9	9:35
5/15/13	14.83	14.60	14.72	25.34	25.70	25.52	5.39	5.96	8.35	8.34	8.35	17.8	0.75	2.30	2.24	3.4	10:18
5/10/13	14.60	13.51	14.06	26.08	26.49	26.29	6.33	6.97	8.42	8.41	8.42	21.7	0.75	2.72	3.11	5.1	10:55
CSHH #8 - Glen Cove Sewage Treatment Plant Outfall																	
11/13/13	10.50	9.33	9.92	22.42	27.32	24.87	9.45	8.52	7.70	7.75	7.73	1.4	1.75	0.84	1.02	3.0	9:55
11/6/13	12.97	12.80	12.89	24.76	26.74	25.75	6.78	6.40	7.82	7.83	7.83	14.7	1.25	1.73	1.15	3.0	9:29
10/29/13	13.80	13.87	13.84	25.30	26.68	25.99	7.81	7.46	7.81	7.85	7.83	9.5	1.0	1.59	0.65	3.4	11:08
10/22/13	16.75	17.15	16.95	23.06	26.70	24.88	7.75	7.12	7.73	7.66	7.70	17.3	0.75	0.75	0.72	2.5	9:45
10/15/13	18.40	17.79	18.10	26.37	26.66	26.52	6.86	6.43	7.65	7.65	7.65	18.3	1.0	1.32	1.17	4.4	10:38
10/8/13	20.65	20.38	20.52	26.31	27.42	26.87	6.45	5.59	7.71	7.62	7.67	17.0	1.0	0.46	1.08	2.0	9:30
10/1/13	20.12	20.15	20.14	26.70	27.53	27.12	8.94	7.65	8.05	7.95	8.00	19.1	0.75	1.12	0.83	4.4	10:03
9/25/13	19.95	19.88	19.92	26.21	26.90	26.56	8.35	9.47	7.89	7.99	7.94	16.8	0.5	3.60	N/A	2.3	9:29
9/18/13	20.21	19.78	20.00	25.90	27.02	26.46	7.14	6.68	7.71	7.67	7.69	15.7	1.0	1.78	1.40	4.5	9:30
9/4/13	23.65	23.50	23.58	24.99	26.69	25.84	6.24	6.25	7.71	7.70	7.71	23.3	0.5	4.64	N/A	5.0	11:10
8/28/13	23.93	23.33	23.63	26.11	26.74	26.43	11.79	9.74	8.14	8.04	8.09	29.40	0.75	2.22	2.22	2.8	10:46
8/21/13	23.50	22.91	23.21	24.59	26.79	25.69	9.61	6.48	7.95	7.76	7.86	30.3	0.5	1.28	N/A	5.6	11:16
8/15/13	23.35	23.11	23.23	24.80	26.52	25.66	3.28	2.91	7.38	7.33	7.36	19.4	1.33	0.58	1.06	2.7	9:35
8/8/13	23.54	22.56	23.05	24.92	26.02	25.47	6.50	2.94	7.52	7.32	7.42	24.0	0.75	3.55	2.18	2.7	9:28
7/31/13	25.37	24.26	24.82	25.18	25.76	25.47	11.59	7.98	8.04	7.82	7.93	25.2	0.5	3.59	N/A	2.9	10:55
7/24/13	24.72	23.84	24.28	25.12	25.74	25.43	8.31	3.91	7.70	7.42	7.56	27.5	0.75	2.28	2.29	3.0	10:10
7/17/13	24.48	23.85	24.17	19.60	25.35	22.48	9.26	8.30	7.88	7.81	7.85	32.6	0.5	1.68	N/A	2.3	10:04
7/10/13	Boat not available.																
7/3/13	21.53	20.62	21.08	21.00	25.36	23.18	8.65	8.12	7.65	7.49	7.57	28.9	0.75	1.87	0.65	3.3	11:35
6/26/13	22.96	22.37	22.67	22.00	25.01	23.51	10.14	8.39	8.22	8.01	8.12	27.8	0.5	2.63	N/A	1.8	10:00
6/19/13	21.36	20.50	20.93	24.52	25.01	24.77	7.89	6.92	8.13	8.07	8.10	22.2	0.5	3.49	N/A	2.0	11:00
6/12/13	18.65	18.32	18.49	2.03	24.72	13.38	9.12	7.71	8.62	7.81	8.22	23.2	0.8	2.33	2.47	2.4	10:10

2013 CSHH Field Monitoring Data

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH			Air Temp (°C)	Secchi (m)	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)
6/5/13	19.06	18.27	18.67	14.02	26.17	20.10	11.99	11.52	8.15	8.19	8.17	20.6	0.5	2.67	N/A	4.2	11:25
5/31/13	17.94	16.58	17.26	23.27	26.24	24.76	12.29	11.68	8.01	7.91	7.96	30.3	0.5	2.42	N/A	2.6	10:00
5/15/13	15.91	14.93	15.42	17.05	25.11	21.08	6.66	6.61	8.20	8.28	8.24	17.7	0.5	4.40	N/A	1.4	10:55
5/10/13	15.62	14.10	14.86	19.71	26.16	22.94	6.96	7.48	8.37	8.36	8.37	24.6	0.5	3.72	N/A	3.6	11:20
CSHH #13 - 60' West of the Mill Pond Weir																	
11/13/13	10.64	9.48	10.06	26.52	27.28	26.90	7.61	7.94	7.61	7.96	7.79	1.2	1.0	1.50	0.89	2.9	10:07
11/6/13	12.99	13.27	13.13	19.70	26.35	23.03	6.92	5.99	7.74	7.67	7.71	15.1	0.75	2.50	3.28	1.3	9:50
10/29/13	14.05	14.06	14.06	25.99	26.32	26.16	7.06	6.51	7.70	7.65	7.68	11.0	0.75	3.09	3.28	1.7	11:24
10/22/13	17.84	17.76	17.80	25.54	25.99	25.77	6.70	6.40	7.50	7.49	7.50	17.6	0.5*	4.26	N/A	0.7	10:00
10/15/13	18.40	18.44	18.42	26.08	26.74	26.41	6.95	3.27	7.55	7.47	7.51	18.4	0.75	4.21	3.39	2.7	10:50
10/8/13	20.32	20.47	20.40	26.69	27.12	26.91	4.19	3.82	7.48	7.46	7.47	16.1	0.5*	2.72	N/A	1.0	9:52
10/1/13	20.02	20.29	20.16	24.06	27.28	25.67	8.69	6.65	7.93	7.77	7.85	20.6	0.75	2.25	2.32	3.0	10:15
9/25/13	20.11	20.16	20.14	26.25	26.45	26.35	5.74	5.68	7.68	7.65	7.67	17.3	0.5*	7.39	N/A	1.0	9:42
9/18/13	20.97	20.95	20.96	26.50	27.29	26.90	5.30	4.83	7.54	7.49	7.52	16.1	1.0	2.12	2.70	4.3	9:48
9/4/13	22.48	24.10	23.29	19.78	25.99	22.89	9.01	4.50	7.83	7.52	7.68	23.4	0.5	5.54	N/A	2.7	11:35
8/28/13	23.69	23.10	23.40	25.84	26.56	26.20	9.84	5.81	7.94	7.75	7.85	28.8	0.5	4.14	N/A	1.7	11:08
8/21/13	23.15	23.07	23.11	25.81	26.59	26.20	7.03	5.99	7.78	7.65	7.72	29.8	0.5	4.69	N/A	3.3	11:35
8/15/13	19.66	23.19	21.43	10.92	24.26	17.59	6.61	3.33	7.70	7.23	7.47	19.6	0.5	1.01	N/A	0.6	10:21
8/8/13	23.12	22.97	23.05	25.42	25.75	25.59	2.85	1.69	7.23	7.16	7.20	24.3	0.5	3.40	N/A	1.7	9:42
7/31/13	24.90	23.98	24.44	22.99	25.41	24.20	14.60	4.61	8.22	7.51	7.87	25.7	0.5	6.02	N/A	1.6	11:10
7/24/13	24.64	23.86	24.25	23.46	25.25	24.36	8.54	2.80	7.68	7.28	7.48	28.1	0.75	3.44	2.75	2.8	10:30
7/17/13	24.66	22.74	23.70	24.63	25.17	24.90	10.16	5.18	7.98	7.52	7.75	34.5	0.75	3.53	2.99	2.0	10:23
7/10/13	Boat not available.																
7/3/13	21.13	20.82	20.98	20.98	25.09	23.04	14.25	2.78	8.17	7.29	7.73	28.9	0.5	4.70	N/A	2.0	11:50
6/26/13	22.21	22.40	22.31	22.04	24.05	23.05	8.69	9.17	8.02	8.03	8.03	27.6	0.75*	4.06	3.58	0.9	10.16
6/19/13	20.73	20.50	20.62	24.38	24.94	24.66	6.24	5.96	7.89	7.92	7.91	22.3	0.5	4.73	N/A	2.1	11:20
6/12/13	17.87	18.57	18.22	0.57	24.10	12.34	9.61	6.72	8.66	7.31	7.99	23.2	0.75	3.01	5.29	1.7	10:40

2013 CSHH Field Monitoring Data

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH			Air Temp (°C)	Secchi (m)	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)
6/5/13	20.01	18.16	19.09	23.70	26.12	24.91	15.85	9.57	8.41	7.99	8.20	22.8	0.5	4.32	N/A	3.2	11:50
5/31/13	16.70	16.66	16.68	7.02	25.99	16.51	11.06	10.20	8.17	7.75	7.96	29.5	0.5	3.79	N/A	1.6	10:14
5/15/13	14.33	15.19	14.76	2.76	24.95	13.86	7.60	5.53	8.39	7.91	8.15	17.8	0.4	8.05	N/A	1.5	11:08
5/10/13	15.99	14.32	15.16	17.72	26.04	21.88	4.95	7.98	8.34	8.37	8.36	23.5	0.5	6.91	N/A	2.8	11.35
*bottom																	
CSHH #14 - 50 yds from Powerhouse Drain																	
11/13/13	No sampling because of high wind and waves.																
10/29/13	Grabbed bacteria sample only, because of position of boom.																
10/15/13	17.77	17.94	17.86	26.66	26.81	26.74	5.96	5.59	7.58	7.55	7.57	12.3	1.0	2.26	1.37	2.6	8:14
9/18/13	19.75	20.45	20.10	26.91	27.32	27.12	7.96	5.32	7.72	7.60	7.66	17.7	0.75	N/A	N/A	2.5	10:35
8/8/13	21.79	21.75	21.77	26.19	26.25	26.22	2.45	1.89	7.20	7.18	7.19	24.0	1.0	2.14	2.23	1.6	10:20
7/3/13	20.06	19.82	19.94	25.31	25.52	25.42	4.75	4.39	7.31	7.29	7.30	24.7	1.2	0.54	0.89	2.0	8:45
6/5/13	18.03	18.13	18.08	24.78	25.59	25.19	9.09	10.46	8.06	8.06	8.06	18.5	0.5	4.19	N/A	2.3	8:34
CSHH #15 - 50 yds from Scudders Pond Outfall, North of Tappen Pool																	
11/13/13	No sampling because of high wind and waves.																
10/29/13	13.51	13.69	13.60	26.53	26.68	26.61	8.09	8.03	7.80	7.82	7.81	9.5	1.25	0.95	0.57	2.1	10:07
10/15/13	17.55	18.07	17.81	26.44	27.03	26.74	6.19	5.89	7.55	7.58	7.57	16.1	1.20	1.49	2.03	2.3	9:35
9/18/13	19.79	19.93	19.86	27.01	27.09	27.05	7.14	6.75	7.66	7.64	7.65	16.7	1.0	N/A	N/A	2.3	10:15
8/8/13	22.36	22.19	22.28	25.78	25.79	25.79	6.41	5.97	7.51	7.45	7.48	25.5	0.75	2.0	2.30	1.9	11:40
7/3/13	20.96	19.84	20.40	25.21	25.65	25.43	6.94	4.94	7.56	7.42	7.49	26.5	0.75	0.72	0.73	2.2	10:12
6/5/13	N/A																
CSHH #4 - Bar Beach Spit																	
11/13/13	No sampling because of high wind and waves.																
10/29/13	13.59	13.62	13.61	26.39	26.40	26.40	8.11	8.03	7.71	7.79	7.75	9.5	1.0	0.83	1.28	2.1	9:48
10/15/13	17.57	17.62	17.60	26.45	26.47	26.46	6.44	6.18	7.60	7.59	7.60	12.4	1.0	1.58	1.68	1.5	8:26

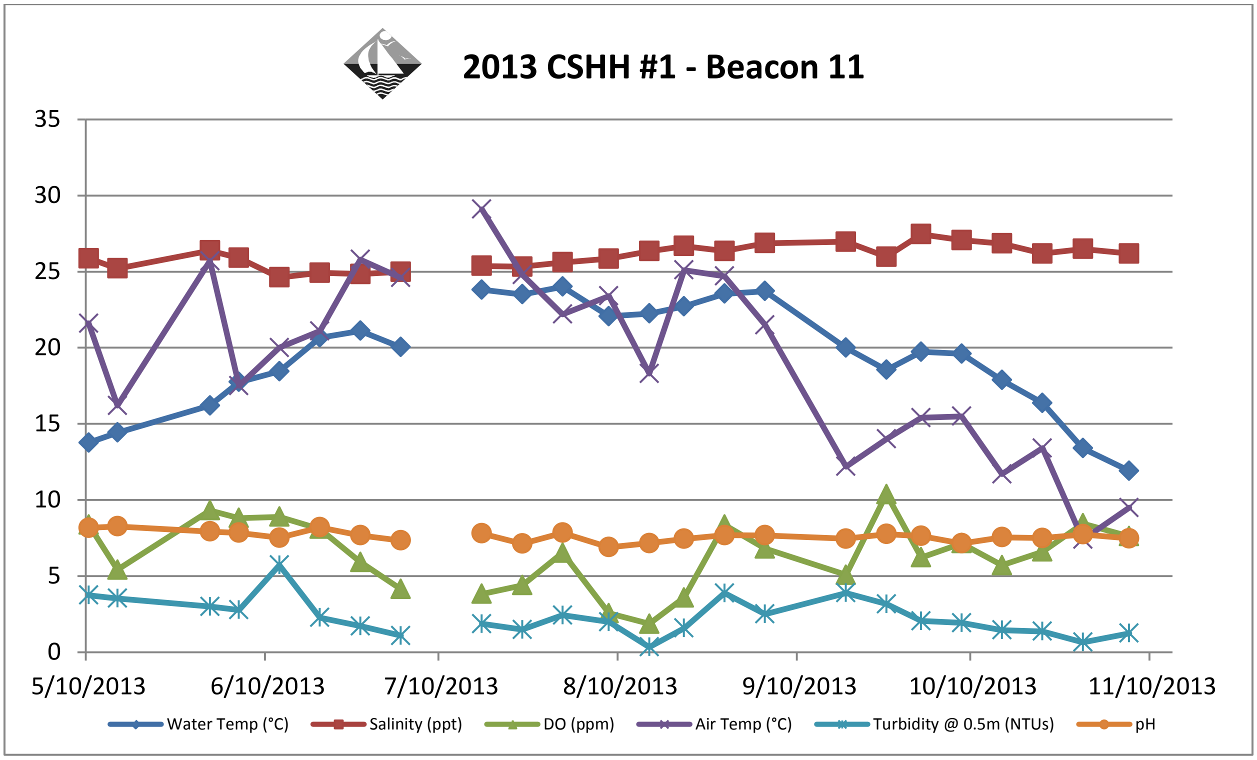
2013 CSHH Field Monitoring Data

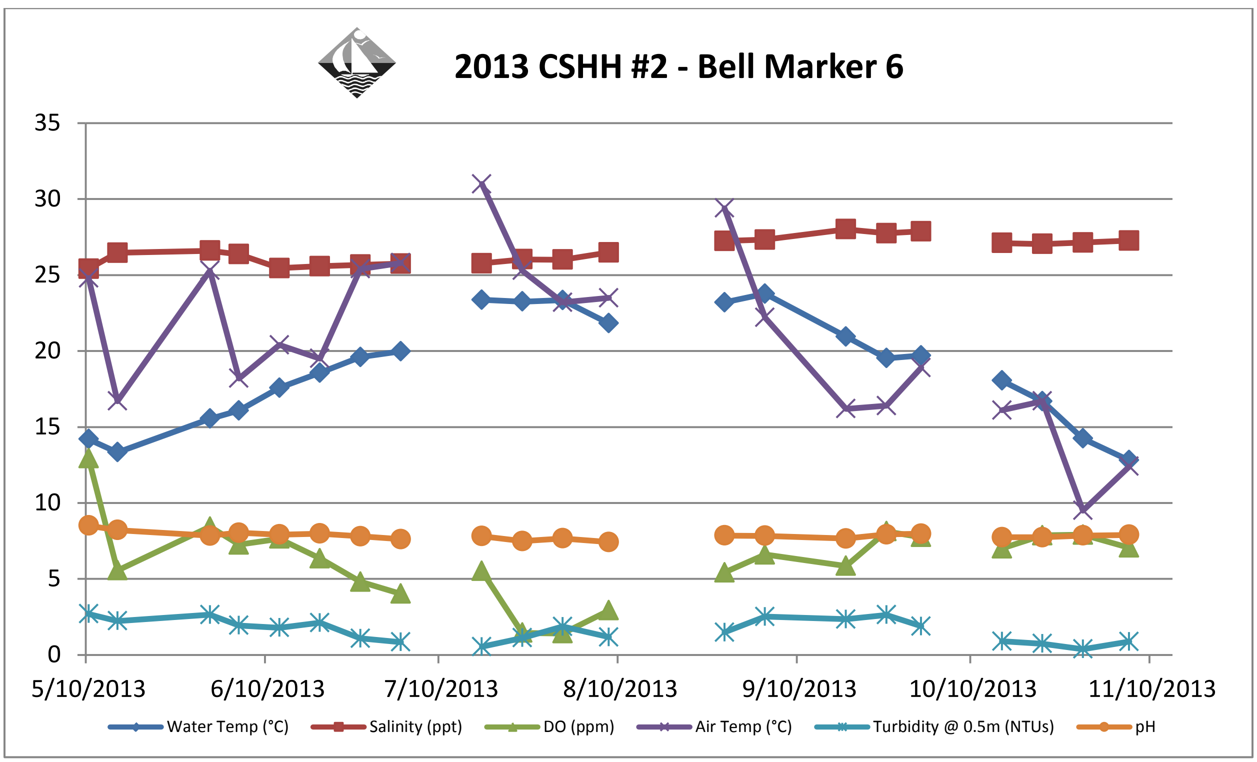
Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH			Air Temp (°C)	Secchi (m)	Turbidity @ 0.5m (NTUs)	Turbidity @ Secchi (NTUs)	Depth (m)	Time
	Surface	Bottom	Ave	Surface	Bottom	Ave	Surface	Bottom	Surface	Bottom	Ave	(°C)	(m)			(Bottom)	(AM)
9/18/13	19.96	20.58	20.27	26.85	27.52	27.19	6.92	5.76	7.68	7.62	7.65	17.90	0.75	N/A	N/A	2.2	10:45
8/8/13	21.89	21.85	21.87	26.26	26.28	26.27	3.86	3.34	7.34	7.30	7.32	24.5	1.0	1.56	2.19	1.8	10:40
7/3/13	20.26	20.04	20.15	25.36	25.46	25.41	5.69	5.05	7.43	7.38	7.41	24.9	0.75	1.45	1.26	2.4	9:00
6/5/13	18.35	18.07	18.21	25.68	25.88	25.78	12.11	11.58	8.20	8.17	8.19	18.2	0.75	3.26	2.91	2.7	8:50
CSHH #5 - Mott's Cove																	
11/13/13	7.71	8.83	8.27	25.62	26.64	26.13	9.65	8.83	7.70	7.70	7.70	-0.7	1.0	2.34	2.02	2.0	8:25
10/29/13	13.62	13.66	13.64	26.07	26.25	26.16	8.07	8.10	7.72	7.74	7.73	9.7	1.50	0.38	0.55	1.8	9:31
10/15/13	17.97	18.04	18.01	26.40	26.80	26.60	5.57	5.50	7.52	7.53	7.53	12.7	1.25	2.65	1.65	2.1	8:43
9/18/13	19.80	20.26	20.03	26.38	27.14	26.76	7.15	5.96	7.67	7.92	7.80	18.3	1.0	N/A	N/A	2.1	10:55
8/8/13	21.97	21.91	21.94	26.05	26.11	26.08	4.11	3.54	7.38	7.30	7.34	25.4	1.0	1.87	1.60	1.3	10:55
7/3/13	20.08	19.56	19.82	24.79	25.51	25.15	4.72	4.20	7.37	7.32	7.35	26.2	1.2	0.29	0.43	1.7	9:15
6/5/13	18.79	18.35	18.57	25.06	25.46	25.26	12.40	12.39	8.22	8.18	8.20	18.0	0.5	4.01	N/A	2.1	9:06
CSHH #6 - East of Former Incinerator Site																	
11/13/13	7.11	7.37	7.24	25.84	25.84	25.84	8.77	8.68	7.70	7.72	7.71	-0.5	1.0	2.30	2.58	2.4	8:47
10/29/13	13.03	13.60	13.32	25.62	25.99	25.81	8.65	8.49	7.71	7.70	7.71	8.7	1.25	0.78	1.05	2.1	9:15
10/15/13	17.36	17.85	17.61	25.60	26.27	25.94	6.68	5.75	7.51	7.52	7.52	13.8	1.00	1.41	1.55	2.7	8:55
9/18/13	19.51	19.79	19.65	25.83	26.64	26.24	7.15	6.30	7.69	7.64	7.67	20.1	0.75	N/A	N/A	2.7	11:10
8/8/13	22.42	22.25	22.34	25.44	25.68	25.56	5.55	4.91	7.41	7.37	7.39	24.6	0.75	3.11	2.68	1.6	11:07
7/3/13	20.65	20.22	20.44	24.96	25.38	25.17	5.40	4.86	7.38	7.35	7.37	25.1	1.0	0.79	0.97	2.1	9:33
6/5/13	18.98	18.68	18.83	24.68	25.13	24.91	12.88	12.30	8.23	8.19	8.21	18.6	0.5	4.17	N/A	2.4	9:30

2013 CSHH Field Monitoring Data

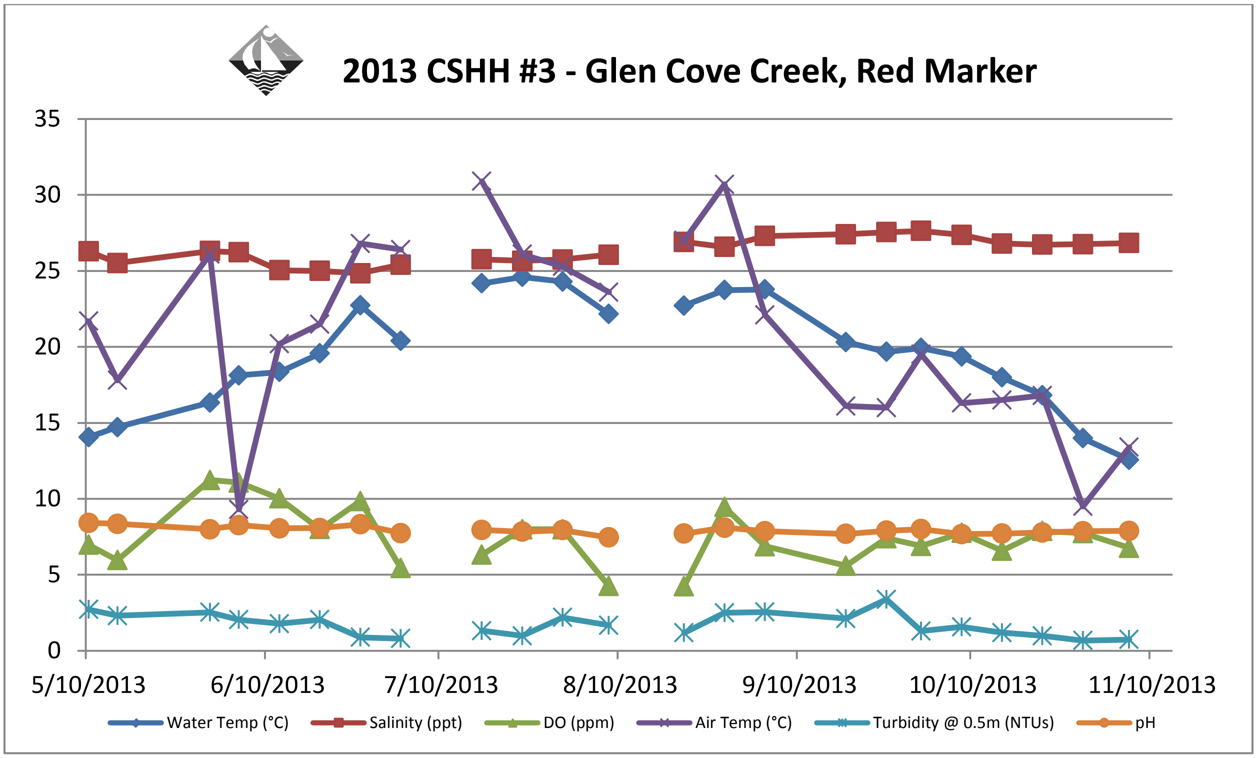
Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH			Air Temp (°C)	Secchi (m)	Turbidity @ 0.5m (NTUs)	Turbidity @ Secchi (NTUs)	Depth (m)	Time
	Surface	Bottom	Ave	Surface	Bottom	Ave	Surface	Bottom	Surface	Bottom	Ave	(°C)	(m)			(Bottom)	(AM)
CSHH #7 - West of Bryant Landing (formerly site of oil dock)																	
11/13/13	4.66	6.75	5.71	21.95	24.85	23.40	10.23	8.89	7.73	7.66	7.70	-0.7	<0.5	6.99	N/A	1.9	9:05
10/29/13	12.50	12.83	12.67	24.61	25.25	24.93	8.21	7.76	7.66	7.66	7.66	8.6	1.0	1.22	2.16	1.8	8:46
10/15/13	17.25	17.67	17.46	25.52	25.62	25.57	6.49	5.90	7.49	7.49	7.49	15.5	0.8	2.32	2.63	2.1	9:08
9/18/13	19.47	19.26	19.37	25.61	25.96	25.79	7.88	6.67	7.70	7.66	7.68	18.2	0.5	N/A	N/A	2.0	11:20
8/8/13	22.39	22.36	22.38	25.38	25.45	25.42	5.31	5.06	7.43	7.36	7.40	25.3	0.5	3.53	N/A	1.7	11:17
7/3/13	20.54	20.50	20.52	25.11	25.17	25.14	4.46	4.11	7.28	7.24	7.26	26.2	0.75	1.39	1.48	1.6	9:45
6/5/13	19.03	19.10	19.07	24.42	24.71	24.57	10.28	12.97	8.24	8.25	8.25	18.6	0.5	4.40	N/A	2.0	9:45

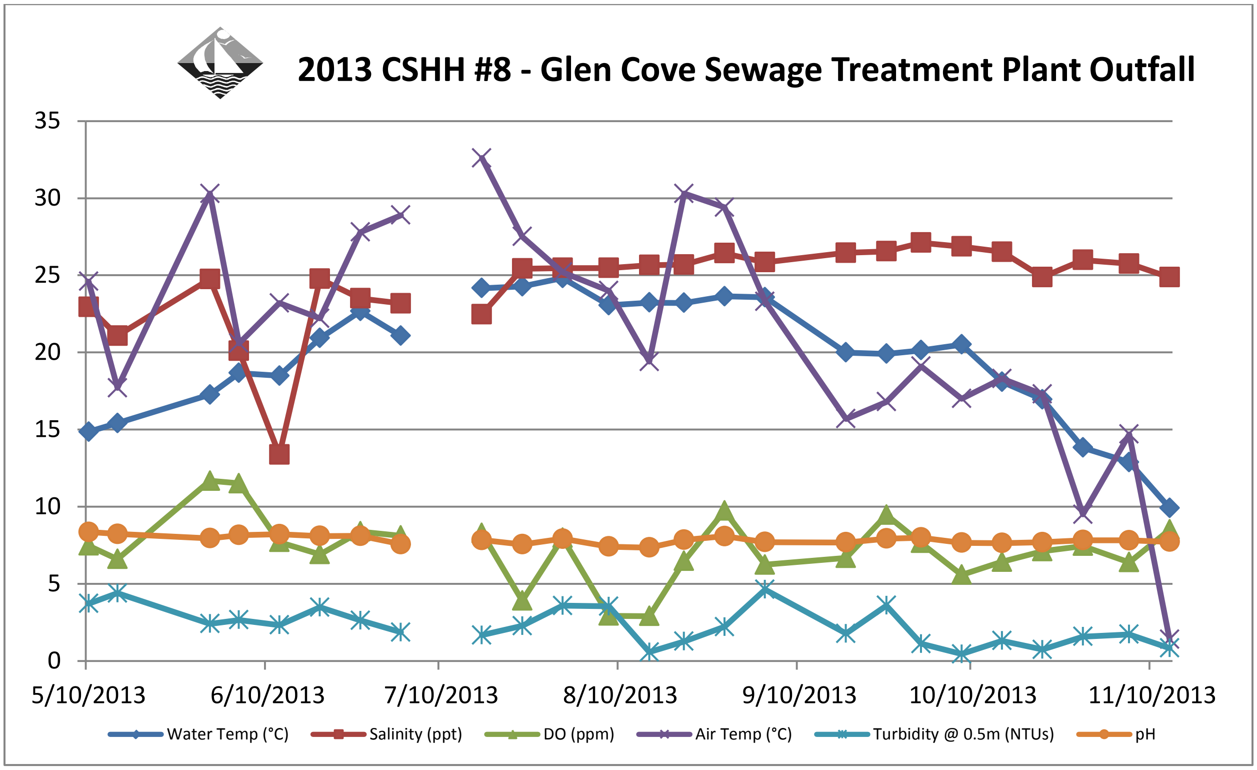
2013 Weekly Graphs for Water-Quality Parameters



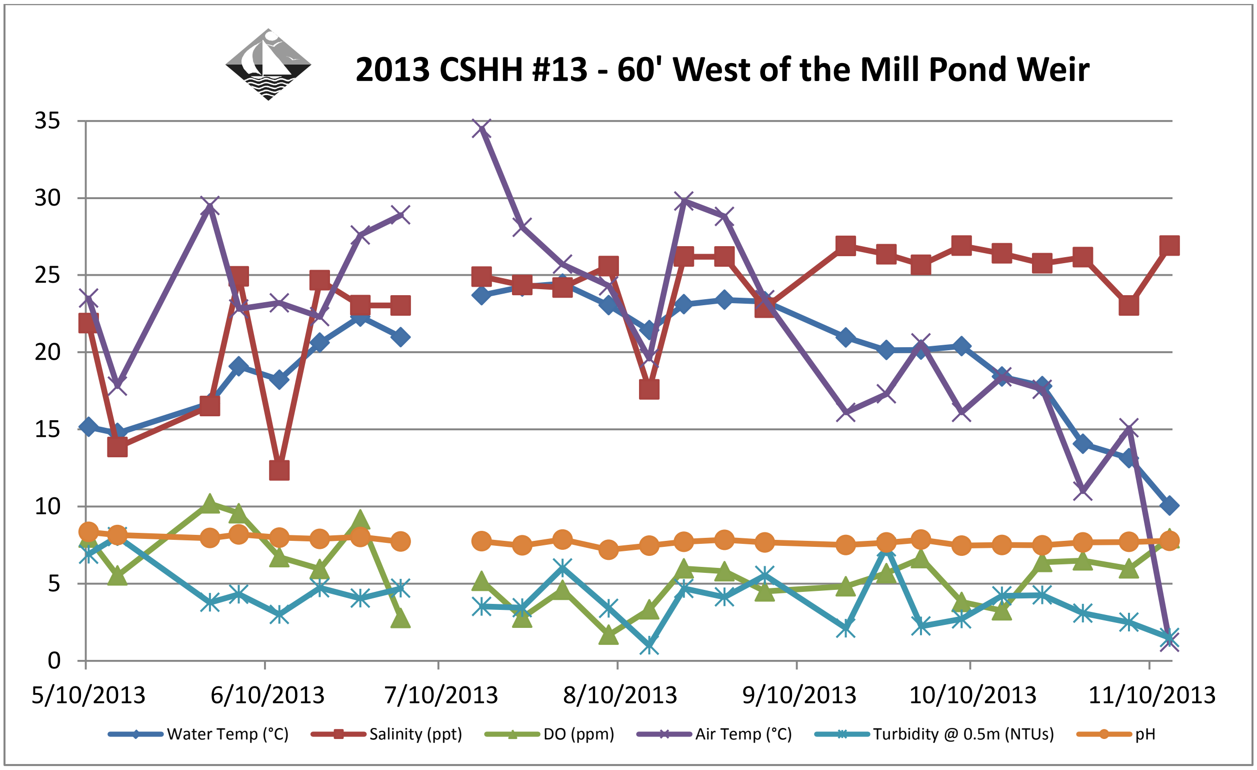


2013 Weekly Graphs for Water-Quality Parameters



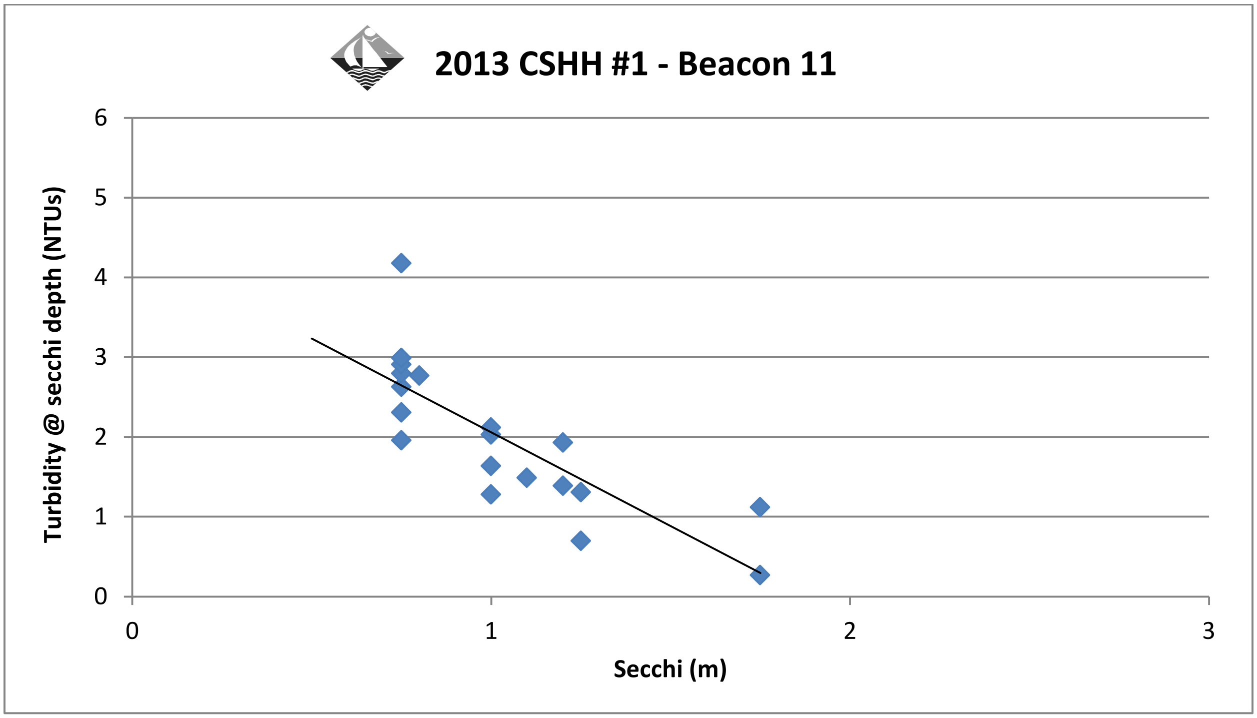


2013 Weekly Graphs for Water-Quality Parameters

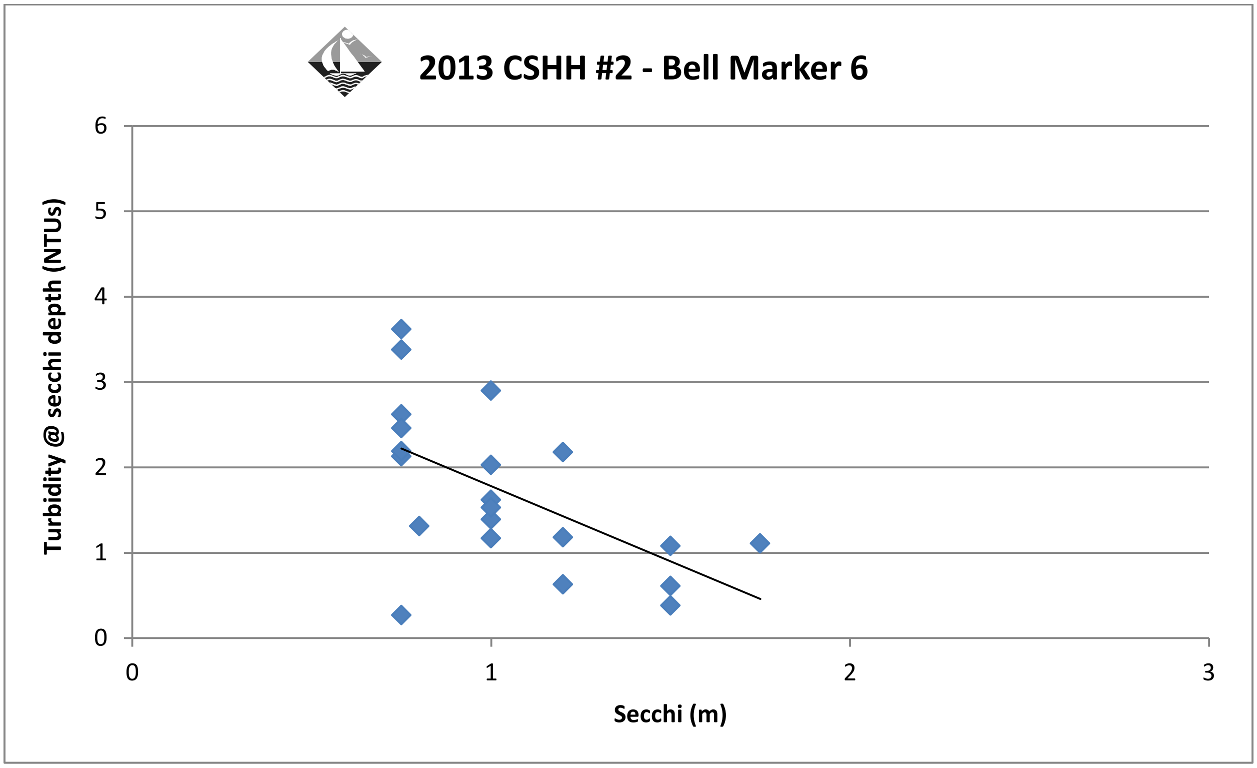


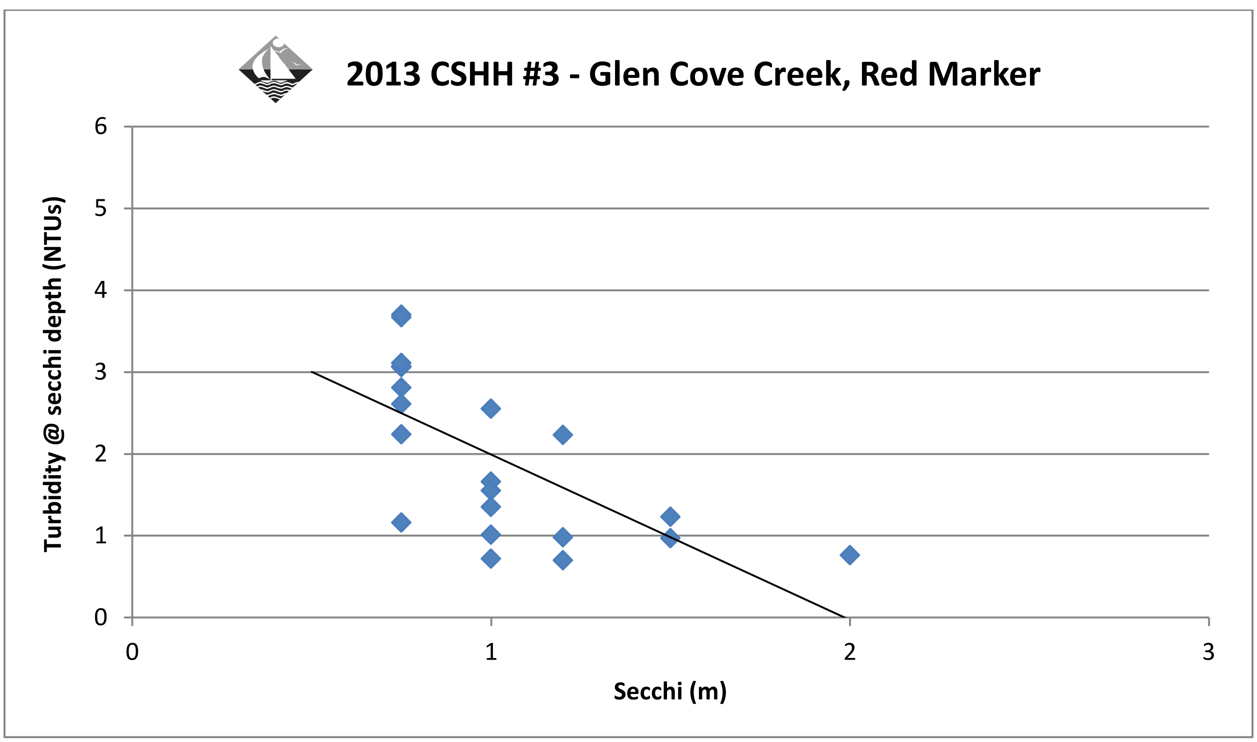
2013 Turbidity and Secchi-Disk Transparency Graphs

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).

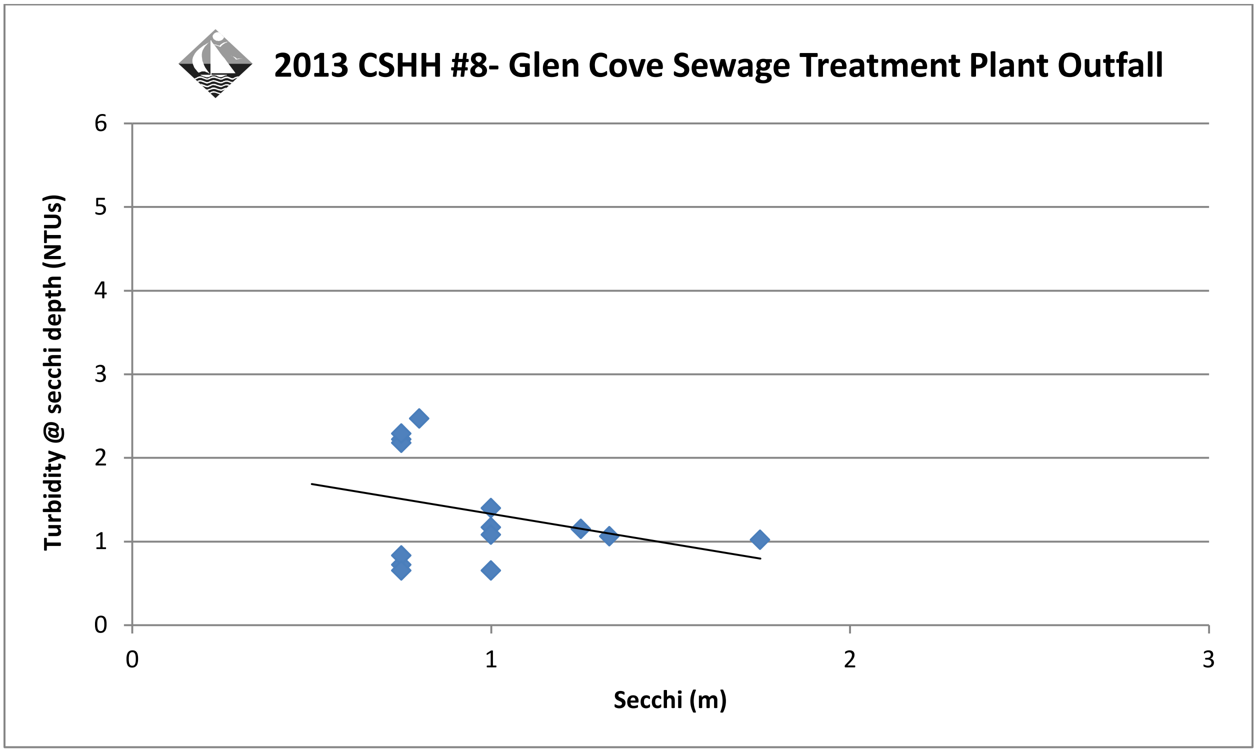


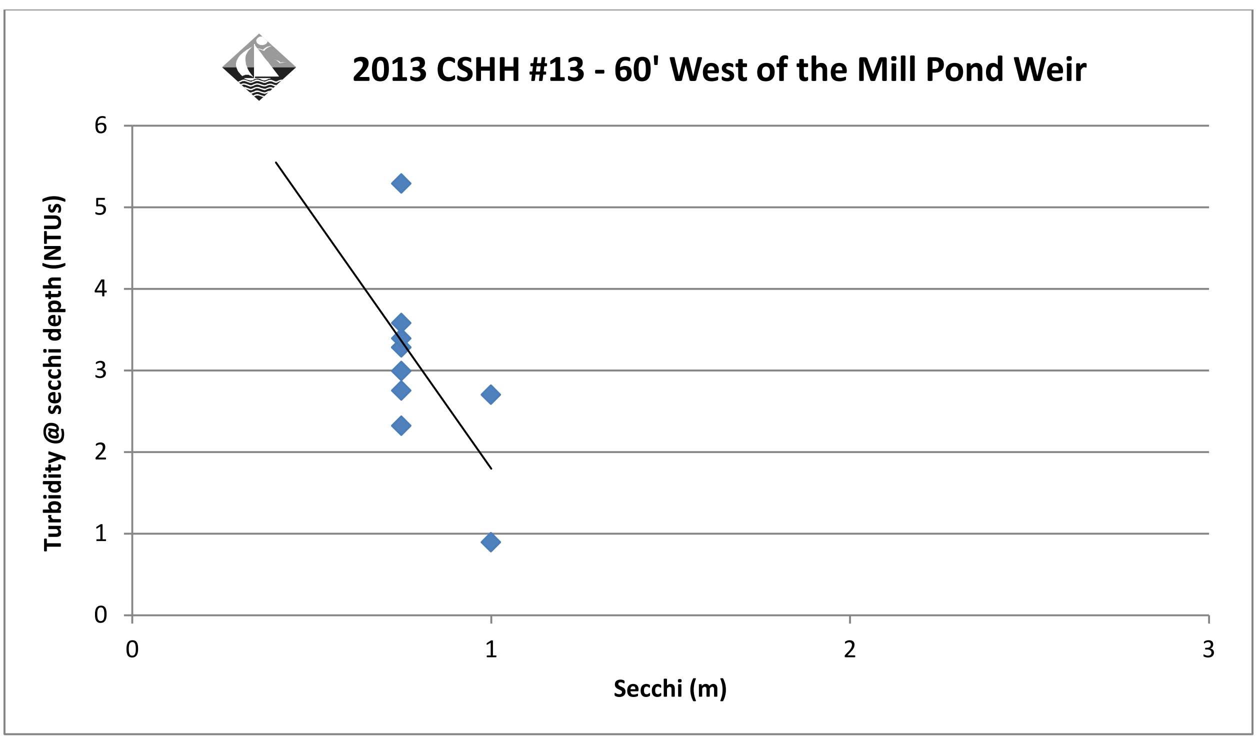
2013 Turbidity and Secchi-Disk Transparency Graphs





2013 Turbidity and Secchi-Disk Transparency Graphs





Appendix B

2013 In-Harbor Bacteria Data
2013 In-Harbor Precipitation and Bacteria Graphs
2013 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Bacteria Data
2013 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Precipitation and Bacteria Graphs
2013-2014 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Bacteria Data
2013-2014 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Precipitation and Bacteria Graphs
2013 Beach-Monitoring Bacteria Data
2013 Beach-Monitoring Precipitation and Bacteria Graphs
2013 Sea Cliff Precipitation Data
2014 Sea Cliff Precipitation Data (partial)
1997-2013 Monthly Precipitation

2013 In-Harbor Bacteria Data

CSHH #1 - Beacon 11

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log AvgFC**	**CFU/100ml**	**Log AvgEnt**
05/10/13	7.00	0.00	2.00	0.00
05/15/13	15.00	10.25	1.00	1.41
05/31/13	21.00	13.02	13.00	2.96
06/05/13	7.00	11.15	5.00	3.38
06/12/13	39.00	17.12	14.00	5.49
06/19/13	14.00	16.83	3.00	7.23
06/26/13	10.00	15.17	6.00	6.96
07/03/13	28.00	16.07	7.00	6.15
07/17/13	8.00	13.31	0.10	1.88
7/24/13	210.00	26.19	31.00	3.38
7/31/13	13.00	27.96	0.10	1.21
8/8/13	42.00	30.95	29.00	1.73
8/14/13	250.00	47.00	42.00	3.28
8/21/13	23.00	58.05	10.00	8.23
8/28/13	17.00	35.11	2.00	4.76
9/4/13	26.00	40.33	6.00	10.79
9/18/13	21.00	21.50	4.00	4.68
9/25/13	24.00	21.73	4.00	3.72
10/1/13	17.00	21.73	5.00	4.68
10/8/13	350.00	41.61	***160.00***	10.64
10/15/13	8.00	29.92	3.00	8.26
10/22/13	13.00	27.19	5.00	8.63
10/29/13	32.00	28.80	52.00	14.42
11/6/13	23.00	30.59	8.00	15.84
11/13/13	13.00	15.83	10.00	9.10

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) refers 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.

2013 In-Harbor Bacteria Data

CSHH #2 - Bell Marker 6

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log AvgFC**	**CFU/100ml**	**Log AvgEnt**
05/10/13	8.00	0.00	0.10	0.00
05/15/13	2.00	4.00	0.10	0.10
05/31/13	2.00	3.17	0.10	0.10
06/05/13	0.10	1.34	0.10	0.10
06/12/13	3.00	1.05	0.10	0.10
06/19/13	1.00	0.88	0.10	0.10
06/26/13	1.00	0.90	0.10	0.10
07/03/13	1.00	0.79	0.10	0.10
07/17/13	0.10	0.56	0.10	0.10
07/24/13	8.00	0.95	8.00	0.30
07/31/13	6.00	1.48	0.10	0.30
08/08/13	0.10	0.83	0.10	0.30
08/28/13	4.00	1.34	1.00	0.22
09/04/13	2.00	0.93	0.10	0.22
09/18/13	6.00	3.63	0.10	0.22
09/25/13	22.00	5.70	0.10	0.18
10/01/13	6.00	6.31	0.10	0.10
10/08/13	24.00	11.74	10.00	0.32
10/15/13	0.10	4.53	0.10	0.25
10/22/13	9.00	4.91	1.00	0.40
10/29/13	0.10	1.67	0.10	0.40
11/06/13	1.00	1.17	0.10	0.40

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) refers 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.

2013 In-Harbor Bacteria Data

CSHH #3 - Glen Cove Creek

Date	*Fecal Coliform* CFU/100ml	Log AvgFC	*Enterococci* CFU/100ml	Log AvgEnt
05/10/13	4.00	0.00	0.10	0.00
05/15/13	29.00	10.77	0.10	0.10
05/31/13	15.00	12.03	7.00	0.41
06/05/13	8.00	10.86	0.10	0.29
06/12/13	6.00	12.02	1.00	0.51
06/19/13	48.00	13.63	3.00	1.20
06/26/13	39.00	16.82	3.00	1.45
07/03/13	49.00	21.32	4.00	1.29
07/17/13	6.00	27.24	0.10	1.38
07/24/13	70.00	29.93	5.00	1.57
07/31/13	11.00	21.81	0.10	0.67
08/08/13	320.00	34.87	4.00	0.67
08/14/13	118.00	44.50	28.00	1.41
08/21/13	8.00	47.13	0.10	1.41
08/28/13	11.00	32.55	1.00	1.02
09/04/13	4.00	26.59	0.10	1.02
09/18/13	5.00	6.48	0.10	0.18
09/25/13	17.00	7.82	2.00	0.38
10/01/13	4.00	6.07	0.10	0.21
10/08/13	900.00	23.52	***200.00***	1.41
10/15/13	11.00	20.20	3.00	1.64
10/22/13	2.00	16.82	2.00	2.99
10/29/13	10.00	15.13	1.00	2.61
11/06/13	3.00	14.28	3.00	5.14

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

Date	*Fecal Coliform* CFU/100ml	Log AvgFC	*Enterococci* CFU/100ml	Log AvgEnt
6/5/13	5.00	0.00	11.00	0.00
6/19/13	24.00	10.95	3.00	5.74
7/3/13	29.00	15.15	4.00	5.09
7/31/13	16.00	21.54	0.10	0.63
8/8/13	15.00	15.49	7.00	0.84
9/18/13	17.00	0.00	2.00	0.00
10/1/13	14.00	15.43	4.00	2.83
10/15/13	17.00	15.93	4.00	3.17
10/29/13	2.00	7.81	2.00	3.17
11/13/13	22.00	9.08	12.00	4.58

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) refers 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.

2013 In-Harbor Bacteria Data

CSHH #5 - Mott's Cove

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log AvgFC**	**CFU/100ml**	**Log AvgEnt**
6/5/13	20.00	0.00	7.00	0.00
6/19/13	39.00	27.93	4.00	5.29
7/3/13	44.00	32.50	7.00	5.81
7/31/13	38.00	40.89	0.10	0.84
8/8/13	47.00	42.26	8.00	0.89
9/18/13	21.00	0.00	10.00	0.00
10/1/13	12.00	15.87	7.00	8.37
10/15/13	52.00	23.58	10.00	8.88
10/29/13	21.00	23.58	5.00	7.05
11/13/13	36.00	34.00	15.00	9.09

CSHH #6 - East of the Former Incinerator Site

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log AvgFC**	**CFU/100ml**	**Log AvgEnt**
6/5/13	18.00	0.00	3.00	0.00
6/19/13	50.00	30.00	1.00	1.73
7/3/13	27.00	28.96	10.00	3.11
7/31/13	25.00	25.98	1.00	3.16
8/8/13	27.00	25.98	10.00	3.16
9/18/13	27.00	0.00	1.00	0.00
10/1/13	20.00	23.24	2.00	1.41
10/15/13	39.00	27.62	2.00	1.59
10/29/13	11.00	20.47	6.00	2.88
11/13/13	33.00	24.19	15.00	5.65

CSHH #7 - West of Old Oil Dock

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log AvgFC**	**CFU/100ml**	**Log AvgEnt**
6/5/13	12.00	0.00	1.00	0.00
6/19/13	450.00	73.48	24.00	4.90
7/3/13	82.00	76.22	5.00	4.93
7/31/13	16.00	36.22	1.00	2.24
8/8/13	52.00	28.84	13.00	3.61
9/18/13	41.00	0.00	1.00	0.00
10/1/13	29.00	34.48	6.00	2.45
10/15/13	50.00	39.03	4.00	2.88
10/29/13	20.00	30.72	12.00	6.60
11/13/13	80.00	43.09	90.00	16.29

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) refers 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.

2013 In-Harbor Bacteria Data

CSHH #8 - Glen Cove STP Outfall

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log AvgFC**	**CFU/100ml**	**Log AvgEnt**
05/10/13	17.00	0.00	3.00	0.00
05/15/13	38.00	25.42	18.00	7.35
05/31/13	24.00	24.94	29.00	11.61
06/05/13	39.00	27.89	13.00	11.94
06/12/13	330.00	58.53	90.00	27.96
06/19/13	440.00	107.97	14.00	26.25
06/26/13	230.00	125.60	3.00	17.01
07/03/13	55.00	148.26	23.00	16.24
07/17/13	33.00	116.42	0.10	3.14
07/24/13	380.00	112.23	43.00	4.15
07/31/13	39.00	72.02	11.00	5.74
08/08/13	46.00	68.87	40.00	6.60
08/14/13	350.00	95.33	58.00	10.19
08/21/13	180.00	133.84	17.00	28.46
08/28/13	62.00	93.13	33.00	26.99
09/04/13	164.00	124.13	18.00	29.78
09/18/13	21.00	78.74	4.00	14.18
09/25/13	91.00	66.39	55.00	19.01
10/01/13	10.00	42.08	8.00	13.34
10/08/13	155.00	41.49	80.00	19.37
10/15/13	17.00	34.71	22.00	19.87
10/22/13	23.00	35.34	38.00	31.17
10/29/13	22.00	26.61	28.00	27.23
11/06/13	11.00	27.12	16.00	31.28
11/13/13	24.00	18.67	21.00	23.94

Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refers 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.

2013 In-Harbor Bacteria Data

CSHH#9 - First Pipe West of STP Outfall

	Fecal Coliform		Enterococci	
Date	CFU/100ml	Log AvgFC	CFU/100ml	Log AvgEnt
05/10/13	22.00	0.00	6.00	0.00
05/15/13	35.00	27.75	20.00	10.95
05/31/13	20.00	24.88	23.00	14.03
06/05/13	35.00	27.10	18.00	14.93
06/12/13	510.00	59.45	***340.00***	***40.96***
06/19/13	300.00	101.73	23.00	***42.42***
06/26/13	270.00	123.66	15.00	34.46
07/03/13	100.00	170.62	24.00	34.75
07/17/13	52.00	143.26	4.00	13.49
07/24/13	***1500.00***	***214.22***	66.00	17.56
07/31/13	22.00	114.45	7.00	14.51
08/08/13	300.00	150.63	31.00	15.47
08/14/13	390.00	182.20	***110.00***	22.90
08/21/13	110.00	***211.65***	36.00	***35.54***
08/28/13	66.00	113.32	26.00	29.50
09/04/13	62.00	139.41	21.00	***36.75***
09/18/13	22.00	56.10	7.00	19.26
09/25/13	58.00	47.80	90.00	24.22
10/01/13	8.00	28.21	4.00	15.17
10/08/13	127.00	33.74	59.00	19.64
10/15/13	12.00	27.44	25.00	20.61
10/22/13	33.00	29.76	26.00	26.79
10/29/13	21.00	24.29	29.00	21.36
11/06/13	14.00	27.16	8.00	24.54
11/13/13	22.00	19.13	12.00	17.84

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) refers 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.

2013 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
05/10/13	16.00	0.00	7.00	0.00
05/15/13	39.00	24.98	39.00	16.52
05/31/13	25.00	24.99	90.00	29.07
06/05/13	27.00	25.48	15.00	24.64
06/12/13	480.00	59.62	***450.00***	***69.77***
06/19/13	280.00	97.59	42.00	***71.07***
06/26/13	220.00	114.82	18.00	***54.00***
07/03/13	360.00	195.75	***270.00***	***67.27***
07/17/13	480.00	***321.20***	8.00	***35.75***
07/24/13	480.00	***367.54***	***200.00***	***52.81***
07/31/13	19.00	199.24	10.00	***45.59***
08/08/13	330.00	194.96	51.00	30.06
08/14/13	***8900.00***	***418.63***	***3500.00***	***77.83***
08/21/13	520.00	***425.38***	28.00	***99.99***
08/28/13	330.00	***394.67***	***270.00***	***106.18***
09/04/13	109.00	***559.72***	11.00	***108.22***
09/18/13	26.00	148.50	9.00	29.41
09/25/13	***2500.00***	***219.89***	***180.00***	***46.83***
10/01/13	15.00	101.53	5.00	17.28
10/08/13	***6000.00***	***276.56***	***560.00***	***46.15***
10/15/13	9.00	139.41	14.00	***36.35***
10/22/13	44.00	154.87	26.00	***44.95***
10/29/13	27.00	62.61	21.00	29.25
11/06/13	23.00	68.20	28.00	***41.28***
11/13/13	21.00	22.01	18.00	20.76

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) refers 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.

2013 In-Harbor Bacteria Data

CSHH #11 - 50 Yards East of STP Outfall

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log AvgFC**	**CFU/100ml**	**Log AvgEnt**
05/10/13	34.00	0.00	10.00	0.00
05/15/13	900.00	174.93	90.00	30.00
05/31/13	47.00	112.88	80.00	***41.60***
06/05/13	30.00	81.05	12.00	30.49
06/12/13	430.00	152.84	***270.00***	***69.50***
06/19/13	200.00	104.94	6.00	***35.31***
06/26/13	***4400.00***	***221.53***	56.00	***38.73***
07/03/13	***1100.00***	***416.19***	***110.00***	***41.27***
07/17/13	***2200.00***	***1208.02***	37.00	34.20
07/24/13	220.00	***1237.15***	***180.00***	***80.03***
07/31/13	270.00	***615.74***	8.00	***49.20***
08/08/13	***3700.00***	***833.88***	***900.00***	***83.22***
08/14/13	***9500.00***	***1356.52***	***2400.00***	***163.01***
08/21/13	***2700.00***	***1413.24***	***100.00***	***198.87***
08/28/13	420.00	***1608.35***	21.00	***129.41***
09/04/13	200.00	***1514.65***	26.00	***163.81***
09/18/13	18.00	***252.77***	11.00	27.84
09/25/13	280.00	143.44	***240.00***	34.65
10/01/13	22.00	68.62	5.00	24.20
10/08/13	***1300.00***	109.57	***580.00***	***52.60***
10/15/13	21.00	78.74	29.00	***46.70***
10/22/13	35.00	89.94	11.00	***46.70***
10/29/13	35.00	59.34	37.00	32.13
11/06/13	22.00	59.34	38.00	***48.20***
11/13/13	47.00	30.55	30.00	26.66

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) refers 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.

2013 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**
05/10/13	110.00	0.00	2.00	0.00
05/15/13	***1200.00***	***363.32***	59.00	10.86
05/31/13	***1300.00***	***555.70***	***170.00***	27.17
06/05/13	230.00	***445.72***	3.00	15.66
06/12/13	290.00	***567.95***	***310.00***	***55.26***
06/19/13	280.00	***394.74***	3.00	26.24
06/26/13	***3700.00***	***617.57***	8.00	20.69
07/03/13	420.00	***492.66***	17.00	13.06
07/17/13	***1000.00***	***812.18***	5.00	6.72
07/24/13	450.00	***914.46***	***230.00***	19.89
07/31/13	110.00	***379.72***	6.00	18.51
08/08/13	***4300.00***	***679.23***	***1900.00***	***60.17***
08/14/13	***8600.00***	***1128.53***	***560.00***	***94.01***
08/21/13	***4200.00***	***1503.71***	***150.00***	***185.60***
08/28/13	127.00	***1167.57***	10.00	***99.14***
09/04/13	270.00	***1397.26***	44.00	***147.67***
09/18/13	164.00	***392.03***	100.00	***50.69***
09/25/13	300.00	***202.67***	59.00	***40.14***
10/01/13	64.00	170.76	33.00	***54.10***
10/08/13	***6000.00***	***370.74***	***2700.00***	***151.42***
10/15/13	51.00	***249.33***	80.00	***133.28***
10/22/13	55.00	***200.39***	47.00	***114.60***
10/29/13	39.00	133.25	16.00	***88.27***
11/06/13	41.00	121.90	58.00	***98.81***
11/13/13	240.00	64.03	59.00	***46.00***

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) refers 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.

2013 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**
5/10/13	360.00	0.00	62.00	0.00
5/15/13	***1900.00***	***827.04***	***1900.00***	***343.22***
5/31/13	164.00	***482.28***	100.00	***227.54***
6/5/13	330.00	***438.64***	23.00	***128.30***
6/12/13	590.00	***496.30***	***480.00***	***214.01***
6/19/13	310.00	***315.42***	70.00	***93.76***
6/26/13	320.00	***316.33***	40.00	***79.07***
7/3/13	800.00	***434.30***	***150.00***	***85.75***
7/17/13	430.00	***429.80***	22.00	***55.13***
7/24/13	730.00	***532.42***	***520.00***	***91.02***
7/31/13	530.00	***604.00***	13.00	***68.73***
8/8/13	***2300.00***	***786.50***	***1700.00***	***126.10***
8/14/13	***5300.00***	***1151.90***	***580.00***	***171.10***
8/21/13	240.00	***1025.09***	***210.00***	***268.66***
8/28/13	182.00	***776.45***	18.00	***137.11***
9/4/13	420.00	***741.15***	39.00	***170.80***
9/18/13	127.00	***219.70***	***110.00***	***63.46***
9/25/13	320.00	***236.09***	***160.00***	***59.29***
10/1/13	42.00	163.63	27.00	***65.61***
10/8/13	***2400.00***	***252.99***	***300.00***	***109.27***
10/15/13	46.00	179.90	41.00	***89.82***
10/22/13	***260.00***	***207.62***	41.00	***73.73***
10/29/13	53.00	144.91	38.00	***55.31***
11/6/13	40.00	143.50	60.00	***64.88***
11/13/13	100.00	76.00	35.00	***42.22***

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

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log AvgFC**	**CFU/100ml**	**Log AvgEnt**
6/5/13	46.00	0.00	12.00	0.00
6/19/13	27.00	35.24	8.00	9.80
7/3/13	82.00	46.70	38.00	15.39
7/31/13	67.00	74.12	5.00	13.78
8/8/13	23.00	39.26	6.00	5.48
9/18/13	14.00	0.00	2.00	0.00
10/1/13	14.00	14.00	2.00	2.00
10/15/13	28.00	17.64	6.00	2.88
10/29/13	7.00	14.00	2.00	2.88

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) refers 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.

2013 In-Harbor Bacteria Data

CSHH #15 – NW Corner of Tappen Pool

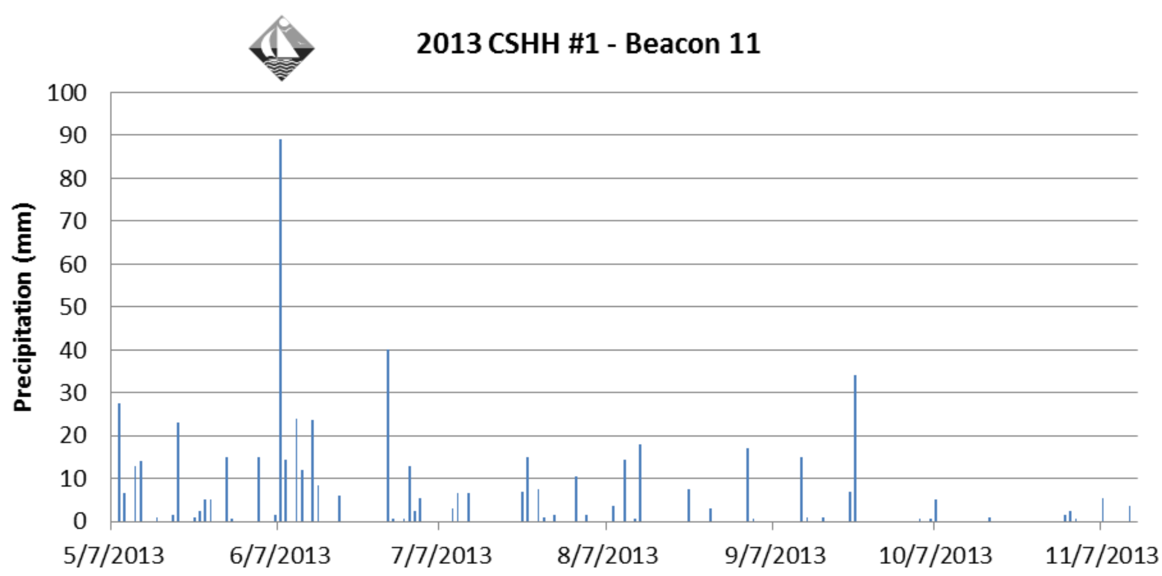
	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log AvgFC**	**CFU/100ml**	**Log AvgEnt**
5/10/13	630.00	0.00	**130.00**	0.00
7/3/13	19.00	0.00	3.00	0.00
8/8/13	58.00	0.00	9.00	0.00
9/18/13	29.00	0.00	4.00	0.00
10/1/13	64.00	43.08	8.00	5.66
10/15/13	18.00	32.21	11.00	7.06
10/29/13	38.00	35.24	6.00	8.08

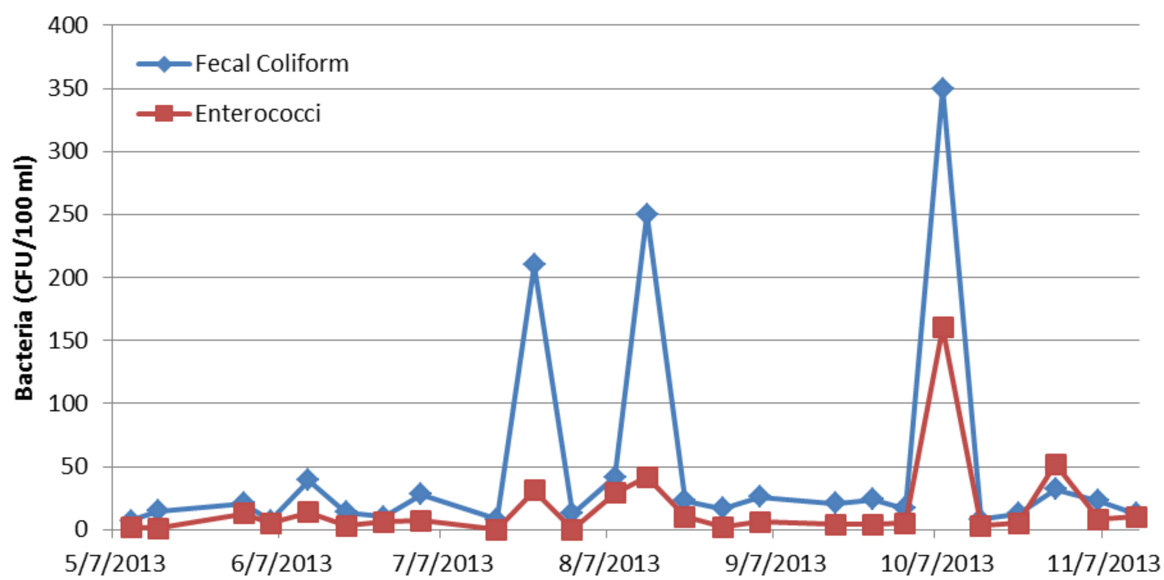
Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refers to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104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

Coalition to Save Hempstead Harbor

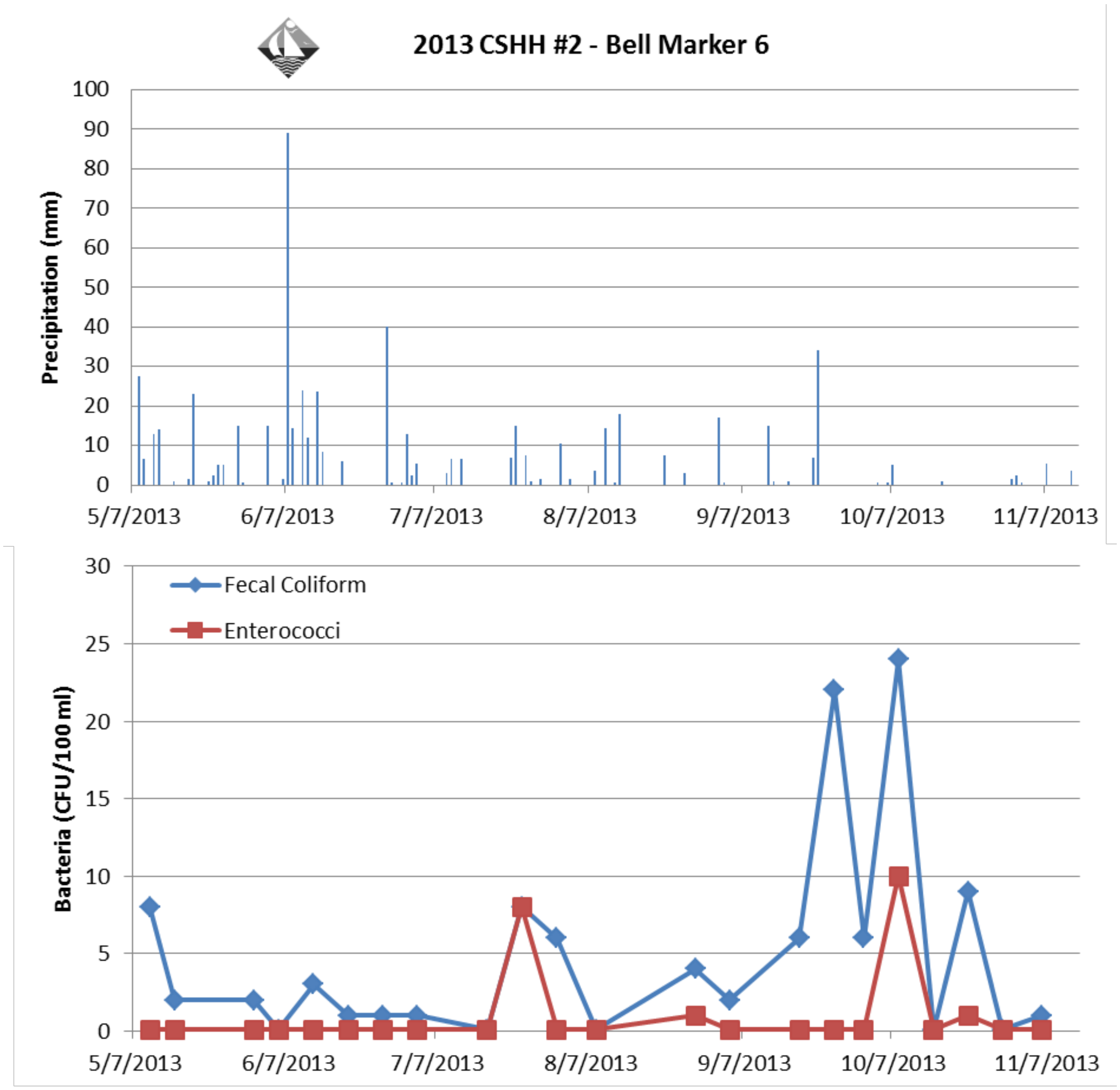
FUSS & O'NEILL

2013 In-Harbor Precipitation And Bacteria Graphs

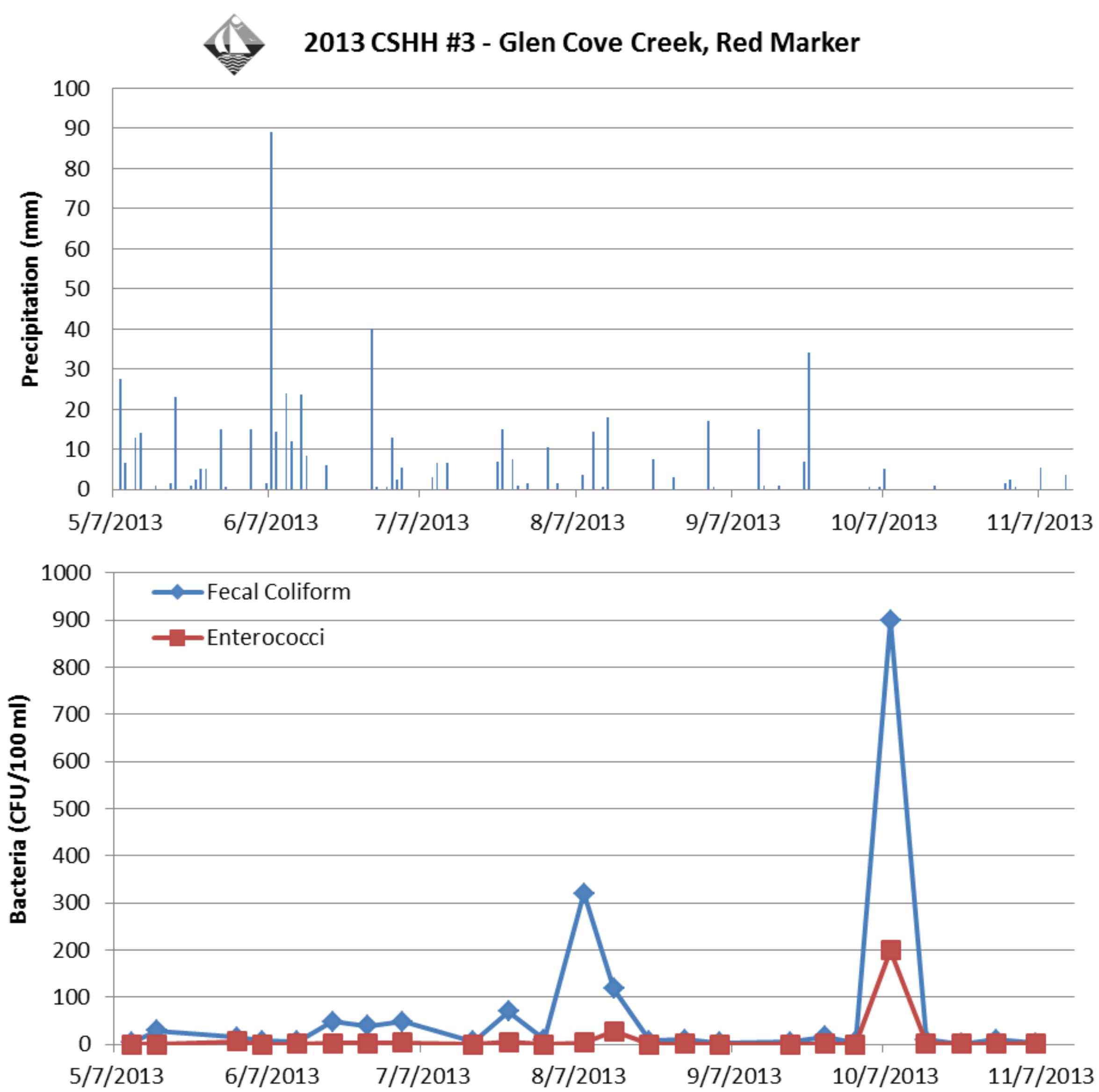




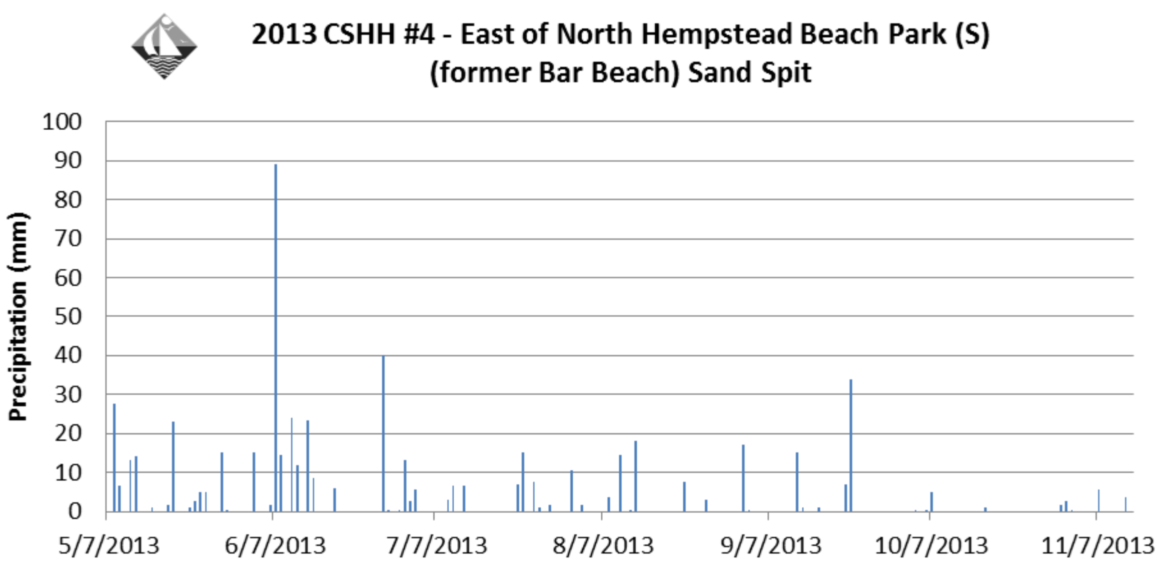
2013 In-Harbor Precipitation And Bacteria Graphs

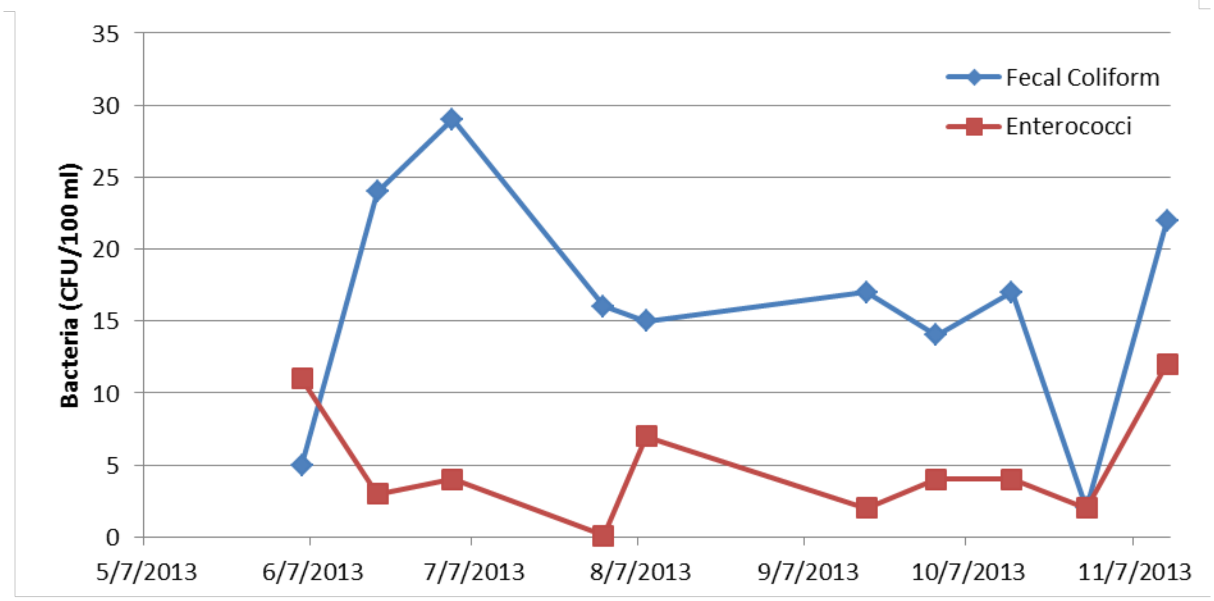


2013 In-Harbor Precipitation And Bacteria Graphs

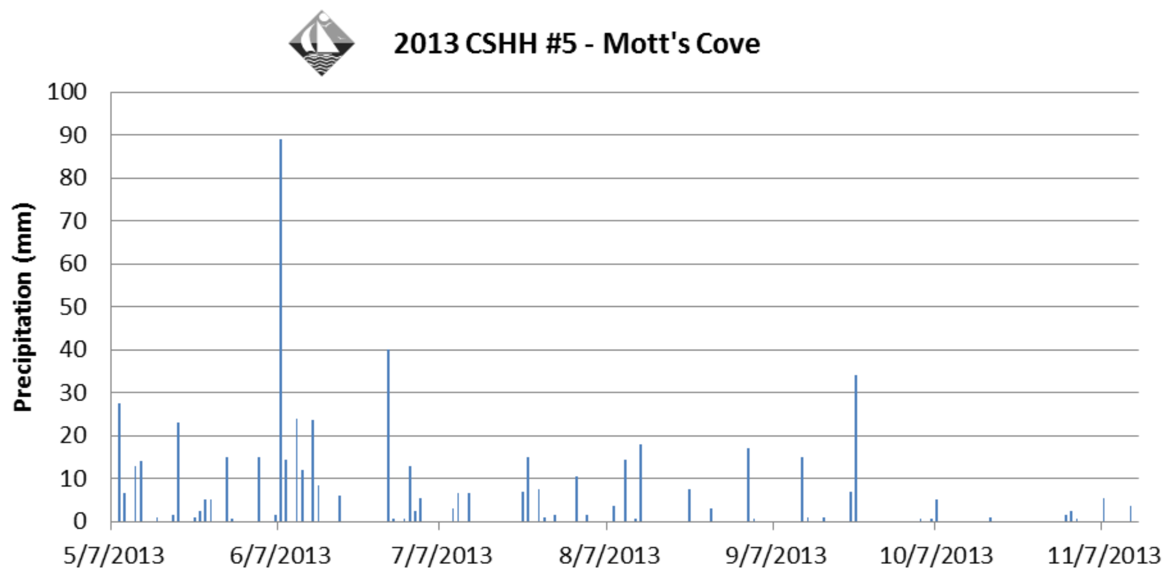


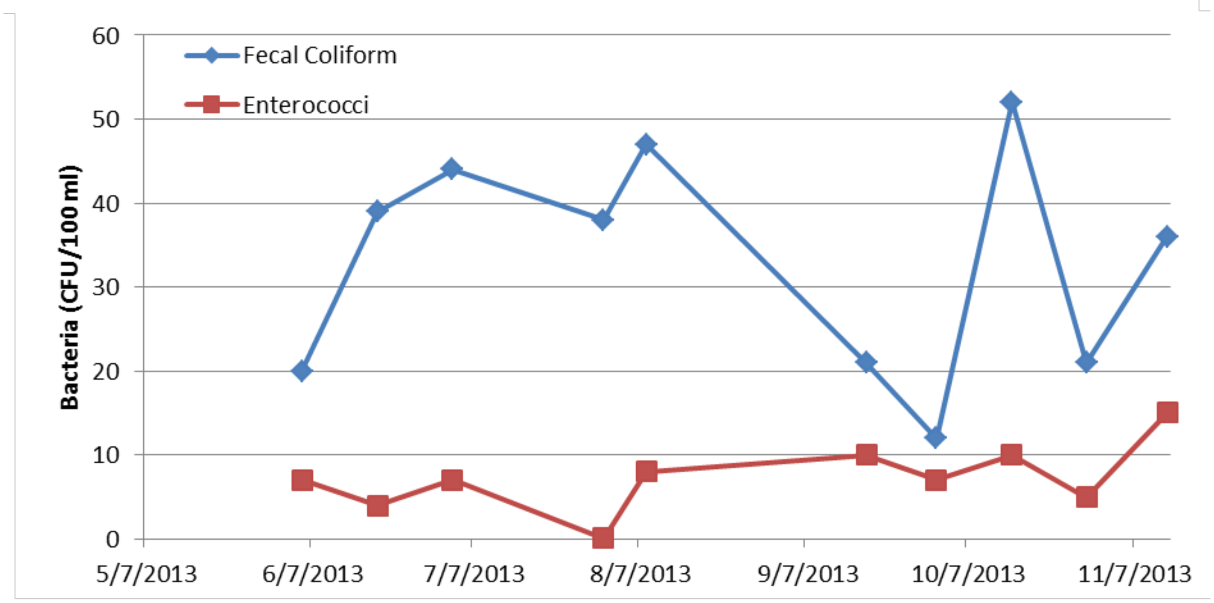
2013 In-Harbor Precipitation And Bacteria Graphs



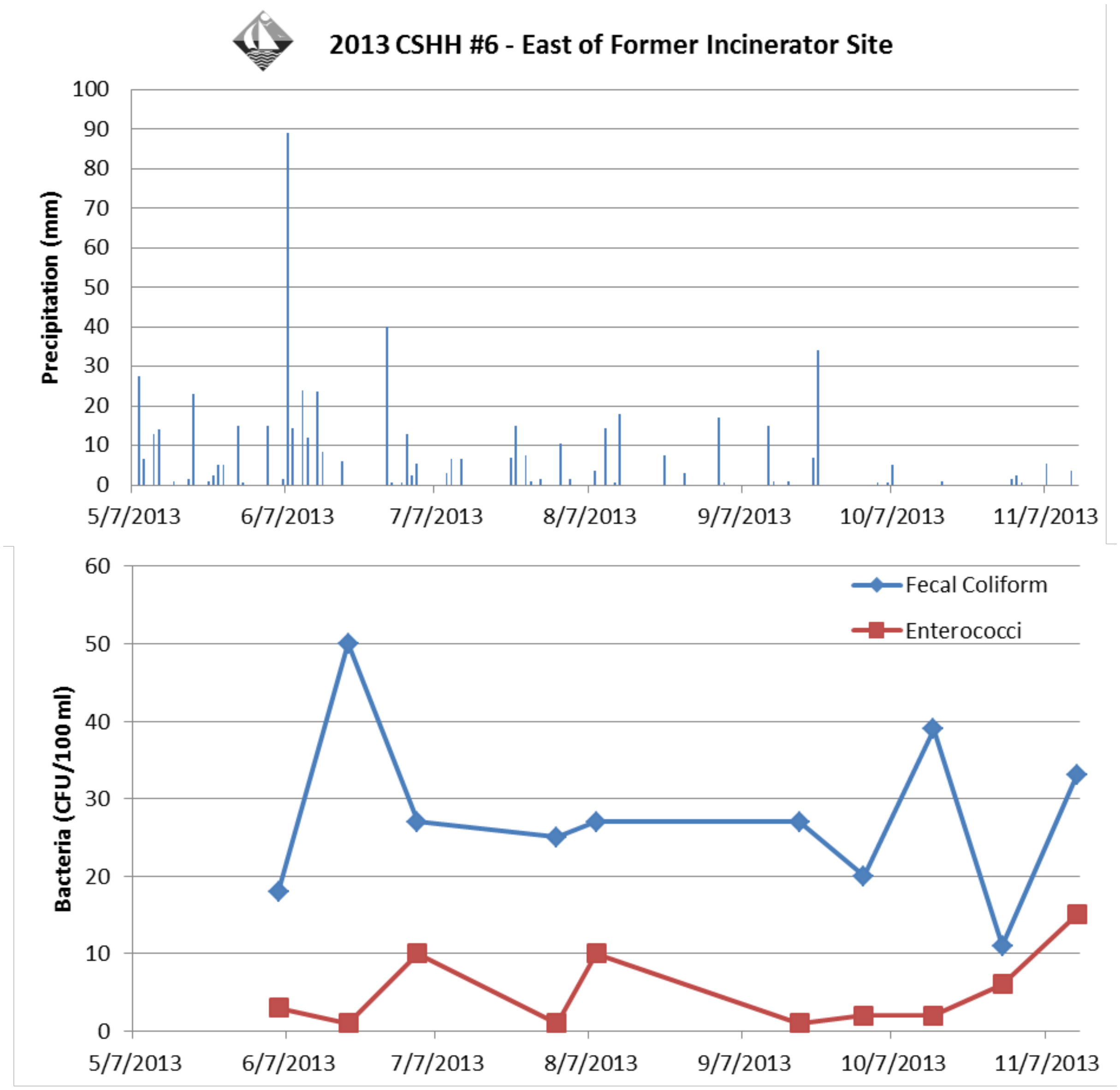


2013 In-Harbor Precipitation And Bacteria Graphs

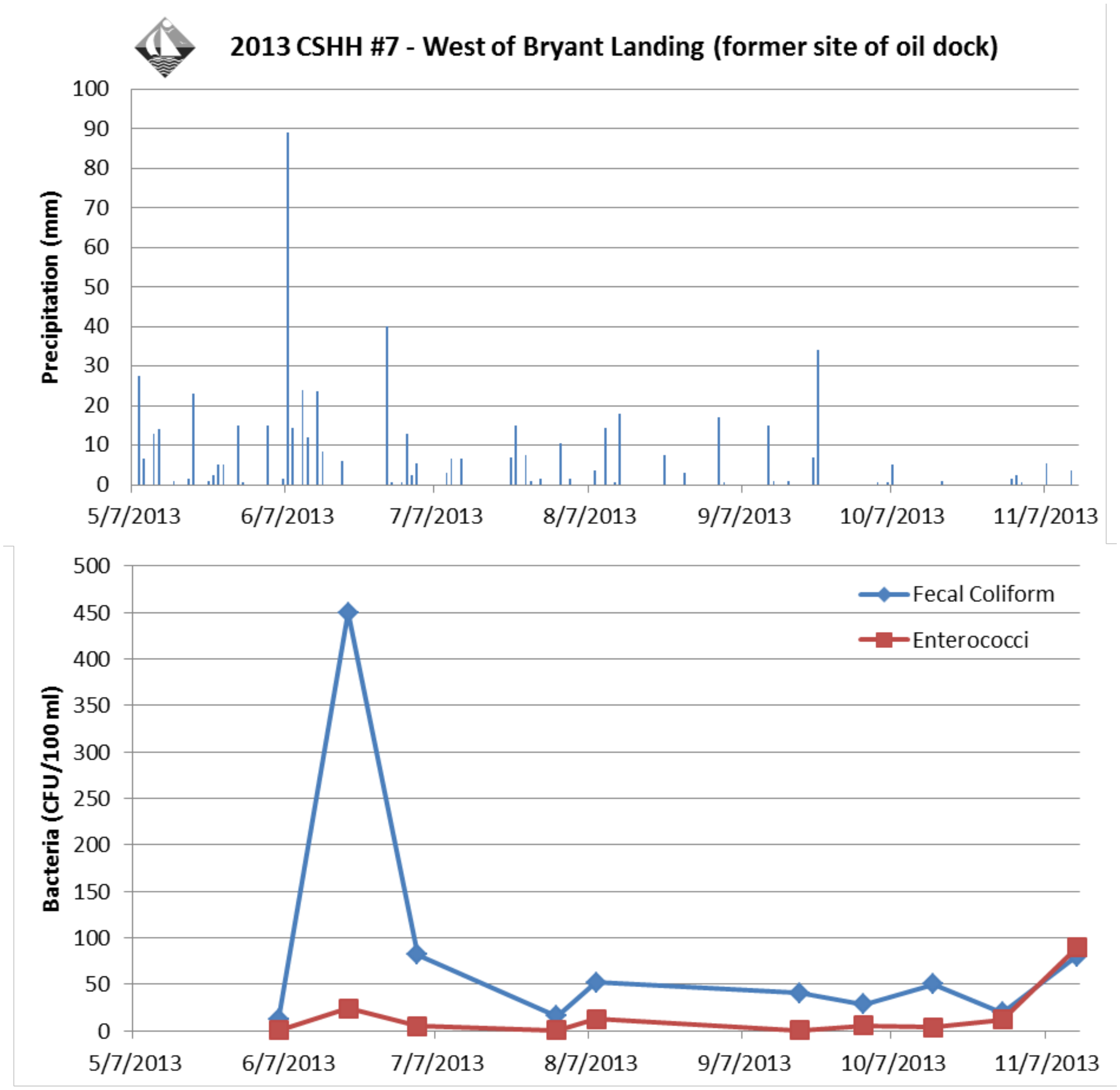




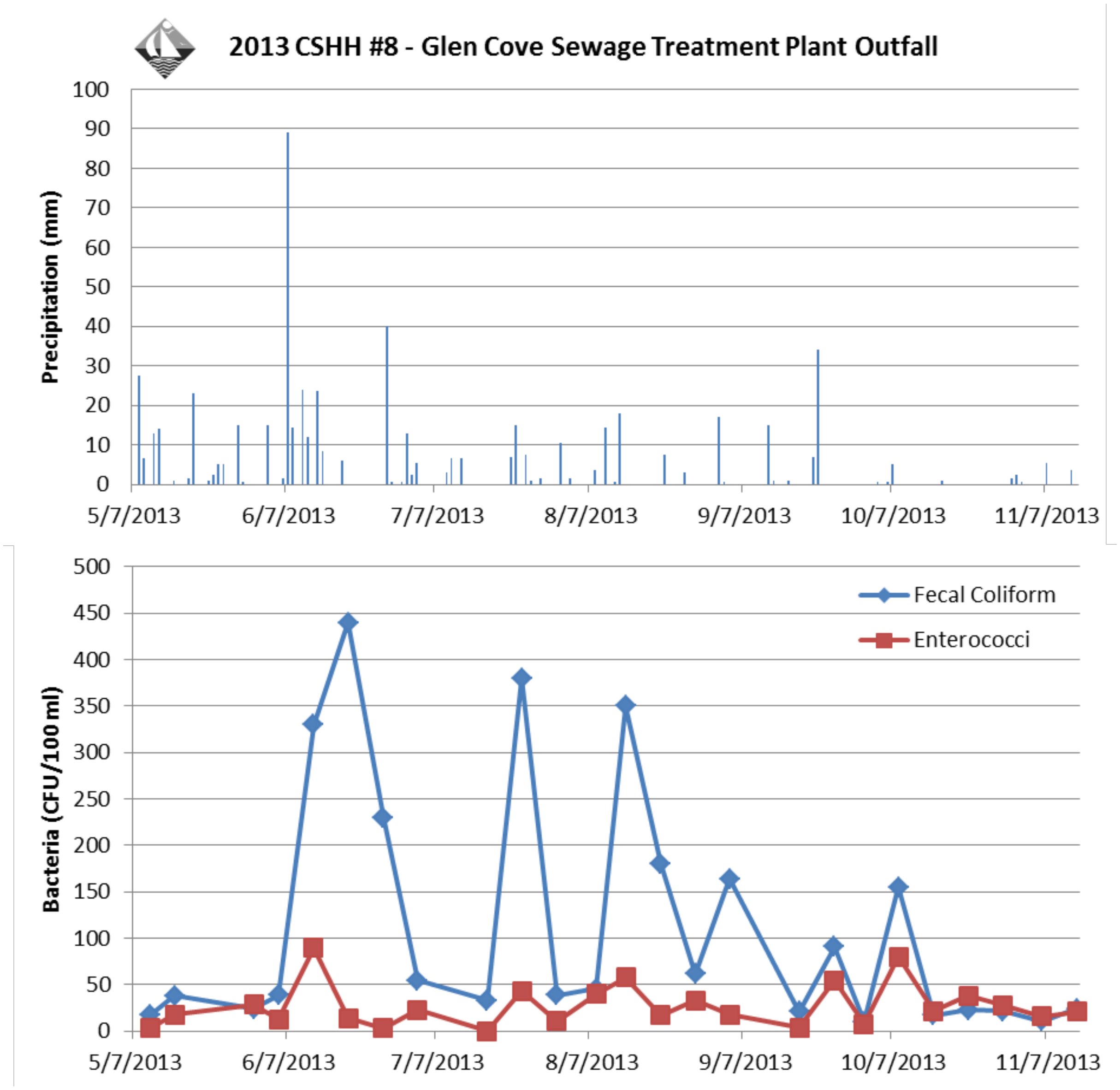
2013 In-Harbor Precipitation And Bacteria Graphs



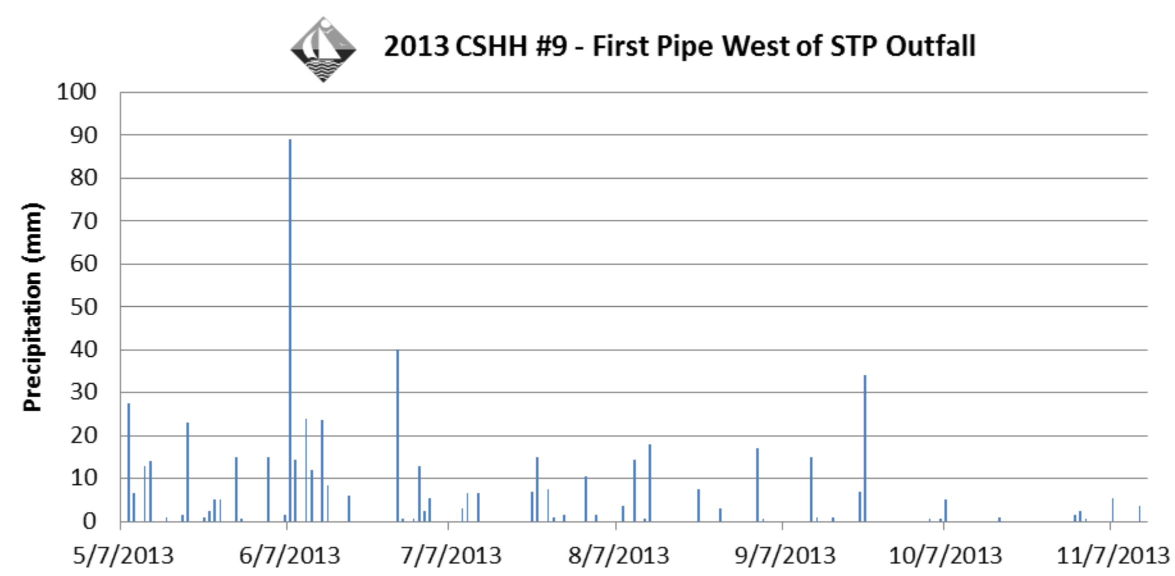
2013 In-Harbor Precipitation And Bacteria Graphs

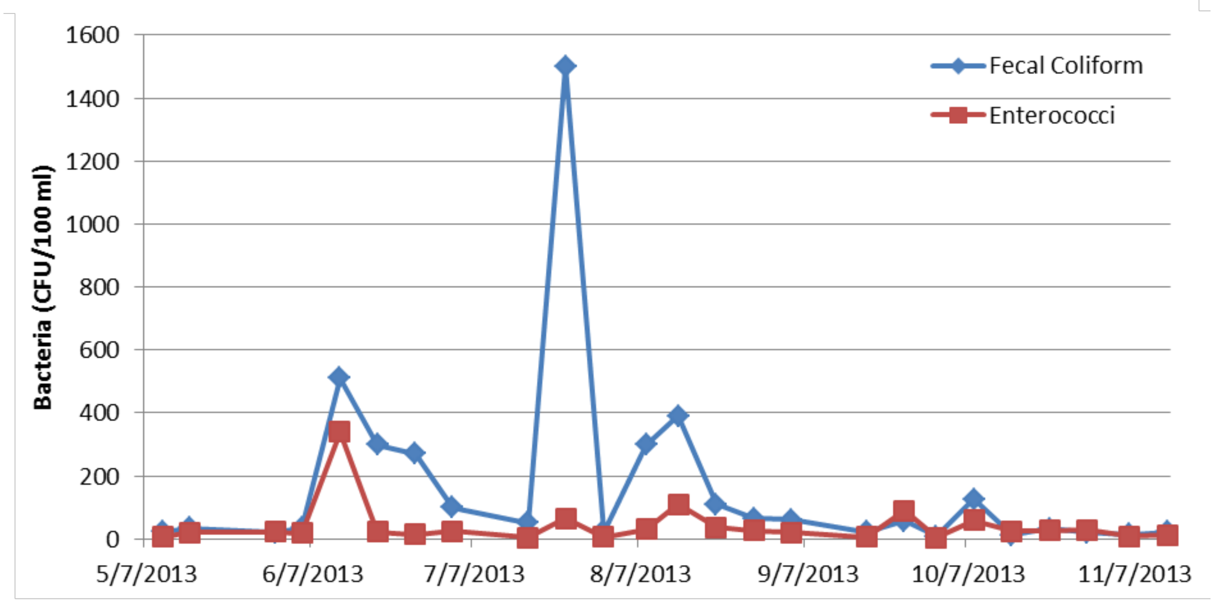


2013 In-Harbor Precipitation And Bacteria Graphs

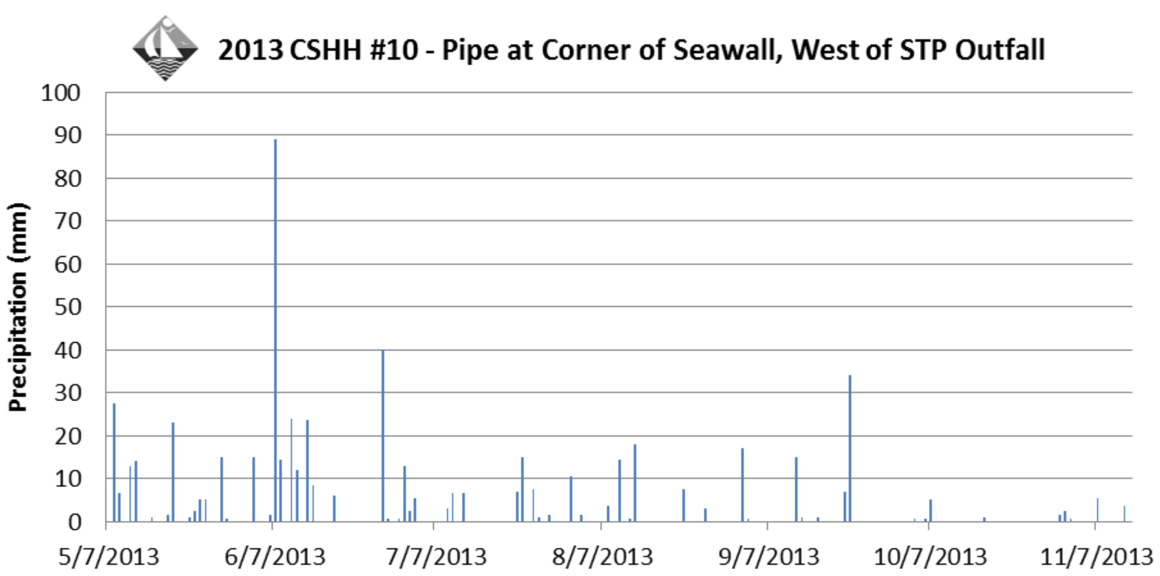


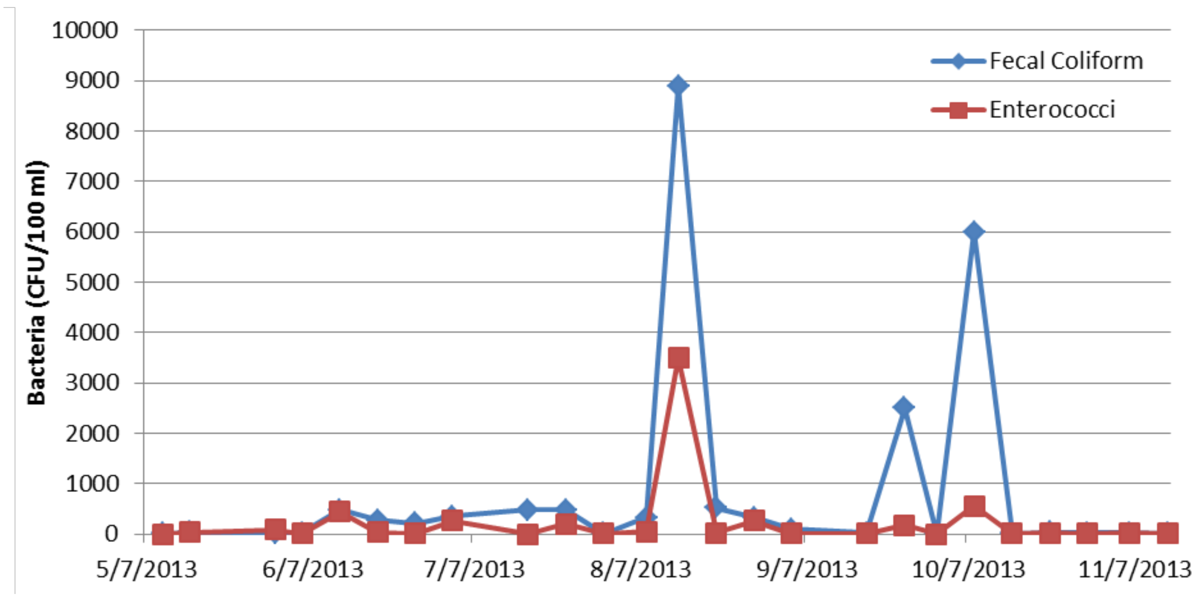
2013 In-Harbor Precipitation And Bacteria Graphs



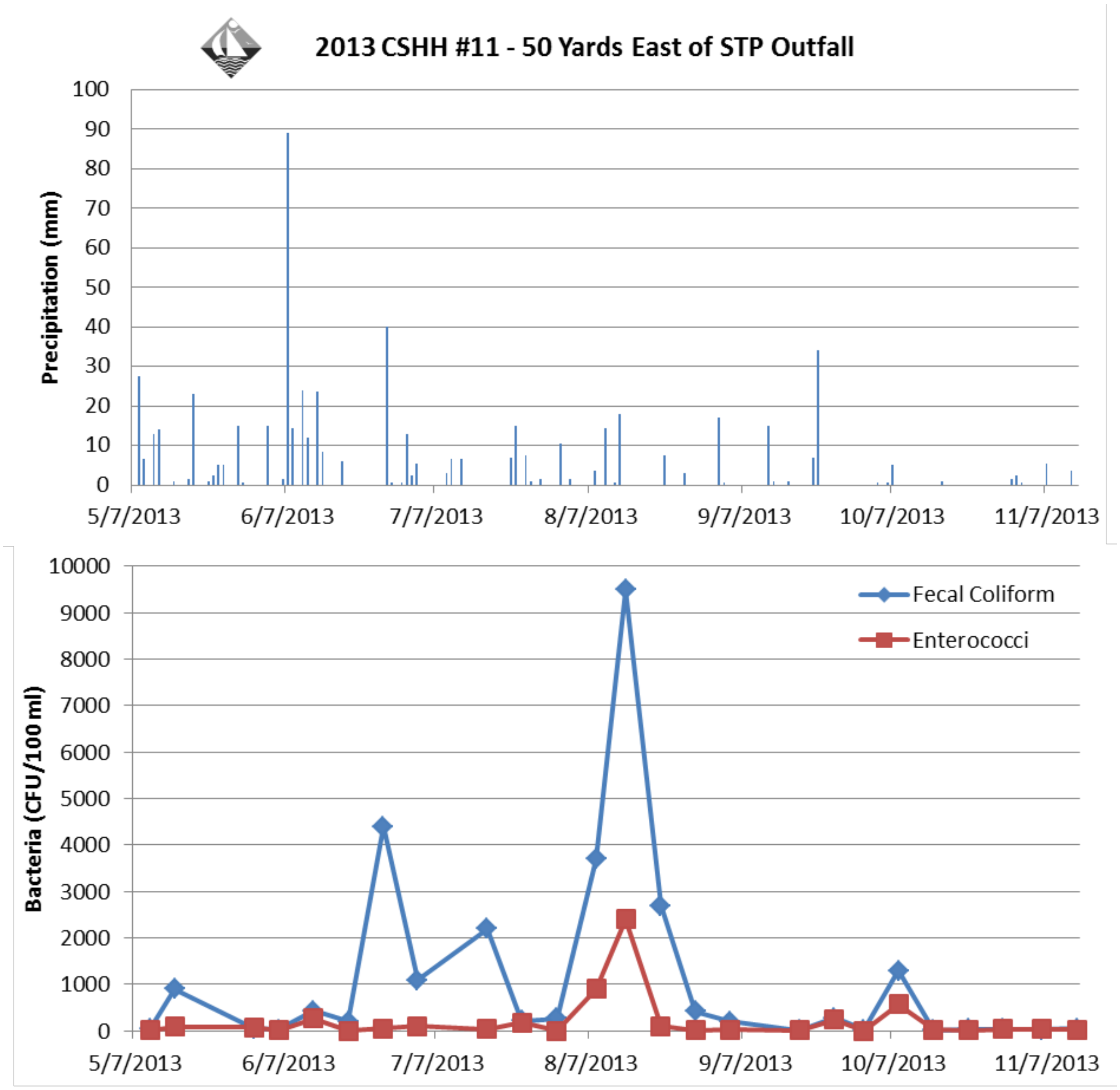


2013 In-Harbor Precipitation And Bacteria Graphs

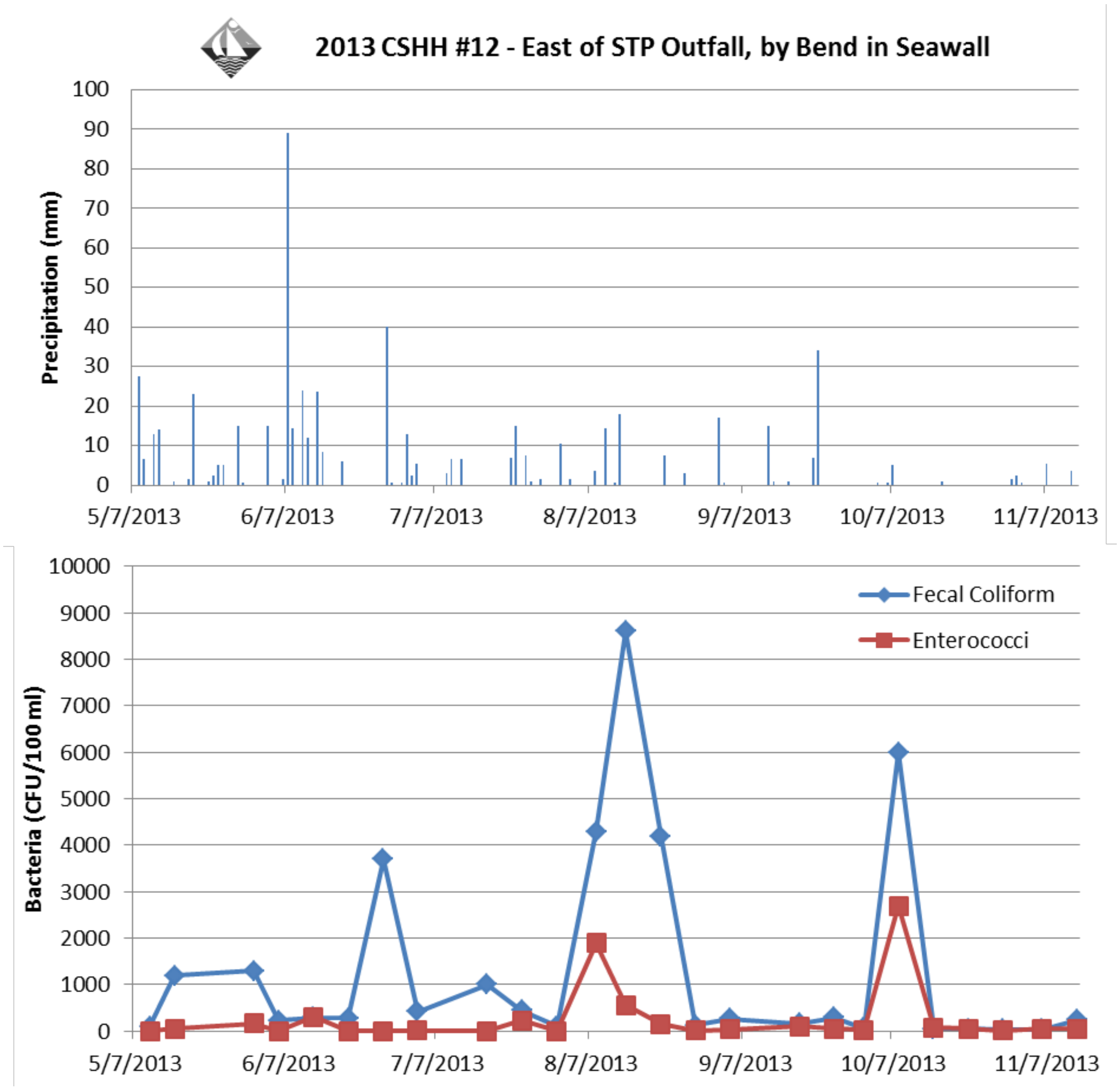




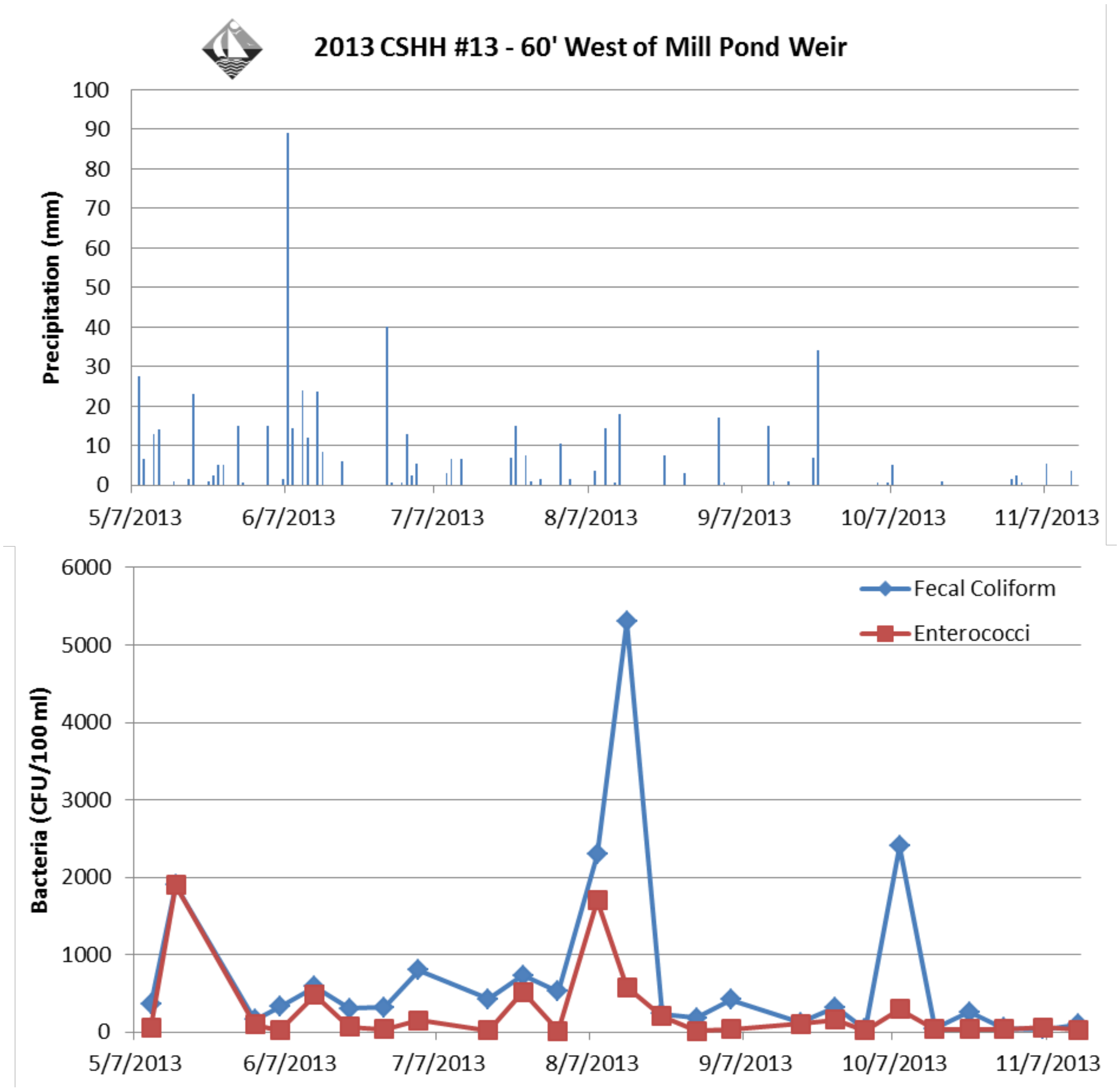
2013 In-Harbor Precipitation And Bacteria Graphs



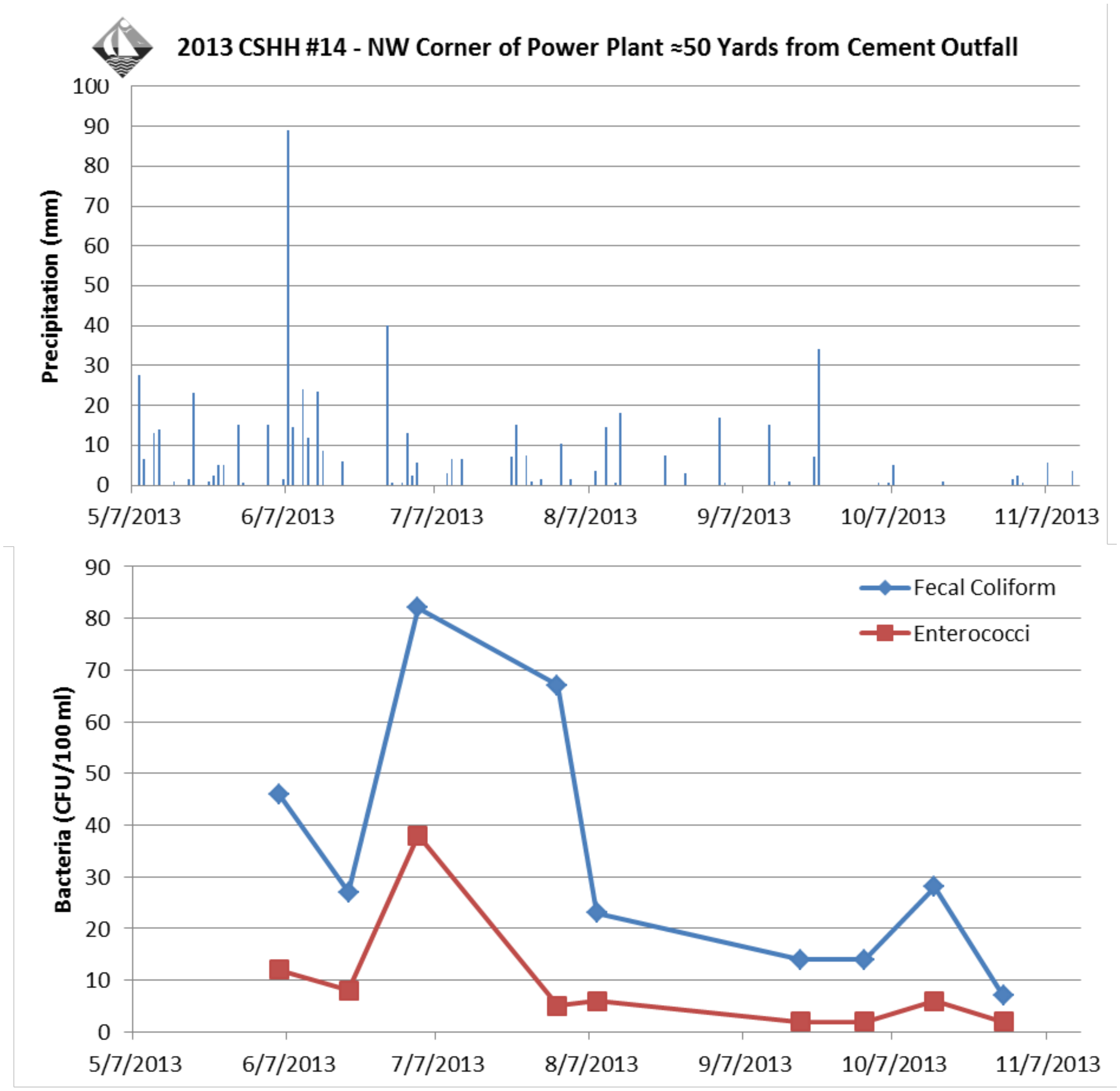
2013 In-Harbor Precipitation And Bacteria Graphs



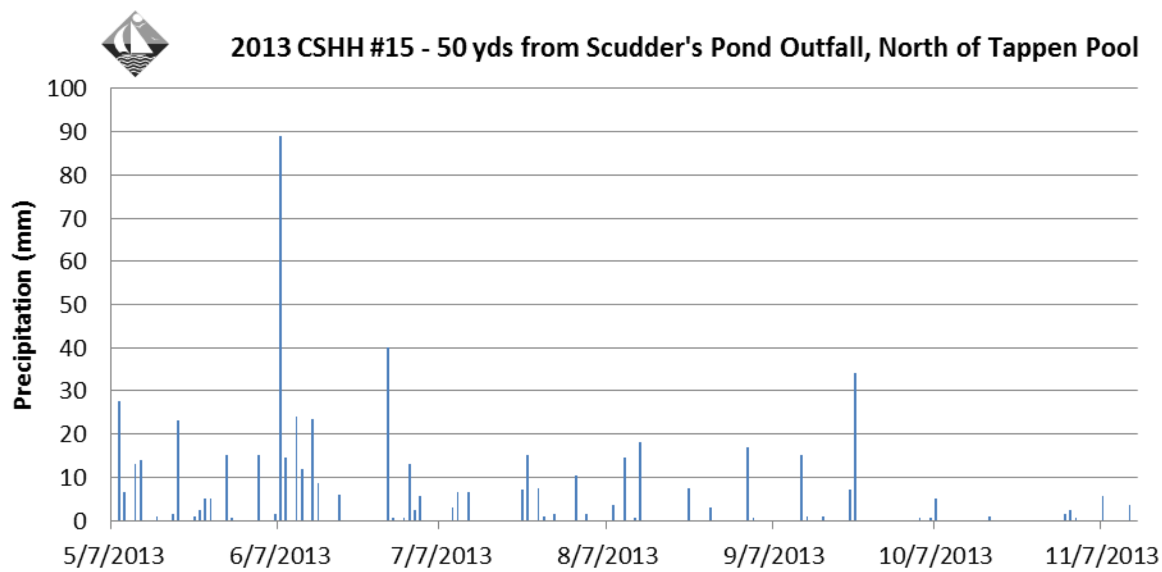
2013 In-Harbor Precipitation And Bacteria Graphs

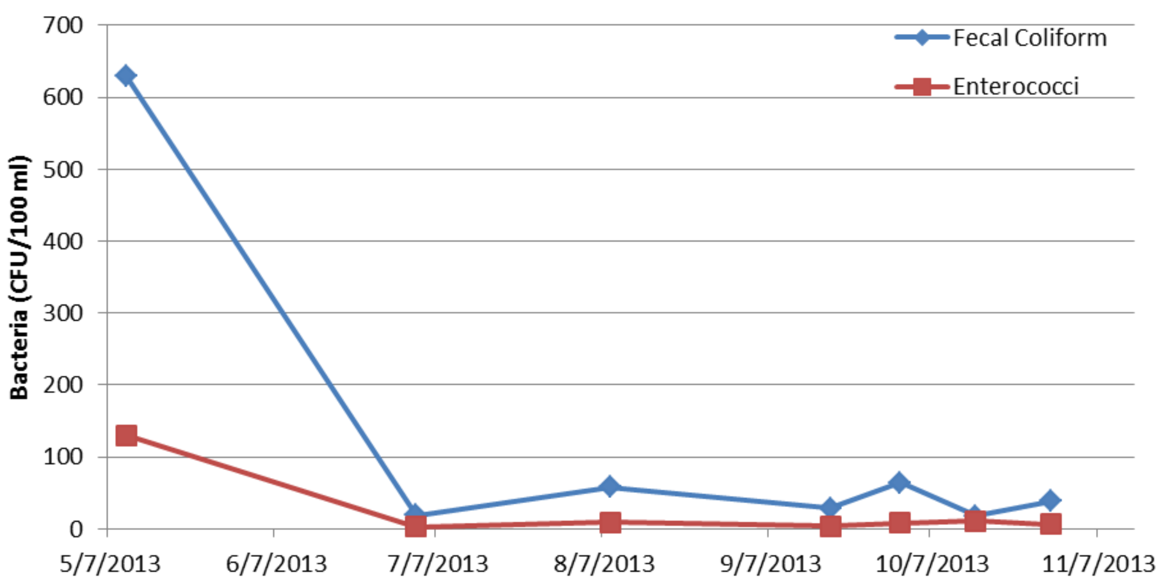


2013 In-Harbor Precipitation And Bacteria Graphs



2013 In-Harbor Precipitation And Bacteria Graphs





2013 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Bacteria Data

CSHH #14A – Cement Outfall Adjacent to Power Plant

	Fecal Coliform		*Enterococci*	
5/15/2013	44.00	0.00	***480.00***	0.00
5/31/2013	520.00	***151.26***	70.00	***183.30***
6/5/2013	430.00	***214.28***	***270.00***	***208.56***
6/12/2013	570.00	***273.65***	***280.00***	***224.50***
6/19/2013	***1100.00***	***611.91***	***180.00***	***175.68***
6/26/2013	540.00	***596.80***	63.00	***143.10***
7/3/2013	127.00	***450.18***	55.00	***136.36***
7/17/2013	340.00	***400.19***	41.00	***71.11***
7/24/2013	***1300.00***	***417.26***	***320.00***	***82.11***
7/31/2013	70.00	***250.37***	23.00	***63.83***
8/8/2013	***4100.00***	***596.80***	***2000.00***	***156.74***
8/14/2013	***2500.00***	***794.78***	***410.00***	***189.97***
8/21/2013	620.00	***896.25***	***430.00***	***303.97***
8/28/2013	***1500.00***	***922.28***	***630.00***	***348.07***
9/4/2013	***5200.00***	***2182.94***	***490.00***	***641.75***
9/10/2013	290.00	***1285.18***	***360.00***	***455.43***
9/18/2013	109.00	***686.85***	***200.00***	***394.52***
9/25/2013	460.00	***647.05***	***130.00***	***310.57***
10/1/2013	41.00	***314.97***	100.00	***214.93***
10/8/2013	***2100.00***	***262.73***	***4500.00***	***334.89***
10/15/2013	43.00	179.36	49.00	***224.74***
10/22/2013	***4900.00***	**383.96**	***480.00***	***267.74***
10/29/2013	120.00	**293.47**	37.00	***208.24***
11/6/2013	580.00	**498.54**	***2700.00***	***402.57***
11/13/2013	240.00	**323.07**	***320.00***	***237.26***

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

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log AvgFC**	**CFU/100ml**	**Log AvgEnt**
5/8/13	310.00	0.00	***180.00***	0.00
5/10/13	660.00	***452.33***	100.00	***134.16***
5/15/13	18.00	154.43	19.00	***69.93***
5/31/13	73.00	128.05	80.00	***72.32***
6/5/13	200.00	139.99	52.00	***67.71***
6/12/13	420.00	102.50	***170.00***	***60.54***
6/19/13	100.00	157.36	80.00	***86.73***
6/26/13	230.00	169.77	18.00	***63.33***
6/28/13	***7400.00***	***318.49***	***7000.00***	***138.73***
7/3/13	***1300.00***	***514.67***	***330.00***	***175.69***
7/17/13	210.00	***541.28***	20.00	***146.08***
7/24/13	770.00	***814.18***	***720.00***	***226.70***
7/31/13	53.00	***324.89***	55.00	***127.15***
8/8/13	300.00	***225.18***	***410.00***	***134.24***

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) refers 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.

2013 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Bacteria Data

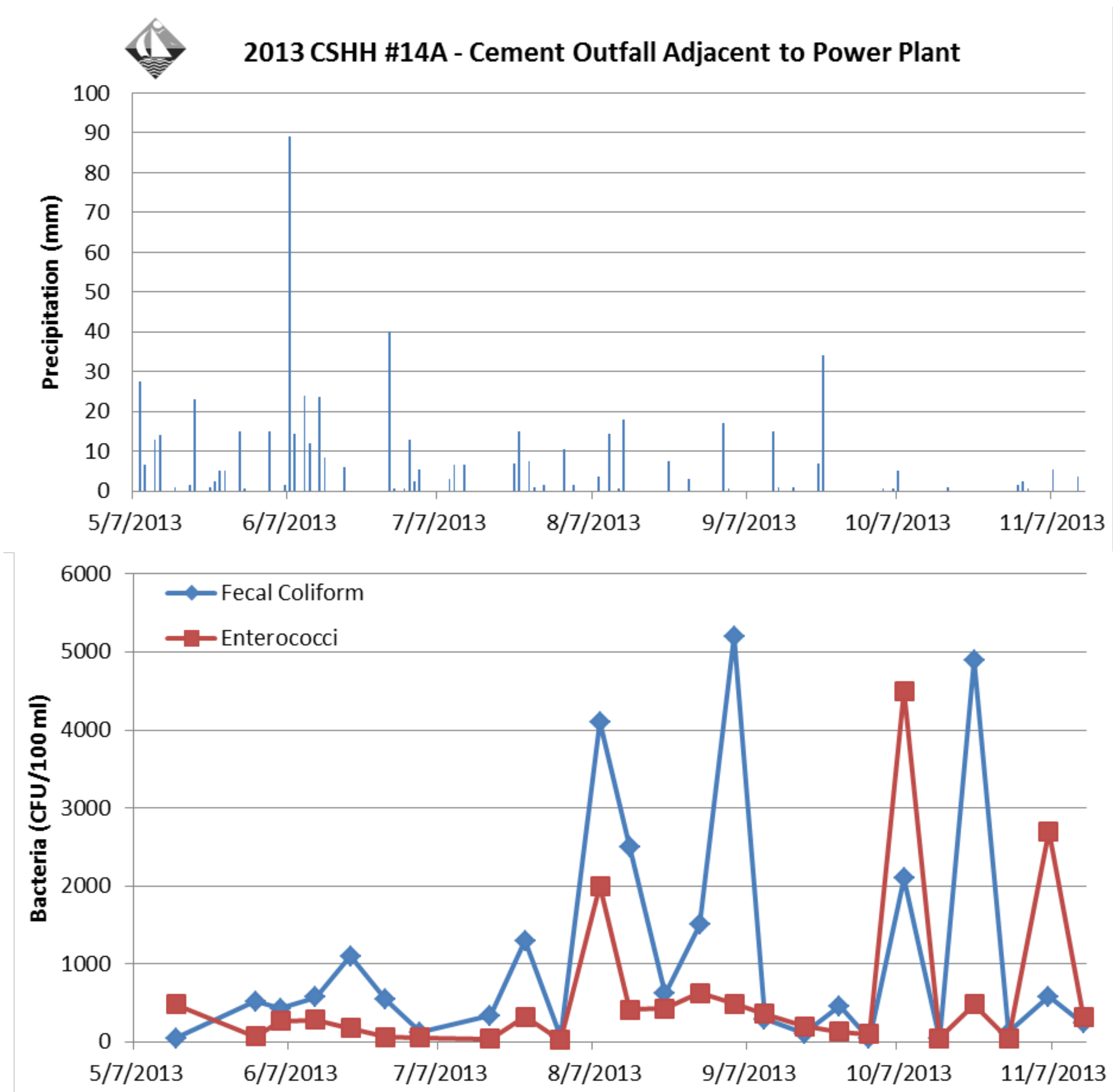
8/14/13	***3100.00***	***380.45***	***430.00***	***169.43***
8/21/13	136.00	***348.78***	***2300.00***	***437.66***
8/28/13	66.00	***213.39***	33.00	***236.25***
9/4/13	***2300.00***	***453.59***	***200.00***	***305.85***
9/10/13	82.00	***349.94***	70.00	***214.77***
9/18/13	30.00	138.40	100.00	***160.43***
9/25/13	***1000.00***	***206.27***	***120.00***	***88.87***
10/1/13	240.00	***267.04***	***160.00***	***121.87***
10/8/13	***2600.00***	***273.67***	***1400.00***	***179.85***
10/15/13	110.00	***290.23***	37.00	***158.32***
10/22/13	240.00	***439.90***	***130.00***	***166.85***
10/29/13	180.00	***312.19***	***160.00***	***176.73***
11/6/13	164.00	***289.29***	100.00	***160.87***
11/13/13	850.00	***231.33***	100.00	***94.90***

CSHH #15B – Scudder's Pond Weir

	Fecal Coliform		***Enterococci***	
Date	**CFU/100ml**	**Log AvgFC**	**CFU/100ml**	**Log AvgEnt**
5/8/13	360.00	0.00	***580.00***	0.00
5/15/13	29.00	102.18	14.00	***90.11***
5/31/13	48.00	79.43	32.00	***63.81***
6/5/13	530.00	127.66	13.00	***42.87***
6/12/13	330.00	124.91	***190.00***	32.43
6/19/13	118.00	177.41	***250.00***	***66.67***
6/26/13	250.00	190.01	6.00	***41.19***
6/28/13	***8200.00***	***355.86***	***6700.00***	***96.24***
7/3/13	***1100.00***	***599.75***	***290.00***	***138.96***
7/17/13	270.00	***590.58***	27.00	***151.07***
7/24/13	430.00	***764.88***	***1500.00***	***216.18***
7/31/13	63.00	***299.50***	***190.00***	***217.35***
8/8/13	290.00	***214.61***	***300.00***	***219.20***
8/14/13	***3400.00***	***372.92***	***3200.00***	***374.71***
8/21/13	***146.00***	***329.77***	***1800.00***	***867.92***
8/28/13	58.00	***220.90***	***250.00***	***606.52***
9/4/13	***1100.00***	***391.39***	***230.00***	***630.15***
9/10/13	82.00	***304.01***	90.00	***495.30***
9/18/13	191.00	170.92	***160.00***	***272.06***
9/25/13	***2000.00***	***288.50***	***170.00***	***169.71***
10/1/13	***430.00***	***430.67***	***190.00***	***160.64***
10/8/13	***4100.00***	***560.31***	***1100.00***	***219.68***
10/15/13	***1420.00***	***991.11***	***990.00***	***354.87***
10/22/13	520.00	***1210.92***	***260.00***	***391.06***
10/29/13	150.00	***721.32***	***210.00***	***407.94***
11/6/13	270.00	***657.21***	90.00	***351.31***
11/13/13	***1050.00***	***500.48***	***190.00***	***247.27***

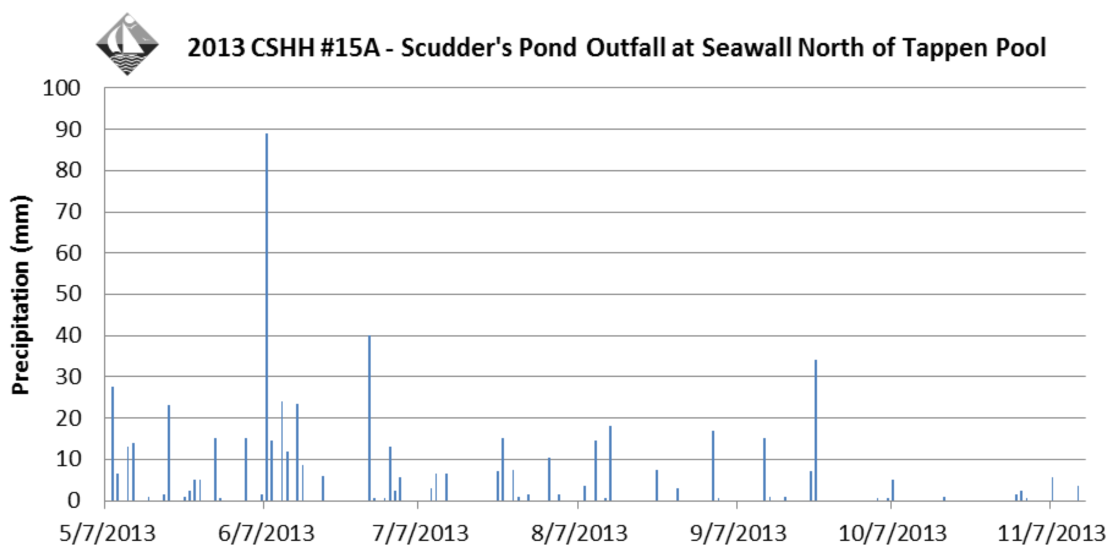
Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refers to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104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

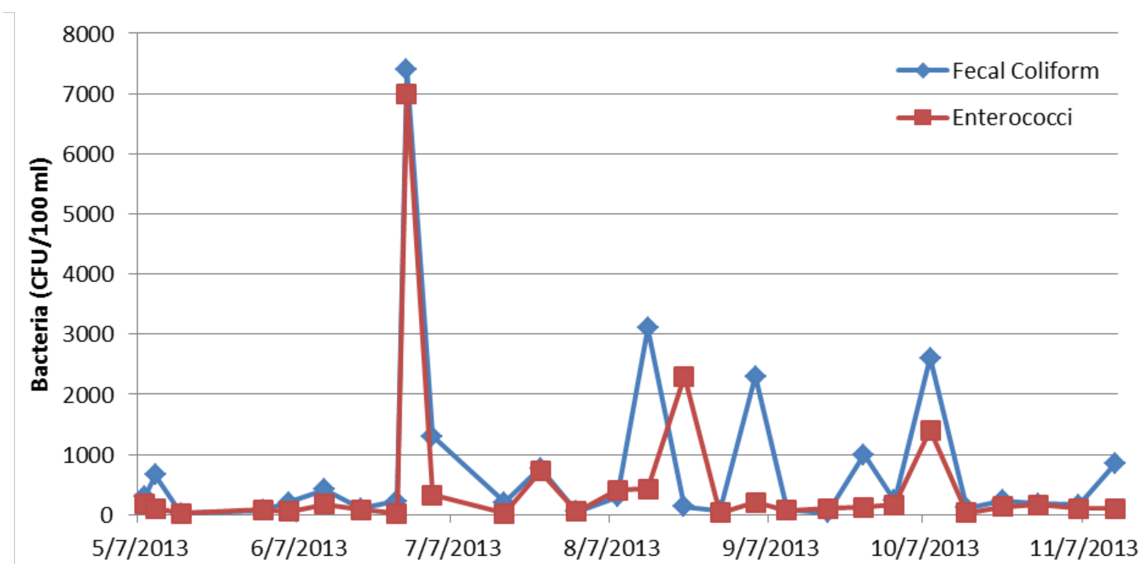
2013 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Precipitation And Bacteria Graphs



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) refers 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.

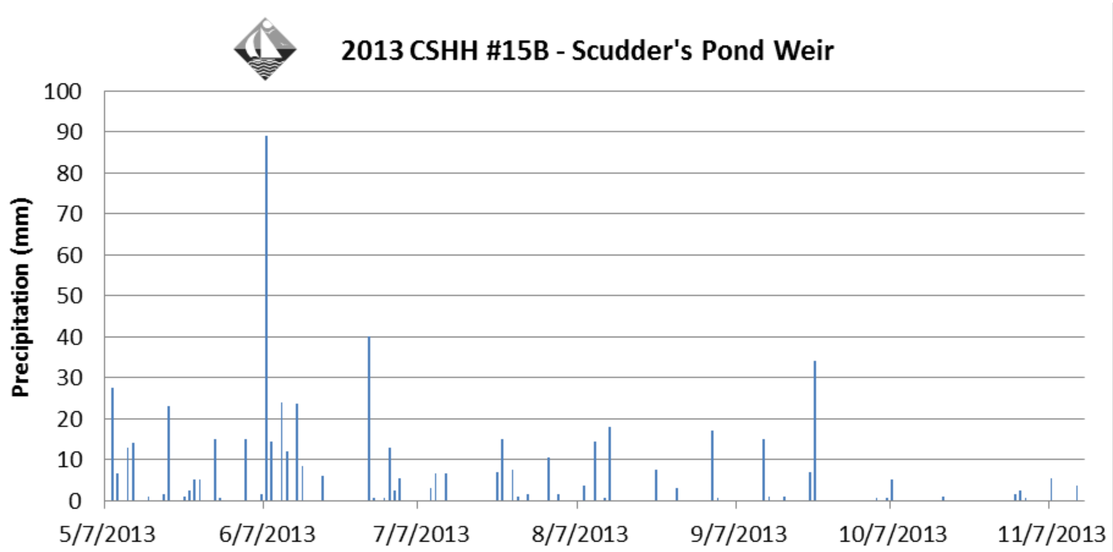
2013 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Precipitation And Bacteria Graphs

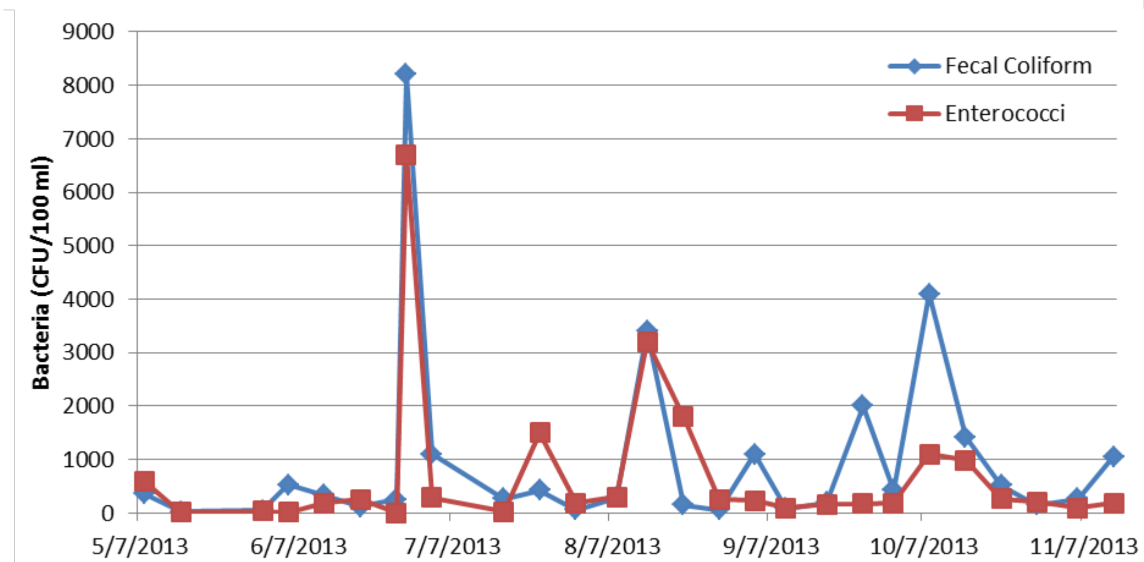




Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refers to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104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

2013 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Precipitation And Bacteria Graphs





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) refers 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.

2013-2014 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Bacteria Data

CSHH #14A – Cement Outfall Adjacent to Power Plant

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
11/18/2013	636.00	0.00	***2000.00***	0.00
11/26/2013	360.00	***478.50***	***470.00***	***969.54***
12/3/2013	118.00	***300.06***	56.00	***374.78***
12/12/2013	***1300.00***	***432.91***	***700.00***	***438.13***
12/18/2013	750.00	***483.20***	***270.00***	***397.70***
12/24/2013	***1600.00***	***581.11***	***1200.00***	***359.08***
12/30/2013	480.00	***615.53***	***270.00***	***321.39***
1/10/2014	***2200.00***	***1104.99***	***900.00***	***560.08***
1/15/2014	82.00	***635.82***	24.00	***285.28***
1/21/2014	***1200.00***	***698.48***	***130.00***	***246.48***
1/28/2014	560.00	***566.20***	***800.00***	***227.28***
3/5/2014	136.00	0.00	***120.00***	0.00
3/11/2014	100.00	116.62	***800.00***	***309.84***
3/20/2014	***3300.00***	***355.37***	***340.00***	***319.58***
4/9/2014	***22200.00***	***1942.18***	***370.00***	***465.15***
4/9/2014	***22700.00***	***3591.06***	***440.00***	***458.73***
4/16/2014	***5500.00***	***9779.44***	***1300.00***	***517.93***
4/23/2014	***29000.00***	***16837.78***	***150.00***	***422.11***
4/30/2014	6.00	***3440.79***	***12900.00***	***836.48***
5/7/2014	***1900.00***	***3116.55***	***260.00***	***688.45***
5/14/14	***2700.00***	***1374.69***	70.00	***539.68***

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

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
11/18/13	***1300.00***	0.00	***900.00***	0.00
11/26/13	200.00	***509.90***	***120.00***	***328.63***
12/3/13	13.00	150.07	15.00	***117.45***
12/12/13	91.00	132.43	***800.00***	***189.74***
12/18/13	155.00	136.67	***260.00***	***202.08***
12/24/13	***1500.00***	140.63	***3900.00***	***270.94***
12/30/13	410.00	162.34	***5200.00***	***575.76***
1/10/14	800.00	370.06	***1300.00***	***1405.45***
1/15/14	440.00	***507.17***	***1800.00***	***1652.92***
1/21/14	82.00	***446.53***	90.00	***1336.92***
1/28/14	73.00	***243.95***	***130.00***	***677.14***
2/20/14	118.00	89.06	***160.00***	***123.24***
2/26/14	57.00	78.89	***180.00***	***155.28***
3/5/14	2.00	23.78	19.00	***81.79***
3/11/14	18.00	22.18	90.00	***83.77***

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) refers 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.

2013-2014 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Bacteria Data

3/20/14	100.00	29.98	***1200.00***	***142.66***
3/26/14	16.00	20.10	***5500.00***	***289.44***
4/2/14	0.10	5.65	32.00	***204.90***
4/2/14	3.00	5.08	35.00	***152.63***
4/9/14	51.00	8.72	16.00	***148.32***
4/9/14	30.00	10.41	20.00	***111.40***
4/16/14	127.00	13.76	***190.00***	***123.95***
4/23/14	900.00	18.83	9.00	***61.61***
4/30/14	1.00	12.67	***300.00***	***40.66***
5/7/14	21.00	39.28	9.00	33.75
5/14/14	***1500.00***	***81.52***	38.00	***44.55***

CSHH #15B – Scudder's Pond Weir

	Fecal Coliform		***Enterococci***	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
11/18/13	***1000.00***	0.00	***700.00***	0.00
11/26/13	***1100.00***	***1048.81***	***230.00***	***401.25***
12/3/13	330.00	***713.35***	***800.00***	***505.02***
12/12/13	73.00	***403.47***	***700.00***	***547.97***
12/18/13	340.00	***389.89***	***240.00***	***464.56***
12/24/13	800.00	***372.87***	***3500.00***	***640.97***
12/30/13	***1700.00***	***406.79***	***7100.00***	***1272.76***
1/10/14	470.00	***436.60***	***1200.00***	***1380.27***
1/15/14	580.00	***660.86***	***2600.00***	***1794.48***
1/21/14	73.00	***485.82***	***150.00***	***1633.48***
1/28/14	82.00	***308.05***	***110.00***	***817.67***
2/20/14	53.00	68.20	70.00	***104.92***
2/26/14	45.00	58.05	70.00	***81.38***
3/5/14	1.00	13.36	0.10	7.88
3/11/14	26.00	15.78	58.00	12.98
3/20/14	127.00	23.95	***2900.00***	***38.30***
3/26/14	1.00	10.82	1.00	16.38
4/2/14	0.10	3.19	16.00	12.19
4/2/14	2.00	2.95	13.00	12.32
4/9/14	50.00	5.66	3.00	21.72
4/9/14	45.00	7.62	0.10	10.07
4/16/14	145.00	9.74	***130.00***	11.30
4/23/14	800.00	12.66	17.00	5.42
4/30/14	2.00	13.98	***160.00***	11.20
5/7/14	27.00	49.15	0.10	4.69
5/14/14	***1700.00***	***101.27***	18.00	14.48

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) refers 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.

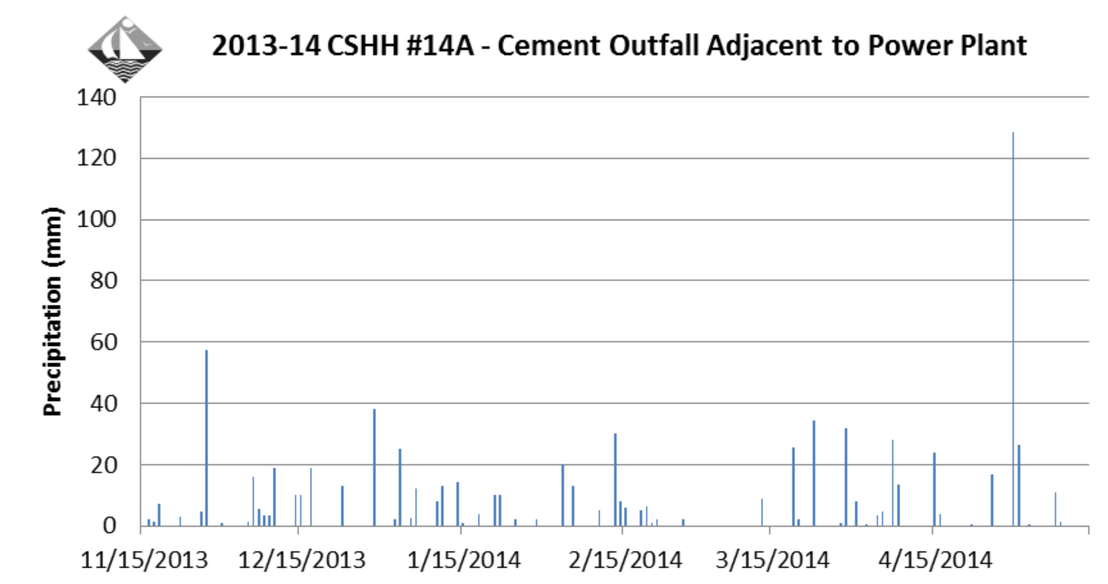
2013-2014 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Bacteria Data

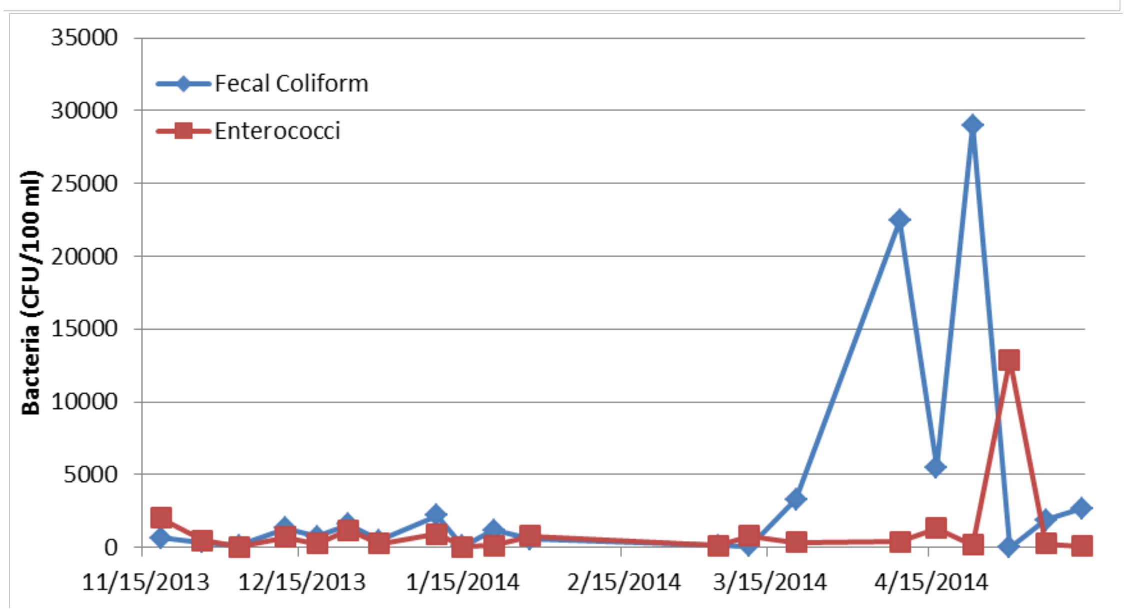
CSHH #15B2 – - Scudder's Pond Weir-Street Side of Boom

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml.**	**Log AvgFC**	**CFU/100ml.**	**Log AvgEnt**
3/20/14	270.00	0.00	***2700.00***	0.00
3/26/14	0.10	5.20	1.00	***51.96***
4/2/14	5.00	5.13	21.00	***38.42***
4/2/14	1.00	3.41	19.00	32.22
4/9/14	52.00	5.88	5.00	22.20
4/9/14	27.00	7.58	0.10	9.02

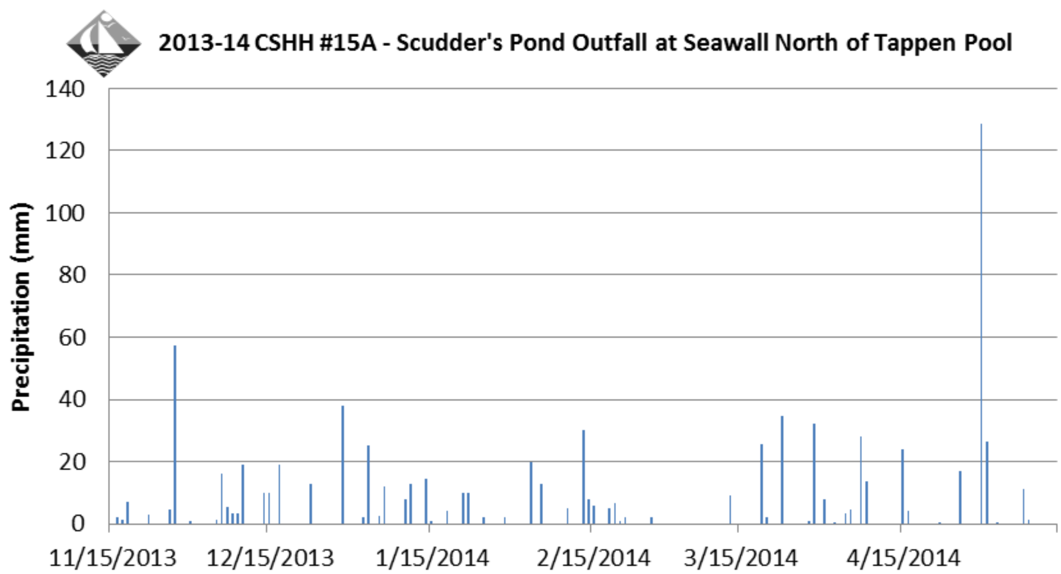
Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refers to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104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

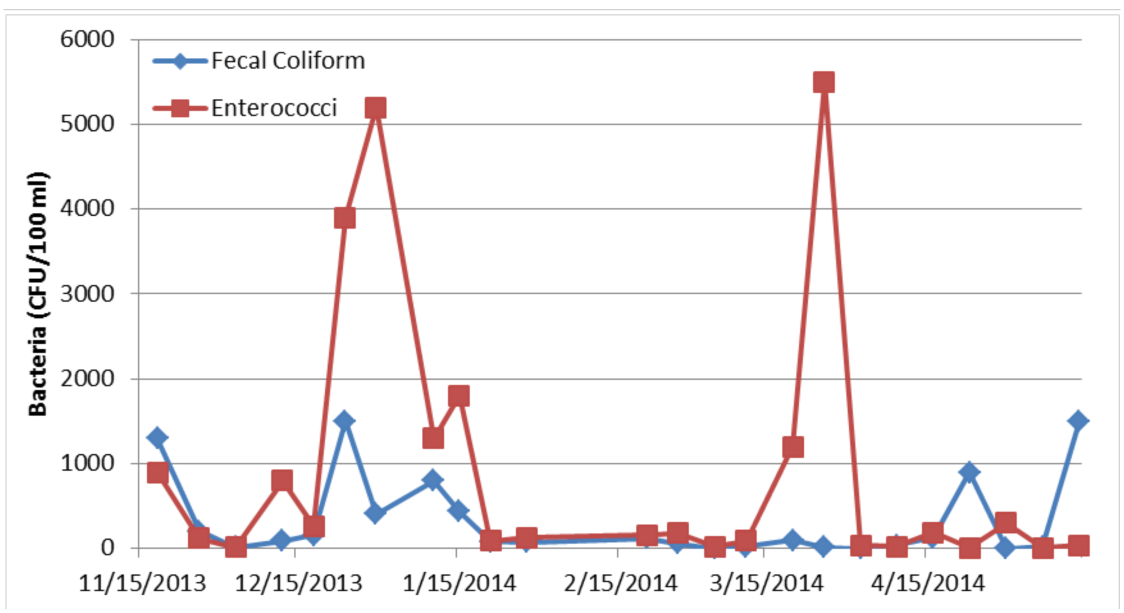
2013-2014 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Precipitation and Bacteria Graphs



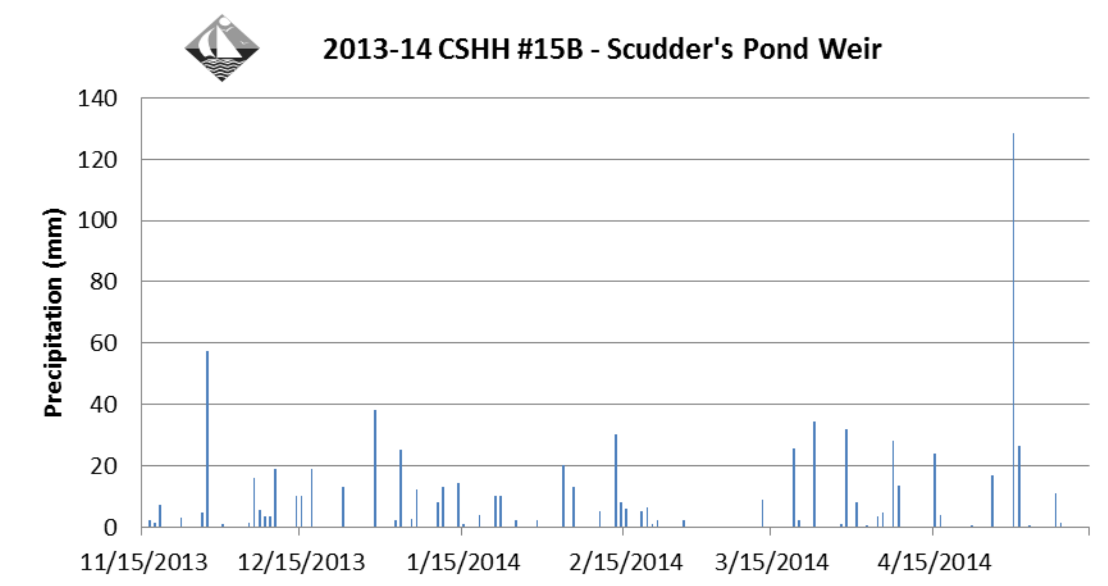


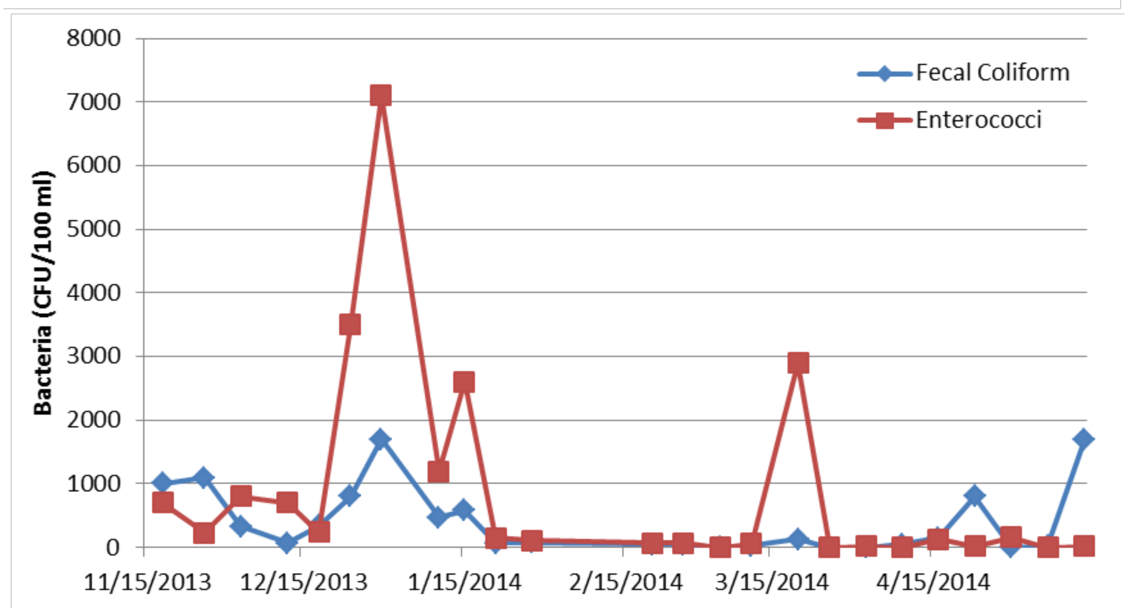
2013-2014 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Precipitation and Bacteria Graphs



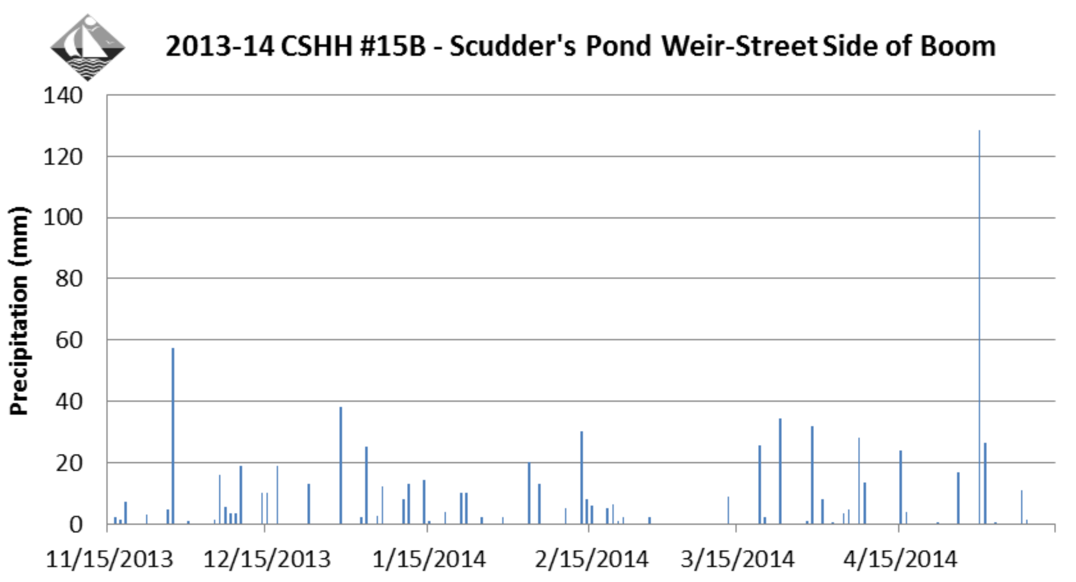


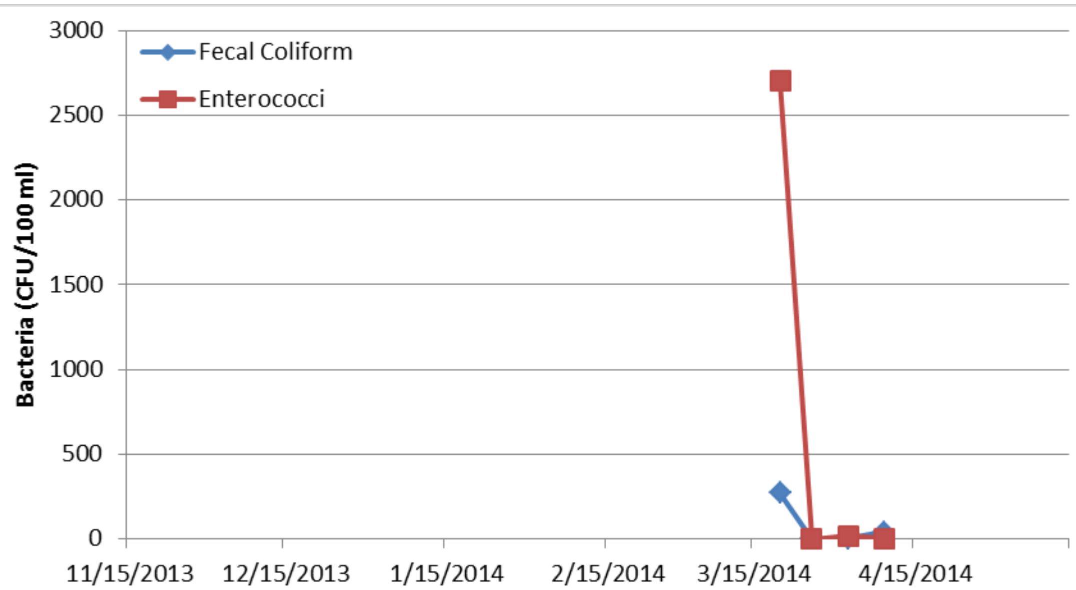
2013-2014 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Precipitation and Bacteria Graphs





2013-2014 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Precipitation and Bacteria Graphs





2013 Beach-Monitoring Bacteria Data

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

	Enterococci	
Date	CFU/100ml	Log AvgEnt
4/17/13	0.10	0.00
4/22/13	8.00	0.89
4/24/13	0.10	0.43
4/29/13	2.00	0.63
5/1/13	0.10	0.44
5/6/13	6.00	0.68
5/8/13	***120.00***	1.42
5/13/13	2.00	1.48
5/20/13	0.10	1.48
5/22/13	11.00	1.85
5/29/13	1.00	2.05
6/3/13	53.00	5.05
6/5/13	48.00	6.69
6/10/13	15.00	5.05
6/12/13	35.00	6.43
6/17/13	10.00	7.87
6/19/13	***110.00***	10.55
6/24/13	10.00	18.66
6/26/13	10.00	17.41
7/1/13	5.00	20.82
7/3/13	1.00	15.37
7/8/13	2.00	9.41
7/10/13	4.00	8.64
7/15/13	1.00	5.47
7/17/13	1.00	4.62
7/22/13	***601.00***	5.12
7/24/13	12.00	5.57
7/29/13	2.00	4.37
7/31/13	1.00	3.77
8/5/13	9.00	4.66
8/7/13	2.00	4.28
8/12/13	6.00	4.88
8/14/13	1.00	4.16
8/19/13	8.00	6.14
8/21/13	4.00	5.89
8/26/13	2.00	2.88
8/28/13	1.00	2.59

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) refers 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.

2013 Beach-Monitoring Bacteria Data

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

	Enterococci	
Date	**CFU/100ml**	**Log AvgEnt**
04/17/13	1.00	0.00
04/22/13	4.00	2.00
04/24/13	0.10	0.74
04/29/13	0.10	0.45
05/01/13	1.00	0.53
05/06/13	2.00	0.66
05/08/13	59.00	1.25
05/13/13	4.00	1.44
05/20/13	3.00	1.66
05/22/13	3.00	1.77
05/29/13	2.00	2.32
06/03/13	11.00	5.13
06/05/13	6.00	5.23
06/10/13	13.00	4.84
06/12/13	12.00	5.42
06/17/13	0.10	3.42
06/19/13	4.00	3.48
06/24/13	7.00	3.94
06/26/13	0.10	2.62
07/01/13	2.00	2.62
07/03/13	2.00	2.55
07/08/13	0.10	1.37
07/10/13	2.00	1.43
07/15/13	0.10	0.66
07/17/13	0.10	0.54
07/22/13	***200.00***	1.01
07/24/13	11.00	1.29
07/29/13	0.10	1.06
07/31/13	0.10	0.84
08/05/13	13.00	0.94
08/07/13	5.00	1.11
08/12/13	3.00	1.52
08/14/13	7.00	1.77
08/19/13	13.00	4.18
08/21/13	11.00	4.61
08/26/13	2.00	2.51
08/28/13	3.00	2.55

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) refers 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.

2013 Beach-Monitoring Bacteria Data

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

	Enterococci	
Date	**CFU/100ml**	**Log AvgEnt**
4/17/13	1.00	0.00
4/22/13	90.00	9.49
4/24/13	0.10	2.08
4/29/13	0.10	0.97
5/1/13	0.10	0.62
5/6/13	1.00	0.67
5/8/13	100.00	1.37
5/13/13	27.00	1.99
5/20/13	3.00	2.28
5/22/13	***130.00***	3.57
5/24/13	46.00	3.32
5/29/13	3.00	4.84
6/3/13	27.00	15.82
6/5/13	23.00	16.49
6/10/13	7.00	16.79
6/12/13	3.00	13.87
6/17/13	0.10	7.44
6/19/13	***590.00***	11.53
6/21/13	3.00	11.53
6/24/13	4.00	6.71
6/26/13	1.00	5.55
7/1/13	6.00	5.95
7/3/13	1.00	5.06
7/8/13	2.00	3.35
7/10/13	3.00	3.32
7/15/13	0.10	2.19
7/17/13	4.00	2.31
7/22/13	12.00	2.07
7/24/13	15.00	2.52
7/29/13	3.00	2.71
7/31/13	5.00	2.88
8/5/13	28.00	3.84
8/7/13	1.00	3.36
8/12/13	9.00	4.02
8/14/13	80.00	5.42
8/19/13	1.00	7.24
8/21/13	2.00	6.36
8/26/13	3.00	4.96
8/28/13	5.00	4.96

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) refers 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.

2013 Beach-Monitoring Bacteria Data

NSB#5 - Tappen Beach

	Enterococci	
Date	**CFU/100ml**	**Log AvgEnt**
04/17/13	1.00	0.00
04/22/13	30.00	5.48
04/24/13	0.10	1.44
04/29/13	1.00	1.32
05/01/13	0.10	0.79
05/06/13	0.10	0.56
05/08/13	**150.00**	1.24
05/13/13	13.00	1.66
05/15/13	1.00	1.57
05/20/13	4.00	1.83
05/22/13	21.00	2.34
05/29/13	2.00	2.46
06/03/13	48.00	5.95
06/05/13	**410.00**	9.52
06/10/13	8.00	11.67
06/12/13	**160.00**	15.61
06/14/13	70.00	18.82
06/17/13	1.00	18.82
06/19/13	3.00	15.66
06/24/13	11.00	16.96
06/26/13	3.00	14.27
07/01/13	4.00	15.29
07/03/13	53.00	17.12
07/08/13	6.00	10.12
07/10/13	11.00	10.20
07/15/13	2.00	5.20
07/17/13	1.00	4.41
07/22/13	22.00	6.49
07/24/13	5.00	6.32
07/29/13	0.10	4.07
07/31/13	0.10	2.81
08/05/13	39.00	2.61
08/07/13	0.10	1.88
08/12/13	6.00	1.55
08/14/13	90.00	2.33
08/19/13	7.00	2.94
08/21/13	1.00	2.64
08/26/13	5.00	2.08
08/28/13	4.00	2.22

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) refers 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.

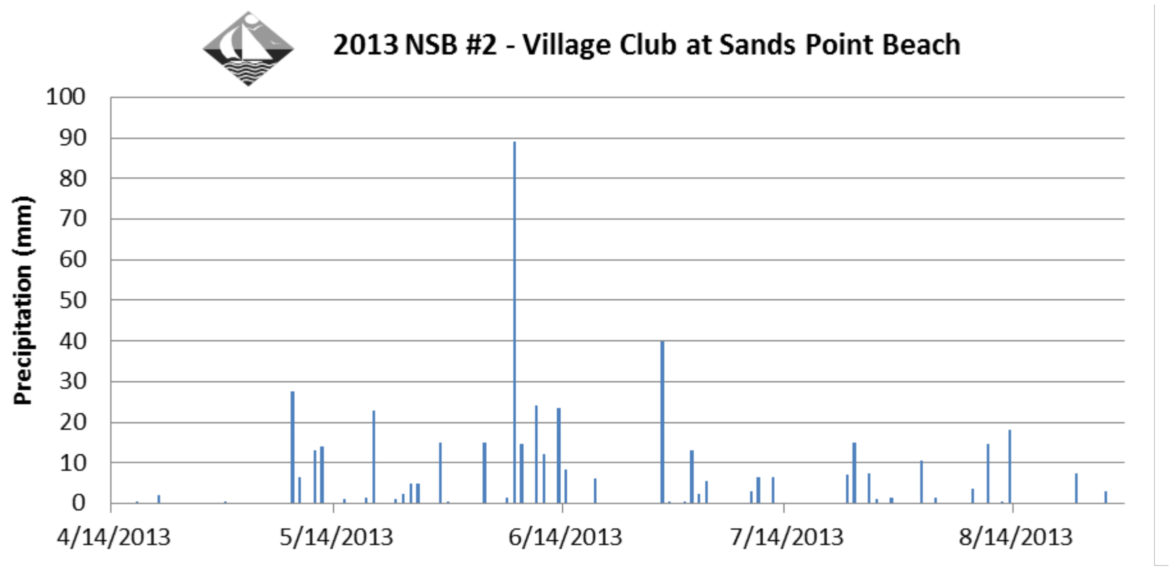
2013 Beach-Monitoring Bacteria Data

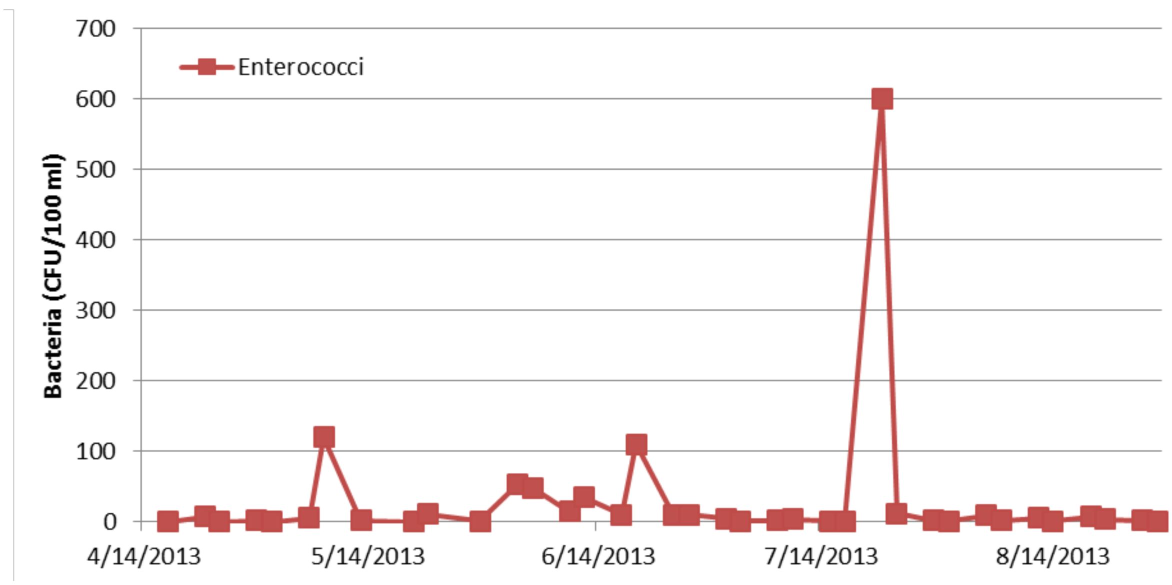
NSB#6 - Sea Cliff Village Beach

Date	Enterococci CFU/100ml	Log AvgEnt
04/17/13	0.10	0.00
04/22/13	26.00	1.61
04/24/13	0.10	0.64
04/29/13	1.00	0.71
05/01/13	30.00	1.51
05/06/13	2.00	1.58
05/08/13	90.00	2.82
05/13/13	11.00	3.34
05/15/13	1.00	2.92
05/20/13	7.00	4.68
05/22/13	19.00	5.39
05/29/13	3.00	6.60
06/03/13	40.00	8.66
06/05/13	10.00	8.80
06/10/13	1.00	6.03
06/12/13	58.00	7.76
06/17/13	9.00	9.77
06/19/13	16.00	10.32
06/24/13	30.00	11.48
06/26/13	3.00	9.89
07/01/13	10.00	11.30
07/03/13	6.00	10.61
07/08/13	1.00	7.09
07/10/13	6.00	6.97
07/15/13	3.00	6.22
07/17/13	8.00	6.38
07/22/13	8.00	5.69
07/24/13	3.00	5.33
07/29/13	1.00	3.90
07/31/13	4.00	3.91
08/05/13	9.00	3.68
08/07/13	3.00	3.61
08/12/13	3.00	3.85
08/14/13	80.00	5.22
08/19/13	10.00	5.69
08/21/13	17.00	6.34
08/26/13	2.00	5.91
08/28/13	2.00	5.30

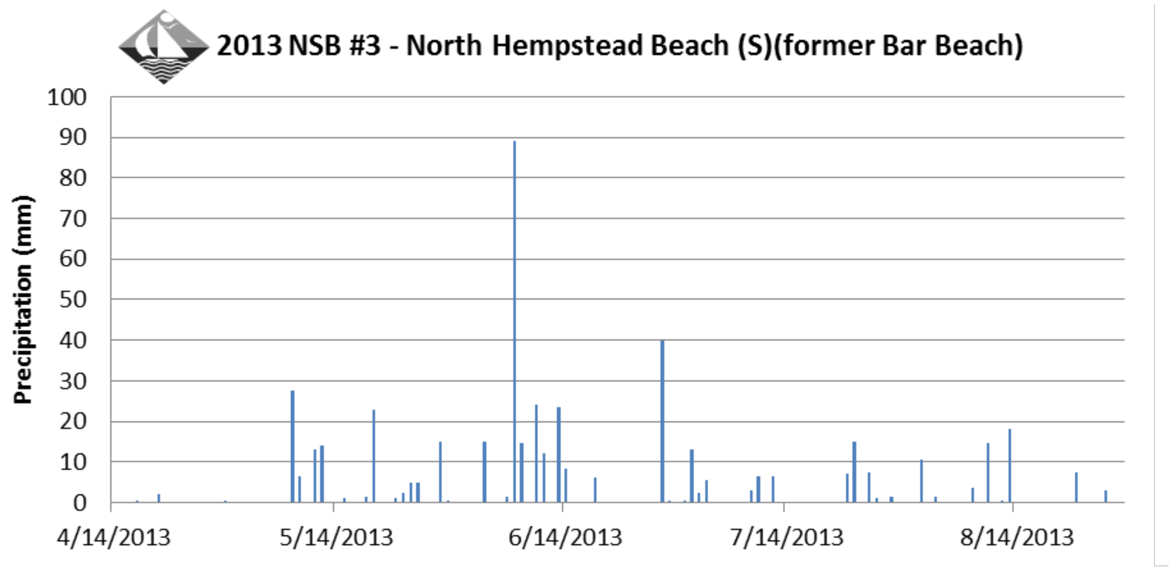
Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refers to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104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

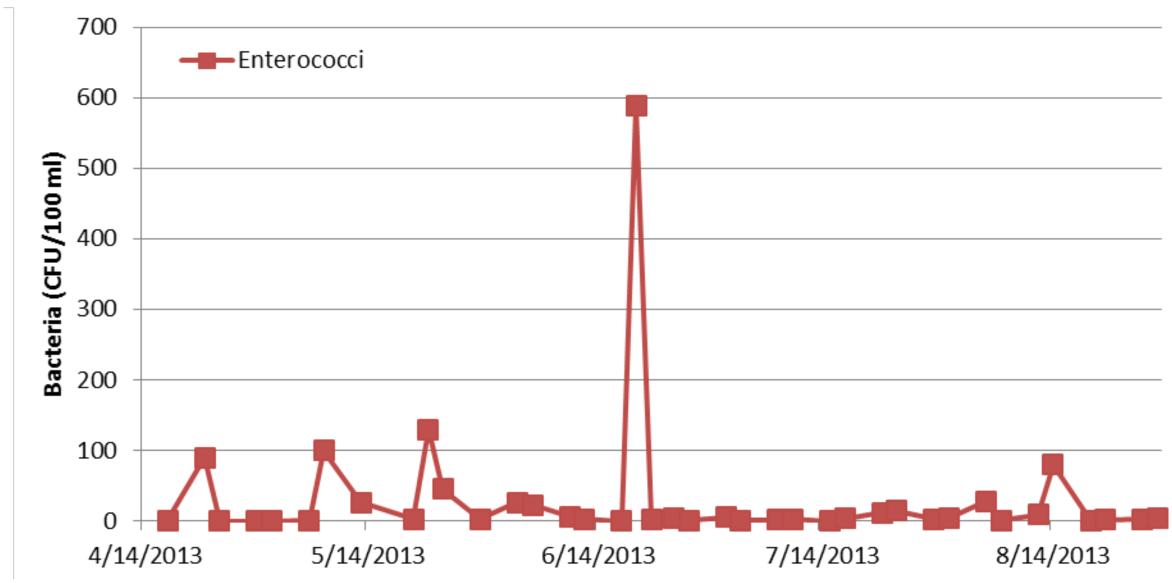
2013 Beach-Monitoring Precipitation And Bacteria Graphs



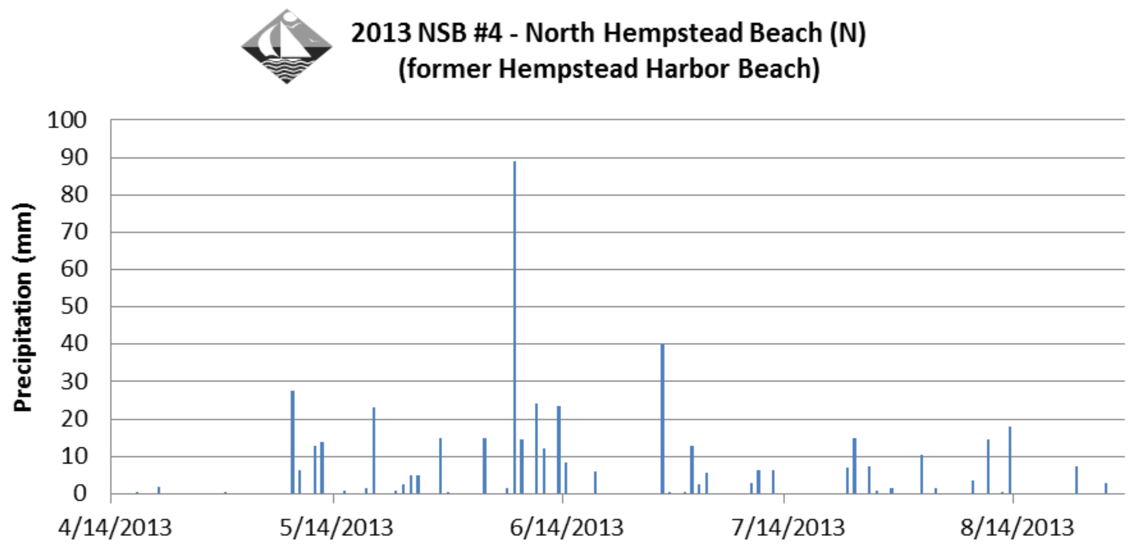


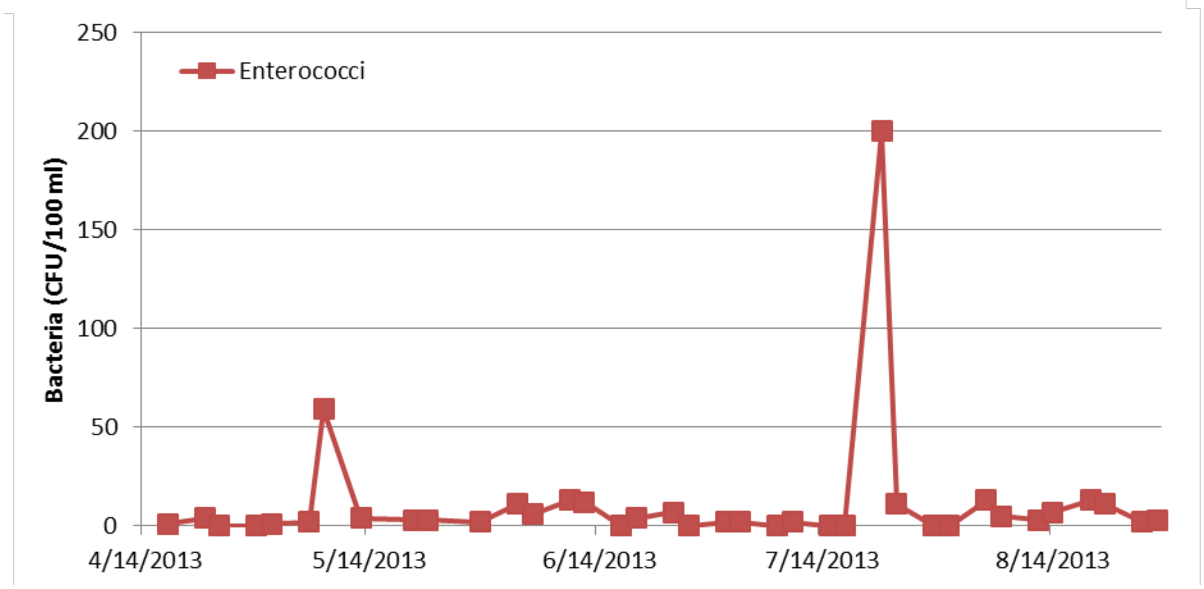
2013 Beach-Monitoring Precipitation And Bacteria Graphs



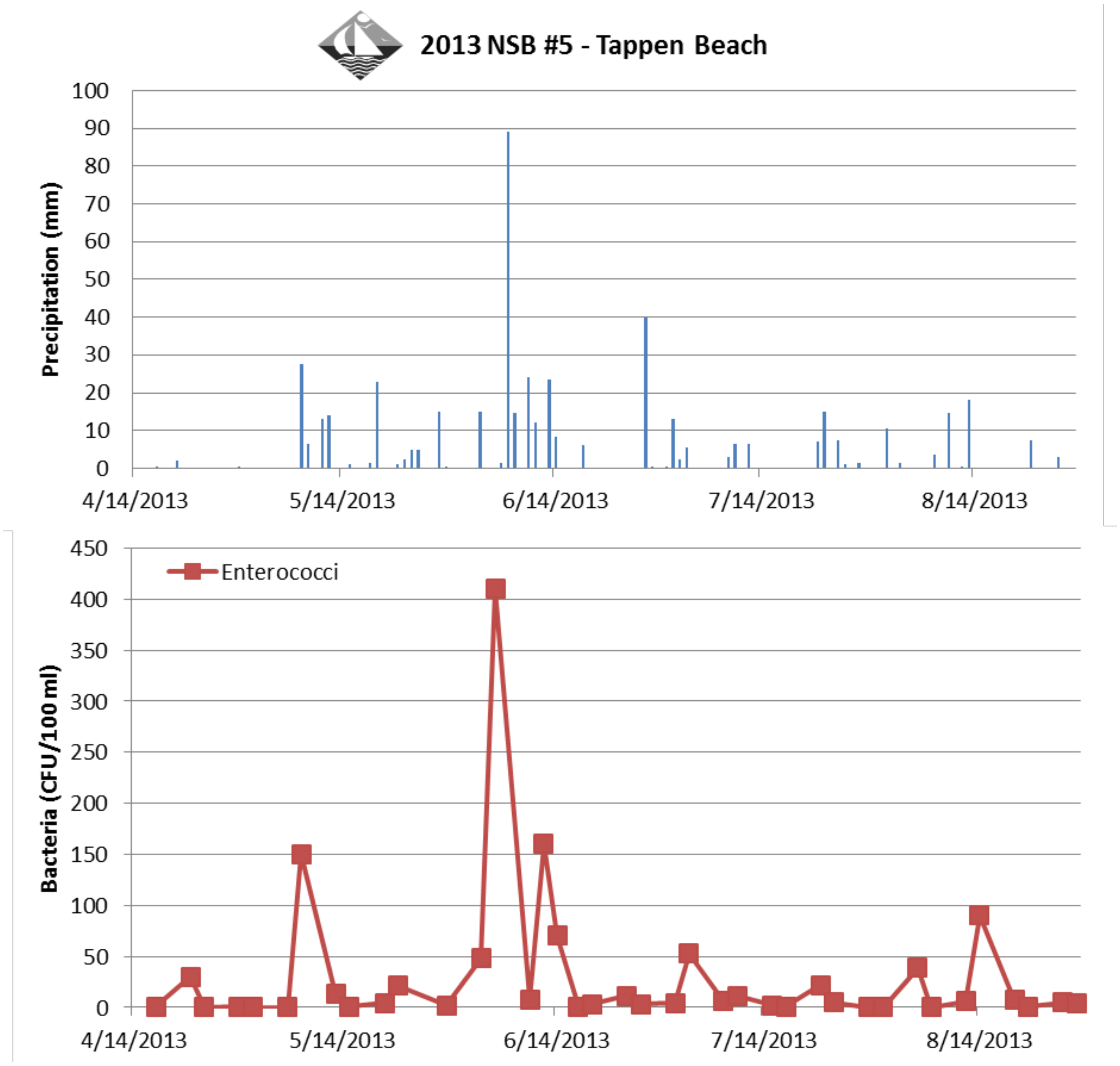


2013 Beach-Monitoring Precipitation And Bacteria Graphs

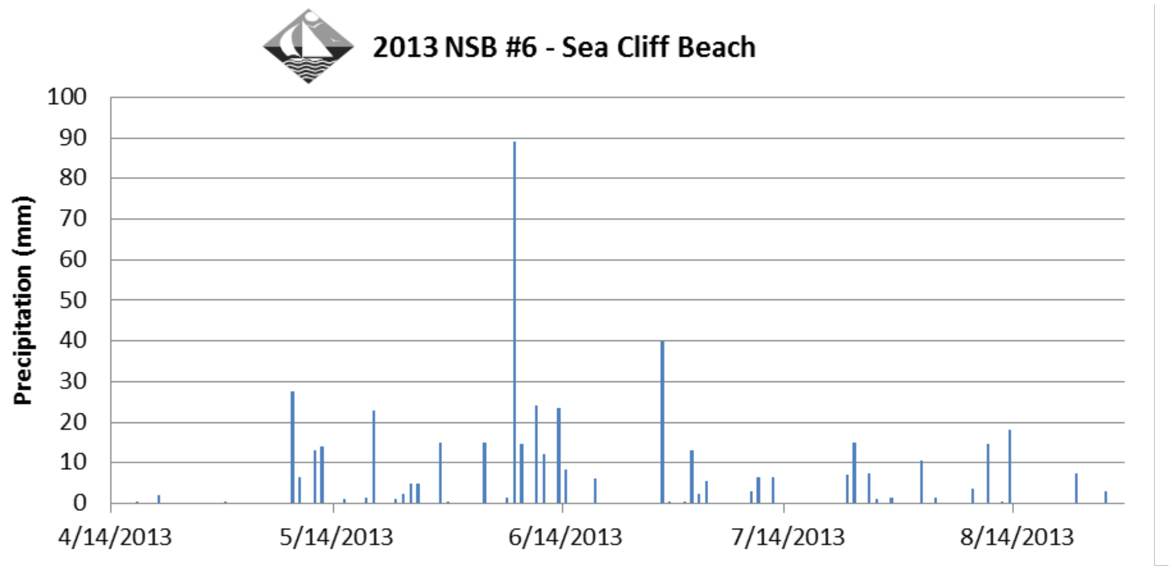


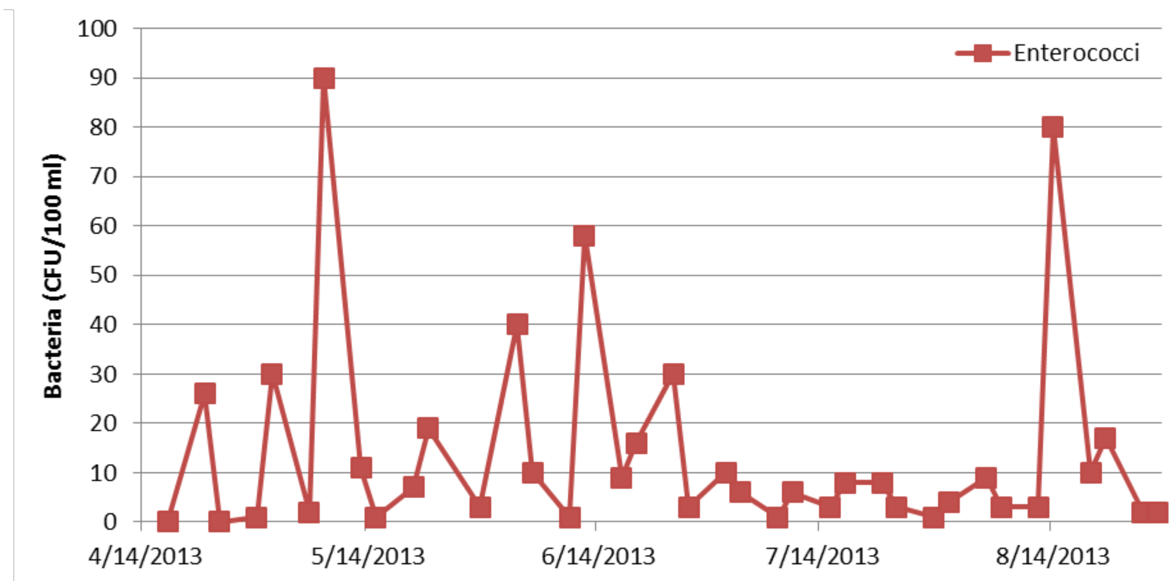


2013 Beach-Monitoring Precipitation And Bacteria Graphs



2013 Beach-Monitoring Precipitation And Bacteria Graphs





2013 Sea Cliff Precipitation Data

CSHH 2013 PRECIPITATION DATA FOR SEA CLIFF													
MO/DAY	**AMT(MM)***		**MO/DAY**	**AMT(MM)**		**MO/DAY**	**AMT(MM)**		**MO/DAY**	**AMT(MM)**		**MO/DAY**	**AMT(MM)**
MARCH			**May cont.**			**JULY**			**SEPTEMBER**			**NOVEMBER**	
2	2****		19	23		1	13B**		2	17A		1	2.5
6,7	rain,sleet		22	1		2	2.5**		3	0.5		2	0.5
8	20****		23	2.5		3	5.5		10	trace		7	5.5
12	29		24,25	10**		8	trace		12	15C		10	trace
16	2****		28	15		9	3		13	1		12	3.5***
18,19	18***		29	0.5		10	6.5		16	1		16	2
25	3.5		**Total**	**115.5**		12	6.5		21	7		17	1.5
31	trace					15	trace		22	34		18	7
Total	**74.5**		**JUNE**			20	trace		**Total**	**75.5**		22	3
			3	15B**		22	7					26	4.5
APRIL			6	1.5		23	15B**		**OCTOBER**			27	57.5
1	0.5		7	89B**		25	7.5		4	0.5		30	1
10	5		8	14.5A**		26	1		6	0.5		**Total**	**88.5**
11	4.5		10	24		28	1.5		7	5			
12	17.5		11	12**		**Total**	**69**		10	trace		**DECEMBER**	
17	0.5		13	23.5C					17	1		5	1.5
20	2		14	8.5**		**AUGUST**			22	trace		6	16
22	trace		16	trace		1	10.5		31	1.5		7	5.5
29	0.5		18	6		3	1.5		**Total**	**8.5**		8,9	7***
Total	**30.5**		23	trace		7	trace					10	19***
			25	trace		8	3.5					14, 15	20***
MAY			27	40B		10	14.5A					17	19***
8	27.5		28	0.5**		12	0.5					23	13
9	6.5		30	0.5		13	18B					29	38
11	13		**Total**	**235**		18	trace					**Total**	**139**
12	14					22	7.5						
15	1					26	3						
18	1.5					**Total**	**59**						

*Precipitation is recorded from midnight to midnight; snow recorded in inches, converted to approximate liquid equivalent (see below).
"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.)
**Administrative (preemptive) beach-closure dates (11): 5/25, 6/3, 6/7-8, 6/11, 6/14, 6/28, 7/1-2, 7/23, 8/14.
***Snow/sleet/rain mix and wet snow converted to approximate liquid equivalent in mm (5 in of wet snow approx. equal to 1 in liquid precip.).
****Snow converted to approximate liquid equivalent in mm (10 in of snow equal to approx. 1 in liquid precip.).

2014 Sea Cliff Precipitation Data (partial)

CSHH 2014 PRECIPITATION DATA FOR SEA CLIFF					
MO/DAY	**AMT(MM)***	**MO/DAY**	**AMT(MM)**	**MO/DAY**	**AMT(MM)**
JAN		***Feb, cont.***		***April, cont.***	
2	2****	20	1	22	0.5
3	25****	21	2	26	17
5	2.5	24	?	30	128.5
6	12	26	2****	**Total**	**220**
10	8				
11	13	**MARCH**		**MAY**	
14	14.5	3	trace	1	26.5
15	1	13	9	3	0.5
18	4***	19	25.5	8	11
21-22	20	20	2	9	1.5
25	2****	23	34.5	10	12.5
26	trace	28	1	11	3
29	2****	29	32	15	2.5
Total	**110.5**	31	8***	16	27
		Total	112	19	1
FEB				22	4.5
3	20****	**APRIL**		23	4
5	13***	2	0.5	24	2
10	5****	4	3.5	27	trace
13	30****	5	4.5	28	trace
14	8****	7	28	30	1.5
15	6****	8	13.5	**Total**	**97.5**
18	5****	15	24		
19	6.5	16	4		

*Precipitation is recorded from midnight to midnight; snow recorded in inches, converted to approximate liquid equivalent (see below).

"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.)

**Administrative (preemptive) beach-closure dates (11): 5/25, 6/3, 6/7-8, 6/11, 6/14, 6/28, 7/1-2, 7/23, 8/14.

***Snow/sleet/rain mix and wet snow converted to approximate liquid equivalent in mm (5 in of wet snow approx. equal to 1 in liquid precip.).

****Snow converted to approximate liquid equivalent in mm (10 in of snow equal to approx. 1 in liquid precip.).

1997-2013 Monthly Precipitation

Total Precipitation Per Month

	June	July	August	September	October
2013	235 mm	69 mm	59 mm	75.5 mm	8.5 mm
2012	175.5	140.5	140.5	117.5	92.5
2011	127.5	48.5	381.5	163	122
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)

Appendix C

2008-2013 Nitrogen Data
2013 Nitrogen Graphs
(Nitrate, Nitrite, Ammonia)

2008-2013 Nitrogen Data

CSHH Water-Monitoring Program

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm)
5/10/2013	CSHH #1	N/A	N/A	0.0
	CSHH#2	0.04	0.008	0.0
	CSHH#3	0.04	0.007	
	CSHH#8	0.03	0.010	N/A
	CSHH#13	0.03	0.017	
5/15/2013	CSHH#1	0.04	0.011	0.0
	CSHH#2	0.04	0.005	
	CSHH#3	0.04	0.007	
	CSHH#8	0.03	0.011	0.0
	CSHH#13	0.03	0.014	
5/31/2013	CSHH#1	0.04	0.008	0.0
	CSHH#2	0.02	0.008	
	CSHH#3	0.03	0.008	
	CSHH#8	0.13	0.008	0.0
	CSHH#13	0.05	0.009	
6/5/2013	CSHH#1	0.03	0.007	0.0
	CSHH#2	0.03	0.005	
	CSHH#3	0.03	0.004	
	CSHH#4	0.04	0.008	
	CSHH#5	0.04	0.007	
	CSHH#6	0.05	0.008	
	CSHH#7	0.04	0.011	
	CSHH#8	0.13	0.009	0.0
	CSHH#14	0.04	0.024	
6/12/2013	CSHH#1	0.04	0.005	0.0
	CSHH#2	0.02	0.003	
	CSHH#3	0.02	0.005	
	CSHH#8	>0.55	0.020	0.0
	CSHH#13	>0.55	0.032	
	CSHH#14	>0.55	0.021	
6/19/2013	CSHH#1	0.01	0.006	0.0
	CSHH#2	0.02	0.003	
	CSHH#3	0.03	0.005	
	CSHH#4	0.02	0.004	
	CSHH#5	0.02	0.005	
	CSHH#6	0.03	0.006	
	CSHH#7	0.27	0.017	
	CSHH#8	0.25	0.005	0.0

2008-2013 Nitrogen Data

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm)
	CSHH#13	0.02	0.008	
	CSHH#14	0.01	0.002	
6/26/2013	CSHH#1	0.02	0.003	0.0
	CSHH#2	0.03	0.002	
	CSHH#3	0.01	0.003	
	CSHH#8	0.03	0.026	N/A
	CSHH#13	0.01	0.010	0.0
7/3/2013	CSHH#1	0.04	0.005	0.15
	CSHH#2	0.02	0.007	N/A
	CSHH#3	0.02	0.007	N/A
	CSHH#4	0.03	0.009	N/A
	CSHH#5	0.06	0.009	N/A
	CSHH#6	0.06	0.002	N/A
	CSHH#7	0.04	0.008	0.15
	CSHH#8	0.38	0.008	0.25
	CSHH#13	0.21	0.019	N/A
	CSHH#14	0.05	0.007	N/A
	CSHH#15	0.02	0.009	0.15
7/17/2013	CSHH#1	0.02	0.002	0.0
	CSHH#2	0.01	0.003	
	CSHH#3	0.02	0.003	
	CSHH#8	0.15	0.006	0.0
	CSHH#13	0.12	0.011	
7/24/2013	CSHH#1	0.03	0.007	0.0
	CSHH#2	0.01	0.005	
	CSHH#3	0.02	0.006	
	CSHH#8	0.23	0.019	0.0
	CSHH#13	0.39	0.026	
7/31/2013	CSHH#1	0.03	0.005	0.0
	CSHH#2	0.03	0.005	
	CSHH#3	0.04	0.005	
	CSHH#4	0.03	0.005	
	CSHH#5	0.03	0.008	
	CSHH#6	0.03	0.009	
	CSHH#7	0.05	0.012	
	CSHH#8	0.35	0.022	0.0
	CSHH#13	0.20	0.019	
	CSHH#14	0.07	0.010	
8/8/2013	CSHH#1	0.06	0.026	0.50
	CSHH#2	N/A	N/A	0.25
	CSHH#3	0.03	0.022	0.25

2008-2013 Nitrogen Data

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm)
	CSHH#4	0.03	0.015	0.25
	CSHH#5	0.02	0.024	0.25
	CSHH#6	0.03	0.019	N/A
	CSHH#7	0.03	0.021	0.50
	CSHH#8	0.32	0.013	0.50
	CSHH#13	>0.55	0.024	0.25
	CSHH#14	0.03	0.019	N/A
	CSHH#15	0.04	0.021	N/A
8/14/2013	CSHH#1	0.03	0.009	2.5
	CSHH#3	0.02	0.008	N/A
	CSHH#8	0.30	0.016	0.15
	CSHH#13	0.47	0.016	N/A
8/21/2013	CSHH#1	0.04	0.006	0.10
	CSHH#2	N/A	N/A	N/A
	CSHH#3	0.03	0.005	0.25
	CSHH#8	0.03	0.009	0.25
	CSHH#13	0.08	0.010	0.25
8/28/2013	CSHH#1	0.03	0.007	<0.05
	CSHH#2	0.02	0.005	0.0
	CSHH#3	0.01	0.005	N/A
	CSHH#8	0.02	0.006	0.0
	CSHH#13	0.16	0.007	N/A
9/4/2013	CSHH#1	0.04	0.011	0.0
	CSHH#2	0.03	0.007	0.25
	CSHH#3	0.03	0.008	0.0
	CSHH#8	0.36	0.010	N/A
	CSHH#13	1.06	0.011	N/A
9/18/2013	CSHH#1	0.13	0.030	0.25
	CSHH#2	0.11	0.020	N/A
	CSHH#3	0.08	0.028	0.25
	CSHH#4	0.03	0.027	N/A
	CSHH#5	0.11	0.027	N/A
	CSHH#6	0.03	0.025	0.25
	CSHH#7	0.12	0.031	N/A
	CSHH#8	0.23	0.029	0.25
	CSHH#13	0.17	0.027	0.25
	CSHH#14	0.08	0.026	0.25
	CSHH#15	0.02	0.026	N/A
9/25/2013	CSHH#1	0.08	0.020	0.0
	CSHH#2	0.04	0.007	
	CSHH#3	0.06	0.011	

2008-2013 Nitrogen Data

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm)
	CSHH#8	0.10	0.010	0.0
	CSHH#13	0.04	0.012	
10/1/2013	CSHH#1	0.11	0.013	0.0
	CSHH#2	0.04	0.009	
	CSHH#3	0.02	0.003	
	CSHH#4	0.05	0.014	
	CSHH#5	0.09	0.016	
	CSHH#6	0.06	0.013	
	CSHH#7	0.09	0.013	
	CSHH#8	0.32	0.007	0.0
	CSHH#13	0.46	0.016	
	CSHH#14	0.22	0.017	
	CSHH#15	0.04	0.009	
10/8/2013	CSHH#1	0.10	0.021	0.25
	CSHH#2	0.06	0.013	N/A
	CSHH#3	0.08	0.018	0.25
	CSHH#8	0.21	0.017	0.0
	CSHH#13	0.23	0.016	0.25
10/15/2013	CSHH#1	0.16	0.024	0.0
	CSHH#2	0.15	0.020	
	CSHH#3	0.10	0.021	
	CSHH#4	0.11	0.027	
	CSHH#5	0.14	0.023	
	CSHH#6	0.17	0.025	
	CSHH#7	0.28	0.027	0.0
	CSHH#8	0.28	0.023	0.0
	CSHH#13	0.48	0.018	
	CSHH#14	0.09	0.024	
	CSHH#15	0.07	0.023	
10/22/2013	CSHH#1	0.16	0.035	0.0
	CSHH#2	0.15	0.040	N/A
	CSHH#3	0.10	0.035	N/A
	CSHH#8	0.11	0.033	0.25
	CSHH#13	0.14	0.019	N/A
10/29/2013	CSHH#1	0.15	0.034	0.0
	CSHH#2	0.14	0.038	
	CSHH#3	0.13	0.040	
	CSHH#4	0.16	0.035	
	CSHH#5	0.10	0.035	
	CSHH#6	0.12	0.031	
	CSHH#7	0.11	0.032	

2008-2013 Nitrogen Data

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm)
	CSHH#8	0.13	0.032	0.0
	CSHH#13	0.11	0.033	
	CSHH#14	0.13	0.037	
	CSHH#15	0.13	0.037	
11/6/2013	CSHH#1	0.18	0.033	0.0
	CSHH#2	0.11	0.036	
	CSHH#3	0.18	0.035	
	CSHH#8	0.40	0.030	0.0
	CSHH#13	0.72	0.022	
11/13/2013	CSHH#1	0.21	0.032	N/A
	CSHH#4	0.18	0.029	
	CSHH#5	0.43	0.026	
	CSHH#6	0.24	0.029	
	CSHH#7	0.49	0.034	
	CSHH#8	0.29	0.025	0.0
	CSHH#13	0.26	0.021	

2008-2013 Nitrogen Data

CSHH Water-Monitoring Program

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm)
5/30/2012	CSHH#1	N/A	N/A	0.05
	CSHH#2	N/A	N/A	1.00
	CSHH#3	N/A	N/A	0.05
	CSHH#8	N/A	N/A	0.00
	CSHH#13	N/A	N/A	0.00
6/6/2012	CSHH#1	N/A	N/A	0.25
	CSHH#2	N/A	N/A	0.10
	CSHH#3	N/A	N/A	0.25
	CSHH#8	N/A	N/A	0.25
	CSHH#13	N/A	N/A	0.25
6/13/2012	CSHH#1	0.02	0.008	0.00
	CSHH#2	0.01	0.005	N/A
	CSHH#3	0.02	0.007	N/A
	CSHH#4	0.02	0.008	N/A
	CSHH#5	0.04	0.010	N/A
	CSHH#6	0.04	0.015	N/A
	CSHH#7	0.06	0.024	0.00
	CSHH#8	0.03	0.011	0.00
	CSHH#13	0.05	0.023	N/A
	CSHH#14	0.02	0.014	N/A
6/20/2012	CSHH#1	0.05	0.006	0.00
	CSHH#2	0.06	0.003	0.00
	CSHH#3	0.05	0.003	N/A
	CSHH#8	0.06	0.005	0.00
	CSHH#13	0.07	0.013	N/A
6/27/2012	CSHH#1	0.04	0.008	0.00
	CSHH#2	0.03	0.008	N/A
	CSHH#3	0.02	0.007	N/A
	CSHH#8	0.2	0.011	0.00
	CSHH#13	0.37	0.020	N/A
7/3/2012	CSHH#1	0.02	0.007	0.00
	CSHH#2	0.02	0.005	0.00
	CSHH#3	0.02	0.006	0.00
	CSHH#4	0.03	0.005	N/A
	CSHH#5	0.04	0.006	N/A
	CSHH#6	0.03	0.008	N/A
	CSHH#7	0.05	0.007	0.00

2008-2013 Nitrogen Data

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm)
	CSHH#8	0.1	0.007	0.00
	CSHH#13	0.27	0.013	N/A
	CSHH#14	0.03	0.006	N/A
	CSHH#15	0.02	0.003	N/A
7/11/2012	CSHH#1	0.02	0.008	0.25
	CSHH#2	0.02	0.008	0.25
	CSHH#3	0.02	0.008	0.25
	CSHH#8	0.02	0.009	0.25
	CSHH#13	0.02	0.012	0.00
7/18/2012	CSHH#1	0.02	0.006	0.25
	CSHH#2	0.02	0.005	0.25
	CSHH#3	0.03	0.004	0.00
	CSHH#4	0.02	0.006	0.00
	CSHH#5	0.06	0.007	0.00
	CSHH#6	0.02	0.005	N/A
	CSHH#7	0.11	0.014	0.25
	CSHH#8	0.4	0.009	0.25
	CSHH#13	0.27	0.010	0.00
	CSHH#14	0.03	0.008	0.25
	CSHH#15	0.02	0.005	0.25
7/25/2012	CSHH#1	0.04	0.007	0.25
	CSHH#2	0.03	0.007	0.25
	CSHH#3	0.02	0.005	0.25
	CSHH#8	0.08	0.011	0.25
	CSHH#13	0.26	0.009	0.25
8/1/2012	CSHH#1	0.04	0.010	0.25
	CSHH#2	0	0.004	0.25
	CSHH#3	0.01	0.009	0.25
	CSHH#4	0.02	0.007	N/A
	CSHH#5	0.03	0.008	N/A
	CSHH#6	0.06	0.021	N/A
	CSHH#7	0.19	0.019	N/A
	CSHH#8	0.05	0.010	0.25
	CSHH#13	0.2	0.014	0.25
	CSHH#14	0.03	0.011	N/A
	CSHH#15	0.02	0.008	0.25
8/8/2012	CSHH#1	0.03	0.012	0.50
	CSHH#2	0.02	0.004	0.25
	CSHH#3	0.03	0.004	0.25
	CSHH#8	0.16	0.012	0.50
	CSHH#13	0.12	0.011	0.15

2008-2013 Nitrogen Data

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm)
8/16/2012	CSHH#1	0.08	0.015	0.50
	CSHH#2	0.03	0.010	N/A
	CSHH#3	0.07	0.010	0.25
	CSHH#4	0.07	0.011	0.25
	CSHH#5	0.09	0.016	0.25
	CSHH#6	0.05	0.013	0.25
	CSHH#7	0.06	0.018	0.25
	CSHH#8	0.04	0.014	0.25
	CSHH#13	0.51	0.015	0.25
	CSHH#14	0.07	0.017	0.25
	CSHH#15	N/A	N/A	0.25
8/22/2012	CSHH#1	0.03	0.026	0.25
	CSHH#2	0.03	0.024	0.25
	CSHH#3	0.04	0.021	0.25
	CSHH#8	0.04	0.024	0.50
	CSHH#13	0.04	0.019	0.25
8/29/2012	CSHH#1	0.04	0.016	0.50
	CSHH#2	0.07	0.030	0.25
	CSHH#3	0.08	0.023	N/A
	CSHH#4	0.06	0.018	0.50
	CSHH#5	0.14	0.021	0.25
	CSHH#6	0.07	0.024	N/A
	CSHH#7	0.07	0.032	0.00
	CSHH#8	0.14	0.023	0.25
	CSHH#13	0.1	0.015	0.25
	CSHH#14	0.06	0.018	0.25
	CSHH#15	0.04	0.018	0.25
9/7/2012	CSHH#1	0.1	0.025	0.50
	CSHH#2	0.07	0.030	0.25
	CSHH#3	0.08	0.022	0.50
	CSHH#8	0.2	0.021	0.50
	CSHH#13	0.36	0.029	N/A
9/12/2012	CSHH#1	0.09	0.040	0.25
	CSHH#2	0.11	0.040	0.25
	CSHH#3	0.07	0.034	0.50
	CSHH#4	0.11	0.045	0.25
	CSHH#5	0.13	0.036	0.25
	CSHH#6	0.13	0.037	N/A
	CSHH#7	0.23	0.107	0.25
	CSHH#8	N/A	N/A	0.25
	CSHH#13	0.37	0.028	N/A

2008-2013 Nitrogen Data

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm)
	CSHH#14	0.14	0.048	0.25
	CSHH#15	0.09	0.033	0.25
9/20/2012	CSHH#1	0.03	0.052	0.50
	CSHH#2	0.03	0.055	0.50
	CSHH#3	0.02	0.055	0.50
	CSHH#8	0.02	0.050	0.50
	CSHH#13	0.02	0.046	N/A
10/5/2012	CSHH#1	0.12	0.054	1.00
	CSHH#2	0.1	0.051	N/A
	CSHH#3	0.14	0.046	N/A
	CSHH#8	0.47	0.051	N/A
	CSHH#13	0.02	0.020	0.50
10/12/2012	CSHH#1	0.15	0.075	0.00
	CSHH#2	0.13	0.078	0.00
	CSHH#3	0.18	0.075	0.00
	CSHH#8	0.48	0.064	N/A
	CSHH#13	0.55	0.026	N/A
10/18/2012	CSHH#1	0.22	0.086	0.00
	CSHH#2	0.19	0.107	0.25
	CSHH#3	0.27	0.090	0.00
	CSHH#8	0.55	0.065	0.00
	CSHH#13	0.28	0.060	0.25
10/25/2012	CSHH#1	0.17	0.088	0.25
	CSHH#2	0.16	0.093	0.25
	CSHH#3	0.22	0.089	0.25
	CSHH#8	0.38	0.076	0.25
	CSHH#13	0.55	0.024	0.00

2008-2013 Nitrogen Data

CSHH Water-Monitoring Program

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm) (Nessler)	Ammonia (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		

2008-2013 Nitrogen Data

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm) (Nessler)	Ammonia (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		

2008-2013 Nitrogen Data

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm) (Nessler)	Ammonia (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		

2008-2013 Nitrogen Data

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm) (Nessler)	Ammonia (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		

2008-2013 Nitrogen Data

Collection Date	Sample No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Ammonia (NH_3)(ppm) (Nessler)	Ammonia (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		

2008-2013 Nitrogen Data

CSHH Water-Monitoring Program

2010 Nitrate & Nitrite Sample Results

Collection Date	Station No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)
5/20/2010	CSHH#1	0.01	0.017
	CSHH#2	0.01	0.024
	CSHH#3	0.09	0.015
	CSHH#8	0.01	0.019
5/26/2010	CSHH#1	0.02	0.030
	CSHH#2	0.02	0.010
	CSHH#3	0.03	0.010
	CSHH#8	0.02	0.015
6/2/2010	CSHH#1	0.03	0.011
	CSHH#2	0.02	0.007
	CSHH#3	0.03	0.008
	CSHH#8	0.05	0.011
	CSHH#13	0.04	0.012
6/9/2010	CSHH#1	0.04	0.008
	CSHH#2	na	na
	CSHH#3	0.03	0.007
	CSHH#8	0.04	0.005
	CSHH#13	0.04	0.007
6/16/2010	CSHH#1	0.02	0.008
	CSHH#2	0.01	0.003
	CSHH#3	0.01	0.007
	CSHH#8	0.06	0.006
	CSHH#13	0.02	0.010
6/23/2010	CSHH#1	0.03	0.008
	CSHH#2	0.02	0.003
	CSHH#3	0.03	0.005
	CSHH#8	0.01	0.012
	CSHH#13	0.55	0.019
6/30/2010	CSHH#1	0.03	0.009
	CSHH#2	0.03	0.013
	CSHH#3	0.03	0.002
	CSHH#8	0.02	0.008
	CSHH#13	0.01	0.012

2010 Ammonia Data

Collection Date	Station No.	Ammonia (NH_3)(ppm) (Nessler)	Ammonia (NH_3)(ppm) (Salicylate)
5/20/2010	CSHH#1	0	0
	CSHH#2		0.2
	CSHH#3		0
	CSHH#8		0
5/26/2010	CSHH#1		0
	CSHH#2		0
	CSHH#3		0
	CSHH#8		0
6/2/2010	CSHH#1		0
	CSHH#2	0	
	CSHH#3		0
	CSHH#8		0
	CSHH#13		0
6/9/2010	CSHH#1		0
	CSHH#3	0	
	CSHH#8		0
	CSHH#4	0	
	CSHH#5	0	
	CSHH#7	0	0
	electronic equipment trouble		
6/16/2010	CSHH#1		0
	CSHH#2		0
	CSHH#3	0	
	CSHH#8		0
	CSHH#13	na	
6/23/2010	CSHH#1		1.0
	CSHH#2		0
	CSHH#3	0	
	CSHH#8		0
	CSHH#13		0
6/30/2010	CSHH#1		0
	CSHH#2	0	
	CSHH#3	0	
	CSHH#8		0
	CSHH#13	na	na

2008-2013 Nitrogen Data

Collection Date	Station No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Collection Date	Station No.	Ammonia (NH_3)(ppm) (Nessler)	Ammonia (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

2008-2013 Nitrogen Data

Collection Date	Station No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Collection Date	Station No.	Ammonia (NH_3)(ppm) (Nessler)	Ammonia (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	

2008-2013 Nitrogen Data

Collection Date	Station No.	Nitrate (NO_3)(ppm)	Nitrite (NO_2)(ppm)	Collection Date	Station No.	Ammonia (NH_3)(ppm) (Nessler)	Ammonia (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	

2008-2013 Nitrogen Data

CSHH Water-Monitoring Program

2008 Nitrite & Nitrate Results

5/21/2008	Nitrite (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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

2009 Nitrogen Sample Results

5/13/2009	Nitrite (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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

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7/2/2008	Nitrite (NO_2)(ppm)	Nitrate (NO_3)(ppm)
CSHH#1	0.008	0.05
CSHH#2	0.010	0.05
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
CSHH#1	0.011	0.05
CSHH#2	0.011	0.03

6/24/2009	Nitrite (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
CSHH#1	0.009	0.03	N:0
CSHH#2	0.005	0.03	N:0
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
CSHH#1	0.008	0.03	S:0

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CSHH#3	0.011	0.04
CSHH#4	na	na
CSHH#5	na	na
CSHH#6	na	na
CSHH#7	na	na
CSHH#8	0.007	0.03
CSHH#13	0.017	0.02
8/13/2008	Nitrite (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
CSHH#1	0.011	0.05

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
8/12/2009	Nitrite (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
CSHH#1	0.032	0.02	S:0
CSHH#2	NA	NA	High winds--no samples

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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
CSHH#13	0.013	0.02

9/10/2008	Nitrite (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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

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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
CSHH#1	0.064	0.02	S:0
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)	Ammonia (NH_3)(ppm)
CSHH#1	0.045	0.02	S:0
CSHH#2	0.036	0.02	S: 0.05

2008-2013 Nitrogen Data

10/2/2008	Nitrite (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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
10/8/2008	Nitrite (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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 (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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

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

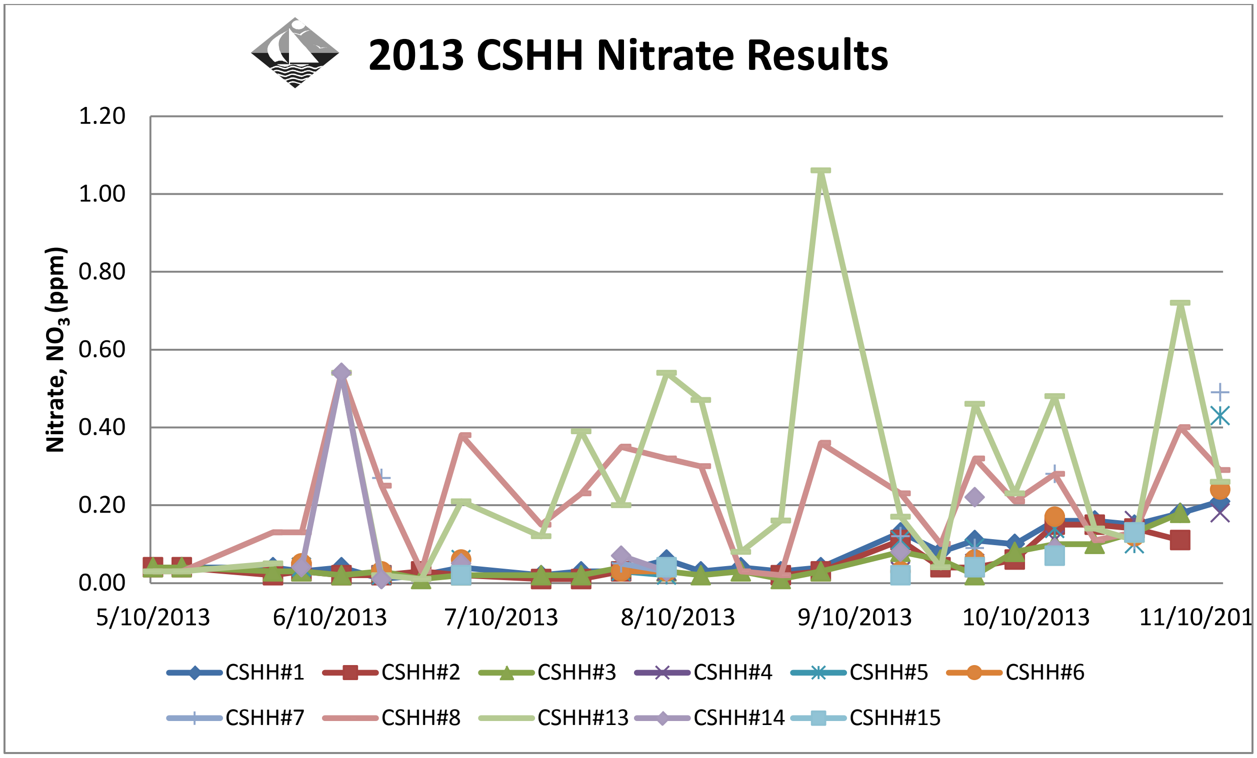
*6/12/09: Called STP plant manager re: NH_3 levels at outfall and was told that the plant was running a 24-hour composite sampling and were within limits.
**7/1/09: NH_3 also at CSHH #4 (S: 0.10) and CSHH #5 (S: 0.25). Large numbers of geese, cormorants, swans, and other birds noted.
***7/15/09: Large opaque flow from CSHH #10--discolored area into marina (w); called City DPW and NCDH; source undetermined.

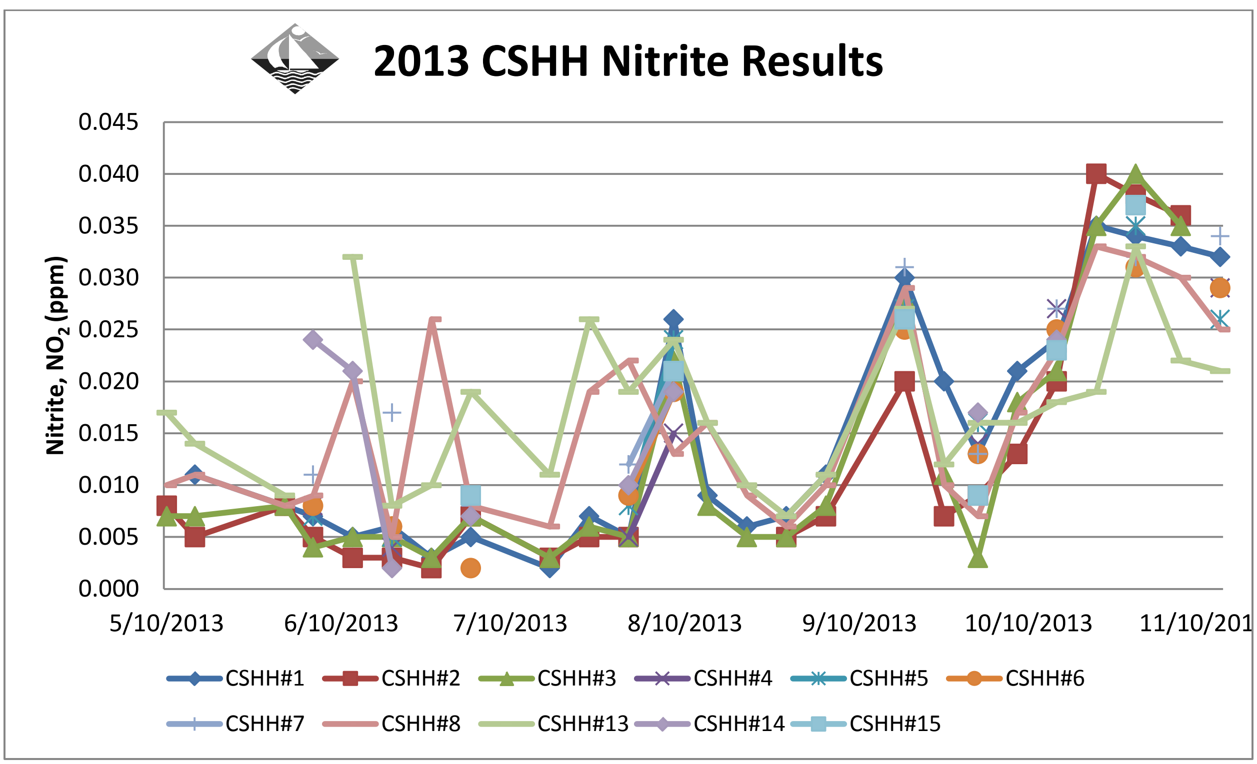
2008-2013 Nitrogen Data

10/31/2008	Nitrite (NO_2)(ppm)	Nitrate (NO_3)(ppm)
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

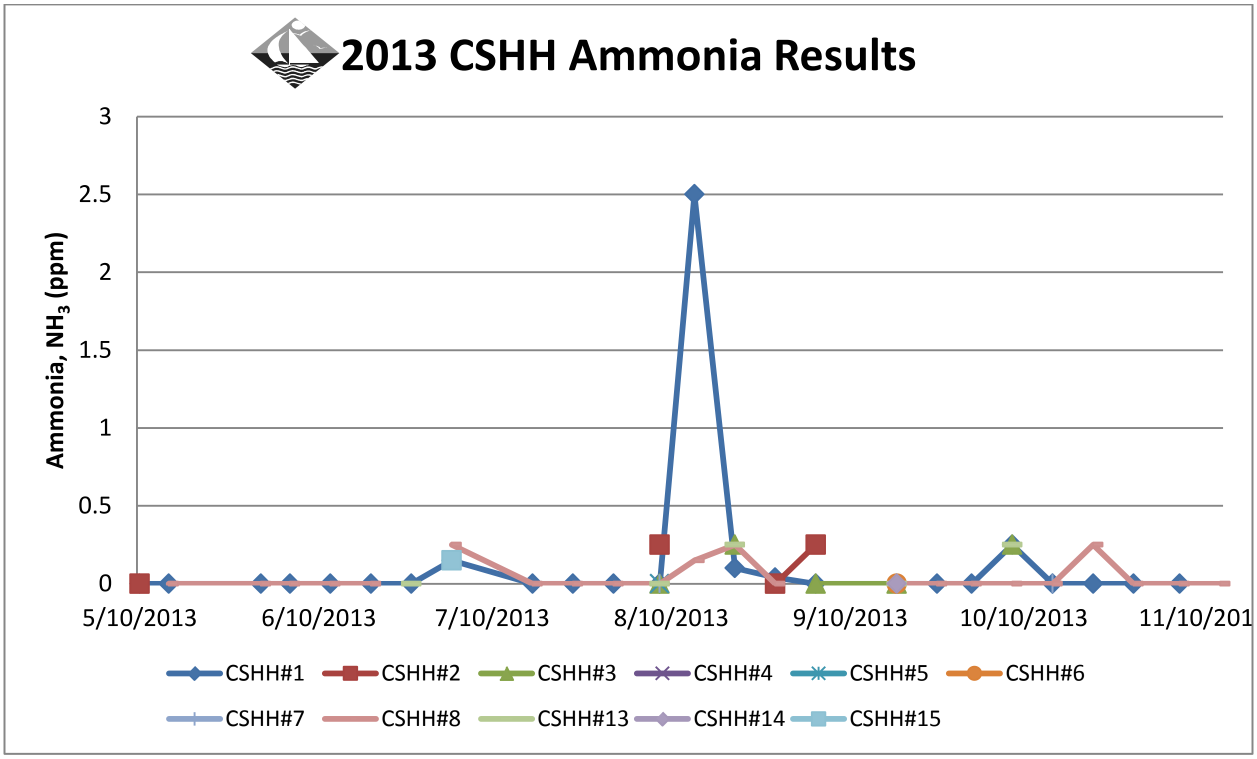
11/5/2008	Nitrite (NO_2)(ppm)	Nitrate (NO_3)(ppm)
CSHH#1	0.036	0.02
CSHH#2	0.039	0.02
CSHH#3	0.033	0.03
CSHH#4	na	na
CSHH#5	na	na
CSHH#6	na	na
CSHH#7	na	na
CSHH#8	0.025	0.02
CSHH#13	0.026	0.02

2013 Nitrogen Graphs



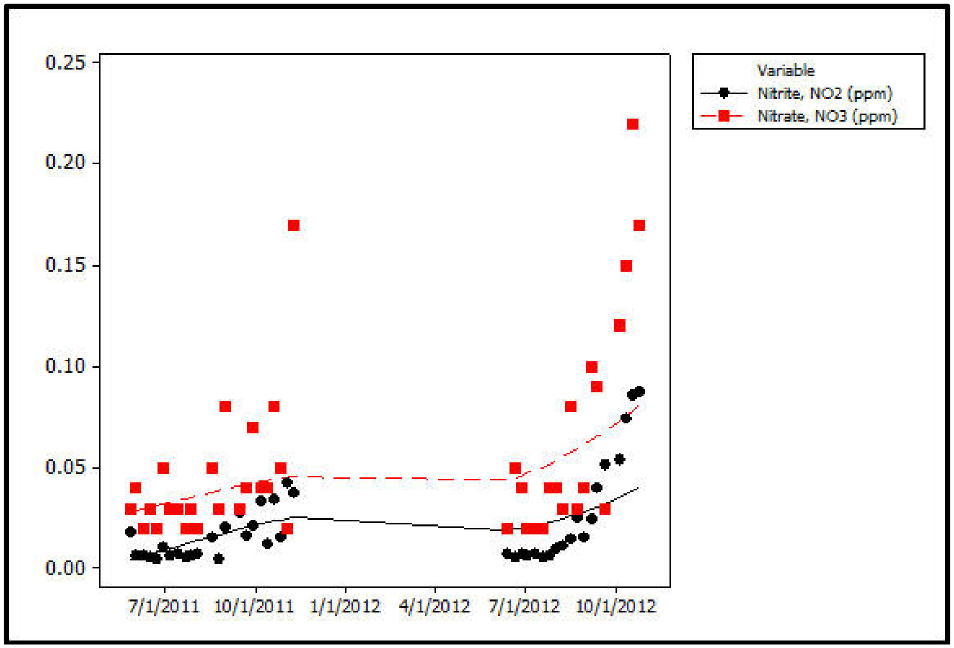


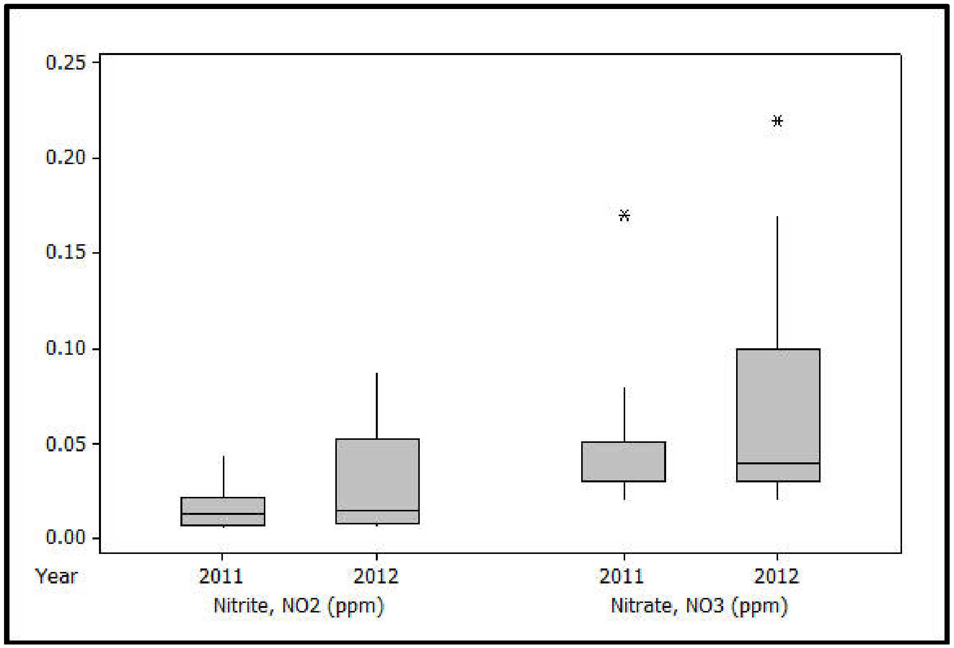
2013 Nitrogen Graphs



2013 Nitrogen Graphs

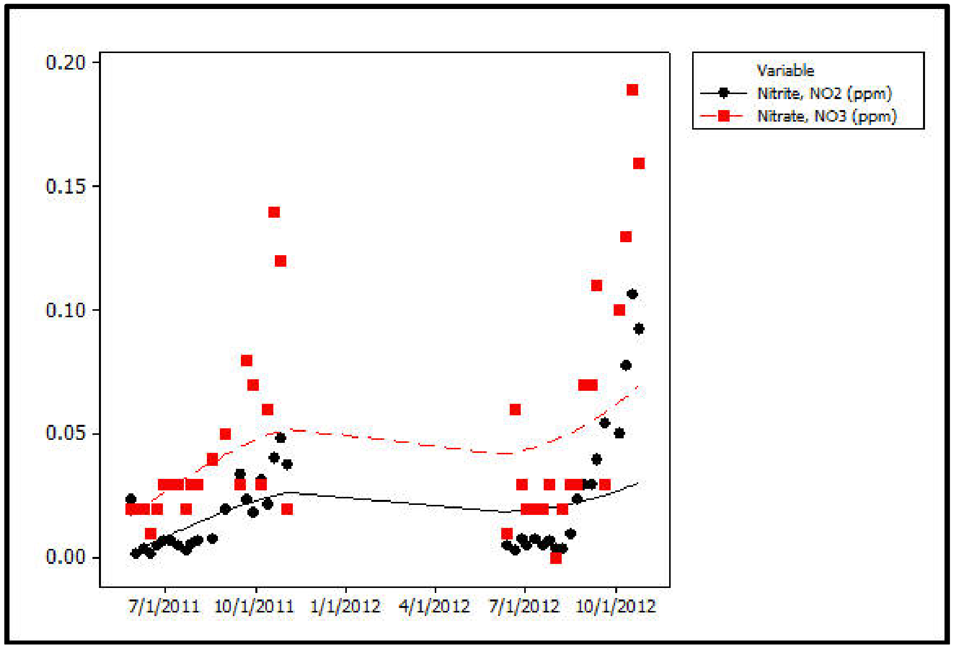
CSHH #1 –Beacon 11

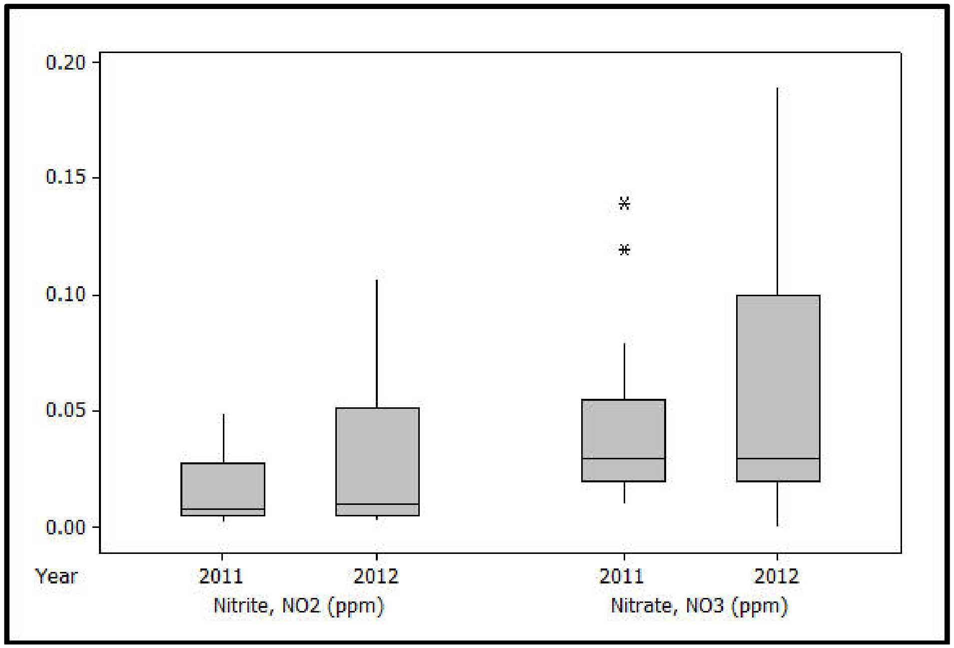




2013 Nitrogen Graphs

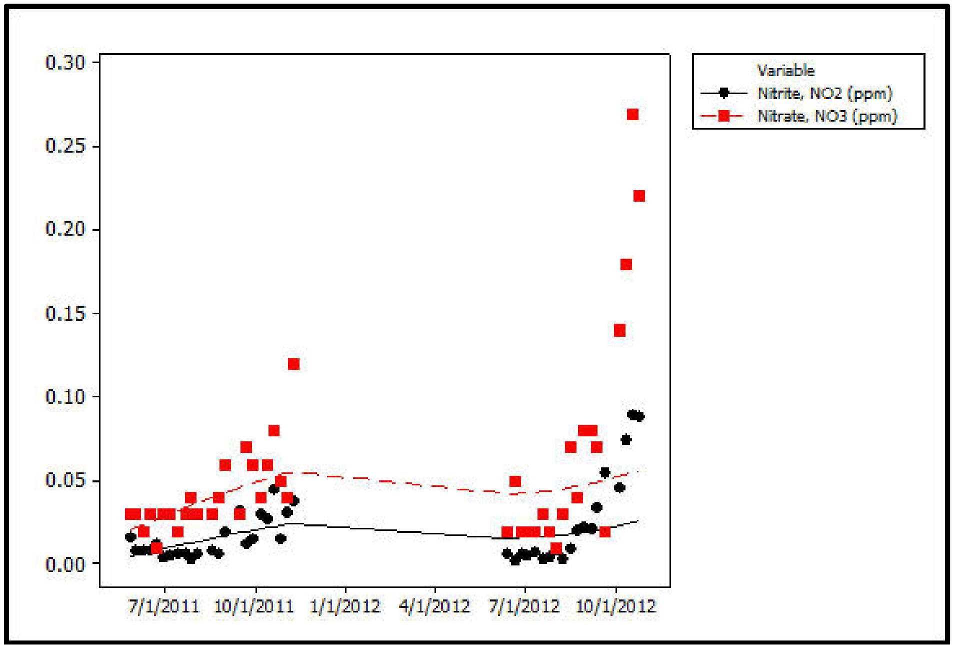
CSHH #2 –Bell Marker 6

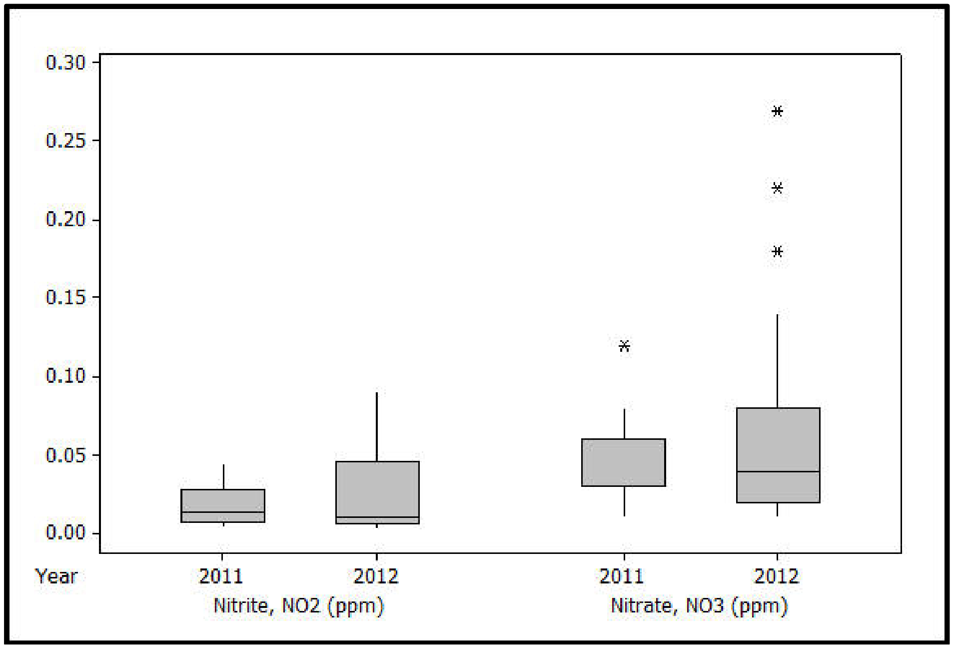




2013 Nitrogen Graphs

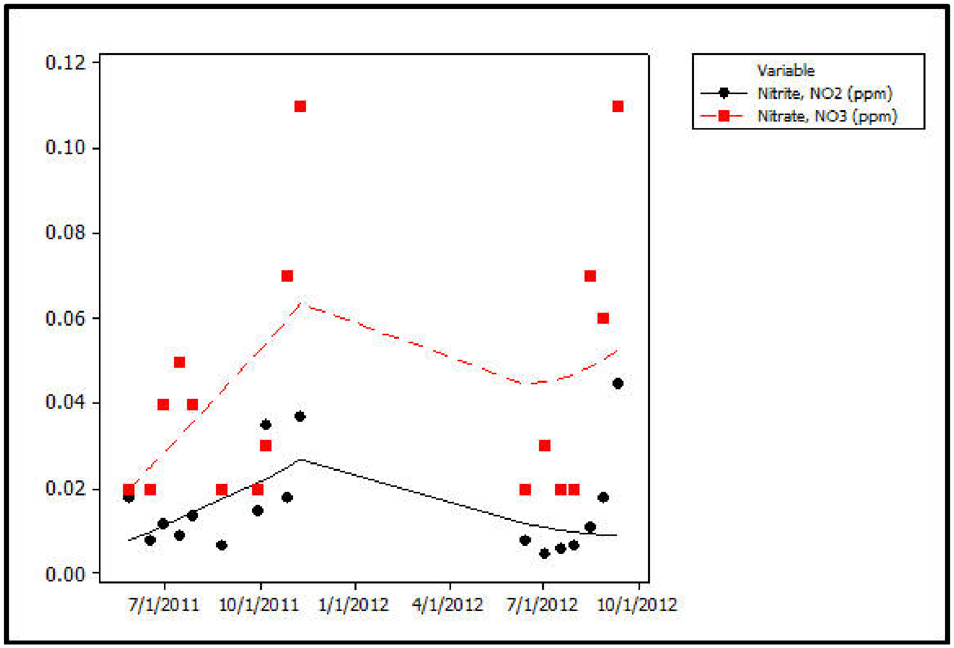
CSHH #3 – Glen Cove Creek, Red Marker

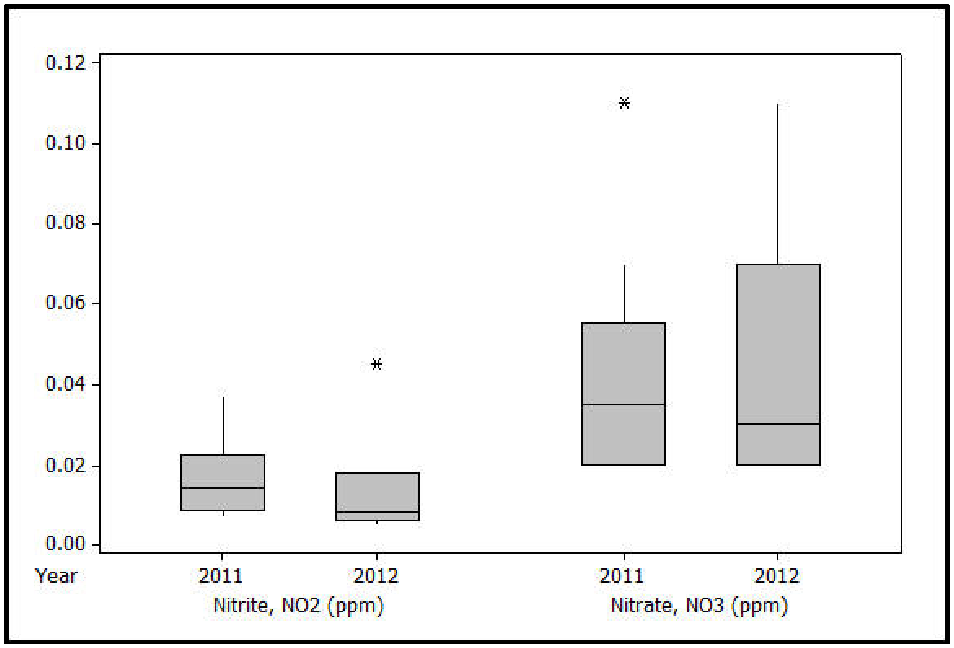




2013 Nitrogen Graphs

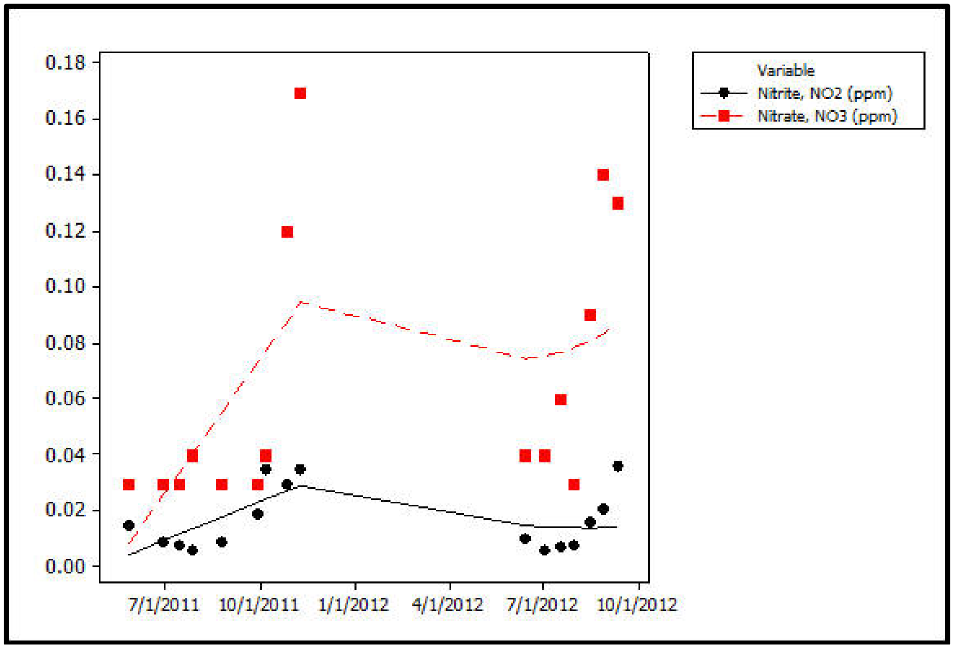
CSHH #4 - East of North Hempstead Beach Park (S)(former Bar Beach) Sand Spit

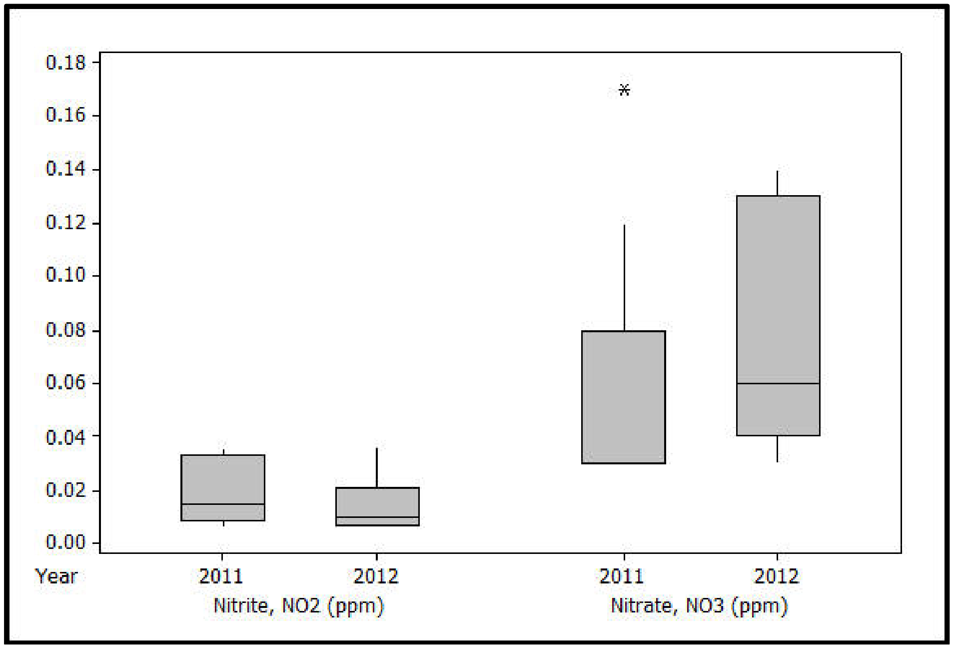




2013 Nitrogen Graphs

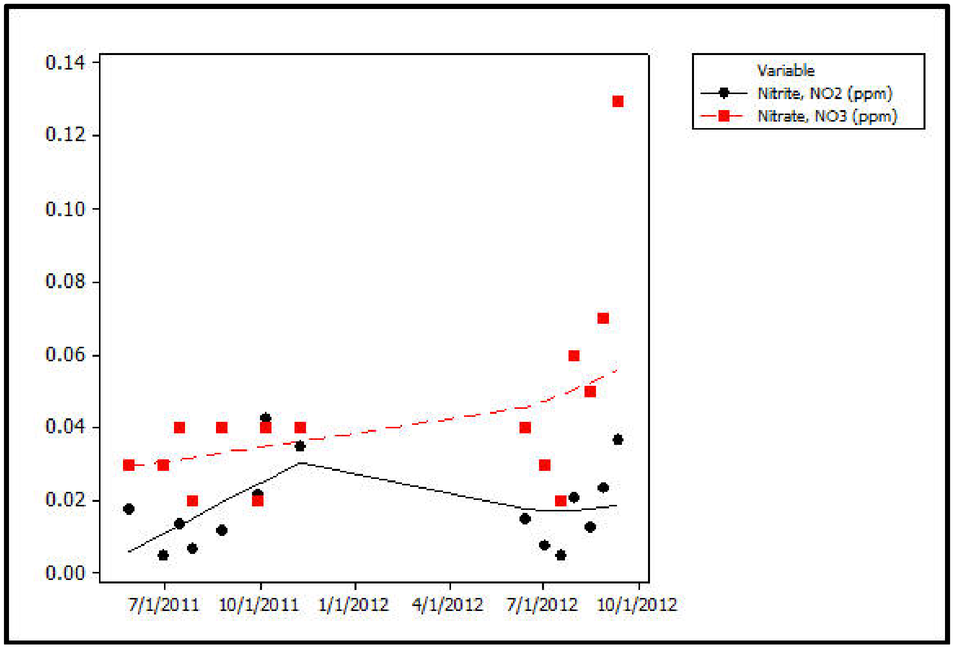
CSHH #5 - Mott's Cove

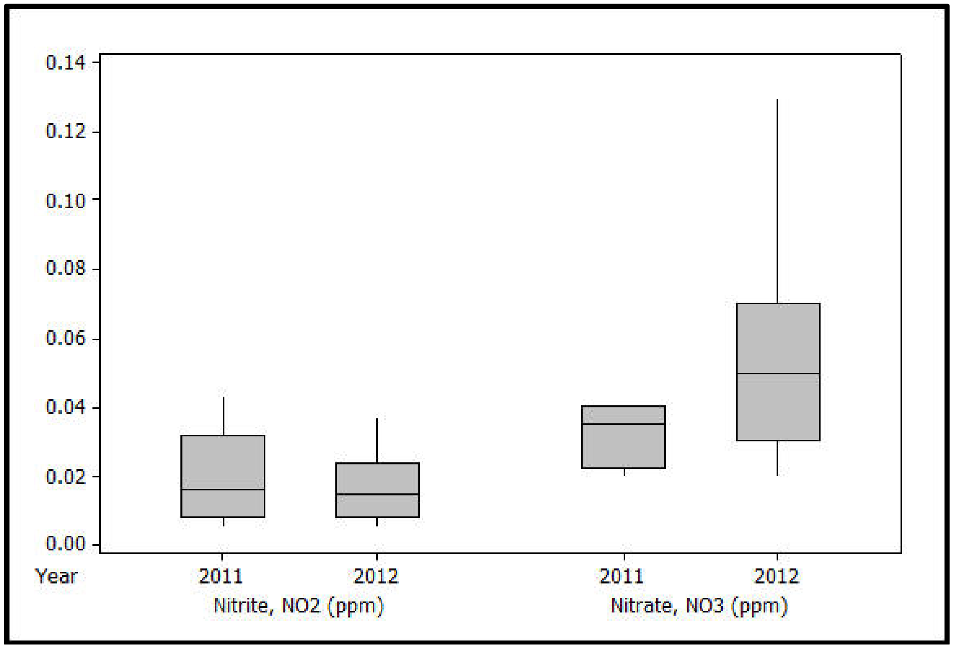




2013 Nitrogen Graphs

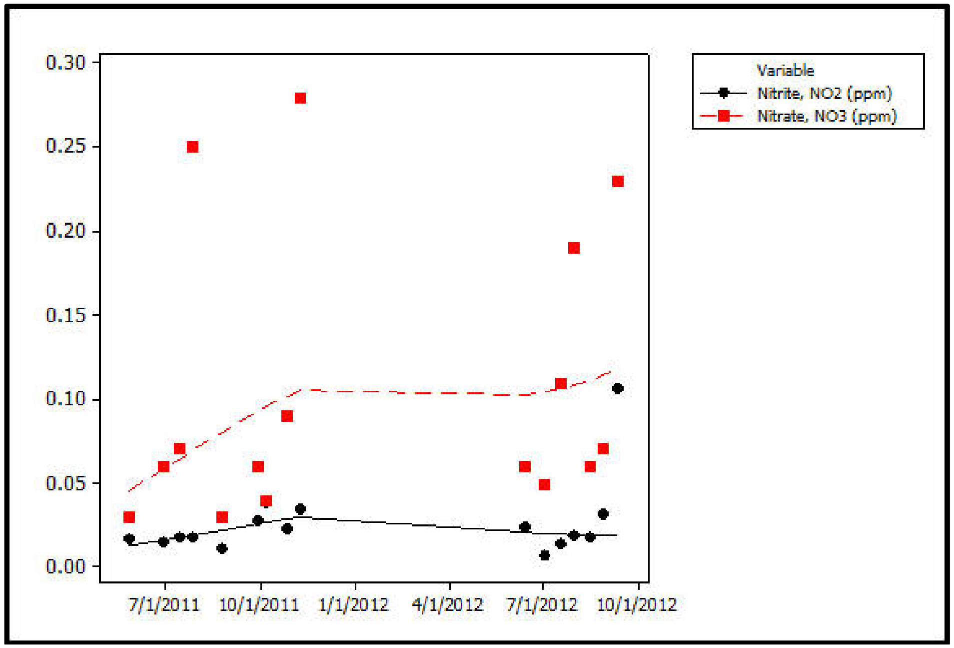
CSHH #6 - East of Former Incinerator Site

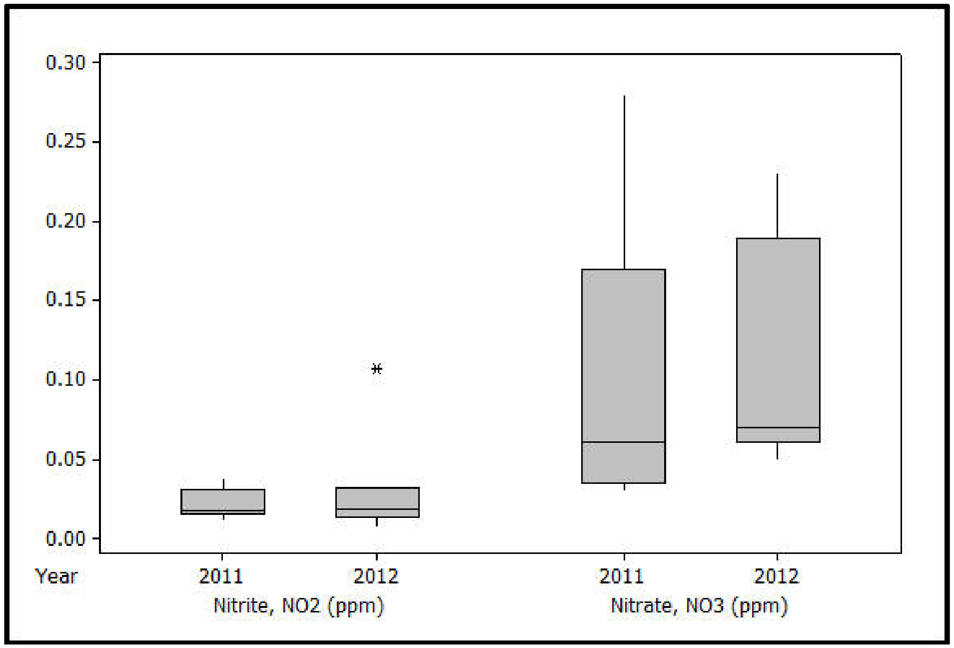




2013 Nitrogen Graphs

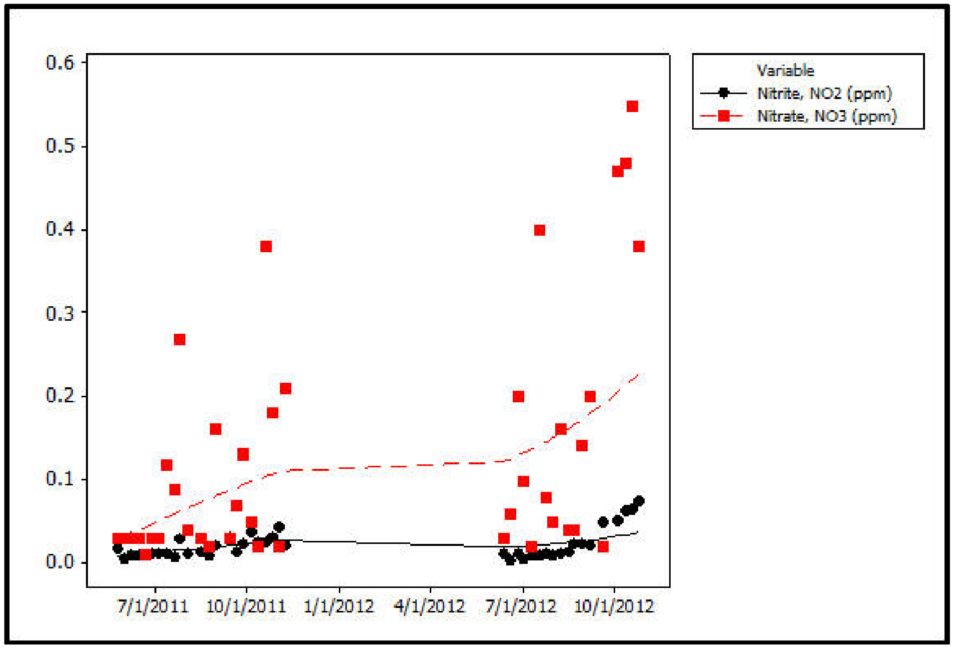
CSHH #7 - West of Bryant Landing (former site of oil dock)

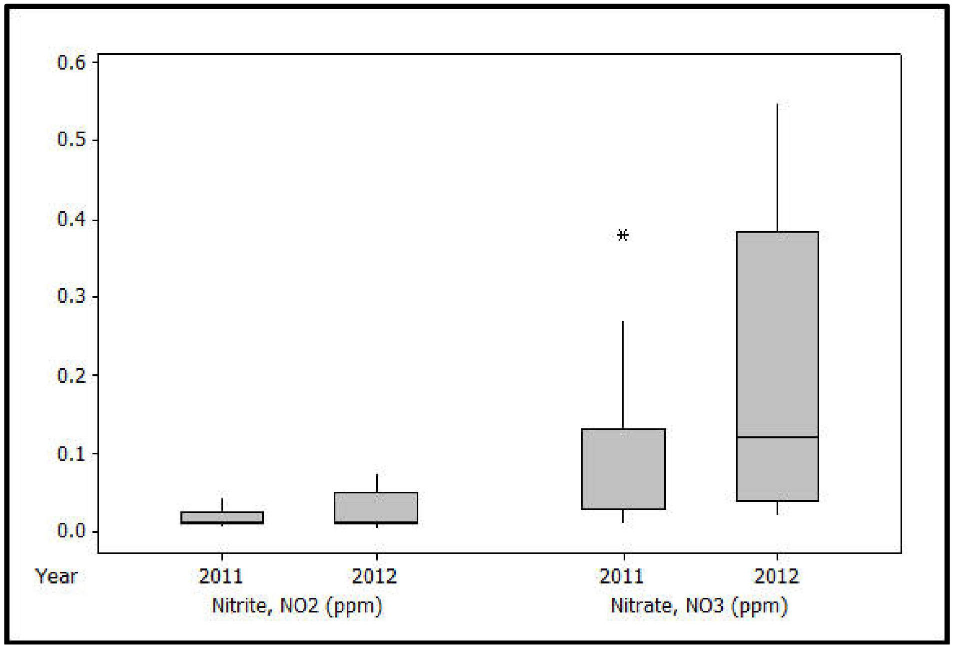




2013 Nitrogen Graphs

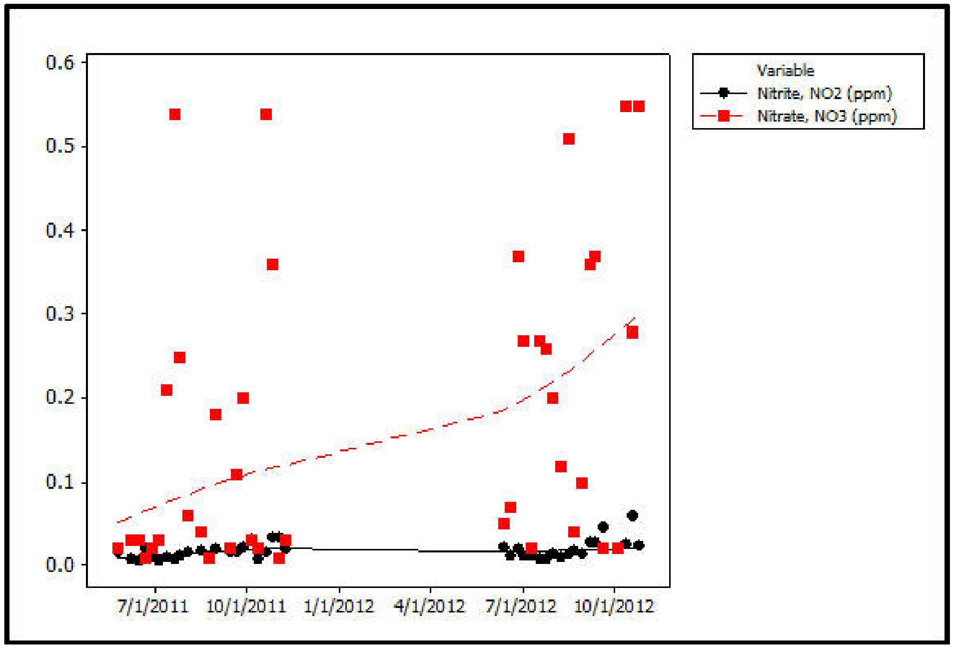
CSHH #8 - Glen Cove Sewage Treatment Plant Outfall

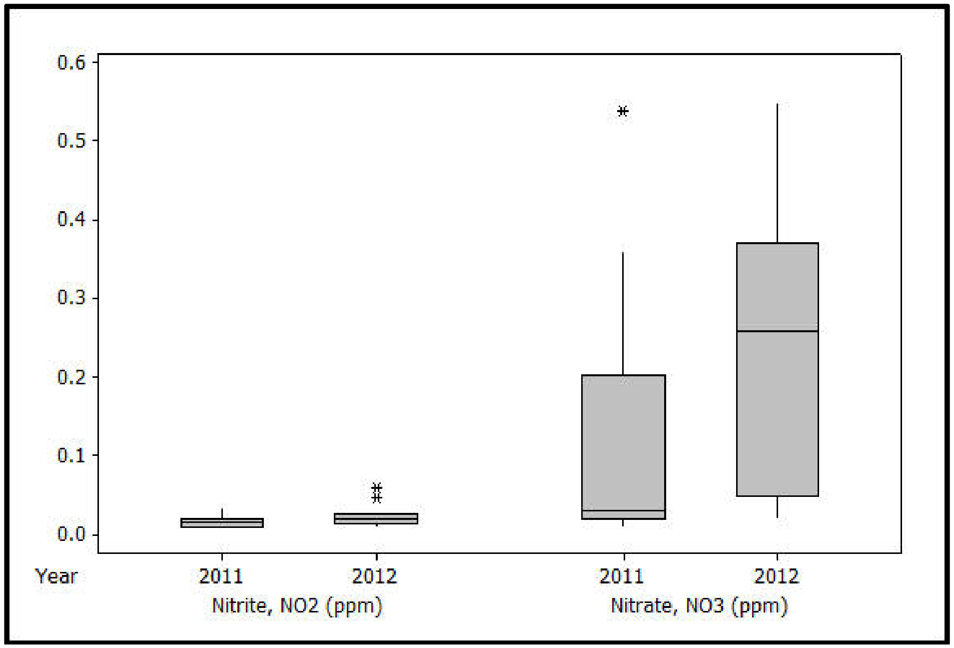




2013 Nitrogen Graphs

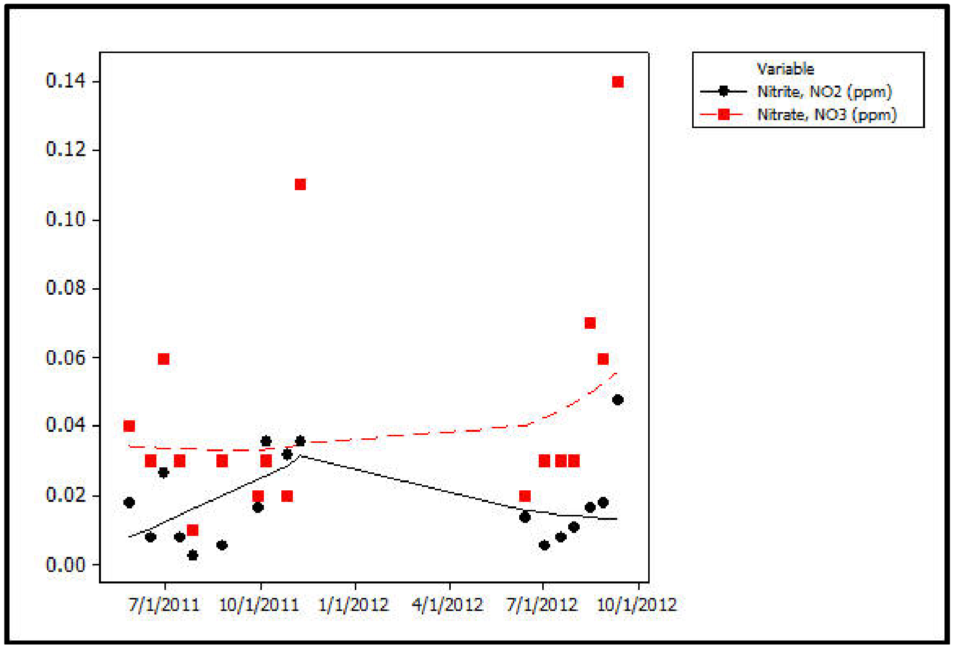
CSHH #13 - 60' West of Mill Pond Weir

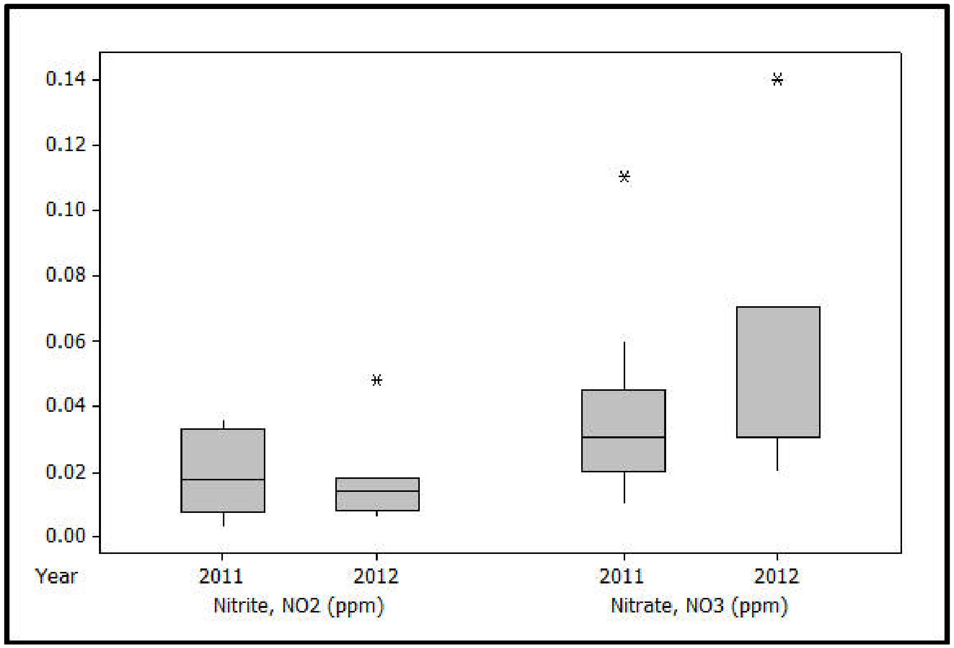




2013 Nitrogen Graphs

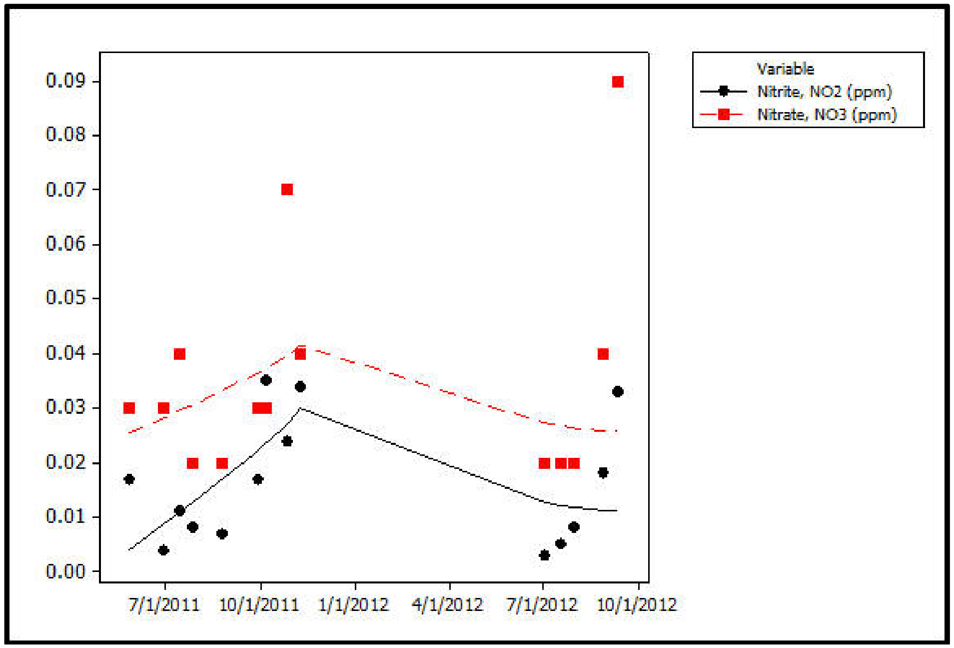
CSHH #14 - NW Corner of Power Plant ≈50 Yards from Cement Outfall

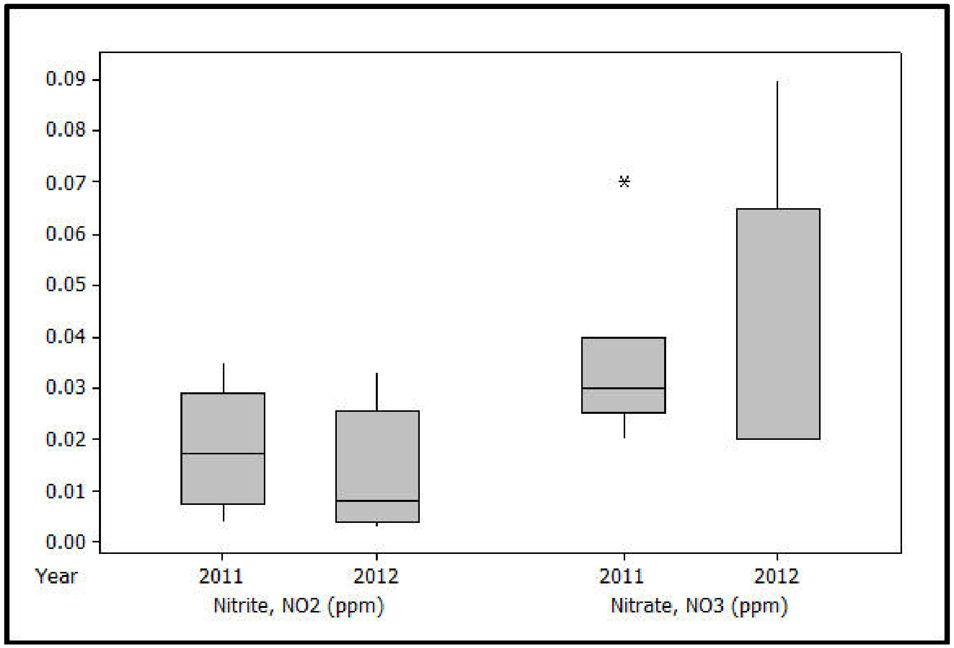




2013 Nitrogen Graphs

CSHH #15 - 50 yds from Scudders Pond Outfall, North of Tappen Pool





Appendix D

Comparison of Averaged Indicator Bacteria Data for Beaches
1995-2013 Water-Quality Data Summary
Seasonal Averages for Selected Water-Quality Parameters

Comparison of Averaged Indicator Bacteria Data for Beaches

2013

	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	2.55	1.30	22.80	8.03	6.80
May	Enterococci	20.03	10.57	38.76	23.90	20.38
June	Enterococci	36.38	6.65	73.12	79.33	20.88
July	Enterococci	63.00	21.75	5.11	10.42	5.00
August	Enterococci	4.13	7.13	16.13	19.01	15.75
Season Averages *	*Enterococci*	*29.85*	*11.00*	*31.78*	*30.61*	*14.03*

*Averages of all of the data points collected during the monitoring season.

2012

	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	2.73	9.48	3.63	9.90	12.17
May	Enterococci	568.26	21.00	11.13	16.78	12.14
June	Enterococci	148.00	72.14	98.01	60.26	76.88
July	Enterococci	81.38	26.01	8.89	8.64	6.40
August	Enterococci	737.67	199.56	53.22	24.67	50.79
Season Averages *	*Enterococci*	*334.27*	*73.59*	*36.22*	*24.42*	*32.64*

*Averages of all of the data points collected during the monitoring season.

Comparison of Averaged Indicator Bacteria Data for Beaches

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 Averages *	*Enterococci*	*122.96*	*52.14*	*64.93*	*77.60*	*27.14*

*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 Averages **	*Enterococci*	*65.22*	*29.61*	*26.22*	*40.19*	*67.48*

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

Comparison of Averaged Indicator Bacteria Data for Beaches

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 Averages **	*Enterococci*	*48.69*	*54.70*	*109.23*	*65.02*	*29.97*

* Only one data point collected in September.
**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 Averages	*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 for Beaches

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 Averages	*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 Averages	*Enterococci*	*40*	*27*	*36*	*83*	*39*
	Fecal	***79***	***151***	***92***	***69***	***82***

Comparison of Averaged Indicator Bacteria Data for Beaches

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 Averages	*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 Averages	*Total*	*268*	*1582*	*701*	*682*	*3574*
	Fecal	***126***	***505***	***359***	***337***	***761***

Comparison of Averaged Indicator Bacteria Data for Beaches

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 Averages	*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 Averages	*Total*	*1226*	*1969*	*3096*	*1463*	*1626*
	Fecal	***605***	***1637***	***1133***	***1008***	***451***

Comparison of Averaged Indicator Bacteria Data for Beaches

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 Averages	***Total***	***1143***	***2848***	***4187***	***4513***	***9080***
	Fecal	***75***	***1325***	***3754***	***3559***	***717***

1995-2013 Water-Quality Data Summary

CSHH #1 - Beacon 11

	2013				
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Turbidity (NTUs) (0.5 m)
May*	14.79	7.71	25.82	21.17	3.43
June	19.49	7.93	25.07	21.10	3.12
July	22.84	4.73	25.33	25.18	1.72
Aug.	22.64	4.10	26.31	22.88	1.95
Sept.	20.75	7.42	26.60	15.90	3.19
Oct.	17.40	6.83	26.81	12.68	1.49
Nov.*	11.92	7.61	26.19	9.50	1.24

	2012					2011				
	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*	18.91	6.39	24.98	23.20	2.32	15.23	6.67	23.57	23.3	2.86
June	20.09	4.92	24.65	21.85	2.26	17.83	5.84	23.82	22.4	2.55
July	22.35	3.12	25.58	25.18	2.98	22.18	3.95	24.37	23.7	1.49
Aug.	23.92	2.58	26.20	23.92	2.74	23.05	4.60	24.56	24.7	2.74
Sept.	22.52	3.60	26.60	18.77	2.33	21.95	4.36	23.74	21.4	2.12
Oct.	17.36	6.32	26.46	13.85	1.09	17.99	7.08	23.81	14.4	2.85
Nov.*	9.26	8.51	26.43	6.80	1.52	12.84	9.16	23.82	6.9	1.21

* Average based on less than full month

1995-2013 Water-Quality Data Summary

CSHH #1 - Beacon 11

	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	-	-	-	-	-

	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 based on less than full month

1995-2013 Water-Quality Data Summary

CSHH #1 - Beacon 11

	2006				2005			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	17.35	6.81	25.22	22.42	17.19	4.5	22.94	20.22
July	20.78	3.77	25.79	24.18	23.19	4.22	24.52	24.3
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

	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

	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 based on less than full month

1995-2013 Water-Quality Data Summary

CSHH #1 - Beacon 11

	2000				1999			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	17.1	5.63	24.43	22.2	19.66	7.07	24.89	23
July	21.8	5.27	25.03	22.2	21.72	3.42	25.78	30
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

	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

	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 based on less than full month

1995-2013 Water-Quality Data Summary

CSHH #2 - Bell Marker 6

	2013				
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Turbidity (NTUs) (0.5 m)
May*	14.36	8.97	26.16	22.27	2.52
June	17.96	6.51	25.77	20.88	1.73
July	22.49	3.10	25.89	26.33	1.09
Aug.	22.51	4.18	26.87	26.45	1.33
Sept.	21.42	6.86	27.70	18.27	2.50
Oct.	17.17	7.63	27.29	15.30	0.97
Nov.*	12.81	7.05	27.27	12.40	0.87

	2012					2011				
	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*	18.08	5.53	25.06	22.30	1.62	14.70	7.64	23.34	19.6	0.57
June	19.32	5.02	25.20	21.90	1.03	16.95	4.95	24.11	22.8	1.18
July	21.94	2.99	26.03	25.30	1.92	19.88	3.39	24.79	24.8	0.83
Aug.	23.26	2.11	26.91	25.72	1.66	22.03	2.86	25.59	23.3	1.93
Sept.	22.92	4.20	27.41	21.10	1.40	21.47	3.91	24.38	22.3	1.48
Oct.	17.68	5.57	27.31	15.25	0.88	18.11	6.93	24.35	16.2	1.71
Nov.*	9.30	9.19	27.33	8.55	1.10	13.75	8.15	24.42	7.2	-

	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 based on less than full month

1995-2013 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	-	-	-	-

	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

	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 based on less than full month

1995-2013 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

	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

	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 based on less than full month

1995-2013 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 based on less than full month

1995-2013 Water-Quality Data Summary

CSHH #3 - Glen Cove Creek

	2013				
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Turbidity (NTUs) (0.5 m)
May*	15.04	8.06	26.04	21.87	2.52
June	19.69	9.74	25.28	19.45	1.69
July	23.37	6.93	25.65	27.18	1.32
Aug.	22.87	5.98	26.52	27.10	1.78
Sept.	21.25	6.62	27.42	18.07	2.68
Oct.	17.62	7.37	27.06	15.72	1.14
Nov.*	12.57	6.77	26.83	13.40	0.74

	2012					2011				
	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*	19.39	7.39	24.87	22.60	1.93	15.51	8.16	23.28	23.7	0.16
June	19.63	5.94	24.72	22.30	2.06	19.01	8.17	23.90	25.0	1.39
July	22.64	3.02	25.78	26.13	2.19	21.53	5.81	24.55	24.6	1.31
Aug.	23.91	3.82	26.56	25.50	1.95	22.60	4.10	25.13	24.1	2.18
Sept.	22.92	5.37	26.93	21.23	1.44	21.78	6.55	23.69	23.3	2.02
Oct.	17.56	8.06	26.78	15.88	0.59	17.91	8.16	23.96	12.8	1.96
Nov.*	9.64	9.29	27.19	8.30	1.28	13.04	9.20	24.03	9.3	0.91

	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*	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 based on less than full month

1995-2013 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	-	-	-	-	-

	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

	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 based on less than full month

1995-2013 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

	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

	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 based on less than full month

1995-2013 Water-Quality Data Summary

CSHH #3 - Glen Cove Creek

	1996 Avg. Water Temp. (°C) (Bottom)	1996 Avg. DO (ppm) (Bottom)	1996 Avg. Salinity (ppt) (Bottom)	1996 Avg. Air Temp. (°C)	1995 Avg. Water Temp. (°C) (Bottom)	1995 Avg. DO (ppm) (Bottom)	1995 Avg. Salinity (ppt) (Bottom)	1995 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 based on less than full month

1995-2013 Water-Quality Data Summary

CSHH #8- Glen Cove Creek STP Outfall

	2013				
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Turbidity (NTUs) (0.5 m)
May*	15.85	8.59	22.92	24.20	3.51
June	20.19	8.64	20.44	23.45	2.78
July	23.58	7.08	24.14	28.55	2.36
Aug.	23.28	5.52	25.81	25.78	1.91
Sept.	21.16	7.47	26.29	18.60	3.34
Oct.	17.91	6.85	26.27	16.24	1.05
Nov.*	11.40	7.46	25.31	8.05	1.29

	2012					2011				
	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*	20.17	6.16	24.14	24.50	3.14	16.64	8.22	22.95	26.1	0.26
June	20.21	5.00	22.43	23.83	2.28	18.75	7.56	23.51	25.5	2.08
July	23.36	4.90	23.87	27.50	2.26	21.96	3.66	24.38	26.0	2.30
Aug.	24.16	4.29	24.44	26.73	2.44	22.99	3.50	24.78	24.9	2.62
Sept.	23.07	4.54	24.95	22.43	2.97	22.17	5.48	23.40	23.6	2.59
Oct.	17.72	5.99	23.93	17.33	1.31	18.01	7.68	23.74	17.2	2.09
Nov.*	9.86	9.18	26.36	8.55	2.01	13.14	9.70	23.86	9.4	1.46

	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 based on less than full month

1995-2013 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	-	-	-	-

	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

	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 based on less than full month

1995-2013 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

	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 based on less than full month

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
2013	26.01 ppt	26.59 ppt	26.34 ppt	24.45 ppt
2012	25.90	26.56	26.19	24.15
2011	23.71	24.27	23.99	23.18
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

Bottom Dissolved Oxygen Averages

	Beacon 11 CSHH #1	Bell 6 CSHH #2	Red Channel Marker, Near Glen Cove Creek, CSHH #3	Glen Cove STP Outfall, CSHH #8
2013	6.42 ppm	6.28 ppm	7.49 ppm	7.29 ppm
2012	4.46	4.31	5.54	5.28
2011	5.64	4.77	6.87	6.14
2010	5.55	5.16	6.41	6.26
2009	6.09	5.30	6.72	6.73
2008	5.50	5.31	6.35	5.73
2007	4.99	5.37	6.02	5.93
2006	5.80	5.30	6.80	7.00
2005	4.59	4.63	5.09	5.76
2004	4.94	5.57	5.76	6.22
2003	4.63	4.55	5.21	5.28
2002	4.64	5.11	5.20	6.11
2001	5.16	5.46	6.47	6.82
2000	5.64	6.10	6.54	7.35
1999	5.85	5.44	6.32	7.14
1998	5.17	5.45	6.48	N/A
1997	4.39	4.54	5.15	N/A
1996	5.90	7.11	7.45	N/A

Seasonal Averages for Selected Water-Quality Parameters

Turbidity at 0.5m Averages

	Beacon 11 CSHH #1	Bell 6 CSHH #2	Red Channel Marker, Near Glen Cove Creek, CSHH #3	Glen Cove STP Outfall, CSHH #8
2013	2.32 ntu	1.61 ntu	1.71 ntu	2.26 ntu
2012	2.23	1.37	1.70	2.29
2011	2.33	1.41	1.61	1.61
2010	2.04	1.61	1.51	2.16
2009	2.58	1.93	2.30	2.19
2008	2.87	2.18	1.64	2.81
2007	N/A	N/A	N/A	N/A
2006	N/A	N/A	N/A	N/A
2005	N/A	N/A	N/A	N/A
2004	N/A	N/A	N/A	N/A
2003	N/A	N/A	N/A	N/A
2002	N/A	N/A	N/A	N/A
2001	N/A	N/A	N/A	N/A
2000	N/A	N/A	N/A	N/A
1999	N/A	N/A	N/A	N/A
1998	N/A	N/A	N/A	N/A
1997	N/A	N/A	N/A	N/A
1996	N/A	N/A	N/A	N/A

Water Temperature Averages

	Beacon 11 CSHH #1	Bell 6 CSHH #2	Red Channel Marker, Near Glen Cove Creek, CSHH #3	Glen Cove STP Outfall, CSHH #8
2013	19.39ºC	18.84ºC	19.58ºC	19.66ºC
2012	20.32	20.03	20.43	20.32
2011	19.92	19.70	20.04	20.25
2010	19.90	19.68	20.15	20.60
2009	19.31	18.75	19.27	19.68
2008	19.25	19.15	19.32	19.63
2007	19.9	19.4	19.96	20.53
2006	20.2	19.8	20.1	20.63
2005	20.24	19.63	20.19	21.1
2004	19.55	19.14	19.41	N/A
2003	18.94	18.37	18.9	N/A
2002	20.67	20.13	20.53	N/A
2001	20.90	19.58	20.23	N/A
2000	19.49	19.03	19.59	N/A
1999	21.01	19.67	20.2	N/A
1998	20.52	19.66	20.28	N/A
1997	20.1	19.12	19.55	N/A
1996	19.87	19.2	19.43	N/A
1995	20.8	20.3	20.59	N/A

Seasonal Averages for Selected Water-Quality Parameters

Air Temperature Averages

	Beacon 11 CSHH #1	Bell 6 CSHH #2	Red Channel Marker, Near Glen Cove Creek, CSHH #3	Glen Cove STP Outfall, CSHH #8
2013	19.20ºC	20.80ºC	20.85ºC	21.47ºC
2012	20.00	21.12	21.38	20.0
2011	20.18	21.15	20.64	22.42
2010	20.81	22.40	23.18	23.9
2009	19.18	20.52	20.69	21.7
2008	18.88	20.68	20.27	21.20
2007	20.22	21.24	21.69	22.31
2006	21	23.4	22.2	22.92
2005	21.1	21.91	22.28	23.2
2004	19.24	19.8	19.48	N/A
2003	20.4	21.1	21.8	N/A
2002	21.1	21.5	22.1	N/A
2001	22.5	22.8	23.6	N/A
2000	20.4	21.8	20.9	N/A
1999	22.22	22.73	23.04	N/A
1998	21.1	21.1	21.1	N/A
1997	20.81	21.37	21.25	N/A
1996	20.71	20.53	20.55	N/A
1995	21.84	22.16	22.18	N/A