HHPC Hempstead Harbor Protection Committee

Long Island, New York

# 2014
# Water-Monitoring Program
# Hempstead Harbor



## 2014 Water-Monitoring Report
(Full Report, Including Appendices)

prepared by

Coalition to Save Hempstead Harbor

FUSS & O'NEILL

Cover photos, left to right:
Bunker finning and splashing at the water surface (Summer 2014);
Scudder's Pond restoration (Fall 2014);
Frozen harbor view from Sea Cliff Beach (2/20/15);
(large background photo) Frozen harbor looking out to the sound from Shore Road (2/18/15))
(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 restoration and construction work: coir banks for stream from upper pond (l) and new septic tanks for country club cottages(r) (photos by Carol DiPaolo, 3/11/14)*

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. In 2013, the program was expanded to include winter monitoring (November to May) of the pond and powerhouse outfalls. The purpose of monitoring these 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. The restoration of the pond was completed in June 2014. The following November, we continued the winter monitoring of the pond and powerhouse outfalls to build the database of cold-weather bacteria levels from these areas and help determine the efficacy of the restoration work at the pond 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 (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.)

*Brownies and Cub Scouts participate in the International Coastal Cleanup at Tappen Beach (photos by Carol DiPaolo, 9/27/14)*

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 embayment report cards to serve as pilot projects to help launch the larger, soundwide report-card system. Both harbors were selected because of their longstanding and credible water-quality monitoring programs and availability of the necessary water-quality data. The project, developed by scientists from the University of Maryland and funded by a 2013 Long Island Sound Futures Fund grant award, was scheduled for completion in 2015.

CSHH's programs and activities are supported by special fund-raising events, member contributions, and grants–including those awarded from EPA's Long Island Sound Office, Long Island Sound Study, NY Sea Grant, The New York Community Bank Foundation, the North Country Garden Club, 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 **Hempstead**

**Harbor Water Quality Improvement Plan** (completed in 1998). Each of the nine municipalities signed an intermunicipal agreement to work cooperatively and to contribute financially to the HHPC.

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. HHPC's executive director serves on the Long Island Sound Study's Citizen's Advisory Committee and on the Board of Directors of the Nassau County Soil and Water Conservation District. These ties and cooperative effort save each municipality expenses and provide a coordinated approach to solving harbor problems and a 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 and was completed in June 2014. This subwatershed (located in Sea Cliff) had 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.

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](http://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.

*One of the interpretive signs installed around the harbor (photo by Carol DiPaolo, 7/18/14)*

The HHPC was instrumental in expanding the harbor's designation as a NYS Significant Coastal Fish and Wildlife Habitat Area to encompass the entire harbor. It has also played a role in 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 HHPC has been a great success and has spawned the creation of other intermunicipal efforts, including the Manhasset Bay Protection Committee, the Oyster Bay/Cold Spring Harbor Protection Committee, the Northport Water Quality Protection Committee, and the Peconic Estuary Protection Committee.

Since 1995, the HHPC has received over 25 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.

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 water-quality standards to support shellfish harvesting are the highest 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 major 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.

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# Acknowledgments

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

We offer special thanks to the National Fish and Wildlife Foundation for funding awarded through the Long Island Sound Futures Fund for the 2006 development of the Quality Assurance Project Plan for the Hempstead Harbor Water-Monitoring Program and for the 2007-2009 and 2011-2014 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 Hempstead Harbor water-monitoring program was one of the New York projects awarded grants through the Long Island Sound Futures Fund 2014 (11/19/14)*

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# 1 Harbor Overview

Hempstead Harbor 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 V-shaped harbor is about 5 miles long from mouth to head, and its shoreline extends about 14 miles from Prospect 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.

Efforts to restore the harbor resulted in the closure of a landfill, two incinerators, and a sewage treatment plant. Dramatic changes around the harbor have resulted in improved water quality. 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 the Glenwood Landing terminal (Global Partners LP) 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 crane and barges off of Glenwood Landing and osprey nest in crane (photos by Carol DiPaolo, 4/28/14)*

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

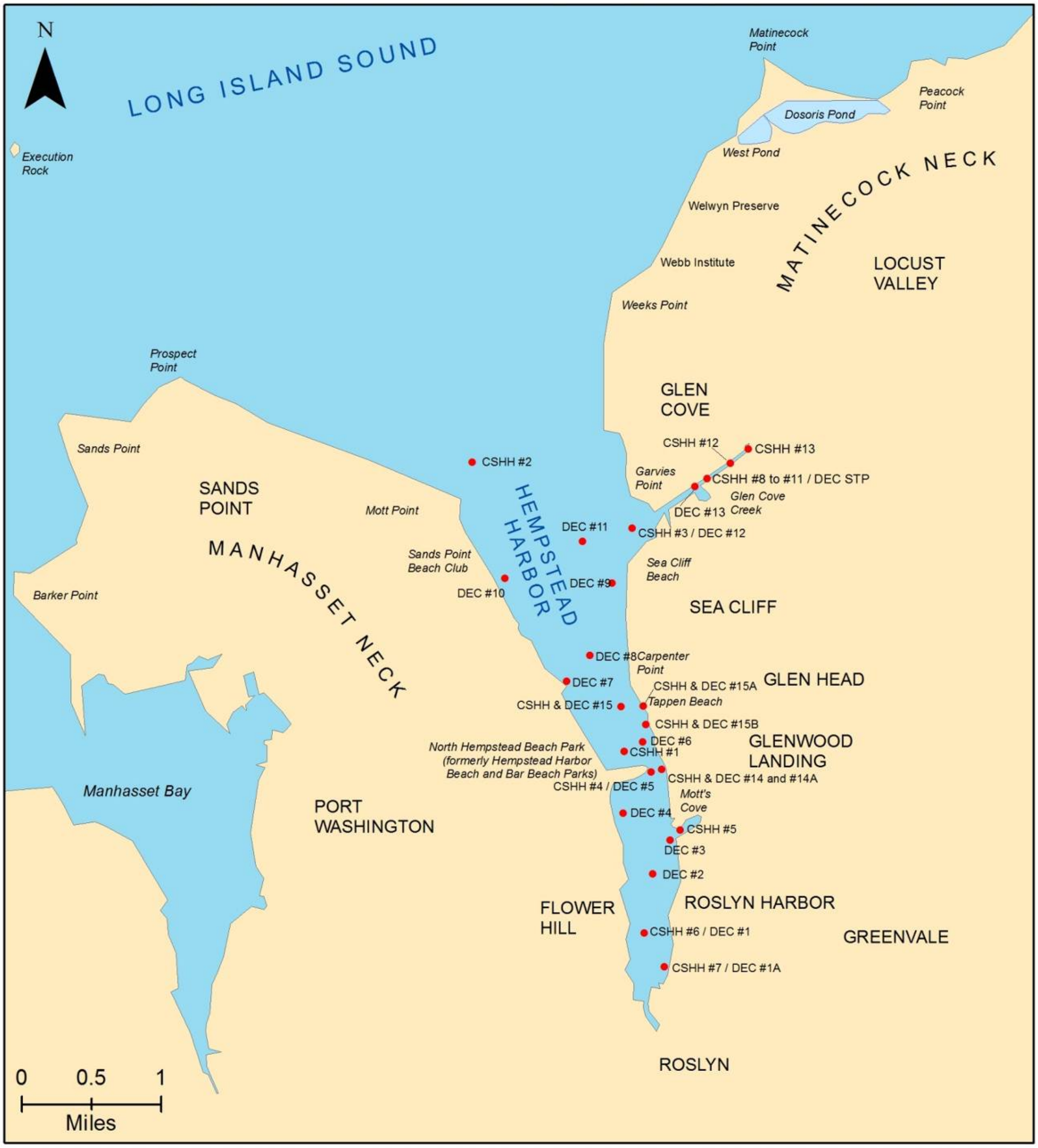
In 2006, a Quality Assurance Project Plan (QAPP) was prepared by the consulting engineering firm of Fuss & O'Neill, Inc., for the Hempstead Harbor Water-Monitoring Program, on behalf of the Coalition to Save Hempstead Harbor (CSHH) and the Hempstead Harbor Protection Committee. The QAPP documents the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

*Old dock pilings and osprey nest on west shore of lower harbor (photo by Carol DiPaolo, 4/28/14)*

## 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 sampling points for DEC's shellfish growing area (SGA) #50 were reestablished, and five new stations were added (#1A, 14, 15, 15A, 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)*

Additional samples from stations #14, 15, 15A, and 15B were collected by CSHH for analysis by the Nassau County Department of Health (using water-quality standards for bathing beaches) as an alternative way to monitor discharges from the powerhouse drain and Scudder's Pond. Both subwatersheds were identified as the largest contributors of bacteria to Hempstead Harbor, and remediation plans were developed for both areas and implemented for Scudder's Pond (pond restoration was completed in June 2014). 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 at the bottom of Glenwood Road. The water samples are analyzed by the Nassau County Department of Health.

*Power plant substation demolition (l) and snowy, cold weather made sample collection difficult at CSHH #14A (r) (photos by Carol DiPaolo, 1/28/14*

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

*Freezing temperatures caused a delay in dredging Scudder’s Pond (l) and in phragmites removal near the weir (CSHH #15B) (photos by Carol DiPaolo, 1/28/14)*

*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).

After many years of planning, work began in November 2013 to restore Scudder's Pond. 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. 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 extended to mid-May 2014 to avoid a data gap between the winter and regular (May through October) 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 ProPlus model) 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 ProPlus | 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 ProPlus | 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 ProPlus | Field |
| pH | Vertical profile at 1-meter intervals at CSHH #1-8, 13, 14, and 15 | YSI ProPlus | Field |
| pH | One station for electronic meter validation | LaMotte 2218 reagent | Field |
| Turbidity | Two vertical locations at 0.5 meter and Secchi depth at CSHH #1-8, and 13, 14, and 15 | LaMotte 2020e (USEPA 180.1) | Field |
| Clarity | CSHH #1-8, 13, 14, and 15 | LaMotte Secchi Disk | Field |
| Ammonia | 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 |

| Parameter | Location | Analyzer or Method | Location of Analysis |
|---|---|---|---|
| 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 |

A LaMotte test kit is used to measure ammonia. (Previous years' test results for ammonia using both the Nessler and salicylate methods indicated that the salicylate method is more reliable for detecting ammonia in the harbor; beginning in 2012, only the salicylate method is used.) Technicians at the Town of Oyster Bay Laboratory use an electronic kit (Hach) for measuring nitrite and nitrate levels.

*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 1995-2013 is compared with 2014 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 water-quality problems that commonly 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.

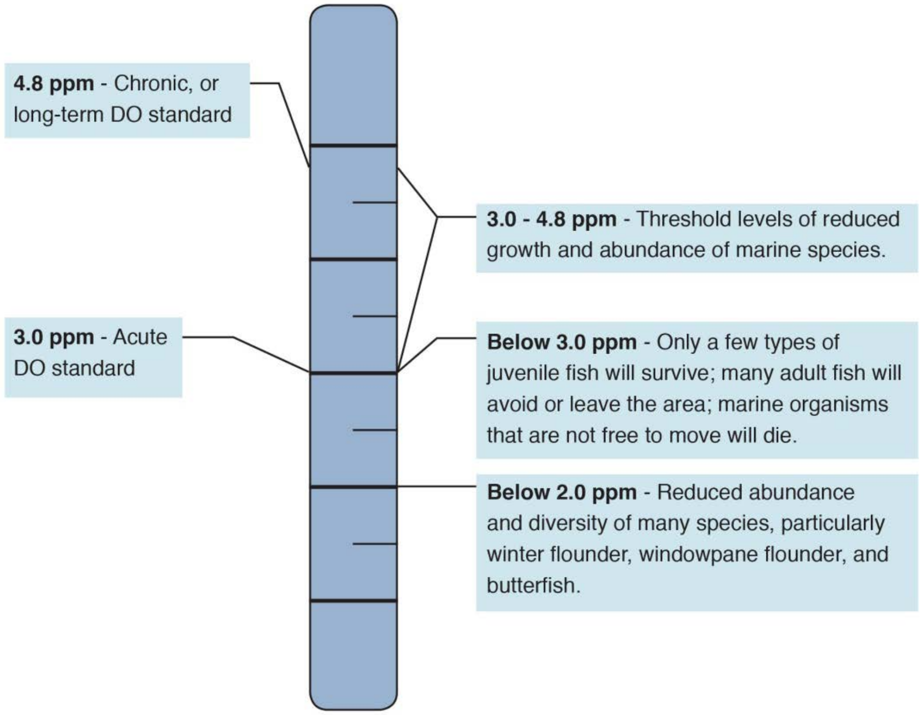
Although many algal species produce oxygen during their growth stage through photosynthesis, algal mortality and subsequent decay generally influence DO levels more strongly, especially later in the summer when more organic matter is decaying and rates of photosynthesis are declining. Therefore, productive 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 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.

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.

### Figure 1
### DO Standards and Effects of Depleted DO on Marine Life



**4.8 ppm** - Chronic, or long-term DO standard

**3.0 - 4.8 ppm** - Threshold levels of reduced growth and abundance of marine species.

**3.0 ppm** - Acute DO standard

**Below 3.0 ppm** - Only a few types of juvenile fish will survive; many adult fish will avoid or leave the area; marine organisms that are not free to move will die.

**Below 2.0 ppm** - Reduced abundance and diversity of many species, particularly winter flounder, windowpane flounder, and butterfish.

ppm = parts per million

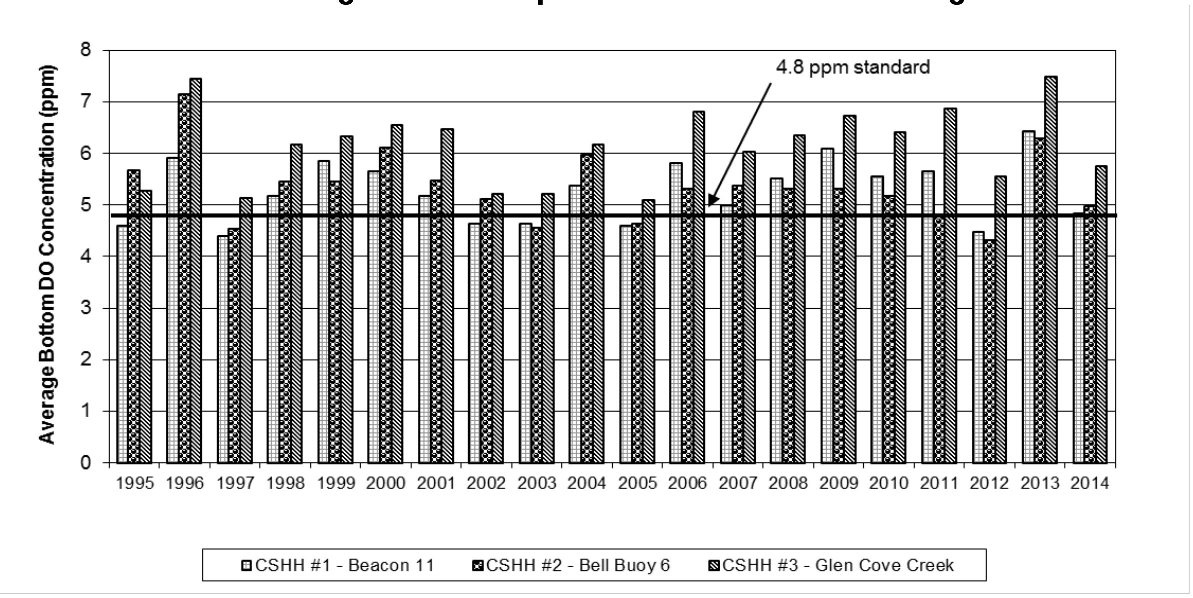
**Percent saturation** of dissolved oxygen is also monitored in Hempstead Harbor. Percent saturation is a measure of the amount of oxygen currently dissolved in water compared with the amount that can be dissolved in the water, and it is influenced by variability in water temperature and salinity. In 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 2014.

*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.) 2014 DO levels at all three locations were lower than the average of the preceding five years at each of the locations (~14%, ~3%, and ~14% lower, respectively). The seasonal averaged DO level for 2014 was above the 4.8 ppm standard at all locations. 2014 DO levels were noticeably lower than 2013 levels and the remainder of the monitoring years (~6% lower than the average of monitoring years 1995-2012 at all locations). The pattern of dissolved oxygen levels from year to year, however, is mixed and does not appear to show collective improvement or degradation.

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



*Looking south in the harbor (photo by Carol DiPaolo, 3/4/14)*

## Table 3
## Average Monitoring-Season DO Levels in Hempstead Harbor

| Average Bottom DO (ppm) | 2014 | 2013 | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CSHH #1** | 4.83 | 6.42 | 4.46 | 5.64 | 5.55 | 6.09 | 5.50 | 4.99 | 5.76 | 4.59 |
| **CSHH #2** | 4.96 | 6.28 | 4.31 | 4.77 | 5.16 | 5.30 | 5.31 | 5.37 | 5.27 | 4.63 |
| **CSHH #3** | 5.74 | 7.49 | 5.54 | 6.87 | 6.41 | 6.72 | 6.35 | 6.02 | 6.80 | 5.09 |
| **CSHH #8** | 5.62 | 7.29 | 5.28 | 6.14 | 6.26 | 6.73 | 5.73 | 5.93 | 7.05 | 5.76 |

| Average Bottom DO (ppm) | 2004 | 2003 | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 |
|---|---|---|---|---|---|---|---|---|---|
| **CSHH #1** | 5.36 | 4.63 | 5.16 | 5.64 | 5.85 | 5.17 | 4.39 | 5.90 | 4.60 |
| **CSHH #2** | 5.96 | 4.55 | 5.46 | 6.10 | 5.44 | 5.45 | 4.54 | 7.11 | 5.67 |
| **CSHH #3** | 6.17 | 5.21 | 6.47 | 6.54 | 6.32 | 6.48 | 5.15 | 7.45 | 5.26 |
| **CSHH #8** | 6.58 | 5.28 | 6.82 | 7.35 | 7.14 | N/A | N/A | N/A | N/A |

There were significantly more hypoxic measurements (below 3.0 ppm) in 2014 than were recorded in 2013 (34 total hypoxic readings, averaging 19% of all samples collected). Hypoxic conditions were recorded three days in June: June 4 and June 11 at CSHH #13 (2.28 ppm and 2.99 ppm, respectively) and June 26 at CSHH #1 (2.61 ppm); five days in July: July 2 at CSHH #1, #2, #8, and #13 (2.59 ppm, 2.16 ppm, 2.58 ppm, and 2.49 ppm, respectively), July 9 at CSHH #2, #5, and #13 (2.43 ppm, 2.66 ppm, and 1.77 ppm, respectively), July 17 at CSHH #13 (2.36 ppm), July 23 at CSHH #1, #4, #5, #6, #7 and #13 (2.83 ppm. 2.91 ppm, 2.10 ppm, 1.85 ppm, 1.39 ppm, and 1.81 ppm, respectively); and July 30 at CSHH #2, and #13 (2.00 ppm and 1.98 ppm, respectively); three days in August: August 6 at CSHH #2 and #13 (2.97 ppm and 1.21 ppm, respectively), August 14 at CSHH #1 and #13 (2.87 ppm and 1.43 ppm, respectively), and August 21 at CSHH #1, #3, #5, #6, #7 and #14 (2.87 ppm, 2.38 ppm, 2.16 ppm, 2.33 ppm, 2.73 ppm, and 2.75 ppm, respectively); three days in September: on September 4 at CSHH #2 and #13 (1.24 ppm and 2.97 ppm, respectively), September 10 and September 17 at CSHH #13 (1.80 ppm and 2.38 ppm, respectively); and one day in October: October 1 at CSHH #13 (2.50 ppm).

Anoxic levels, below 1 ppm, were not recorded during the 2014 monitoring season.

The percentage of DO measurements in the high DO range (> 6.0 ppm) decreased in 2014 at all stations compared with levels in 2013 (see *Table 4)*. The percentage of DO measurements in the mid- to low-level ranges (3 to 5 ppm) in 2014 increased at all locations, compared with the percentage in 2013. The percentage of DO measurements in the hypoxic range increased at all of the sampling locations.

It appears that the notably higher DO levels recorded in 2013 may have been an anomaly as these levels did not continue into the 2014 monitoring season. Although this is discouraging, continued sampling is needed to determine any definitive trends.

Lower DO levels may be the result of a variety of factors, including anthropogenic influences such as nutrient enrichment from wastewater-treatment-plant discharges; overuse of fertilizers in home gardening, and golf-course maintenance; and residual oxygen demand in bottom sediments from past industrial activities. Changes in air and water temperature and the physical nature and chemistry of the water can also influence DO levels, although typical effects are relatively minor (see *Sections 3.2 and 3.3.*). It is also possible that differences in wind patterns could affect vertical mixing within the water column, resulting in a well-mixed water column during some years, and a more stratified water column in others.

## Table 4
## DO Readings 1996-2014: 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 |
| **2014** | 8 | 33 | 2 | 8 | 9 | 38 | 5 | 21 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **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 |
| **2014** | 6 | 26 | 6 | 26 | 6 | 26 | 5 | 22 |
| **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 |
| **2014** | 11 | 46 | 3 | 13 | 9 | 38 | 1 | 4 |

| **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 |
| **2014** | 8 | 33 | 8 | 33 | 7 | 29 | 1 | 4 |

## 3.2 Temperature

**Water temperature** is monitored to record seasonal and annual changes of temperature within the harbor and to determine whether temperature could be affecting marine life, especially organisms in the harbor that are in the southernmost limit of their habitat. Although a warming trend has been observed in Long Island Sound (about 1-1.1ºC warmer over the last 15 years at bottom and surface, respectively), when temperatures are averaged throughout the sound, a difference is also observed between the western and eastern portion of the sound: the western portion, influenced most by fresh water inputs, is cooler than the eastern portion, influenced most by ocean water. The 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.

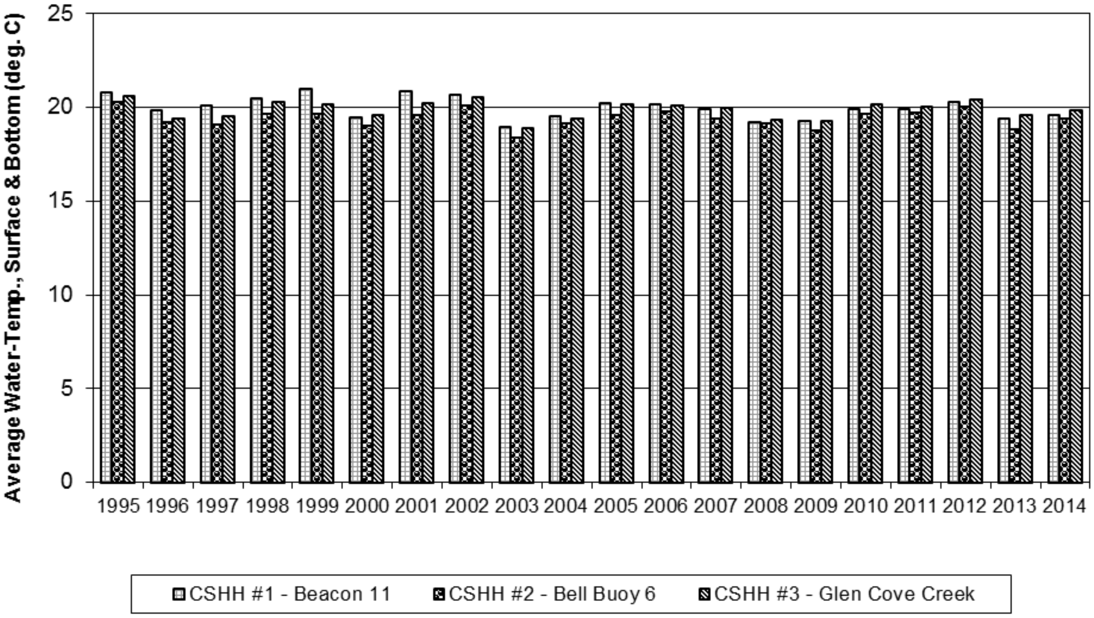
*Bar Beach pier surrounded by floating ice (photo by Carol DiPaolo, 1/28/14)*

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 2014, water temperature was warmer than in 2013 but similar to the average temperature at all locations in past years (average water temperatures for CSHH stations #1-3 for years 1995-2013 are 20.0ºC, 19.4ºC, and 19.9ºC, respectively). See *Appendix A* for additional air and water temperature monitoring data.

**Figure 3**

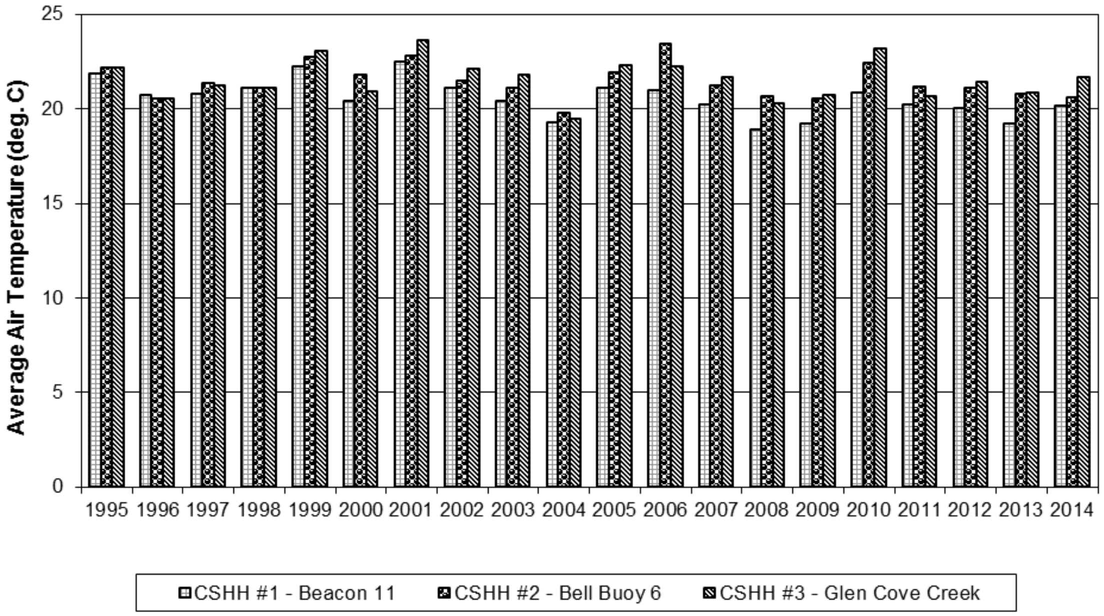
**Average Water Temperature Recorded During Seasonal Monitoring Events**



**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 2014, the average air temperature was similar to that recorded in 2011-2013. The average temperature in 2014 was less than 1ºC higher than in 2008 and 2009 (the second and third coolest monitoring season on record, respectively) and less than 1.5ºC higher than in 2004 (the coldest).

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



From 2013 to 2014, water temperature increased slightly, and air temperature increased more so. However, over the long term, water temperature has remained relatively static, whereas air temperature has greater variability from year to year. No clear trend is indicated for either water temperature or air temperature in Hempstead Harbor over the last 20 years

*Sea Isle at high tide (4/17/12) and during early stages of condominium construction on site along south shore of Glen Cove Creek (8/27/14) (photos by Carol DiPaolo)*

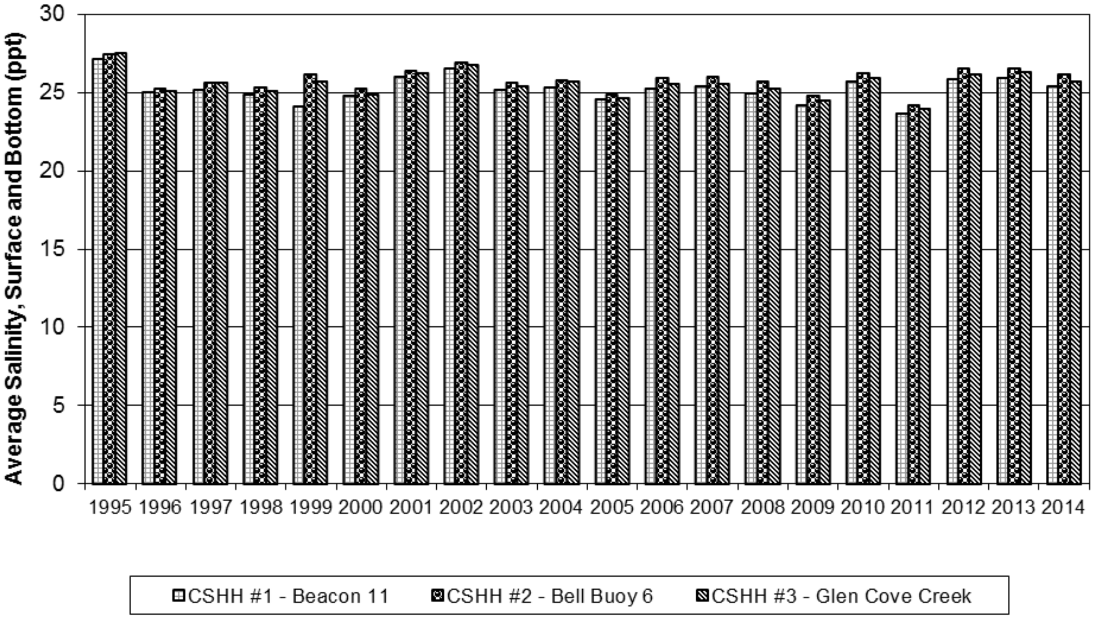
## 3.3 Salinity

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 32-38 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 range from 23 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**

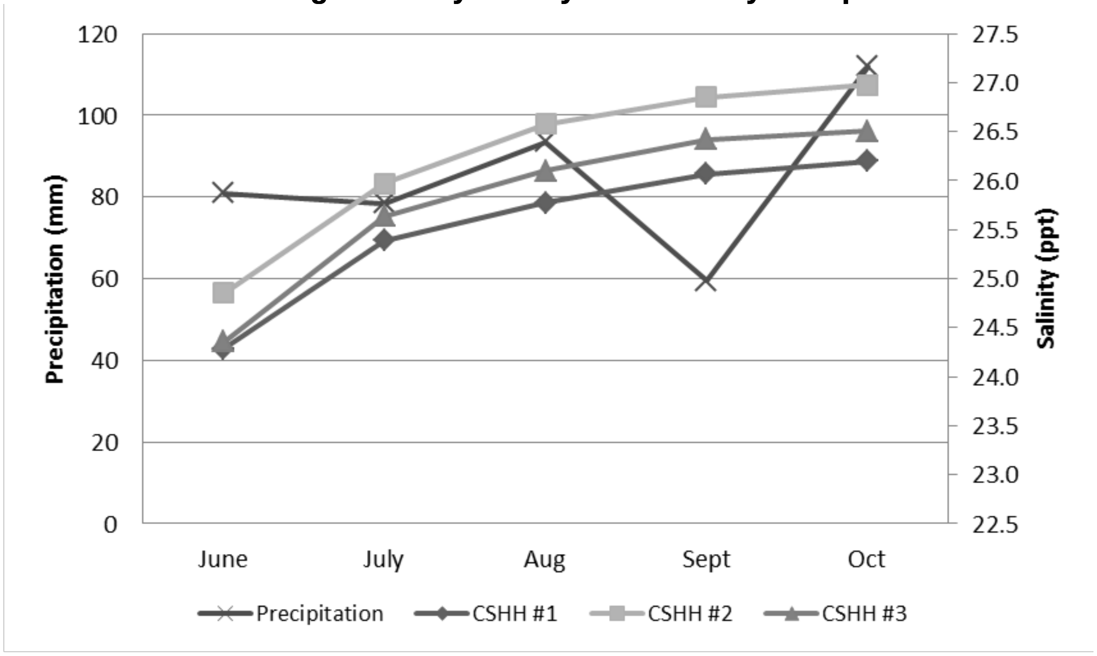


Additionally, salinity levels measured at the bottom of the harbor are generally higher than those near the surface, because high-salinity water is denser and tends to sink. Surface salinity levels are often approximately 1 ppt lower than those at the bottom, suggesting that slight stratification is 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 2014 (25.81 ppt) were slightly higher than average levels recorded in the previous five years (25.42 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 23.42 ppt to 25.53 ppt, whereas readings in October for each station ranged from 25.76 ppt to 27.36 ppt – slightly higher. As shown in *Figure 6*, average salinity at each station (CSHH #1-3) appears to increase regardless of the amount of precipitation. Although not supported by *Figure 6*, in general, there may be some effect on salinity (particularly surface salinity) in areas influenced (diluted) by stormwater discharges. The possible effects of dilution are noted at CSHH #8 (near the discharge from the sewage treatment plant) and CSHH #13 (near 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**
**2014 Average Monthly Salinity and Monthly Precipitation**



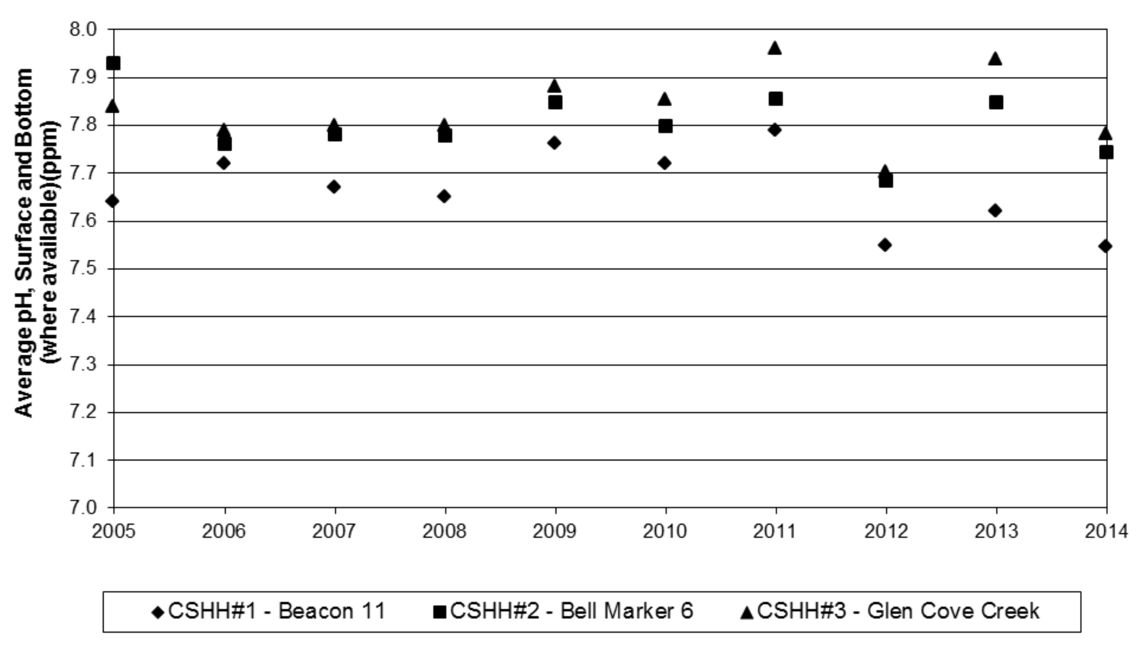
## 3.4 pH

*Figure 7* presents averaged surface and bottom pH for CSHH #1-#3 for years 2005-2014.

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. Retrieved from http://www.plosone.org/article/info:doi/10.1371/journal.pone.0083648).

Measured average pH during the 2014 season was lower than that seen in 2013 but similar to that seen in the previous eight monitoring seasons. In 2014, 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 2014, the range for the monitoring season was 0.5 to 2.0 meters (for CSHH #1-#3), which is the same range as recorded in 2013. The large amount of plankton in the water 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:<br>• 5 NTU above background levels when the background is 50 NTU or less<br>• 0% increase if the background is greater than 50 NTU<br>"Good and fair quality" waters – Not to exceed:<br>• 10 NTU above the background levels when it is less than 50 NTU<br>• 20% increase if the background is more than 50 NTU | WAC 173-201A-210(1)(e) |
| Oregon | Not to exceed a 10% increase from background levels | OAR 340-041-0036 |
| British Columbia | • Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters<br>• Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters<br>• Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters<br>• Change from background of 10% when background is >50 NTU at any time during high flows or in turbid waters | www.env.gov.bc.ca/wat/wq/BCguidelines/turbidity/turbidity.html |

Because of the previously cited significance of turbidity on the marine environment, turbidity sampling was initiated for Hempstead Harbor stations in July 2008. At each station monitored, turbidity is measured using a LaMotte 2020e meter at two depths—at a half meter below the surface and at Secchi-disk depth. (It should be noted that the results generated by the LaMotte 2020e (an EPA approved design) may be affected by color interferences from certain algal blooms.)

Given that the Secchi-disk depth decreases as the water sampled gets harder to see through, it follows that turbidity measurements should generally be inversely related and increase as the Secchi depth decreases (and vice versa). 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)). However, 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 2014, the turbidity ranged from 0.70 to 8.82 NTUs at the sampling depth of one-half meter (CSHH #1-#3); for the preceding year, the range was 0.34 to 5.72 NTUs, and since 2008 (when turbidity monitoring began), the range has been 0.11 to 8.82 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. 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 water bodies 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)*

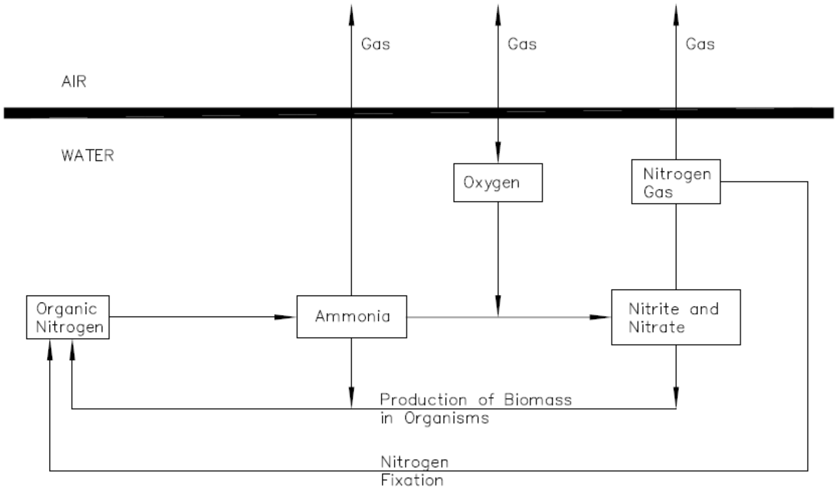
Ammonia and nitrate are important for organisms, which require nitrogen for growth and reproduction. Nitrogen forms amino acids, proteins, urea, and other compounds that are needed for life. These forms of nitrogen are referred to as organic nitrogen.

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 2014, as in 2008-2013, 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 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 a LaMotte test kit at CSHH #1, #7, and #8. If ammonia is detectable at CSHH #1, a midpoint in the harbor, ammonia levels are then measured at 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, free ammonia ($NH_3$). pH has the largest effect on increasing ammonia toxicity.

***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.

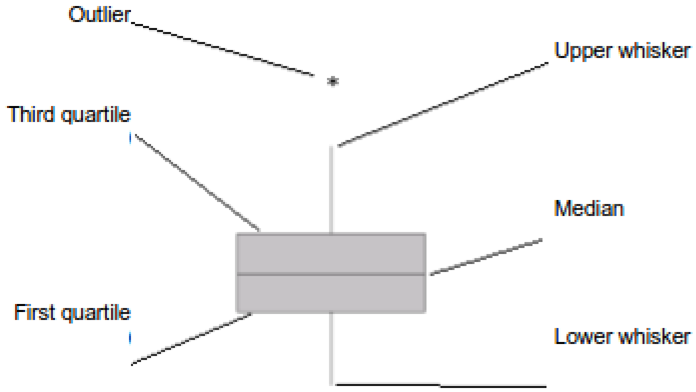
Following years of studies and modeling around Long Island Sound, nitrogen discharge limitations were imposed on sewage treatment plants all around the sound to reduce nitrogen inputs, thereby reducing algal blooms and the frequency and duration of low oxygen levels throughout the sound. However, reducing 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. However, in 2014, most of the occurrences of detectable ammonia were at CSHH #8—similar to most previous seasons. However, this distinction is not likely significant as the difference of occurrences was small – two detections at CSHH #8 versus one at both CSHH #1 and CSHH #2.

The nitrite and nitrate monitoring data was analyzed at all sampling locations for the 2004 to 2014 monitoring seasons. The assessment of any trend in the data can be difficult with scatterplots alone. Although a formal trend analysis was not completed for the data, a locally weighted scatterplot smoothing (LOWESS) technique was applied to look at the relationship between nitrate and nitrate concentrations and time (see graphs on pages C-47 through C-57). The LOWESS line is a “smoother line” that is fitted to the data to help explore the potential relationships between two variables (here, concentration and time) without fitting a specific model, such as a regression line or a theoretical distribution. Many stations look like there is no consistent change in nitrogen based on the LOWESS line. Exceptions might be CSHH #13, which seems to have gradually increasing nitrate and CSHH #6 and CSHH #8, which appear to have increasing nitrate toward levels observed in 2004-2006 after a low in 2009-2010.

Box and whisker plots, also called boxplots, were also prepared for the same data. Boxplots are a graphing tool that provides a concise summary of a large amount of data. *Figure 9* shows the composition of a boxplot. The height of the box represents the variability in the data, the whiskers show the general extent of the data, and the horizontal line in the box represents the median of the data. Boxplots of the nitrogen monitoring data (see graphs on pages C-47 through C-57) indicate that there is less variability in results in 2014 than in 2013 with the exceptions of CSHH #8 and #13. Nitrate is more variable than nitrite. In order to confirm any possible trends, nitrogen data should continue to be collected and analyzed with prior years' data. See *Appendix C* for additional nitrogen data and graphs.

**Figure 9**
**Elements of a Boxplot**



## 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 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

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

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.

**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** are 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.

In response, 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 include the following thresholds:

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.

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. Another advantage to using 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 2008, enterococcus became the sole indicator organism recommended by the 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. NCDH, therefore, discontinued analyzing beach water samples for fecal coliform.

On July 31, 2014, EPA issued an updated version of its National Beach Guidance and Required Performance Criteria for Grants. EPA has proposed additional changes to the beach-closure standards, which will be partially implemented by the NCDH during the 2015 beach season.

Key changes in the 2014 Beach Guidance include:

- Updating the science on pathogens, fecal indicator bacteria (FIB), and health concerns
- Updating the science on beach water-quality monitoring
- Providing guidance on when to issue or remove a notification
- Describing new beach notification and communication tools, such as social media, e-mail, and text messages
- Adding new performance criterion

### 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 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 (or administrative) beach-closure program. This means that in addition to closing beaches based on high bacteria sample results, NCDH closes beaches as a precautionary measure 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, but 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 2014, area beaches were preemptively closed on 7 days (based on threshold of ½-inch of precipitation over a 24-hour period). The dates of closure included: 6/5, 6/9, 6/14, 7/15, 7/16, 8/13, and 9/1. (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 2014**

| | 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 | 20.83 | 16.05 | 7.20 | 8.85 | 7.55 |
| May | Enterococci | 223.16 | 39.91 | 34.31 | 37.41 | 10.33 |
| June | Enterococci | 103.79 | 221.71 | 91.92 | 74.00 | 395.65 |
| July | Enterococci | 8.02 | 13.68 | 17.22 | 24.44 | 31.44 |
| August | Enterococci | 139.26 | 83.51 | 74.58 | 96.75 | 125.79 |
| Season Average | Enterococci | 97.63 | 84.60 | 50.49 | 50.89 | 140.11 |

**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.

Unusual discharges from these pipes were noted in 2004-2006 and were brought to the attention of Glen Cove city officials, NCDH, HHPC, NC Department of Public Works (DPW), and DEC. In 2006, representatives from Glen Cove, the city's consultants, and CSHH arranged a boat trip to view the discharge pipes along the creek. Also in 2006, Glen Cove received a NY Department of State grant 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.

*Opaque flow from CSHH #10*
*(photo by Carol DiPaolo, 5/21/14)*

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 in 2013 and again in 2014.

*CSHH #15A during placement of coir tubes for new plantings at Scudder's Pond (l) and an autumn view of the pond postconstruction (r) (photos by Carol DiPaolo, 7/2/14 and 10/29/14, respectively)*

In 2013, years of planning finally culminated into the implementation of the Scudder's Pond Subwatershed Plan (2006). The winter monitoring of CSHH #14A, 15A, and #15B in 2013 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 continued in 2014 after the completion of the pond restoration to help determine whether the structural changes made to the pond help diminish stormwater runoff and 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 individual beaches 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 2014, monthly average bacteria results for enterococci at area beaches ranged from 7.20 CFU (colony forming units)/100 ml at North Hempstead Beach (S) (former Bar Beach) in April to 395.65 CFU/100 ml at Sea Cliff Beach in June. Overall, in 2014, Sea Cliff Beach had the highest average bacteria levels, whereas North Hempstead Beach (S) (former Bar Beach) and Tappen 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 #1, #3, #8, #9, #10, #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, #14A, and #15, which makes seasonal evaluation using time series plots difficult.

In general, bacteria levels at CSHH #2 are lower than other locations. (It should be noted that there was one abnormally high fecal coliform reading on June 4, 2014 [2,130 CFU/100 ml] that is considered an anomaly.) CSHH #2 is located at the mouth of the harbor and is thus less influenced by discharges to the watershed, which are likely the largest source of bacteria to the harbor.

For a few of the sampling events, concentrations of the two indicator organisms fecal coliform and enterococci were noticeably different with concentrations of one organism being low and concentrations of the other being high (examples include June 4 at CSHH #1 and #2 and July 23 8 at CSHH #11 and #12). (This was also noted during the 2013 monitoring season.) Although this difference in the behavior of the two indicator organisms 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, bacteria levels during cold weather, levels during construction of pond improvements, as well as bacteria levels after the completion of the restoration project. 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.

*Sands Point at sunset—view from Sea Cliff Park*
*(photo by Carol DiPaolo, 3/4/14)*

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, lower temperatures and UV conditions during winter months 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, thus far, are encouraging for the two Scudder's Pond stations – both fecal coliform and enterococci appear to be decreasing. Additional data is needed to confirm any possible trends. 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[1] Exceedances** | **FC[2]** | **EC[3]** | **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% |
| 5/21/14 – 11/5/14 | 8% | 36% | 20% | 28% | 25% | 100% |
| 11/13/14 – 4/29/15 | 8% | 33% | 10% | 30% | --[4] | --[4] |

[1] CFU: colony-forming units
[2] FC: fecal coliform
[3] EC: enterococci
[4] Only one sample collected during this period.

## 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 shellfishing, and, therefore, in the event that the entire area of Hempstead Harbor’s Class SA waters is opened, the TMDL would be satisfied and no additional remedial actions (other than monitoring) would be required. However, there may be a portion of the harbor’s SA waters that will not be reopened – even in the long term – and the harbor may therefore require some percentage reduction in coliform. Discussion then focused on whether the HHPC and local municipalities would be given credit for the numerous efforts already undertaken to reduce pathogens. The DEC stated that it would be sufficient for municipalities to continue these efforts along with monitoring to see whether reductions occur. It was agreed that Nassau County’s 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.

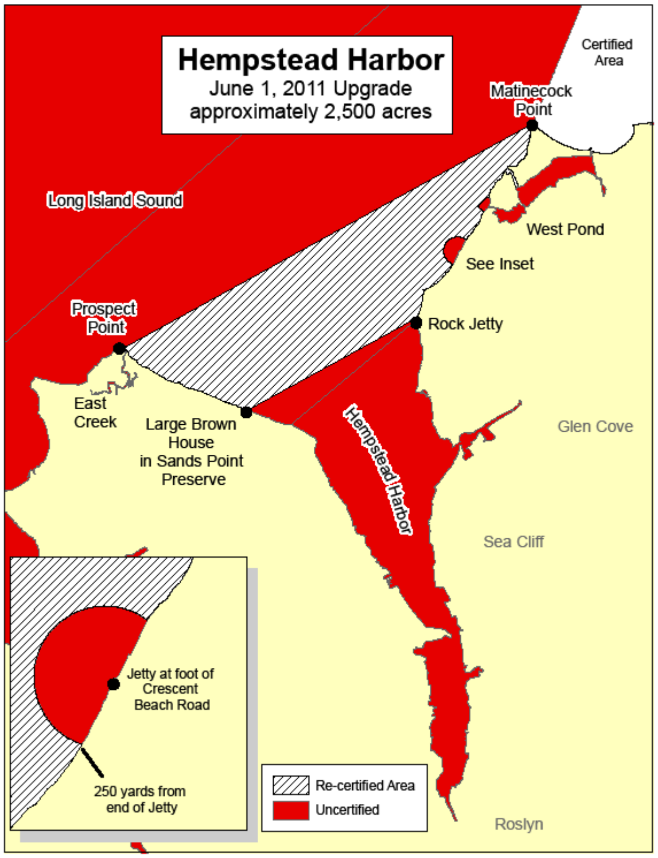
### 3.8.6 Monitoring Shellfish Growing Area #50

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 water samples. Thirteen of the 19 stations sampled were the same stations established by DEC in 1988 for shellfish growing area (SGA) #50; five stations were new to SGA #50. The samples were delivered to the DEC lab in East Setauket, where they were analyzed for fecal coliform. The results showed 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%.

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 2014, closures occurred in Hempstead Harbor May 1-8 and December 10-17 following heavy rainfall. The May closure followed a rainfall of over 6 inches on April 30-May 1.

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 June-July 2014, we saw 8-16 clam boats near the area around Crescent Beach and Matinecock Point; fewer boats were noted (2-10) during weekly monitoring in August through October 2014.

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

According to a NYDEC report, the 2014 haul of hard clams from Hempstead Harbor totaled 17,303 bushels. That is the second largest harvest of hard clams out of all of the harvest areas around Long Island and represents an economic value of nearly $1.4 million.

### 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.

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 2014.

The total precipitation that fell in June through October 2014 (424.5 mm) was the lowest seasonal total rainfall recorded for the 18 years of monitoring –well below the average quantity that fell in previous years (647 mm). The rainfall in 2014 was over 30 mm less than the second lowest seasonal total rainfall (2010). However, a pre-monitoring-season rainfall on April 30-May 1 amounted to over 6 inches of rainfall and caused severe erosion problems, including a mudslide below a house on the eastern shore of Hempstead Harbor, in Sea Cliff.

Typically, the distribution of precipitation varies from month to month. In 2014, September was very dry (59.5 mm), whereas October was the wettest month of the monitoring season (112 mm).

**Table 8**
**Monthly Rainfall Totals for the 1997-2014 Monitoring Seasons, in mm**

| | June | July | August | September | October | Total |
|---|---|---|---|---|---|---|
| 2014 | 81 | 78.5 | 93.5 | 59.5 | 112 | 424.5 |
| 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

The last two hurricane seasons were quiet for Hempstead Harbor communities, but weather continued to be newsworthy, starting with a ten-inch snow storm on January 3, 2014. Winter 2014 was snowier than the year before, with low temperatures that were sustained long enough to freeze ponds and large areas of Hempstead Harbor. The snow and ice affected work schedules for the restoration of Scudder's pond, the demolition of the Glenwood Landing1920s-style brick power-plant substation, and repair of an underwater electric transmission line that had been severed accidently by a barge anchor on January 6.

The winter snow and ice melted into a rainy spring that included a two-day downpour (April 30-May 1) of over six inches of rain around the harbor that resulted in erosion problems, including a mudslide in Sea Cliff. Things dried out by summer with less than usual rainfall, and for August, most of the entire month's rain fell on one day—August 13—when Hempstead Harbor received a more than 2¼-inch soaking, while some parts of Long Island received a downpour of more than 13 inches.

We began our regular monitoring season with a reconnaissance trip on April 28 to check out conditions and accessibility of monitoring stations. We noted that the docks by the sewage treatment plant in Glen Cove Creek were in worse shape than they were previously, and we would not be able to use the easternmost section to get to CSHH #11; for the season, we had to take the boat the short distance to grab a water sample. At the head of the creek, an old derelict barge was tied to the bulkhead below the Nassau Ready Mix concrete operation on the north side of the creek.

We also use the early reconnaissance trip to check on the number of active osprey nests in the lower harbor. Five of the usual six nesting sites normally observed in the lower harbor were occupied. The surprise was that one of the usual sites, Beacon 11, the navigational light between Tappen Marina and the former Bar Beach, did not have an osprey nest in it.


*Fox in Roslyn Harbor (photo by David North, 9/4/14)*

Our first winter-monitoring component of the water program extended into May 2014 (for the 2013 water program), collecting water samples for bacteria analysis from Scudder's Pond outfalls and the outfall by the power plant; our regular monitoring season for the 2014 program began on May 21 and extended to November 5. By August 6, 2014, access to the outfall at the power planet was prevented because of the demolition work in deconstructing the six white stacks at the top of the brick building. Samples from the powerhouse drain could not be collected for the second, 2014 winter monitoring--November 13 through April 29, 2015—until the last day.

The second winter monitoring was marked by even more frequent snowfalls and colder temperatures than in the year before, with the harbor frozen out to Long Island Sound and not fully thawing until early April—snow and sleet fell the last three days of March. The snow and ice in the winter of 2015 caused wildlife fencing to go down around Scudder's Pond and damaged pilings at local marinas.

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.

For example from 2011 to 2014, we received several reports (and photos) of red foxes in communities all around Hempstead Harbor. It seemed clear that the fox population had recovered. We also had reports of deer moving westward across the north shore of Long Island, and deer were increasingly seen in 2014 in parts of Glen Cove and Locust Valley, as well as in Port Washington.

## 4.1 Fish-Survey Reports

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

Substation 3, with the sand-colored stacks, at the Glenwood Landing power plant was demolished is 2013 but had previously been the subject of a marine-life monitoring report–the Glenwood Power Station Entrainment and Impingement Monitoring Report (by ASA Analysis & Communication, Inc., September 2005). The report has been referenced in the Hempstead Harbor annual water-monitoring reports since 2005 because it summarized the findings of a 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 staggering 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. The samples that were collected weekly March through September and biweekly the rest of 2004 found **thirty-four types of fish and several other marine animals** in the samples.

*Demolition stages of the Glenwood Landing power plant from April to December 2014 (photos by Carol DiPaolo)*

In December 2011, the Long Island Power Authority (LIPA) and National Grid submitted plans for demolition of two substations at the Glenwood Power Station **(**Substation 2, the brick building, and Substation 3, the adjacent building with the sand-colored stacks), which had 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 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."**

It will be interesting to see whether there will be a noticeable difference in fish populations in Hempstead Harbor over the next few years as a result of the substation demolition and the end of the once-through cooling system at the power plant.

### 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.

## NYSDEC Western Long Island Sound Beach-Seine Survey
## Hempstead Harbor 2014 Catch

| | | | Month | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Type | Common_name | AGE* | 5 | 6 | 7 | 8 | **9** | 10 | Total |
| Diadromous: | ALEWIFE | 99 | | | 2 | | | | 2 |
| | STRIPED BASS | 0 | | | 10 | 21 | 9 | | 40 |
| | STRIPED BASS | 1 | | 3 | 9 | 5 | 6 | 2 | 25 |
| Marine: | ATLANTIC HERRING | 99 | 3 | | | | | | 3 |
| | ATLANTIC MENHADEN | 0 | | | 442 | 15 | 1 | 1 | 459 |
| | BLACKFISH (TAUTOG) | 0 | | | 91 | 131 | 16 | | 238 |
| | BLACKFISH (TAUTOG) | 1 | 1 | | | 3 | | | 4 |
| | BLUEFISH | 0 | | | 481 | 478 | 478 | 4 | 1441 |
| | CUNNER | 99 | | | | 3 | 1 | | 4 |
| | GRUBBY SCULPIN | 99 | | 1 | 4 | 1 | 1 | | 7 |
| | NAKED GOBY | 99 | | | 1 | | | | 1 |
| | NORTHERN KINGFISH | 99 | | | | 5 | 1 | | 6 |
| | NORTHERN PIPEFISH | 99 | 3 | 27 | 2 | 4 | 1 | | 37 |
| | NORTHERN PUFFER | 99 | | | | 3 | | | 3 |
| | NORTHERN SEAROBIN | 99 | | | | | 1 | | 1 |
| | OYSTER TOADFISH | 99 | | | | 1 | | | 1 |
| | POLLOCK | 99 | 3 | | | | | | 3 |
| | SCUP | 99 | | | 1 | 118 | 25 | 3 | 147 |
| | SEABOARD GOBY | 99 | | 4 | 1 | | 5 | | 10 |
| | SILVERSIDE SPP. | 99 | 119 | 98 | 6640 | 5396 | 2324 | 1578 | 16155 |
| | STRIPED SEAROBIN | 99 | | | 1 | 15 | | | 16 |
| | SUMMER FLOUNDER | 99 | | | 1 | | | | 1 |
| | WINTER FLOUNDER | 0 | | | 9 | 6 | 2 | 2 | 19 |
| | WINTER FLOUNDER | 1 | 1 | 1 | | 1 | | | 3 |
| Estuarine: | KILLIFISH SPP. | 99 | 29 | 1 | 81 | 68 | 52 | 257 | 488 |
| Invertebrates: | CALICO (LADY) CRAB | 99 | | | 1 | 1 | 6 | | 8 |
| | HORSESHOE CRAB | 99 | 2 | 6 | 1 | 1 | | | 10 |
| | ASIAN SHORE CRAB | 99 | | | | 1 | | | 1 |
| | MUD CRAB | 99 | | 3 | 2 | 2 | 1 | | 8 |
| | SPIDER CRAB | 99 | | 1 | 2 | 1 | 1 | | 5 |
| | SEA STAR | 99 | | 2 | 7 | 6 | 50 | 1 | 66 |
| | | | | | | | | | |
| | | # of Hauls | 6 | 6 | 6 | 6 | 6 | 6 | 36 |

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

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 monthly, May through October.

The 2014 catch totals for the harbor included in the table above were provided by Jesse Hornstein, Marine Biologist at the NYSDEC Bureau of Marine Resources, Diadromous Fisheries Unit.

## 4.2 Field Observations and Recreational-Fishing Reports

**May**
As mentioned previously, our regular monitoring season of in-harbor and shoreline stations began on May 21; the second survey for the month was on May 28. For both surveys, we covered only upper harbor stations because of the tidal cycle. However, we took our first trip out in the harbor on April 28 for our preseason reconnaissance of water-monitoring stations. Also, the 2013 winter monitoring extended into early May 2014 and provided an opportunity for additional wildlife observations.

We didn’t see any comb jellies in the harbor on either of the May survey dates and saw only one lion’s mane jelly on May 28. This was in contrast to the large numbers of comb jellies observed in May 2013. We saw some bunker near the surface at Beacon 11 on May 21.

Local fisherman Paul Boehm commented:

> *Early on the water was much colder than normal so the season (official start mid-April) started off slowly. Just picked a few small stripers (around 18-24" trolling in shallow water down harbor). On May 5 I started picking up keepers, all of which were pretty large bass. For three weeks caught nothing below 35" with the largest fish by length at 42" and by weight 33lbs (39" heavily built fish with 2 porgies and two big bunker in his stomach).*

On May 14, a very large snapping turtle made an appearance by the Scudder’s Pond weir, apparently disturbed by the sample jar and pole used to grab water samples at that site.

In May, we saw the usual variety of birds that inhabit the harbor during the spring and summer: cormorants, mallards (probably with some black ducks mixed in—hard to tell the difference), egrets, Canada geese, ospreys, swans, and terns. **Brant geese** were present in early May, as they were in 2013. On May 21 and 28, we saw a **loon** near the area between Sea Cliff Beach and the Hempstead Harbor Club.

*A common loon in its winter plumage (photos by Carol DiPaolo, 5/28/14)*

**June**
During our June water-monitoring surveys (June 4, 11, 18, 26), no comb jellies were noted On June 18, we had a report that a diamondback terrapin was seen on June 17 in Glen Cove Creek at Brewer’s Dock B.

Although we didn’t see much fish activity during our sampling dates in June, the fishermen who usually report their catches to us were catching large striped bass and bluefish in the harbor. They said they also saw lots of bunker, and when they went north of Matinecock Point saw some other species.

On June 29, Paul Boehme reported his observations:

> *…For a while there I was regularly catching 4-5 large bass a night. Surprisingly, have not hooked a lot of blues; usually as the water warms I'll get 2-3 blues for every striper. Lots of bunker pods around. Have also caught a lot of sea robins, dogfish, as well as several black sea bass (to me, tied with weakfish for the most beautiful local fish). Fluke fishing has been spotty; started off great then trailed off for me, did get a 27.5," 7.5 lb fluke which is by far the largest I have ever caught. Lately very slow with only a few shorts. Have not seen any unusual species coming through this year.*

On June 30, Pete Emmerich reported on his early-season fishing:

> *I’ve only been fishing for bass so far this year, once again concentrating my efforts inside the harbor. I have fished only as deep as Webb Institute a couple of times, but can see it is time to go deeper now as the bass move out. I did well off of Hempstead Harbor beach, Sea Cliff, or just stop anywhere the bunker are and make fish marks on the sonar machine. Has been a pretty typical year, thank goodness for all the bunker. Just this past Friday was the first time this spring I had trouble snagging bunker and it was the first time I was skunked all season. All of the trips have resulted in multiple bass being caught, typically the bite switching off with a change in current, or as is typical getting a good bite at sunset, then going home because work gets in the way.*

*Did not catch a fish under 30 inches this year, and the largest one was 30 pounds (photo attached), but I did not have a tape measure on it. It's hard to detail the quantity of fish caught, just don't keep count. I did not see any unusual conditions; however, I thought you may be interested in what the bass are eating. See attached photos showing the amount of mantis shrimp one bass can swallow. This was the contents of the stomach of one of a 32-inch fish.*

*30-lb striped bass (l) and mantis shrimp found in the belly of large (32") striped bass (photos by Pete Emmerich, 6/6/14)*

The usual variety of birds we see around the harbor were observed on all monitoring dates in June, and they included cormorants, mallards, egrets, and Canada geese (large numbers and mostly at the beaches—North Hempstead Beach Park and Tappen Beach), ospreys, swans, and terns. We also saw two red-tailed hawks flying over Glen Cove Creek on June 4 and one in the same area on June 18.

**July**

Weekly surveys were on July 2, 9, 17, 23, and 30. The first comb jelly noted for the season was on July 9—only one sea walnut at one station. We didn't see comb jellies again until August. In mid-July, we observed baitfish and bunker at the surface; large schools of bunker were seen in Glen Cove Creek on July 30, with some finning at the surface. On July 17, we observed what appeared to be bluefish breaking the surface at midharbor.

Our fishing contacts as well as others we met at Tappen Marina reported seeing large schools of bunker. Pete Emmerich reported good bass fishing at Matinecock Point on July 8; he said he caught "six fish including the first short bass I caught this year"; his catch also included a 35-lb, 42 inch striped bass. The July DEC seining in Hempstead Harbor included large numbers of young-of-the-year bunker and bluefish, as well as thousands (6,640) silversides (see the table at *Section 4.1.2*).

The usual variety of birds we see around the harbor was observed on monitoring dates in July; they included belted kingfishers, cormorants, mallards, egrets, Canada geese, hooded gulls, ospreys, swans, terns, and blue herons. On July 2 a turkey vulture was seen near Tappen Marina; 2 red-wing black birds were seen by Glen Cove Creek on July 9; and a type of sand piper was seen on July 30 at the head of Glen Cove Creek. We also saw killdeer and sanderlings. On July 23, two **peregrine falcons** were seen landing on the ledge of the brick building that was being demolished at the power plant.

**August**
*Comb jellies*—both sea walnuts and sea gooseberries—were observed on all monitoring dates in August—6, 14, 21, and 27—but in varying quantities and not at all monitoring stations. Large schools of *bunker* and *baitfish* were noted throughout the harbor on August 16 and 27; both bunker and smaller baitfish were breaking the surface of the water as though lots of larger fish were under them. Bunker were also observed finning at the surface.

Our fishing contact Paul Boehme reported the following on August 20:

> *There have been numerous bunker pods in the harbor pretty much throughout the summer. There were a lot of bass around right through July (got 7 keeper bass and 3 big blues on evening of 7/16). Of these, biggest bass was 39" 23 lbs; the biggest blue was 14 bs. Continued to regularly catch keeper bass out in the sound and at Matinecock through July. Never really got around to fishing the west side of the harbor, Execution or Westchester as I was doing well fishing east and a little north (maybe a little past midsound off Matinecock and Bayville).*
>
> *This slowed down in August when things got pretty spotty for the bass out deep. It appears the "spring run" is over, about 3 weeks later than usual, so the normal pattern seems to have held, just running late due to the cold winter. This time of year I usually change my methods, i.e., move inshore to the rocks for bass. The bunker pods continue to be around, now being actively hunted by big blues, which you can catch by any number of methods when they are actively feeding. Blues have been 8-14 lbs for me. Snappers all over the place, I see a lot of guys getting them fishing from the shore. Still look pretty small. Haven't been fluking but continue to pull up sea robins from all over as well as smooth dogfish up from deeper water (40-70 ft)….*

The usual bird species we see around the harbor were observed on monitoring dates in August: cormorants, mallards, egrets, Canada geese, hooded gulls, ospreys, swans, terns, and herons. The numbers of **ospreys** in the lower harbor have been striking; 11 were observed on August 6, and 4 perched in a tree in Mott's Cove; 13 were observed on August 21. On August 6 and 14, we saw 2 belted kingfishers. On August 21, a **peregrine falcon** flew to one of the stacks on the power plant (we had seen two fly to the ledges of the plant on July 18). On August 27, we saw a **night heron** in Glen Cove Creek.

**September**
During September monitoring dates (September 4, 10, 17, 24), comb jellies were observed at different stations; on September 17, sea walnuts and sea goose berries were too numerous to count at CSHH #2, near the mouth of the harbor. Large schools of baitfish and bunker were present throughout the harbor. Interestingly, although the September DEC seine included 2,324 silversides and a good number of killifish, only one bunker was in the catch in

Hempstead Harbor. A large number of young-of-the-year bluefish were in the catch, along with 50 sea stars.

*Bunker finning at the surface (photo by Carol DiPaolo, 9/10/14)*

The usual variety of birds we see around the harbor were observed on monitoring dates in September; they included cormorants, mallards, egrets, and Canada geese (with the largest numbers around the harbor on September 4), blue herons, ospreys, and swans. As was the case in August, when we did a full harbor survey that include the lower harbor, we saw a large number of ospreys—19 in all. We also saw a belted kingfisher and a green heron.

*Cormorants in front of the Sea Cliff Yacht Club*
*(photo by Carol DiPaolo, 9/10/14)*

**October**

During monitoring dates in October (October 1, 9, 15, and 29) (boat was unavailable for in-harbor monitoring on October 22), no comb jellies were observed, but large schools of bunker continued to be present throughout the harbor and Glen Cove Creek.

On October 30, Paul Boehm reported:

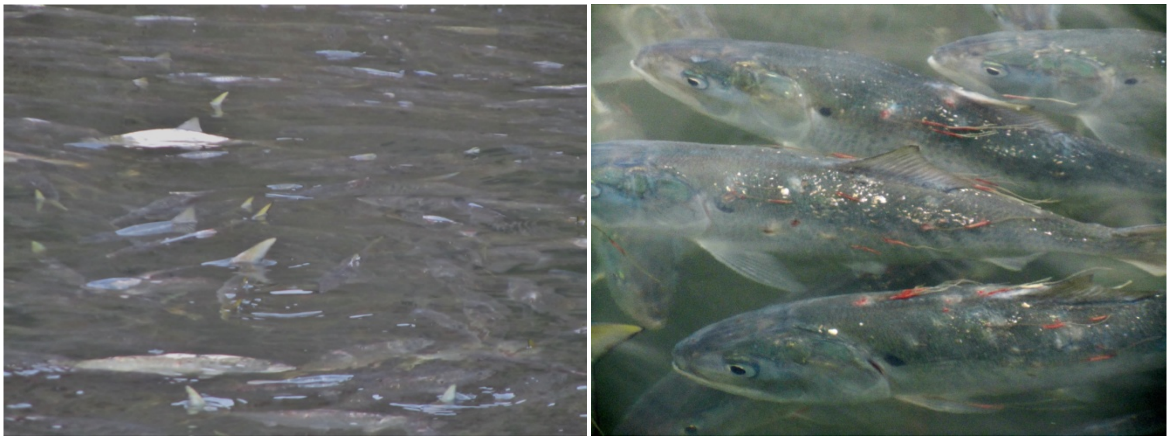
> *Lately I have been fishing the other side of the sound for blackfish. The blackfish population seems very healthy. Numerous fish in any rocky location. Most of them are "shorts" (less than 16") with a ratio of about 25-1 shorts to keepers with a few really huge ones thrown in (I have caught 8.5lb 23" and 7.5lb 22" fish). The blackfish seem to be feeding on mussels. The harbor seems full of life. Bunker pods are still around. Big bunker, around a foot long. Tappen Marina has become kind of bunker condo, with a school taking up residence down there for about the last three weeks. There are long stringy parasites attached to many of them, even the pods out in the harbor, so seems like the long residence in one place has allowed the parasites to build up.*
>
> *There seems to be bait everywhere. Schools of peanut bunker, rainfish, silver sides, etc. Sometimes when anchored near shore you can look down and see seemingly endless schools of bait swimming under the boat. Although there does not seem to be frenetic feeding activity under them, you can reliably get big blues (6-14 lbs) by throwing in a bunker chunk. Also some stripers mixed in, although not as large as the spring run. All the predators seem very to be well-fed, healthy looking specimens. It's nice to see what appears to be a healthy ecosystem out there, tons of bait, fat and happy predatory game fish, water looks pretty clean.*

Later in the month, Paul reported:

> *Blackfish very plentiful and mostly shorts but I did get 3 really big ones (7.5 - 8.5 & 9 lbs) this fall. I attached a picture of the 9.0 lb fish which is the largest I have ever caught. Belly was full of mussels, as were the bellies of all the keepers I caught this year….All three were caught in the last three weeks of October, the one in the picture on Oct 29. The blackfish are interesting, they have big human looking buck teeth which they use to grasp mussels and rip them free from the rocks. Then they have heavy grinders in their throat to help break mussels up for digestion. Huge jaw mussels, which accounts for the heavy, high head. They are a wrasse, related to parrotfish….Very powerful bite cleanly cutting through crab baits. Get tight into crevices and become quiescent at night (some call it sleeping)….In my opinion, the best eating of the local fish, even better than fluke. Also slow growing, the one in the picture was around 25 years old….*

*Blackfish caught 10/29/14 (photo provided by Paul Boehm)*

The last DEC seine of the season in Hempstead Harbor (October 21) had large numbers of baitfish—silversides and killifish—corresponding with the monitoring and recreational-fishing reports.



*Bunker in tight schools in and seen just below the surface with ribbon-like parasitic copepods (photos by Carol DiPaolo, 10/29/14)*

The birds we noted while sampling included cormorants (43 on October 9), mallards, Canada geese, egrets (26 great egrets on October 9), blue herons, belted kingfishers, ospreys (through October 9), and swans.

**November**

In November we had only one monitoring date for in-harbor stations (November 5). Despite so many signs of seasonal change, the bunker were still in the harbor—in large numbers and finning. We saw very large adult bunker—no juveniles—and they had chunks taken out of them and also had a lot parasitic copepods attached to them. The fish were all the way up to the head of Glen Cove Creek.

On November 13, Pete Emmerich reported:

> *…my favorite fishing is fall fishing for tautog. So, for us now Tappen is closed, all boats are out, pretty sure the season is done for us. We went out yesterday on Nov. 12, in a ridiculous dense fog, pea soup, maybe 150 feet visibility, and I know I have said this before, but I have never seen more fish in Hempstead Harbor than I saw yesterday. From the minute we left Tappen Marina, all the way to Matinecock Point …the bunker schools on the surface finning was beyond words. Birds were working, I assume working schoolie bass. But the bunker were incredible, the dense fog, low pressure had the bunker barley moving, finning in great schools. There was not a moment that we were not surrounded by these schools for the entire 7-mile trip. The entire time (7 hours) that we fished at anchor we had these schools within feet of the boat.*

> *So we caught 40 to 50 blackfish between two of us, normal for the last 5 weeks, loads of short fish, difficult to catch just a few of 16 inches, which is the legal size, but the fish activity was wild. There was no wind, dead flat sea. Low tide was 9:15 am, the blackfish bite was wild, and by 10 am the bass started hitting those bunker schools. WHOOSH, and a school erupted. What was interesting is we saw the normal large bunker schools of adult fish, but also saw large finning schools of juveniles, maybe 4 to 5 inches long.*
>
> *Don't know what else I can say to describe the scene, I fished on November the 12th in a tee shirt and foul weather pants. I am sure that people who do not fish, or never take a calculated risk to fish in pea soup (knowing what they are doing of course) can ever imagine a day like we had yesterday.*

Pete also said that he had side catches of black sea bass, bergalls, and a fish that resembled a monkfish.

As the season drew to a close, we saw fewer birds in the harbor; they included cormorants, mallards, a blue heron, Canada geese, and swans.

November 13 was the first monitoring date of the second winter sampling for the Hempstead Harbor water-monitoring program. This portion of the program extended through April 29, 2015. It included weekly monitoring of the two outfalls draining Scudder's Pond and was intend to determine whether a trend of lower bacteria levels would develop as a result of the completion of the pond restoration in June 2014. So far, the results are inconclusive, in part because of the way bacteria behaves in cold temperatures and also because it may take a while for disturbed sediments to settle post-construction, including dredging, removing phragmites (an invasive plant species), and replanting with native plants around the pond's perimeter and steam bed. (See *Section 3.8.4* of this report.) Another round of winter monitoring will be required to help judge the effectiveness of the pond restoration.

## 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. In 2014, no blue-claw crabs were noted on monitoring dates and none were in the 2014 Hempstead Harbor seine hauls by DEC.

*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. Increasingly, local fishermen have been finding mantis shrimp in the bellies of striped bass and some other fish. Paul Boehm noted on June 30, 2014:

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

*The bass' stomachs are always full of mantis shrimp early in the season. In addition, I've caught fluke full of mantis shrimp and one of the black sea bass I caught hit a plastic mantis shrimp. So the shrimp are a major, perhaps the major, forage species in the area.*

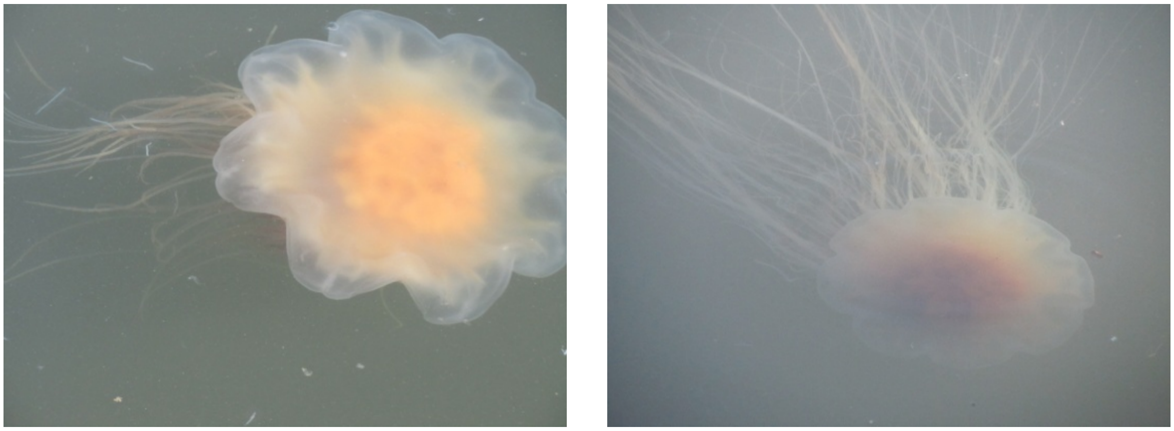
Pete Emmerich suggested that bass find mantis shrimp because they root the bottom for worms and anything else they can find.

## 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 had usually appeared in large numbers in Hempstead Harbor in late June and through mid-October. Over the last few 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. In 2014, there seemed to be a late arrival (July), fewer numbers over the season, and an early departure (no comb jellies were observed on any of the October monitoring dates).

Two types of tentacled 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. Both types of jellyfish are usually observed earlier in the season in Hempstead Harbor. 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**. In 2014, we saw only one lion's mane—on May 28. The DEC seine hauls often 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)*

The opening of the shellfish beds in Hempstead Harbor (June 1, 2011) was exciting 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 at *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 from about the first quarter of the nineteenth century into the first quarter of the twentieth century. Clams and oysters were shipped regularly from Hempstead Harbor 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 the outer portion of Hempstead Harbor 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 began incorporating a trip to the area during weekly monitoring surveys to count the number of boats in the area.

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 placed outside of Crescent Beach to delineate the 250-yard radius around the beach that remained closed to shellfishing.

*One of three buoys marking the closed area around Crescent Beach (l) and a posting for the 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 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 2014, the shellfish beds were closed twice—in May and December—following heavy rain.

### 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.

### 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 **autumn 2008**, the Town of Oyster Bay and the HHPC coordinated a broader shellfish population density survey, including 61 stations in Hempstead Harbor.

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 and replicated the 2008 survey. The survey involved collecting 120 bottom grab samples at the same 61 stations used in the 2008 survey. The survey study was completed on July 9, 2014. Among the study findings are (1) hard clams in the harbor were widespread and fairly abundant; (2) although clam density was lower than in the 2008 survey, it had not changed significantly; (3) the density of seed clams decreased and represented a smaller percentage of the overall clam population; (4) the density of the clam population in the certified area of the harbor is less than what it was in 2008 but not by a statistically significant amount; (5) overall, the size of the clams were larger than in the 2008 survey and this could be because commercial harvesting focuses on the smaller little neck clams. A cautionary note concerned the decline in seed clams; a decline over several consecutive years could indicate an overall decline in the resource. Further studies would be needed to determine whether the 2013 seed-clam decline was an anomaly or part of an ongoing condition.

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

The baymen harvesting the clams are also a good source of information regarding the types, sizes, and quantities of clams that have been found in the area. The first rakings seemed to yield a good mix of sizes, including little necks, which have the most commercial value. As the 2011 season progressed, baymen reported 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. The site seemed to have a healthy population of 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.

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

Over the last 20 years or so, we have seen 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** are generally 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, we have seen fewer numbers of young birds over the last few years. 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; in 2014, it was 11 on August 21.

*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.

There have been five to six osprey nests easily visible from our monitoring stations in Hempstead Harbor that have been established over more than 20 years. Since 2010, there have been some changes; a blue sailboat that had been moored in the lower harbor and used only by nesting ospreys broke off its mooring early in the season and was removed. The returning ospreys chose an alternative nesting site, 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 11 saw the three fledglings fly off the nest as we approached it.

In 2011, the blue sailboat was in its usual place in the lower harbor, and ospreys rebuilt a nest there; we saw three eggs in the nest on May 26. On June 29, one of the eggs remained unhatched, and one of the two osprey chicks in the nest seemed very weak and not able to raise its head. On July 14, the weak chick was the only one that remained in the nest but in time recovered and was able to leave. Also in 2011, a new osprey nest was built on an old tug at the Gladsky Marine Salvage site in the lower harbor.

The osprey population continues to grow, and by May 21, 2014, seven osprey nests were within easy view around the harbor: (1) at Beacon 11, (2) on the large Gladsky crane, (3) on a cell tower behind the power plant, (4) on old pilings on the west shore near the cove of the former Bar Beach, (5) on a nesting platform on the western shore, (6) on another set of old pilings on the western shore, south of the platform, and (7) a private dock on the eastern shore of the lower harbor.

Since about 2004, a pair of **peregrine falcons**, a protected species, has been sighted at the Glenwood Landing power plant. On October 28, 2009, we saw a pair of 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.

The nesting box remained unoccupied for the entire 2013 and 2014 seasons. In May 2014, the falcons decided to build a nest in one of the white stacks on top of the brick building at the power plant, despite the noise and demolition work that was going on. Demolition work at the building with the stack was halted until it was determined that the nest and egg in it were no longer viable.

*Nesting box along the shoreline south of the powerplant and peregrine falcon on ledge of power plant building (photos by Carol DiPaolo, 4/28/14 and 7/23/14, respectively)*

Although **red-tailed hawks** are seen often in wooded areas around Hempstead 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 and were seen in that location again on June 4 and 8, 2014.

*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 at this time). And although we don’t usually see any turkey vultures during our water-sampling tours, they have been seen frequently and throughout the year near the eastern shore of the harbor, flying over East Hills, Greenvale, Roslyn Harbor, Mott's Cove, and Sea Cliff. 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. On July 2, 2014, a turkey vulture was flying near Tappen Marina.

**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 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 and 275 mm long–about 11 inches long—which is longer than the average size recorded) near the bar at the southern end of the North Hempstead Beach Park). On July 11 and August 19, 2009, a diamondback turtle was seen in Brewer's Marina. In 2010, a large (about a foot long) diamondback was seen 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. On June 17, 2014, a diamond back terrapin was seen at Brewer's Marina.

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 2014 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) can range from 0.25 m to 3 m, depending on the season. In 2014, the range during the monitoring period 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, a red tide was present in some bays around Long Island Sound. A red tide is generally caused by the presence of Alexandrium cells, some forms of which can be toxic, producing paralytic shellfish poisoning. Some Alexandrium cells were detected in Hempstead Harbor; larger quantities were found in Northport and the western Peconic Bay.

In 2010, unusual red-brown water color was observed on three occasions in Hempstead Harbor. On June 16, sections of the harbor were an abnormal red-brown to olive green. 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 seemed abnormally 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

Weeks prior to the September 16 conditions in Hempstead Harbor, the Connecticut shellfish program had reported "red tide" blooms, identified as *Cochlodinium polykrikoides* (Cp), in mid-Long Island Sound. 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 2014 monitoring season, the water at monitoring stations was judged to be within the normal color range of green to brown throughout most of the season. However, on May 28 and June 11, the lower harbor was greener than other areas; on June 26 and July 23, water in Tappen Marina was judged abnormally brown. Abnormally brown water was also noted on September 4 in the harbor.

# Water-Monitoring Data Sheet

**Collection Date :** ______________________________ **Time :** ____________________

**Monitor Name :** ______________________________________________

**Site Name :** CSHH #1, Beacon 11 **Location :** Hempstead Harbor

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

**% Cloud Cover :** ☐ 0% ☐ 25% ☐ 50% ☐ 75% ☐ 100% other ________

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

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

**Tidal Stage :** ☐ incoming ☐ outgoing hours to high tide : ____________

**Water Surface :** ☐ calm ☐ ripple ☐ waves ☐ whitecaps

**Water Color :**
☐ normal : ☐ brown ☐ green other ________
☐ abnormal : ☐ brown ☐ green other ________

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

Comments ______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

**Plankton** count ________ type ________ sample taken : ☐ surface ☐ below surface

**Human Activities**

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

☐ Boats, power____________ sailboats____________ kayaks____________ crew____________

☐ Anglers, at beaches____________ at piers____________

☐ Other______________________________________________

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

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

☐ Styrofoam, cups________ pieces________ ☐ Wood, boards________ pieces________

☐ Other______________________________________________

# Water Monitoring Data Sheet

**Air Temperature :** ________ °C

**Station :** **Time :** ________________ **Date:** ________________

Wind ________

Air °C ______

| Depth (meters) | Temp °C | Salinity (ppt) | DO (ppm) | pH | Secchi (meters) | Nitrogen (ppm) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | NO₂ | NO₃ | NH₃ |
| Surface | | | | | | | | |
| 0.5 | | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Station :** **Time :** ________________

Wind ________

Air °C ______

| Depth (meters) | Temp °C | Salinity (ppt) | DO (ppm) | pH | Secchi (meters) | Nitrogen (ppm) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | NO₂ | NO₃ | NH₃ |
| Surface | | | | | | | | |
| 0.5 | | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Station :** **Time :** ________________

Wind ________

Air °C ______

| Depth (meters) | Temp °C | Salinity (ppt) | DO (ppm) | pH | Secchi (meters) | Nitrogen (ppm) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | NO₂ | NO₃ | NH₃ |
| Surface | | | | | | | | |
| 0.5 | | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

# 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

LABORATORY SECTION
☐ Chemistry
☐ Environmental Microbiology
☐ Clinical Microbiology

FORM NAME:

☐ QC ☐ Equip Maint ☐ Training ☐ Comp Doc ☐ Other

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 PuBLIC HEALTH LABORATORIES
209 MAIN STREET, HEMPSTEAD, NY 11550
RODGER P. SILLETTI Ph.D., D (ABMM), DIRECTOR TELEPHONE (516) 572-1202 FAX (516) 572-1206

**COLLECTOR'S NAME**

**DATE**

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

| Field No. | Area No. | Point No. | Sample Type | Location | Time | Temperature | | Wind | Weather | Wave Height | Laboratory Use Only | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Air | Water | | | | Lab Number | Fecal Coliforms | Enterococci | Comments |
| CSHH-1 | 10 | | 5 | BEACON ELEVEN | | | | | | | | | | |
| CSHH-2 | 10 | | 5 | BELL BUOY 6 | | | | | | | | | | |
| CSHH-3 | 10 | | 5 | RED MARKER GLEN COVER CREEK | | | | | | | | | | |
| CSHH-4 | 10 | | 5 | BAR BEACH SPIT | | | | | | | | | | |
| CSHH-5 | 10 | | 5 | MOTT'S COVE | | | | | | | | | | |
| CSHH-6 | 10 | | 5 | EAST OF FORMER TNH INCINERATOR | | | | | | | | | | |
| CSHH-7 | 10 | | 5 | BRYANT LANDING | | | | | | | | | | |
| CSHH-8 | 10 | | 5 | GLEN COVE STP | | | | | | | | | | |
| CSHH-9 | | | 5 | FIRST PIPE WEST OF STP OUTFALL | | | | | | | | | | |
| CSHH-10 | | | 5 | PIPE AT CORNER OF SEAWALL WEST OF STP OUTFALL | | | | | | | | | | |
| CSHH-11 | | | 5 | 50 YARDS EAST OF STP OUTFALL | | | | | | | | | | |
| CSHH-12 | | | 5 | EAST OF STP OUTFALL BY BEND IN SEAWALL | | | | | | | | | | |
| CSHH-13 | | | 5 | 60 FEET WEST OF MILL POND WEIR | | | | | | | | | | |
| | | | | | | | | | | | | | | |

COMMENTS/REMARKS

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

DATA ENTRY

PROOFED

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

TEMP CONTROL:

TIME RECEIVED:

DATE ANALYZED:

DATE RECEIVED:

SAMPLE ACCEPTABLE: YES ☐ NO ☐

ANALYSIS SUCCESSFUL: YES ☐ NO ☐

**LABORATORY ACCREDITATION NOTICE:**

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

**VERIFICATION REVIEW**

**Name:**

**Title:**

**Date:**

**Comments:**

|  |  |  |
|---|---|---|
| **Nassau Co. DOH PHL**<br>209 Main Street<br>Hempstead, NY 11550 | FORM NAME: COALITION TO SAVE HEMPSTEAD HARBOR<br>☐ QC ☐ Equip Maint ☐ Training ☐ Comp Doc ☑ Other | |
| LABORATORY SECTION<br>☐ Chemistry<br>☑ Environmental Microbiology<br>☐ Clinical Microbiology | Form. No.: Beach Monitoring Daily Sampling Log - 1 | Rev: 2 |
| | Date: 4/8/2011 | 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
THOMAS EDWARDS, LEAD TECHNICAL DIRECTOR; CONNIE IANNUCCI, MICROBIOLOGY TECHNICAL 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 CFU/100 mL** | **Enterococci CFU/100 mL** | **Comments** |
| CSHH-14 | 10 | | | NW CORNER OF POWER PLANT ~ 50 YARDS FROM CEMENT OUTFALL | | | | | | | | | | |
| CSHH-14A | 10 | | | 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 | | | | | | | | | | |
| | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | |
| **TRIP BLANK** | | | | | | | | | | | | | | |

COMMENTS/REMARKS

**REPORT TO:** **RECREATIONAL FACILITIES**
**200 COUNTY SEAT DRIVE**
**MINEOLA, NY 11501**

***ESTIMATED COUNT**

**TNTC = "TOO NUMEROUS TO COUNT"**

**24hr rain:** **48hr rain:**

DATA ENTRY PROOFED

| **TEST** | **TECHNOLOGY** | **METHOD** |
|---|---|---|
| Fecal Coliform CFU/100 ml. | MF-QN | SM 9222 D-97, -11 |
| Enterococci CFU/100 ml | MF-QN | EPA 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. **Page 1 of 2**

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

# Appendix A

2014 CSHH Field-Monitoring Data
2014 Weekly Graphs for Water-Quality Parameters
2014 Turbidity and Secchi-Disk Transparency Graphs

# 2014 CSHH Field-Monitoring Data

## CSHH Water-Monitoring Program 2014

| 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 | Avg | Surface | Bottom | Avg | Surface | Bottom | Surface | Bottom | Avg | | | | | (Bottom) | (AM) |
| **CSHH #1 - Beacon 11** | | | | | | | | | | | | | | | | | |
| 11/5/14 | 11.7 | 12.6 | 12.2 | 26.49 | 27.55 | 27.02 | 9.24 | 8.55 | 7.53 | 7.77 | 7.65 | 15.0 | 1.2 | 1.88 | 1.99 | 5.5 | 8:00 |
| 10/29/14 | 14.8 | 14.9 | 14.9 | 25.82 | 26.11 | 25.97 | 8.06 | 7.51 | 7.37 | 7.68 | 7.53 | 17.0 | 1.5 | 2.08 | 1.52 | 3.5 | 8:14 |
| 10/22/14 | Monitoring canceled; boat moved out of marina because of construction. | | | | | | | | | | | | | | | | |
| 10/15/14 | 18.1 | 17.9 | 18 | 26.48 | 27.08 | 26.78 | 6.64 | 6.05 | 7.50 | 7.56 | 7.53 | 22.1 | 1.0 | 1.96 | 1.69 | 4.5 | 8:01 |
| 10/9/14 | 18.1 | 18.1 | 18.1 | 25.76 | 25.79 | 25.78 | 6.77 | 6.37 | 7.48 | 7.54 | 7.51 | 15.0 | 1.0 | 3.90 | 3.50 | 3.5 | 8:05 |
| 10/1/14 | 19.9 | 20.0 | 20 | 26.26 | 26.28 | 26.27 | 4.38 | 4.25 | 7.44 | 7.42 | 7.43 | 16.9 | 1.0 | 2.99 | 2.99 | 4.5 | 8:00 |
| 9/24/14 | 19.5 | 20.2 | 19.9 | 25.39 | 26.40 | 25.90 | 8.09 | 4.78 | 7.78 | 7.64 | 7.71 | 14.7 | 0.75 | 4.09 | 3.78 | 3.5 | 8:00 |
| 9/17/14 | 20.7 | 21.2 | 21 | 25.92 | 26.77 | 26.35 | 6.36 | 4.07 | 7.75 | 7.55 | 7.65 | 18.0 | 0.75 | 4.56 | 4.44 | 5.0 | 9:26 |
| 9/10/14 | 22.4 | 22.5 | 22.5 | 25.74 | 26.00 | 25.87 | 5.60 | 5.03 | 7.45 | 7.63 | 7.54 | 18.4 | 0.5 | 4.13 | N/A | 3.5 | 7:50 |
| 9/4/14 | 24.1 | 23.9 | 24 | 26.06 | 26.26 | 26.16 | 6.16 | 3.94 | 7.76 | 7.55 | 7.66 | 22.4 | 0.5 | 3.52 | N/A | 5.0 | 8:05 |
| 8/27/14 | 23.6 | 23.5 | 23.6 | 25.68 | 26.05 | 25.87 | 5.33 | 3.34 | 7.55 | 7.40 | 7.48 | 22.8 | 0.75 | 4.09 | 4.21 | 3.5 | 8:00 |
| 8/21/14 | 23.3 | 22.4 | 22.9 | 25.83 | 26.83 | 26.33 | 5.79 | 2.08 | 7.48 | 7.21 | 7.35 | 22.7 | 1.0 | 2.33 | 2.53 | 5.0 | 8:18 |
| 8/14/14 | 22.0 | 22.2 | 22.1 | 24.41 | 24.44 | 24.43 | 3.34 | 2.87 | 7.23 | 7.19 | 7.21 | 19.0 | 1.25 | 2.42 | 3.08 | 3.0 | 8:03 |
| 8/6/14 | 22.5 | 21.7 | 22.1 | 26.68 | 26.27 | 26.48 | 6.89 | 3.56 | 7.67 | 7.40 | 7.54 | 22.1 | 0.5 | 2.26 | N/A | 5.5 | 8:10 |
| 7/30/14 | 22.8 | 22.8 | 22.8 | 25.21 | 25.43 | 25.32 | 6.94 | 6.38 | 7.69 | 7.68 | 7.69 | 19.5 | 1.0 | 4.18 | 3.55 | 3.25 | 8:05 |
| 7/23/14 | 21.5 | 21.0 | 21.3 | 25.60 | 26.00 | 25.80 | 4.04 | 2.83 | 7.38 | 7.30 | 7.34 | 24.3 | 0.5 | 8.82 | N/A | 3.5 | 8:05 |
| 7/17/14 | 20.3 | 20.3 | 20.3 | 25.27 | 25.32 | 25.30 | 5.01 | 4.28 | 7.5** | | | 20.9 | 1.0 | 3.61 | 3.20 | 4.0 | 8:14 |
| 7/9/14 | 21.1 | 17.2 | 19.2 | 25.07 | 26.12 | 25.60 | 6.07 | 3.53 | 7.66 | 7.30 | 7.48 | 25.8 | 0.75 | 3.11 | 2.97 | 4.75 | 8:06 |
| 7/2/14 | 20.4 | 18.8 | 19.6 | 24.57 | 25.27 | 24.92 | 4.39 | 2.59 | 7.25 | 7.30 | 7.28 | 25.6 | 0.5 | 2.91 | N/A | 4.0 | 7:53 |
| 6/26/14 | 20.2 | 18.2 | 19.2 | 24.54 | 25.21 | 24.88 | 5.29 | 2.61 | 7.49 | 7.22 | 7.36 | 23.4 | 0.5 | 2.63 | N/A | 3.5 | 8:00 |
| 6/18/14 | 20.3 | 20.1 | 20.2 | 23.42 | 23.57 | 23.50 | 6.26 | 5.01 | 7.55 | 7.57 | 7.56 | 27.4 | 0.5 | 3.76 | N/A | 4.0 | 8:00 |
| 6/11/14 | 18.6 | 17.4 | 18 | 23.95 | 24.74 | 24.35 | 7.55 | 4.35 | 7.80 | 7.76 | 7.78 | 17.6 | 0.5 | 4.14 | N/A | 5.0 | 8:35 |
| 6/4/14 | 17.2 | 16.7 | 17 | 24.27 | 24.56 | 24.42 | 6.74 | 7.13* | 7.63 | 7.66 | 7.65 | 19.6 | 1.0 | 2.70 | 3.18 | 5.0 | 8:30 |
| 5/28/14 | 17.2 | 15.7 | 16.5 | 23.83 | 24.44 | 24.14 | 8.41 | 7.71 | 7.72 | 7.71 | 7.72 | 13.3 | 0.75 | 2.83 | 2.67 | 3.5 | 8:10 |
| 5/21/14 | 16.4 | 15.0 | 15.7 | 23.70 | 24.57 | 24.14 | 9.30 | 8.12 | 7.94 | 8.07 | 8.01 | 20.7 | 1.0 | 2.38 | 2.23 | 7.0 | 8:40 |
| *Problem with meter; bottom DO check with Winkler titration equaled 6.1 as compared with 7.13 meter reading. | | | | | | | | | | | | | | | | | |
| **pH probe on meter malfunctioned and was unusable for rest of 7/17 survey; 7.5 ppm is the reading from the LaMotte pH kit, which is used as check against the meter. | | | | | | | | | | | | | | | | | |

# 2014 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 | Avg | Surface | Bottom | Avg | Surface | Bottom | Surface | Bottom | Avg | | | | | (Bottom) | (AM) |
| **CSHH #2 - Bell Marker 6** | | | | | | | | | | | | | | | | | |
| 11/5/14 | 13.1 | 13.1 | 13.1 | 27.75 | 27.74 | 27.75 | 8.83 | 8.65 | 7.91 | 7.92 | 7.92 | 17.6 | 1.25 | 1.99 | 0.78 | 11.0 | 9:50 |
| 10/29/14 | 15.3 | 15.5 | 15.4 | 26.93 | 27.08 | 27.01 | 7.89 | 7.59 | 7.85 | 7.82 | 7.84 | 19.1 | 1.75 | 0.70 | 0.98 | 8.25 | 8:54 |
| 10/22/14 | Monitoring canceled; boat moved out of marina because of construction. | | | | | | | | | | | | | | | | |
| 10/15/14 | 18.0 | 17.9 | 18.0 | 27.14 | 27.36 | 27.25 | 6.76 | 5.98 | 7.68 | 7.61 | 7.65 | 22.9 | 1.5 | 1.07 | 1.01 | 9.0 | 0.35 |
| 10/9/14 | 18.4 | 18.5 | 18.5 | 26.55 | 26.60 | 26.58 | 7.78 | 6.91 | 7.74 | 7.70 | 7.72 | 16.0 | 1.0 | 2.31 | 1.77 | 9.75 | 8:45 |
| 10/1/14 | 20.2 | 20.2 | 20.2 | 27.06 | 27.07 | 27.07 | 6.02 | 5.89 | 7.68 | 7.66 | 7.67 | 17.5 | 1.0 | 2.10 | 2.49 | 7.5 | 8:25 |
| 9/24/14 | 20.5 | 20.6 | 20.6 | 26.69 | 26.74 | 26.72 | 7.08 | 5.67 | 7.78 | 7.64 | 7.71 | 18.2 | 1.0 | 2.32 | 1.85 | 7.5 | 8:31 |
| 9/17/14 | 21.5 | 21.4 | 21.5 | 27.20 | 27.21 | 27.21 | 6.53 | 5.51 | 7.65 | 7.60 | 7.63 | 18.3 | 1.5 | 1.83 | 1.52 | 8.5 | 9:46 |
| 9/10/14 | 22.6 | 22.6 | 22.6 | 26.74 | 26.94 | 26.84 | 6.31 | 5.23 | 7.78 | 7.71 | 7.75 | 18.1 | 0.75 | 2.25 | 2.42 | 6.5 | 8:25 |
| 9/4/14 | 24.2 | 22.9 | 23.6 | 26.37 | 26.93 | 26.65 | 8.79 | 1.24 | 8.09 | 7.31 | 7.70 | 22.8 | 0.75 | 2.23 | 2.28 | 9.5 | 8:36 |
| 8/27/14 | 23.5 | 22.9 | 23.2 | 26.54 | 26.70 | 26.62 | 8.07 | 3.86 | 7.98 | 7.46 | 7.72 | 25.8 | 1.0 | 2.04 | 2.65 | 8.25 | 9:01 |
| 8/21/14 | 23.2 | 22.4 | 22.8 | 26.69 | 26.82 | 26.76 | 8.06 | 3.69 | 7.90 | 7.48 | 7.69 | 25.1 | 1.0 | 1.55 | 1.71 | 9.5 | 10:13 |
| 8/14/14 | 22.2 | 22.3 | 22.3 | 26.52 | 26.65 | 26.59 | 4.74 | 4.39 | 7.57 | 7.56 | 7.57 | 19.2 | 1.0 | 2.70 | 2.09 | 8.5 | 8:25 |
| 8/6/14 | 22.5 | 21.2 | 21.9 | 26.28 | 26.44 | 26.36 | 7.85 | 2.97 | 8.06 | 7.38 | 7.72 | 23.8 | 1.2 | 1.02 | 1.03 | 9.5 | 10:00 |
| 7/30/14 | 22.7 | 21.2 | 22.0 | 26.21 | 26.43 | 26.32 | 7.73 | 2.00 | 7.97 | 7.34 | 7.66 | 21.6 | 0.75 | 2.54 | 2.09 | 7.5 | 8:45 |
| 7/23/14 | 22.3 | 21.4 | 21.9 | 25.94 | 26.10 | 26.02 | 8.52 | 5.50 | 8.02 | 7.77 | 7.90 | 27.5 | 0.75 | 3.97 | 4.35 | 11.0 | 9:53 |
| 7/17/14 | 20.8 | 19.6 | 20.2 | 25.89 | 26.18 | 26.04 | 10.58 | 3.65 | no data | no data | | 22.7 | 0.5 | no data | no data | 7.0 | 10:00 |
| 7/9/14 | 19.6 | 16.1 | 17.9 | 25.62 | 26.44 | 26.03 | 6.25 | 2.43 | 7.75 | 7.32 | 7.54 | 27.3 | 1.5 | 0.96 | 0.67 | 9.25 | 10:00 |
| 7/2/14 | 21.0 | 16.9 | 19.0 | 25.21 | 25.68 | 25.45 | 6.03 | 2.16 | 7.67 | 7.23 | 7.45 | 25.8 | 1.0 | 0.97 | 1.16 | 8.0 | 8:28 |
| 6/26/14 | 20.5 | 16.8 | 18.7 | 24.70 | 25.53 | 25.12 | 8.32 | 3.55 | 7.93 | 7.35 | 7.64 | 23.4 | 0.75 | 1.97 | 1.16 | 9.5 | 8:38 |
| 6/18/14 | **Abandoned because of high wind and waves.** | | | | | | | | | | | | | | | | |
| 6/11/14 | 18.6 | 16.0 | 17.3 | 24.47 | 25.06 | 24.77 | 9.98 | 4.66 | 8.20 | 7.61 | 7.91 | 18.3 | 0.75 | 1.50 | 1.65 | 9.5 | 10:35 |
| 6/4/14 | 17.5 | 15.5 | 16.5 | 24.52 | 24.85 | 24.69 | 9.52 | 7.58* | 8.08 | 7.72 | 7.90 | 9.4 | 1.0 | 1.25 | 1.10 | 7.5 | 9:07 |
| 5/28/14 | 16.7 | 12.5 | 14.6 | 24.36 | 25.24 | 24.80 | 11.42 | 7.83 | 8.16 | 7.76 | 7.96 | 13.2 | 1.0 | 1.83 | 1.72 | 7.5 | 8:30 |
| 5/21/14 | 16.5 | 13.8 | 15.2 | 24.22 | 24.75 | 24.49 | 11.67 | 8.62 | 8.27 | 7.98 | 8.13 | 19.5 | 1.0 | 1.36 | 1.09 | 10.0 | 9:30 |
| *Problem with meter; bottom DO check with Winkler titration equaled 6.2 as compared with 7.58 meter reading. | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| **CSHH #3 - Glen Cove Creek, Red Marker** | | | | | | | | | | | | | | | | | |
| 11/5/14 | 12.2 | 12.4 | 12.3 | 27.15 | 27.38 | 27.27 | 8.68 | 8.54 | 7.90 | 7.88 | 7.89 | 16.8 | 0.75 | 1.15 | 1.06 | 5.5 | 10:10 |
| 10/29/14 | 15.1 | 15.2 | 15.2 | 25.71 | 26.72 | 26.22 | 7.64 | 7.85 | 7.80 | 7.82 | 7.81 | 19.2 | 1.25 | 1.87 | 1.14 | 4.0 | 9:20 |
| 10/22/14 | Monitoring canceled; boat moved out of marina because of construction. | | | | | | | | | | | | | | | | |

# 2014 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 | Avg | Surface | Bottom | Avg | Surface | Bottom | Surface | Bottom | Avg | | | | | (Bottom) | (AM) |
| 10/15/14 | 18.0 | 17.8 | 17.9 | 26.17 | 27.02 | 26.60 | 6.15 | 6.02 | 7.63 | 7.62 | 7.63 | 23.0 | 1.2 | 1.00 | 1.26 | 4.25 | 9:00 |
| 10/9/14 | 18.0 | 18.1 | 18.1 | 26.10 | 26.21 | 26.16 | 7.71 | 7.43 | 7.77 | 7.65 | 7.71 | 16.5 | 1.2 | 1.82 | 1.97 | 4.5 | 9:17 |
| 10/1/14 | 20.3 | 20.4 | 20.4 | 26.90 | 27.19 | 27.05 | 5.25 | 4.99 | 7.59 | 7.56 | 7.58 | 17.2 | 1.0 | 3.05 | 1.89 | 4.0 | 8:40 |
| 9/24/14 | 20.2 | 20.5 | 20.4 | 26.17 | 26.53 | 26.35 | 8.02 | 5.79 | 7.97 | 7.73 | 7.85 | 18.7 | 0.75 | 2.87 | 3.23 | 4.5 | 9:04 |
| 9/17/14 | 21.5 | 21.4 | 21.5 | 26.19 | 27.12 | 26.66 | 5.86 | 4.88 | 7.71 | 7.64 | 7.68 | 19.3 | 1.0 | 2.45 | 2.91 | 5.5 | 10:11 |
| 9/10/14 | 22.6 | 22.6 | 22.6 | 26.53 | 26.59 | 26.56 | 6.02 | 5.07 | 7.80 | 7.71 | 7.76 | 18.5 | 0.75 | 2.00 | 2.22 | 3.5 | 8:48 |
| 9/4/14 | 24.7 | 23.6 | 24.2 | 25.75 | 26.47 | 26.11 | 8.38 | 3.18 | 8.06 | 7.51 | 7.79 | 25.1 | 0.5 | 3.28 | N/A | 5.25 | 9:02 |
| 8/27/14 | 24.1 | 23.1 | 23.6 | 26.12 | 26.63 | 26.38 | 9.18 | 3.04 | 8.08 | 7.43 | 7.76 | 27.0 | 1.0 | 2.98 | 2.89 | 4.3 | 9:50 |
| 8/21/14 | 24.1 | 22.4 | 23.3 | 26.17 | 26.86 | 26.52 | 7.07 | 2.38 | 7.83 | 7.31 | 7.57 | 26.4 | 0.75 | 2.34 | 2.71 | 5.5 | 10:38 |
| 8/14/14 | 22.0 | 22.1 | 22.1 | 25.54 | 25.84 | 25.69 | 5.15 | 4.91 | 7.55 | 7.55 | 7.55 | 19.7 | 1.0 | 1.76 | 2.20 | 2.5 | 9:03 |
| 8/6/14 | 23.2 | 22.1 | 22.7 | 25.33 | 26.32 | 25.83 | 7.65 | 6.55 | 7.92 | 7.84 | 7.88 | 24.2 | 1.0 | 1.41 | 1.33 | 4.5 | 10:25 |
| 7/30/14 | 22.8 | 22.8 | 22.8 | 25.76 | 26.02 | 25.89 | 9.80 | 7.43 | 8.15 | 7.91 | 8.03 | 20.5 | 0.75 | 2.41 | 2.41 | 3.5 | 9:06 |
| 7/23/14 | 22.7 | 21.4 | 22.1 | 25.77 | 25.91 | 25.84 | 8.76 | 4.06 | 8.09 | 7.47 | 7.78 | 27.2 | 0.75 | 6.21 | 6.78 | 5.5 | 10:08 |
| 7/17/14 | 21.1 | 20.1 | 20.6 | 25.55 | 26.08 | 25.82 | 5.54 | 5.66 | no data | no data | | 22.9 | 2.0 | no data | no data | 3.0 | 10:30 |
| 7/9/14 | 21.7 | 18.1 | 19.9 | 25.06 | 26.00 | 25.53 | 6.64 | 3.03 | 7.84 | 7.38 | 7.61 | 27.7 | 1.0 | 1.81 | 1.16 | 5.5 | 10:30 |
| 7/2/14 | 20.8 | 18.9 | 19.9 | 24.87 | 25.37 | 25.12 | 6.36 | 3.09 | 7.71 | 7.34 | 7.53 | 27.2 | 0.75 | 1.78 | 1.07 | 3.5 | 9:10 |
| 6/26/14 | 20.9 | 19.4 | 20.2 | 24.54 | 25.00 | 24.77 | 10.33 | 4.86 | 8.16 | 7.52 | 7.84 | 24.5 | 0.5 | 3.99 | N/A | 4.5 | 9:05 |
| 6/18/14 | 21.3 | 20.1 | 20.7 | 23.46 | 24.18 | 23.82 | 8.26 | 6.67 | 8.06 | 7.79 | 7.93 | 25.0 | 0.75 | 2.57 | 2.63 | 3.0 | 9:08 |
| 6/11/14 | 18.2 | 17.3 | 17.8 | 24.10 | 24.79 | 24.45 | 8.46 | 6.82 | 8.01 | 7.84 | 7.93 | 19.3 | 0.75 | 1.99 | 1.85 | 5.5 | 11:10 |
| 6/4/14 | 17.3 | 16.1 | 16.7 | 24.06 | 24.72 | 24.39 | 7.11 | 5.8* | 7.81 | 7.72 | 7.77 | 21.4 | 1.0 | 1.58 | 1.82 | 3.5 | 10:04 |
| 5/28/14 | 16.4 | 15.5 | 16.0 | 24.20 | 24.49 | 24.35 | 10.36 | 8.11 | 8.11 | 7.93 | 8.02 | 13.0 | 1.0 | 1.59 | 2.32 | 4.5 | 9:00 |
| 5/21/14 | 16.7 | 14.9 | 15.8 | 23.45 | 24.52 | 23.99 | 10.56 | 10.58 | 8.14 | 8.14 | 8.14 | 19.9 | 0.8 | 2.43 | 2.69 | 3.5 | 10:05 |
| *Problem with meter; bottom DO check with Winkler titration equaled 6.8 as compared with 5.80 meter reading. | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| **CSHH #8 - Glen Cove Sewage Treatment Plant Outfall** | | | | | | | | | | | | | | | | | |
| 11/5/14 | 13.3 | 12.1 | 12.7 | 21.23 | 26.80 | 24.02 | 8.61 | 8.54 | 7.68 | 7.77 | 7.73 | 17.8 | 0.75 | 1.23 | 2.60 | 4.0 | 10:30 |
| 10/29/14 | 15.5 | 14.9 | 15.2 | 21.58 | 25.67 | 23.63 | 6.85 | 6.89 | 7.57 | 7.65 | 7.61 | 19.4 | 0.5 | 5.25 | N/A | 3.0 | 9:39 |
| 10/22/14 | Monitoring canceled; boat moved out of marina because of construction. | | | | | | | | | | | | | | | | |
| 10/15/14 | 17.7 | 17.9 | 17.8 | 22.52 | 26.59 | 24.56 | 5.39 | 5.83 | 7.48 | 7.55 | 7.52 | 23.6 | 1.0 | 1.66 | 1.39 | 3.5 | 9:16 |
| 10/9/14 | 18.2 | 17.7 | 18.0 | 19.17 | 25.02 | 22.10 | 6.85 | 6.85 | 7.54 | 7.51 | 7.53 | 16.3 | 0.75 | 3.75 | 3.75 | 3.0 | 9:42 |
| 10/1/14 | 20.3 | 20.4 | 20.4 | 25.97 | 26.93 | 26.45 | 4.30 | 4.70 | 7.56 | 7.55 | 7.56 | 16.9 | 0.75 | 2.35 | 2.37 | 3.0 | 8:55 |
| 9/24/14 | 20.8 | 20.6 | 20.7 | 23.55 | 26.23 | 24.89 | 7.27 | 6.71 | 7.82 | 7.81 | 7.82 | 18.8 | 0.75 | 2.79 | 3.77 | 3.5 | 9:22 |
| 9/17/14 | 21.6 | 21.4 | 21.5 | 25.92 | 26.66 | 26.29 | 4.80 | 5.05 | 7.57 | 7.63 | 7.60 | 19.2 | 0.75 | 3.09 | 4.46 | 3.0 | 10:27 |
| 9/10/14 | 22.5 | 22.9 | 22.7 | 24.59 | 26.53 | 25.56 | 4.10 | 3.08 | 7.50 | 7.47 | 7.49 | 19.5 | 1.0 | 2.66 | 2.52 | 3.0 | 9:13 |

# 2014 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 | Avg | Surface | Bottom | Avg | Surface | Bottom | Surface | Bottom | Avg | | | | | (Bottom) | (AM) |
| 9/4/14 | 24.4 | 24.6 | 24.5 | 21.20 | 26.07 | 23.64 | 7.21 | 7.24 | 7.79 | 7.95 | 7.87 | 25.4 | 0.5 | 3.28 | N/A | 3.25 | 9:25 |
| 8/27/14 | 24.1 | 23.8 | 24.0 | 22.08 | 26.25 | 24.17 | 8.69 | 6.95 | 7.91 | 7.87 | 7.89 | 27.7 | 0.75 | 3.09 | 3.55 | 4.5 | 10:20 |
| 8/21/14 | 23.3 | 23.4 | 23.4 | 19.70 | 26.40 | 23.05 | 7.37 | 5.41 | 7.57 | 7.37 | 7.47 | 26.0 | 0.75 | 3.57 | 3.71 | 4.5 | 11:10 |
| 8/14/14 | 22.4 | 22.6 | 22.5 | 21.87 | 25.66 | 23.77 | 4.26 | 3.23 | 7.36 | 7.38 | 7.37 | 19.6 | 0.75 | 4.01 | 2.42 | 2.0 | 9:18 |
| 8/6/14 | 22.9 | 22.5 | 22.7 | 21.79 | 26.12 | 23.96 | 5.68 | 5.10 | 7.60 | 7.64 | 7.62 | 24.7 | 0.75 | 2.08 | 1.85 | 3.75 | 10:40 |
| 7/30/14 | 22.9 | 23.0 | 23.0 | 18.72 | 25.78 | 22.25 | 6.69 | 4.51 | 7.68 | 7.62 | 7.65 | 21.5 | 0.75 | 2.69 | 2.37 | 2.5 | 9:34 |
| 7/23/14 | 22.9 | 21.9 | 22.4 | 20.36 | 25.73 | 23.05 | 5.5 | 3.98 | 7.53 | 7.47 | 7.50 | 29.3 | 0.5 | 7.38 | N/A | 3.5 | 10:31 |
| 7/17/14 | 21.8 | 20.7 | 21.3 | 16.04 | 25.70 | 20.87 | 6.09 | 3.96 | no data | no data | | 24.0 | 1.25 | no data | no data | 1.75 | 11:10 |
| 7/9/14 | 22.8 | 20.0 | 21.4 | 19.31 | 25.50 | 22.41 | 5.29 | 3.16 | 7.52 | 7.47 | 7.50 | 28.4 | 0.75 | 3.28 | 4.31 | 4.5 | 10:48 |
| 7/2/14 | 21.2 | 20.5 | 20.9 | 17.75 | 24.89 | 21.32 | 5.08 | 2.58 | 7.40 | 7.31 | 7.36 | 28.5 | 0.5 | 4.04 | N/A | 3.5 | 9:32 |
| 6/26/14 | 21.2 | 20.4 | 20.8 | 19.99 | 24.71 | 22.35 | 6.89 | 5.46 | 7.60 | 7.64 | 7.62 | 25.0 | 0.75 | 2.06 | 2.45 | 4.0 | 9:28 |
| 6/18/14 | 21.0 | 20.6 | 20.8 | 23.17 | 24.08 | 23.63 | 7.15 | 5.76 | 7.87 | 7.90 | 7.89 | 27.8 | 0.5 | 3.32 | N/A | 1.5 | 9:32 |
| 6/11/14 | 18.8 | 17.9 | 18.4 | 23.92 | 24.63 | 24.28 | 6.21 | 5.49 | 7.88 | 7.81 | 7.85 | 20.8 | 0.5 | 4.96 | N/A | 4.5 | 11:34 |
| 6/4/14 | 18.7 | 17.6 | 18.2 | 22.58 | 24.54 | 23.56 | 7.85 | 5.59* | 7.86 | 7.70 | 7.78 | 21.5 | 0.75 | 3.53 | 2.82 | 2.5 | 10:45 |
| 5/28/14 | 17.2 | 16.2 | 16.7 | 20.62 | 23.07 | 21.85 | 7.86 | 8.56 | 7.85 | 7.98 | 7.92 | 14.3 | 0.75 | 3.05 | 2.84 | 4.5 | 9:24 |
| 5/21/14 | 17.0 | 16.4 | 16.7 | 19.82 | 23.86 | 21.84 | 11.22 | 10.30 | 8.14 | 8.13 | 8.14 | 22.5 | 0.70 | 2.16 | 2.24 | 2.5 | 10:20 |
| *No Winkler titration for this station. | | | | | | | | | | | | | | | | | |
| Red numbers indicate that the readings were unusually low or high but reflect station conditions. | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| **CSHH #13 - 60' West of the Mill Pond Weir** | | | | | | | | | | | | | | | | | |
| 11/5/14 | 12.8 | 12.1 | 12.5 | 17.88 | 26.38 | 22.13 | 7.54 | 7.30 | 7.48 | 7.55 | 7.52 | 17.8 | 0.75 | 2.54 | 3.82 | 3.0 | 10:40 |
| 10/29/14 | 14.7 | 14.8 | 14.8 | 17.84 | 24.69 | 21.27 | 5.66 | 4.79 | 7.50 | 7.40 | 7.45 | 19.9 | 0.50 | 7.05 | N/A | 1.5 | 9:55 |
| 10/22/14 | Monitoring canceled; boat moved out of marina because of construction. | | | | | | | | | | | | | | | | |
| 10/15/14 | 17.1 | 17.6 | 17.4 | 19.08 | 26.08 | 22.58 | 4.54 | 4.28 | 7.22 | 7.28 | 7.25 | 23.6 | 0.75 | 3.59 | 2.71 | 1.5 | 9:34 |
| 10/9/14 | 14.1 | 18.4 | 16.3 | 1.90 | 24.53 | 13.22 | 9.27 | 5.20 | 7.96 | 7.40 | 7.68 | 16.6 | 0.75 | 4.27 | 4.20 | 2.25 | 9:55 |
| 10/1/14 | 20.4 | 20.5 | 20.5 | 25.85 | 26.49 | 26.17 | 2.69 | 2.50 | 7.40 | 7.36 | 7.38 | 17.1 | 0.75 | 5.96 | 7.58 | 1.5 | 9:06 |
| 9/24/14 | 19.9 | 20.6 | 20.3 | 21.88 | 26.13 | 24.01 | 4.93 | 5.26 | 7.61 | 7.61 | 7.61 | 19.1 | 0.75 | 4.05 | 4.47 | 2.0 | 9:34 |
| 9/17/14 | 21.8 | 21.8 | 21.8 | 26.17 | 26.72 | 26.45 | 1.89 | 2.38 | 7.27 | 7.32 | 7.30 | 19.4 | 0.75 | 4.71 | 5.18 | 2.0 | 10:41 |
| 9/10/14 | 22.8 | 22.9 | 22.9 | 26.05 | 26.42 | 26.24 | 1.90 | 1.80 | 7.36 | 7.35 | 7.36 | 19.8 | 0.75 | 4.95 | 5.73 | 1.5 | 9:32 |
| 9/4/14 | 21.60 | 24.60 | 23.1 | 15.86 | 25.90 | 20.88 | 6.12 | 2.97 | 7.42 | 7.40 | 7.41 | 25.2 | 0.75 | 5.50 | 5.85 | 2.5 | 9:40 |
| 8/27/14 | 22.2 | 23.5 | 22.9 | 18.61 | 25.72 | 22.17 | 5.55 | 4.49 | 7.42 | 7.43 | 7.43 | 27.5 | 0.75 | 7.41 | 8.40 | 2.0 | 10:56 |
| 8/21/14 | 21.4 | 23.6 | 22.5 | 12.43 | 26.20 | 19.32 | 8.83 | 6.31 | 7.61 | 7.27 | 7.44 | 27.6 | 0.5 | 4.99 | N/A | 3.0 | 11:30 |
| 8/14/14 | 20.5 | 22.4 | 21.5 | 15.73 | 25.04 | 20.39 | 4.80 | 1.43 | 7.18 | 7.11 | 7.15 | 19.7 | 0.5 | 4.59 | N/A | 1.3 | 9:41 |
| 8/6/14 | 22.1 | 22.0 | 22.1 | 23.20 | 25.77 | 24.49 | 3.92 | 1.21 | 7.25 | 7.19 | 7.22 | 25.4 | 0.75 | 3.27 | 3.58 | 2.5 | 11:00 |

# 2014 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 | Avg | Surface | Bottom | Avg | Surface | Bottom | Surface | Bottom | Avg | | | | | (Bottom) | (AM) |
| 7/30/14 | 20.6 | 22.8 | 21.7 | 22.56 | 25.43 | 24.00 | 4.51 | 1.98 | 7.32 | 7.29 | 7.31 | 22.0 | 0.5 | 4.01 | N/A | 1.5 | 9:55 |
| 7/23/14 | 19.1 | 22.0 | 20.6 | 4.62 | 25.39 | 15.01 | 8.15 | 1.81 | 7.38 | 7.30 | 7.34 | 29.8 | 0.75 | 5.69 | 11.1 | 2.5 | 10:50 |
| 7/17/14 | 20.5 | 21.0 | 20.8 | 20.77 | 25.21 | 22.99 | 3.09 | 2.36 | no data | no data | | 25.4 | 1.0 | no data | no data | 1.0 | 11:25 |
| 7/9/14 | 19.2 | 21.8 | 20.5 | 3.04 | 24.82 | 13.93 | 8.78 | 1.77 | 7.59 | 7.22 | 7.41 | 28.6 | 0.75 | 6.49 | 7.71 | 2.5 | 11.02 |
| 7/2/14 | 18.2 | 20.6 | 19.4 | 3.68 | 24.06 | 13.87 | 8.37 | 2.49 | 7.79 | 7.42 | 7.61 | 28.2 | 0.5 | 7.13 | N/A | 1.0 | 9:50 |
| 6/26/14 | 20.8 | 20.6 | 20.7 | 22.64 | 24.33 | 23.49 | 5.51 | 3.07 | 7.43 | 7.28 | 7.36 | 25.5 | 0.5 | 4.36 | N/A | 2.25 | 9:45 |
| 6/18/14 | 18.8 | 19.8 | 19.3 | 5.58 | 21.96 | 13.77 | 7.91 | 4.81 | 7.22 | 7.28 | 7.25 | 28.2 | 0.5 | 4.10 | N/A | 0.75 | 9:52 |
| 6/11/14 | 18.9 | 18.3 | 18.6 | 23.95 | 24.52 | 24.24 | 3.78 | 2.99 | 7.48 | 7.42 | 7.45 | 21.1 | 0.5 | 8.59 | N/A | 3.0 | 11:55 |
| 6/4/14 | 17.4 | 17.5 | 17.5 | 22.22 | 24.21 | 23.22 | 3.08 | 2.28* | 7.27 | 7.31 | 7.29 | 22.4 | 0.5 | 7.25 | N/A | 1.5 | 11:02 |
| 5/28/14 | 18.2 | 17.5 | 17.9 | 23.34 | 23.81 | 23.58 | 7.32 | 3.27 | 7.72 | 7.35 | 7.54 | 14.2 | 0.75 | 3.72 | 4.94 | 3.5 | 9:38 |
| 5/21/14 | 16.8 | 16.7 | 16.8 | 15.33 | 23.26 | 19.30 | 10.50 | 10.40 | 7.96 | 7.93 | 7.95 | 22.2 | 0.5 | 6.79 | N/A | 1.0 | 10:45 |
| Red numbers indicate that the readings were unusually low or high but reflect station conditions. | | | | | | | | | | | | | | | | | |
| *No winkler titration for this station. | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| **CSHH #14 - 50 yds from Powerhouse Drain** | | | | | | | | | | | | | | | | | |
| 11/5/14 | No access because of power-plant demolition. | | | | | | | | | | | | | | | | |
| 10/9/14 | 17.9 | 18.0 | 18.0 | 25.97 | 26.00 | 25.99 | 7.78 | 7.57 | 7.62 | 7.68 | 7.65 | 17.5 | 0.75 | 3.12 | 2.51 | 2.5 | 10:35 |
| 9/17/14 | 20.7 | 20.8 | 20.8 | 26.00 | 26.14 | 26.07 | 5.61 | 5.30 | 7.63 | 7.60 | 7.62 | 17.2 | 0.75 | 3.29 | 2.92 | 2.0 | 9:02 |
| 8/21/14 | 23.2 | 23.0 | 23.1 | 26.05 | 26.25 | 26.15 | 4.35 | 2.75 | 7.43 | 7.30 | 7.37 | 23.3 | 0.75 | 2.85 | 2.68 | 2.25 | 8:30 |
| 8/6/14 | 22.5 | 22.5 | 22.5 | 25.67 | 25.81 | 25.74 | 5.67 | 5.69 | 7.67 | 7.67 | 7.67 | 22.5 | 0.5 | 2.79 | N/A | 2.5 | 8:28 |
| 7/23/14 | 21.5 | 21.4 | 21.5 | 25.63 | 25.67 | 25.65 | 3.62 | 3.19 | 7.37 | 7.33 | 7.35 | 26.2 | 0.5 | 7.40 | N/A | 2.0 | 8:22 |
| 7/9/14 | 19.2 | 18.9 | 19.1 | 25.60 | 25.73 | 25.67 | 3.32 | 3.23 | 7.43 | 7.41 | 7.42 | 25.9 | 1.0 | 1.49 | 1.66 | 2.0 | 8:27 |
| 6/26/14 | 20.7 | 20.1 | 20.4 | 24.53 | 24.76 | 24.65 | 8.75 | 6.32 | 7.98 | 7.63 | 7.81 | 26.1 | 0.5 | 4.96 | N/A | 3.5 | 10:35 |
| 6/11/14 | 18.5 | 18.5 | 18.5 | 24.04 | 24.03 | 24.04 | 6.36 | 6.62 | 7.73 | 7.73 | 7.73 | 17.9 | 0.5 | 5.00 | N/A | 2.5 | 8:56 |
| Red numbers indicate that the readings were unusually low or high but reflect station conditions. | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| **CSHH #15 - 50 yds from Scudder's Pond Outfall, North of Tappen Pool** | | | | | | | | | | | | | | | | | |
| 11/5/14 | 12.0 | 12.0 | 12.0 | 26.82 | 27.02 | 26.92 | 8.07 | 8.31 | 7.82 | 7.82 | 7.82 | 16.9 | 1.0 | 1.59 | 1.30 | 2.0 | 9:36 |
| 10/9/14 | 18.3 | 18.3 | 18.3 | 25.77 | 26.15 | 25.96 | 8.32 | 8.18 | 7.81 | 7.81 | 7.81 | 19.8 | 0.75 | 2.56 | 3.09 | 2.25 | 12:00 |
| 9/17/14 | **no data** | | | | | | | | | | | | | | | | |
| 8/21/14 | 23.3 | 23.2 | 23.3 | 26.31 | 26.41 | 26.36 | 3.70 | 3.01 | 7.36 | 7.32 | 7.34 | 25.1 | 0.75 | 2.34 | 2.58 | 1.75 | 10:00 |
| 8/6/14 | 22.7 | 22.5 | 22.6 | 25.68 | 25.99 | 25.84 | 6.27 | 5.88 | 7.73 | 7.74 | 7.74 | 23.6 | 1.2 | 1.56 | 1.32 | 2.0 | 9:45 |
| 7/23/14 | 21.6 | 21.5 | 21.6 | 25.46 | 25.53 | 25.50 | 3.76 | 3.31 | 7.36 | 7.32 | 7.34 | 27.4 | 0.5 | 8.08 | N/A | 1.5 | 9:33 |
| 7/9/14 | 21.6 | 20.8 | 21.2 | 24.88 | 25.39 | 25.14 | 6.18 | 4.82 | 7.64 | 7.51 | 7.58 | 26.3 | 1.0 | 3.05 | 2.29 | 2.0 | 9:45 |

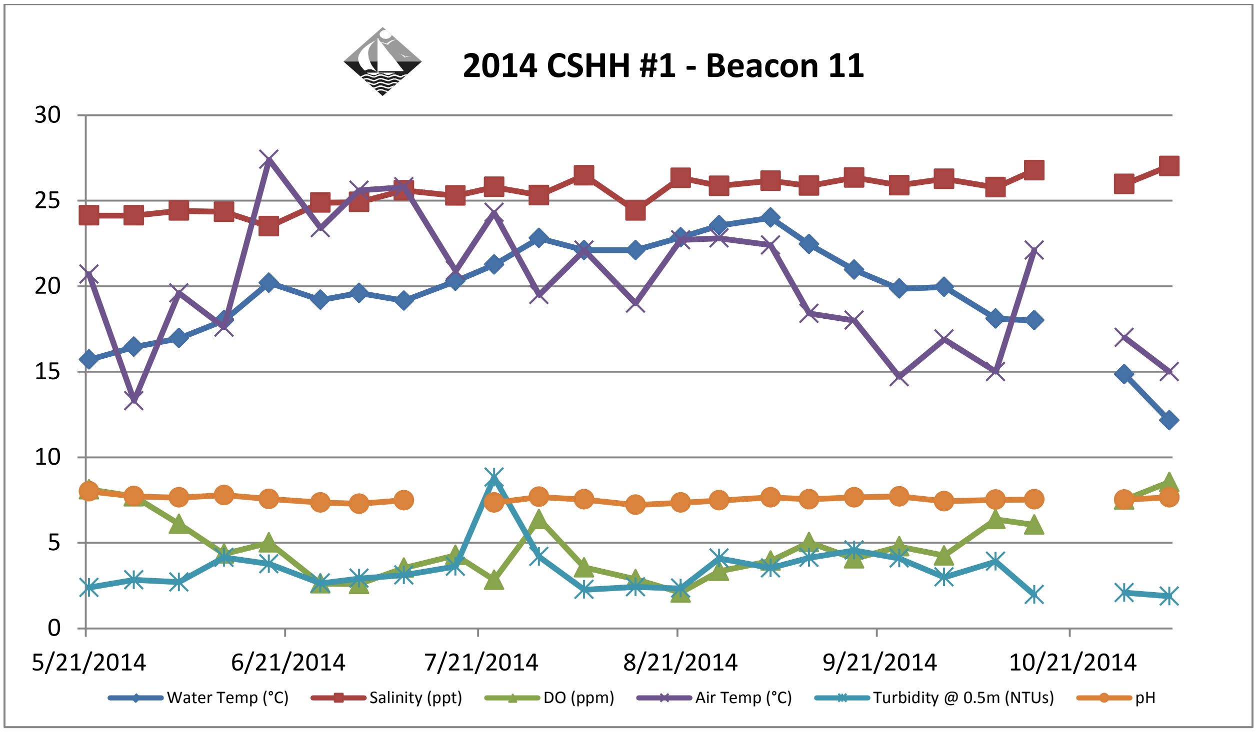
# 2014 CSHH Field-Monitoring Data

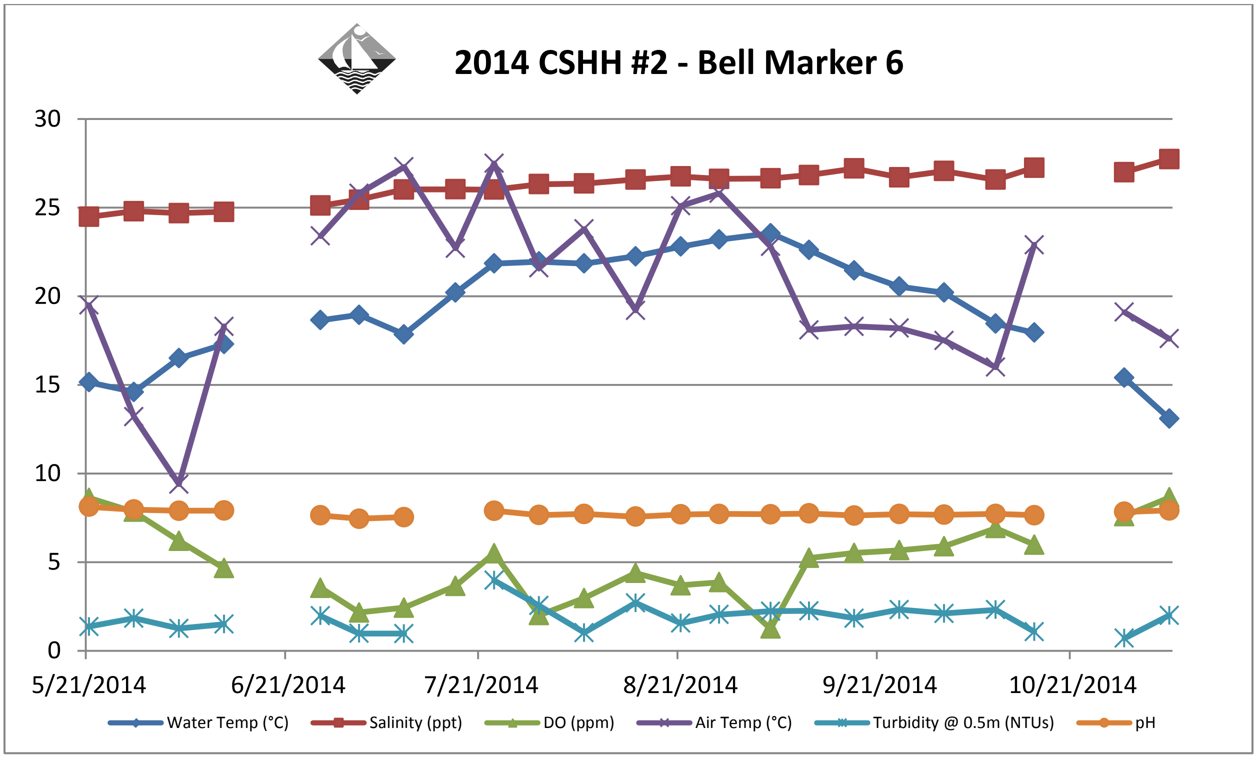
| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp (°C) | Secchi (m) | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Avg | Surface | Bottom | Avg | Surface | Bottom | Surface | Bottom | Avg | | | | | (Bottom) | (AM) |
| 6/26/14 | 20.0 | 19.6 | 19.8 | 24.68 | 24.83 | 24.76 | 6.99 | 4.92 | 7.49 | 7.47 | 7.48 | 25.5 | 0.75 | 1.62 | 2.57 | 3.25 | 10:15 |
| 6/11/14 | 18.6 | 18.6 | 18.6 | 24.21 | 24.29 | 24.25 | 7.93 | 7.32 | 7.94 | 7.95 | 7.95 | 19.0 | 0.5 | 3.32 | N/A | 2.5 | 10:55 |
| Red numbers indicate that the readings were unusually low or high but reflect station conditions. | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| **CSHH #4 - Bar Beach Spit** | | | | | | | | | | | | | | | | | |
| 11/5/14 | 12.1 | 12.2 | 12.2 | 27.16 | 27.22 | 27.19 | 8.33 | 8.37 | 7.80 | 7.81 | 7.81 | 15.4 | 1.0 | 1.86 | 2.0 | 2.0 | 8:20 |
| 10/9/14 | 18.3 | 18.4 | 18.4 | 26.07 | 26.09 | 26.08 | 6.82 | 6.78 | 7.66 | 7.66 | 7.66 | 18.0 | 0.75 | 3.10 | 3.26 | 2.5 | 10:43 |
| 9/17/14 | 21.1 | 21.1 | 21.1 | 26.56 | 26.56 | 26.56 | 4.49 | 4.56 | 7.60 | 7.49 | 7.55 | 17.1 | 0.75 | 3.90 | 4.11 | 2.0 | 9:08 |
| 8/21/14 | 23.3 | 23.2 | 23.3 | 26.25 | 26.27 | 26.26 | 4.55 | 4.42 | 7.46 | 7.45 | 7.46 | 23.9 | 0.75 | 2.67 | 2.84 | 1.25 | 8:42 |
| 8/6/14 | 22.6 | 22.6 | 22.6 | 25.80 | 25.80 | 25.80 | 6.60 | 6.60 | 7.81 | 7.82 | 7.82 | 22.9 | 0.5 | 2.57 | N/A | 1.5 | 8:38 |
| 7/23/14 | 21.2 | 21.2 | 21.2 | 25.86 | 25.84 | 25.85 | 3.33 | 2.91 | 7.33 | 7.31 | 7.32 | 25.4 | 0.5 | 8.53 | N/A | 1.75 | 8:35 |
| 7/9/14 | 21.3 | 21.0 | 21.2 | 25.05 | 25.14 | 25.10 | 5.35 | 5.40 | 7.72 | 7.69 | 7.71 | 25.7 | 0.75 | 3.22 | 2.63 | 1.75 | 8:37 |
| 6/26/14 | 21.2 | 20.5 | 20.9 | 24.57 | 24.68 | 24.63 | 10.10 | 7.72 | 8.13 | 7.95 | 8.04 | 25.5 | 0.5 | 3.64 | N/A | 1.75 | 10:45 |
| 6/11/14 | 18.5 | 18.5 | 18.5 | 24.13 | 24.15 | 24.14 | 7.27 | 6.98 | 7.82 | 7.81 | 7.82 | 17.7 | 0.5 | 4.08 | N/A | 1.75 | 9:05 |
| Red numbers indicate that the readings were unusually low or high but reflect station conditions. | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| **CSHH #5 - Mott's Cove** | | | | | | | | | | | | | | | | | |
| 11/5/14 | 12.0 | 12.3 | 12.2 | 26.52 | 27.18 | 26.85 | 8.55 | 8.22 | 7.77 | 7.78 | 7.78 | 15.1 | 1.0 | 1.82 | 2.15 | 2.5 | 8:30 |
| 10/9/14 | 17.9 | 18.0 | 18.0 | 25.49 | 25.74 | 25.62 | 6.80 | 7.13 | 7.61 | 7.62 | 7.62 | 17.8 | 0.75 | 3.14 | 3.45 | 2.5 | 11:04 |
| 9/17/14 | 20.6 | 20.8 | 20.7 | 25.21 | 26.14 | 25.68 | 4.68 | 4.53 | 7.49 | 7.52 | 7.51 | 17.3 | 0.75 | 3.50 | 3.10 | 1.5 | 8:50 |
| 8/21/14 | 22.9 | 22.8 | 22.9 | 26.02 | 26.41 | 26.22 | 2.68 | 2.16 | 7.22 | 7.22 | 7.22 | 25.3 | 1.0 | 2.19 | 2.36 | 2.0 | 9:00 |
| 8/6/14 | 22.1 | 22.3 | 22.2 | 24.78 | 25.56 | 25.17 | 4.21 | 4.48 | 7.35 | 7.46 | 7.41 | 23.7 | 0.75 | 1.95 | 2.12 | 2.0 | 8:55 |
| 7/23/14 | 21.2 | 21.1 | 21.2 | 25.20 | 25.72 | 25.46 | 2.31 | 2.10 | 7.23 | 7.21 | 7.22 | 26.4 | 0.50 | 7.63 | N/A | 1.75 | 8:50 |
| 7/9/14 | 19.1 | 17.8 | 18.5 | 24.53 | 25.83 | 25.18 | 2.95 | 2.66 | 7.39 | 7.29 | 7.34 | 25.5 | 1.0 | 1.91 | 1.91 | 2.0 | 8:55 |
| 6/26/14 | 19.8 | 19.2 | 19.5 | 24.41 | 24.84 | 24.63 | 7.62 | 4.36 | 7.54 | 7.43 | 7.49 | 25.9 | 1.0 | 2.72 | 2.64 | 2.0 | 10.58 |
| 6/11/14 | 18.5 | 18.6 | 18.6 | 22.01 | 23.80 | 22.91 | 6.65 | 5.94 | 7.70 | 7.75 | 7.73 | 17.8 | 0.5 | 5.17 | N/A | 2.25 | 9:26 |
| Red numbers indicate that the readings were unusually low or high but reflect station conditions. | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| **CSHH #6 - East of Former Incinerator Site** | | | | | | | | | | | | | | | | | |
| 11/5/14 | 11.8 | 12.0 | 11.9 | 26.32 | 26.83 | 26.58 | 7.94 | 8.09 | 7.73 | 7.77 | 7.75 | 16.2 | 1.0 | 2.50 | 2.88 | 3.0 | 8:44 |
| 10/9/14 | 18.2 | 18.2 | 18.2 | 25.77 | 25.77 | 25.77 | 6.63 | 6.65 | 7.64 | 7.63 | 7.64 | 18.8 | 0.75 | 4.27 | 4.26 | 3.0 | 11:14 |
| 9/17/14 | 20.7 | 21.0 | 20.9 | 25.71 | 26.14 | 25.93 | 5.58 | 4.63 | 7.61 | 7.56 | 7.59 | 16.4 | 0.75 | 4.01 | 3.83 | 2.0 | 8:35 |
| 8/21/14 | 23.7 | 23.2 | 23.5 | 25.71 | 26.27 | 25.99 | 3.93 | 2.33 | 7.35 | 7.26 | 7.31 | 24.8 | 0.75 | 3.27 | 3.35 | 3.0 | 9:15 |
| 8/6/14 | 22.6 | 22.6 | 22.6 | 25.64 | 25.67 | 25.66 | 5.96 | 5.72 | 7.63 | 7.54 | 7.59 | 23.7 | 0.5 | 3.87 | N/A | 2.5 | 9:05 |

# 2014 CSHH Field-Monitoring Data

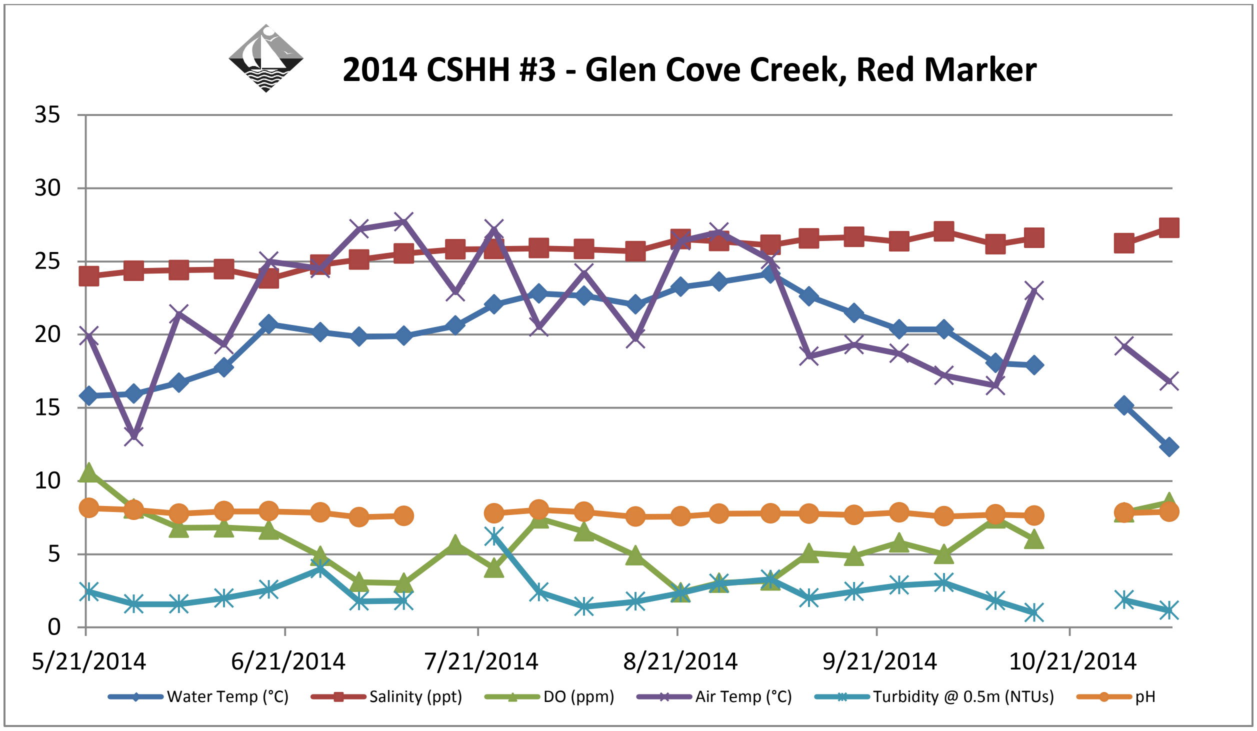
| Date | Water Temp (°C) | | | Salinity (ppt) | | | DO (ppm) | | pH | | | Air Temp (°C) | Secchi (m) | Turbidity @ 0.5m (NTUs) | Turbidity @ Secchi (NTUs) | Depth (m) | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Bottom | Avg | Surface | Bottom | Avg | Surface | Bottom | Surface | Bottom | Avg | | | | | (Bottom) | (AM) |
| 7/23/14 | 21.8 | 21.4 | 21.6 | 25.09 | 25.54 | 25.32 | 3.11 | 1.85 | 7.31 | 7.21 | 7.26 | 26.3 | 0.5 | 8.18 | N/A | 3.0 | 9:00 |
| 7/9/14 | 21.0 | 18.7 | 19.9 | 24.86 | 25.67 | 25.27 | 5.99 | 3.93 | 7.61 | 7.34 | 7.48 | 27.0 | 0.5 | 4.66 | N/A | 2.5 | 9:12 |
| 6/26/14 | 21.1 | 19.9 | 20.5 | 24.48 | 24.67 | 24.58 | 6.41 | 3.87 | 7.69 | 7.40 | 7.55 | 26.2 | 0.75 | 3.73 | 4.08 | 4.25 | 11:05 |
| 6/11/14 | 19.1 | 18.7 | 18.9 | 23.21 | 23.83 | 23.52 | 6.81 | 6.37 | 7.73 | 7.74 | 7.74 | 17.8 | 0.5 | 6.79 | N/A | 2.5 | 9:43 |
| Red numbers indicate that the readings were unusually low or high but reflect station conditions. | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| **CSHH #7 - West of Bryant Landing (formerly site of oil dock)** | | | | | | | | | | | | | | | | | |
| 11/5/14 | 11.8 | 11.8 | 11.8 | 25.87 | 26.29 | 26.08 | 8.13 | 8.12 | 7.71 | 7.72 | 7.72 | 17.1 | 0.75 | 3.78 | 3.40 | 3.5 | 9:12 |
| 10/9/14 | 18.0 | 18.0 | 18.0 | 24.92 | 25.50 | 25.21 | 6.71 | 6.64 | 7.57 | 7.59 | 7.58 | 18.8 | 0.5 | 5.36 | N/A | 2.5 | 11:25 |
| 9/17/14 | 20.4 | 20.9 | 20.7 | 24.86 | 25.80 | 25.33 | 5.11 | 4.98 | 7.32 | 7.48 | 7.40 | 15.4 | 0.5 | 4.79 | N/A | 1.5 | 8:24 |
| 8/21/14 | 23.8 | 23.8 | 23.8 | 25.75 | 25.90 | 25.83 | 4.68 | 2.73 | 7.43 | 7.30 | 7.37 | 26.2 | 0.5 | 3.84 | N/A | 2.0 | 9:31 |
| 8/6/14 | 22.4 | 22.4 | 22.4 | 24.78 | 25.22 | 25.00 | 5.39 | 3.88 | 7.46 | 7.38 | 7.42 | 22.9 | 0.5 | 4.73 | N/A | 2.0 | 9:16 |
| 7/23/14 | 21.8 | 21.8 | 21.8 | 25.16 | 25.29 | 25.23 | 2.00 | 1.39 | 7.18 | 7.15 | 7.17 | 27.7 | 0.5 | 8.08 | N/A | 2.0 | 9:10 |
| 7/9/14 | 22.2 | 20.9 | 21.6 | 23.78 | 25.04 | 24.41 | 5.95 | 3.45 | 7.67 | 7.48 | 7.58 | 28.7 | 0.5 | 5.29 | N/A | 2.0 | 9:25 |
| 6/26/14 | 21.9 | 21.2 | 21.6 | 22.66 | 24.13 | 23.40 | 5.57 | 5.20 | 7.50 | 7.48 | 7.49 | 26.0 | 0.5 | 3.04 | N/A | 1.75 | 11:18 |
| 6/11/14 | 18.7 | 19.0 | 18.9 | 20.13 | 23.27 | 21.70 | 6.89 | 5.91 | 7.50 | 7.70 | 7.60 | 18.0 | 0.25 | 8.10 | N/A | 2.5 | 10:00 |
| Red numbers indicate that the readings were unusually low or high but reflect station conditions. | | | | | | | | | | | | | | | | | |

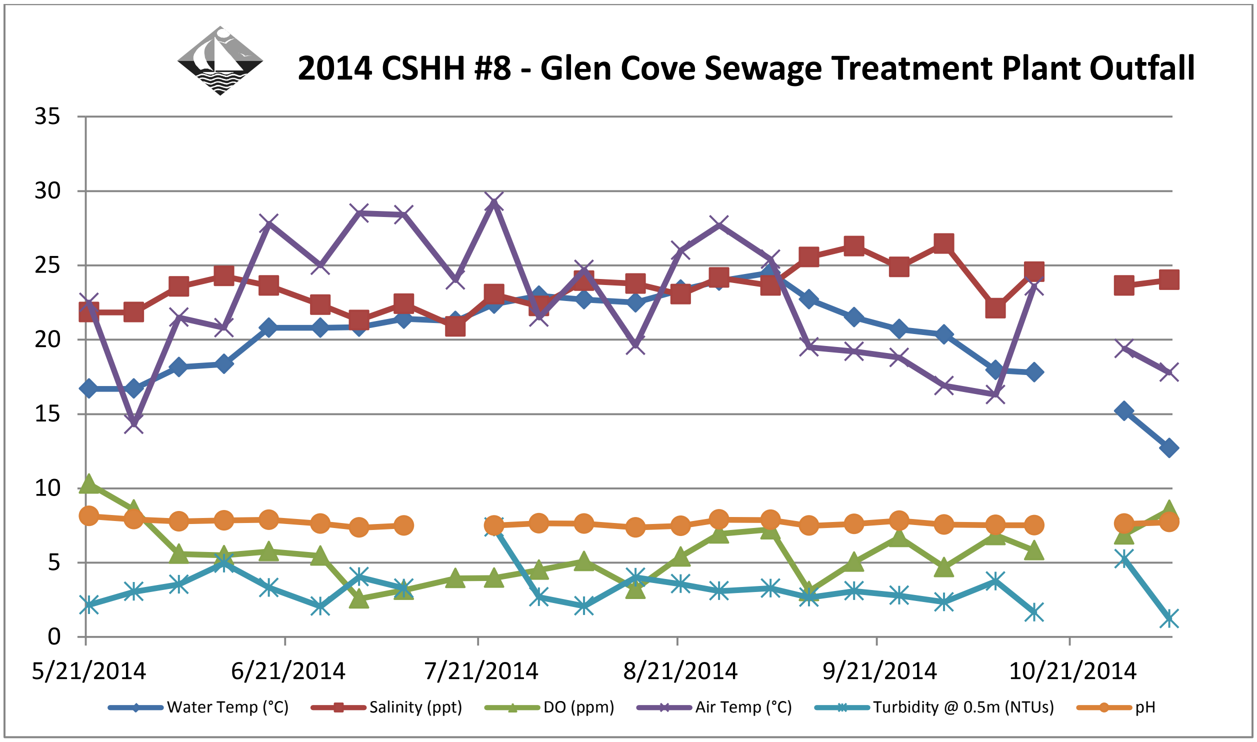
# 2014 Weekly Graphs for Water-Quality Parameters



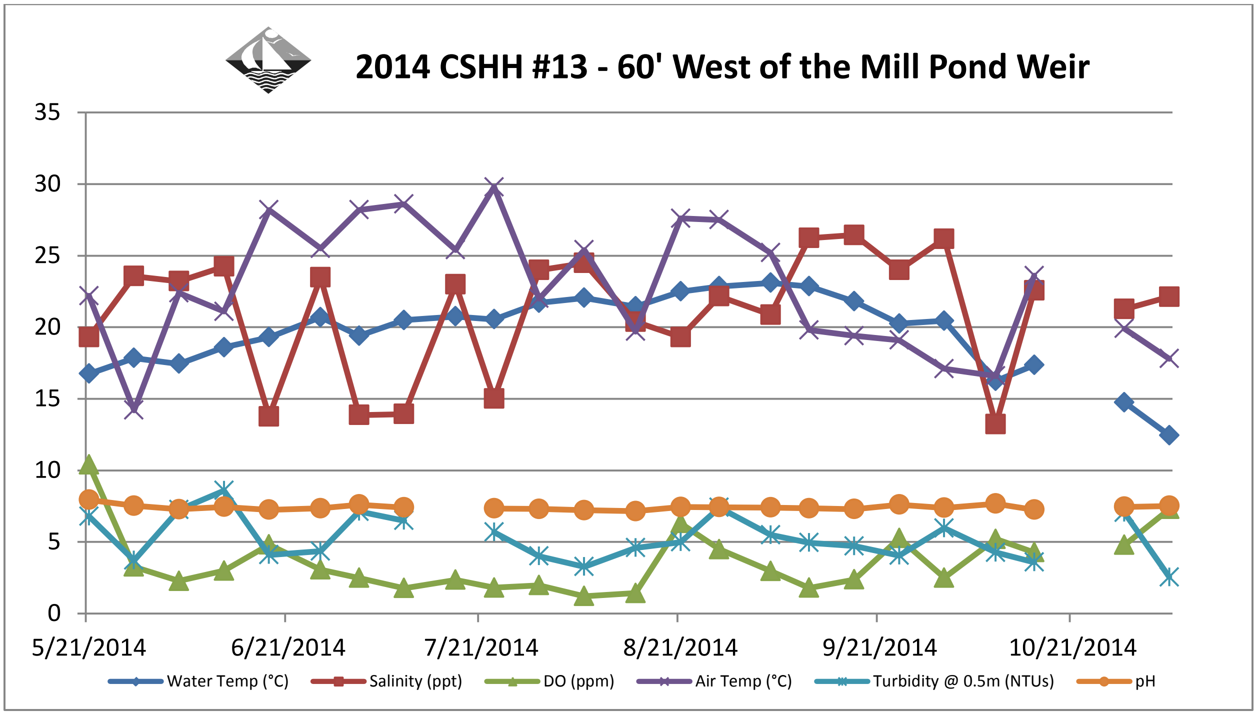


# 2014 Weekly Graphs for Water-Quality Parameters



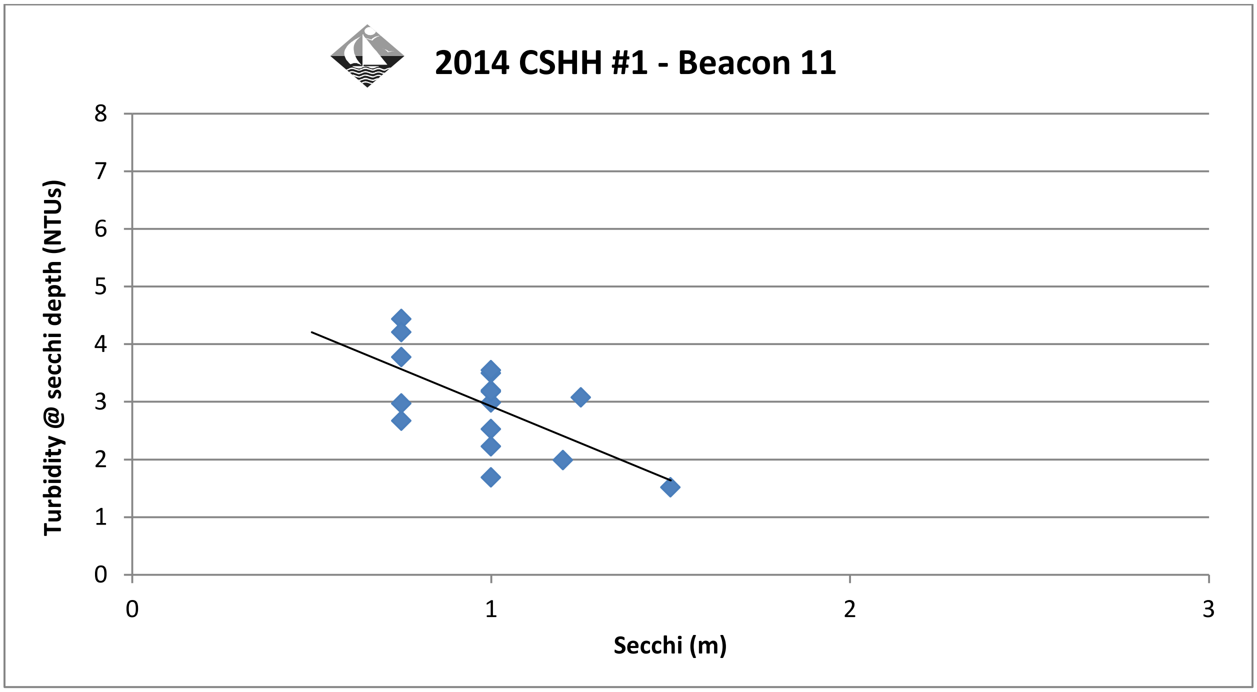


# 2014 Weekly Graphs for Water-Quality Parameters

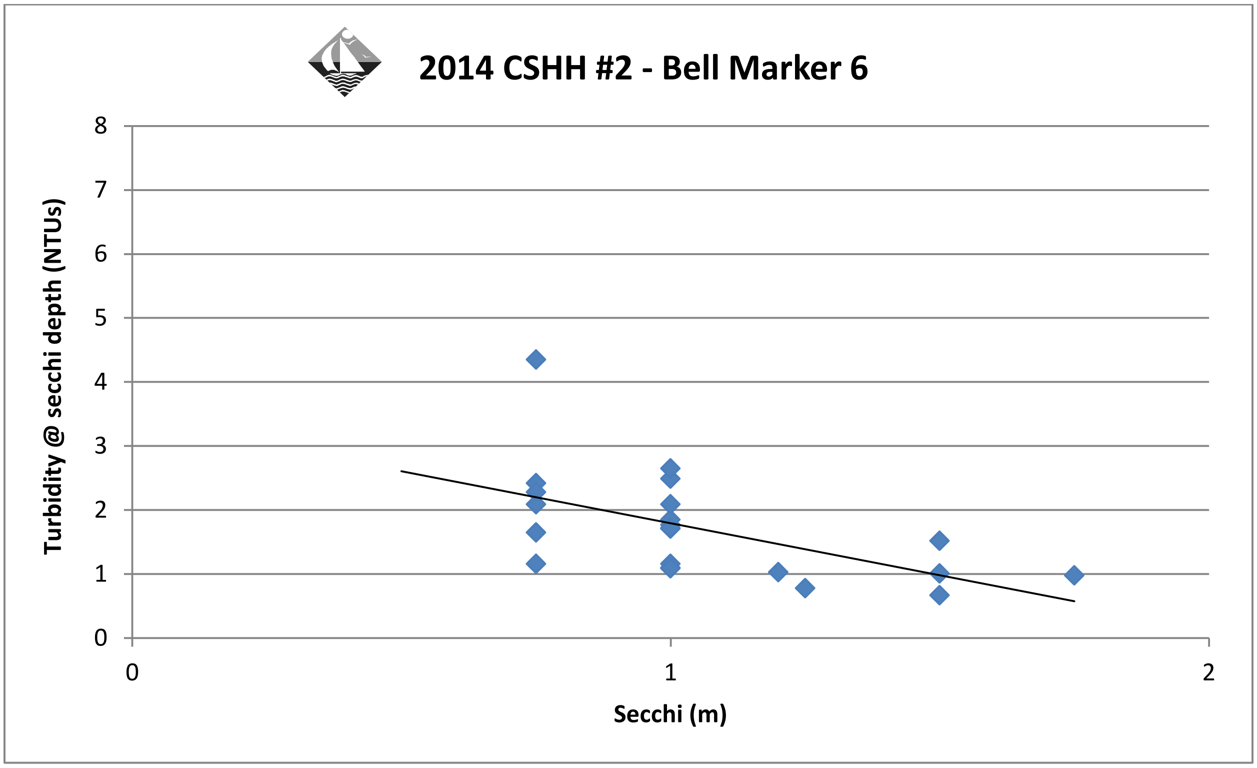


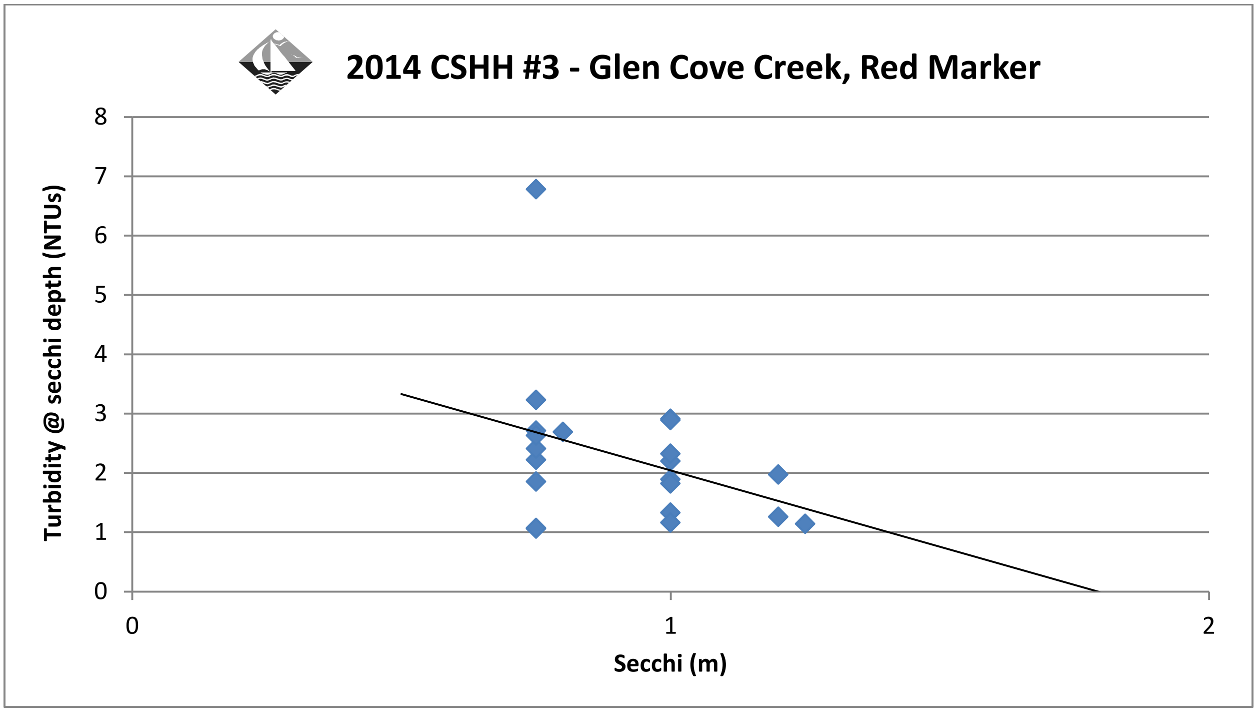
# 2014 Turbidity and Secchi-Disk Transparency Graphs

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).

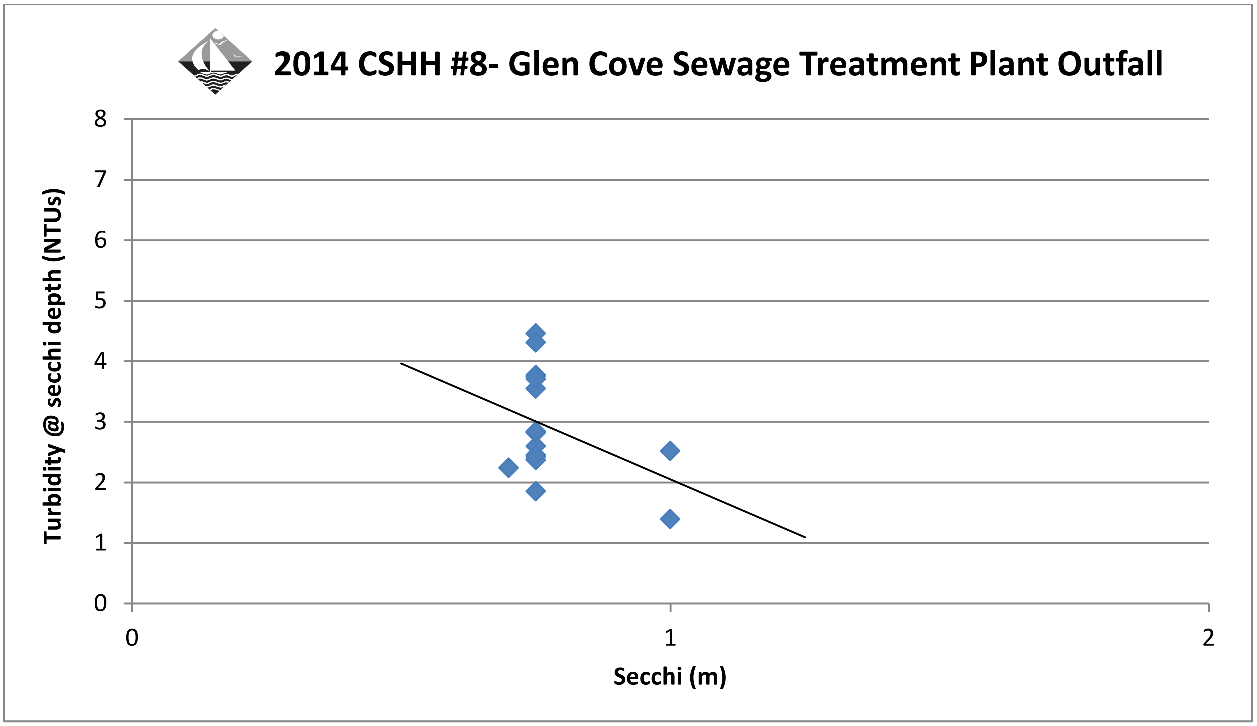


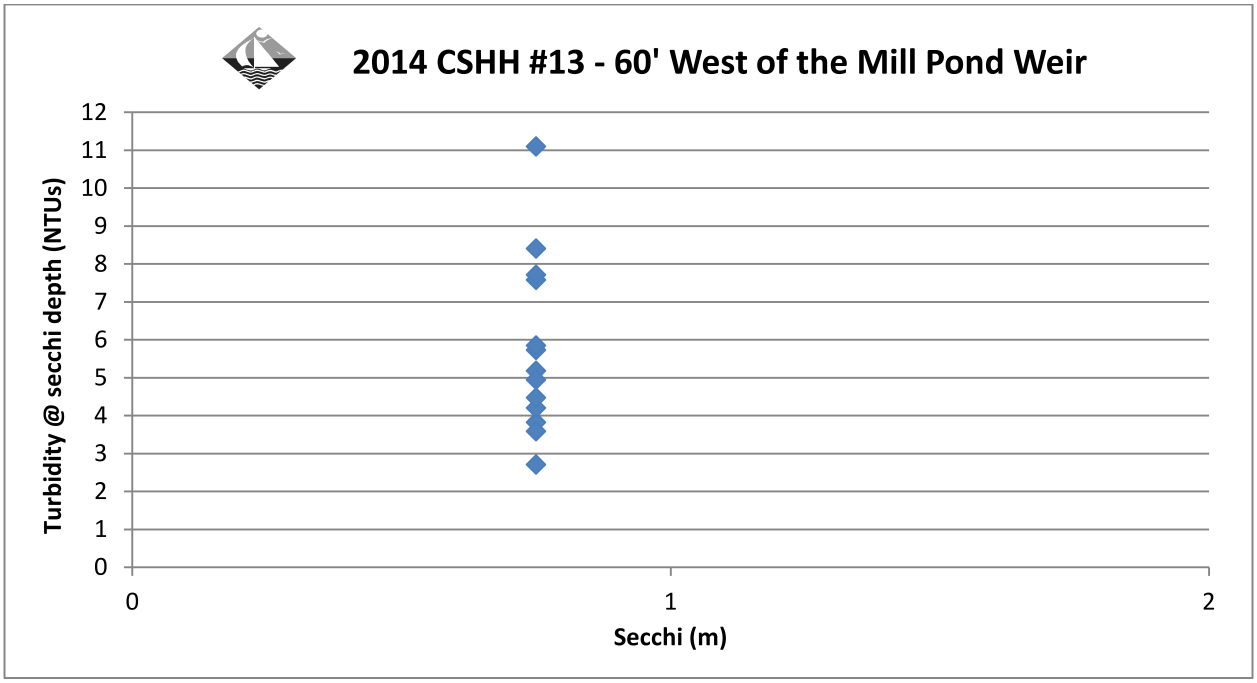
# 2014 Turbidity and Secchi-Disk Transparency Graphs





# 2014 Turbidity and Secchi-Disk Transparency Graphs





# Appendix B

2014 In-Harbor Bacteria Data
2014 In-Harbor Precipitation and Bacteria Graphs
2014 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Bacteria Data
2014 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Precipitation and Bacteria Graphs
2014-2015 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Bacteria Data
2014-2015 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Precipitation and Bacteria Graphs
2014 Beach-Monitoring Bacteria Data
2014 Beach-Monitoring Precipitation and Bacteria Graphs
2014 Sea Cliff Precipitation Data
2015 Sea Cliff Precipitation Data (partial)
1997-2014 Monthly Precipitation

# 2014 In-Harbor Bacteria Data

## CSHH #1 - Beacon 11

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 05/21/14 | 42.00 | 0.00 | 0.10 | 0.00 |
| 05/28/14 | 12.00 | 22.45 | 16.00 | 1.26 |
| 06/04/14 | ***1650.00*** | 94.04 | 6.00 | 2.13 |
| 06/11/14 | 19.00 | 63.05 | 5.00 | 2.63 |
| 06/18/14 | 37.00 | 56.67 | 4.00 | 2.86 |
| 06/26/14 | 56.00 | 60.03 | 7.00 | 6.69 |
| 07/02/14 | 12.00 | 60.03 | 4.00 | 5.07 |
| 07/09/14 | 37.00 | 28.09 | 17.00 | 6.25 |
| 07/17/14 | 91.00 | 38.42 | 24.00 | 8.55 |
| 7/23/14 | 7.00 | 27.54 | 10.00 | 10.27 |
| 7/30/14 | 16.00 | 21.44 | 2.00 | 7.99 |
| 8/6/14 | 23.00 | 24.41 | 0.10 | 3.82 |
| 8/14/14 | 370.00 | 38.69 | 39.00 | 4.51 |
| 8/21/14 | 24.00 | 29.64 | 0.10 | 1.51 |
| 8/27/14 | 24.00 | 37.92 | 4.00 | 1.26 |
| 9/4/14 | 18.00 | 38.83 | 13.00 | 1.83 |
| 9/10/14 | 73.00 | 48.92 | 11.00 | 4.67 |
| 9/17/14 | 52.00 | 33.04 | 5.00 | 3.10 |
| 9/24/14 | 51.00 | 38.41 | 8.00 | 7.45 |
| 10/1/14 | 270.00 | 62.33 | 80.00 | 13.55 |
| 10/9/14 | 80.00 | 84.00 | 43.00 | 17.22 |
| 10/15/14 | 19.00 | 64.17 | 20.00 | 19.41 |
| 10/29/14 | 8.00 | 42.57 | 7.00 | 26.34 |
| 11/5/14 | 21.00 | 22.48 | 9.00 | 15.26 |

*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.*

# 2014 In-Harbor Bacteria Data

## CSHH #2 - Bell Marker 6

| | Fecal Coliform | | Enterococci | |
|---|---|---|---|---|
| Date | CFU/100ml. | Log AvgFC | CFU/100ml. | Log AvgEnt |
| 05/21/14 | 1.00 | 0.00 | 0.10 | 0.00 |
| 05/28/14 | 6.00 | 2.45 | 4.00 | 0.63 |
| 06/04/14 | ***2130.00*** | 23.38 | 0.10 | 0.34 |
| 06/11/14 | 8.00 | 17.88 | 0.10 | 0.25 |
| 06/18/14 | 0.10 | 6.34 | 0.10 | 0.21 |
| 06/26/14 | 9.00 | 9.83 | 0.10 | 0.21 |
| 07/02/14 | 3.00 | 8.56 | 2.00 | 0.18 |
| 07/09/14 | 2.00 | 2.12 | 1.00 | 0.29 |
| 07/17/14 | 38.00 | 2.90 | 1.00 | 0.46 |
| 07/23/14 | 2.00 | 5.28 | 0.10 | 0.46 |
| 07/30/14 | 3.00 | 4.24 | 0.10 | 0.46 |
| 08/06/14 | 0.10 | 2.15 | 0.10 | 0.25 |
| 08/14/14 | 14.00 | 3.17 | 5.00 | 0.35 |
| 8/21/2014 | 0.10 | 0.97 | 0.10 | 0.22 |
| 08/27/14 | 4.00 | 1.11 | 0.10 | 0.22 |
| 09/04/14 | 4.00 | 1.18 | 0.10 | 0.22 |
| 09/10/14 | 2.00 | 2.14 | 0.10 | 0.22 |
| 09/17/14 | 1.00 | 1.26 | 0.10 | 0.10 |
| 09/24/14 | 2.00 | 2.30 | 0.10 | 0.10 |
| 10/01/14 | 35.00 | 3.55 | 2.00 | 0.18 |
| 10/09/14 | 21.00 | 4.94 | 7.00 | 0.43 |
| 10/15/14 | 5.00 | 5.93 | 4.00 | 0.89 |
| 10/29/14 | 16.00 | 15.57 | 2.00 | 3.25 |
| 11/05/14 | 14.00 | 12.38 | 3.00 | 3.60 |

*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.*

# 2014 In-Harbor Bacteria Data

## CSHH #3 - Glen Cove Creek

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 05/21/14 | 20.00 | 0.00 | 3.00 | 0.00 |
| 05/28/14 | 5.00 | 10.00 | 10.00 | 5.48 |
| 06/04/14 | 400.00 | 34.20 | 1.00 | 3.11 |
| 06/11/14 | 23.00 | 30.97 | 13.00 | 4.44 |
| 06/18/14 | 55.00 | 34.74 | 2.00 | 3.79 |
| 06/26/14 | 23.00 | 35.72 | 4.00 | 4.01 |
| 07/02/14 | 28.00 | 50.42 | 3.00 | 3.15 |
| 07/09/14 | 200.00 | 43.89 | 12.00 | 5.18 |
| 07/17/14 | 164.00 | 65.02 | 3.00 | 3.87 |
| 07/23/14 | 73.00 | 68.80 | 8.00 | 5.10 |
| 07/30/14 | 31.00 | 73.04 | 1.00 | 3.87 |
| 08/06/14 | 35.00 | 76.37 | 2.00 | 3.57 |
| 08/14/14 | 280.00 | 81.69 | ***150.00*** | 5.91 |
| 08/21/14 | 7.00 | 43.47 | 1.00 | 4.74 |
| 08/27/14 | 10.00 | 29.21 | 0.10 | 1.97 |
| 09/04/14 | 109.00 | 37.56 | 5.00 | 2.72 |
| 09/10/14 | 18.00 | 32.88 | 2.00 | 2.72 |
| 09/17/14 | 22.00 | 19.77 | 0.10 | 0.63 |
| 09/24/14 | 22.00 | 24.86 | 13.00 | 1.05 |
| 10/01/14 | 45.00 | 33.59 | 17.00 | 2.94 |
| 10/09/14 | 10.00 | 20.83 | 6.00 | 3.05 |
| 10/15/14 | 13.00 | 19.52 | 9.00 | 4.12 |
| 10/29/14 | 8.00 | 14.71 | 2.00 | 6.55 |
| 11/05/14 | 8.00 | 9.55 | 2.00 | 3.83 |

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

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 6/11/14 | 9.00 | 0.00 | 6.00 | 0.00 |
| 6/26/14 | 28.00 | 15.87 | 1.00 | 2.45 |
| 07/09/14 | 44.00 | 22.30 | 13.00 | 4.27 |
| 7/23/14 | 5.00 | 18.33 | 8.00 | 4.70 |
| 8/6/14 | 27.00 | 18.11 | 4.00 | 7.47 |
| 8/21/14 | 14.00 | 12.36 | 3.00 | 4.58 |
| 9/17/14 | 35.00 | 22.14 | 1.00 | 1.73 |
| 10/9/14 | 43.00 | 38.79 | 13.00 | 3.61 |
| 11/5/14 | 17.00 | 27.04 | 6.00 | 8.83 |

*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.*

# 2014 In-Harbor Bacteria Data

## CSHH #5 - Mott's Cove

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 6/11/14 | 32.00 | 0.00 | 8.00 | 0.00 |
| 6/26/14 | 82.00 | 51.22 | 8.00 | 8.00 |
| 7/9/14 | 53.00 | 51.81 | 11.00 | 8.90 |
| 7/23/14 | 73.00 | 68.20 | 16.00 | 11.21 |
| 8/6/14 | 220.00 | 94.77 | 23.00 | 15.94 |
| 8/21/14 | 82.00 | 109.61 | 5.00 | 12.25 |
| 9/17/14 | 48.00 | 62.74 | 4.00 | 4.47 |
| 10/9/14 | 127.00 | 78.08 | 27.00 | 10.39 |
| 11/5/14 | 35.00 | 66.67 | 12.00 | 18.00 |

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

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 6/11/14 | 21.00 | 0.00 | 2.00 | 0.00 |
| 6/26/14 | 54.00 | 33.67 | 7.00 | 3.74 |
| 7/9/14 | 37.00 | 34.75 | 18.00 | 6.32 |
| 7/23/14 | 8.00 | 25.19 | 1.00 | 5.01 |
| 8/6/14 | 28.00 | 20.24 | 7.00 | 5.01 |
| 8/21/14 | 16.00 | 15.30 | 0.10 | 0.89 |
| 9/17/14 | 28.00 | 21.17 | 2.00 | 0.45 |
| 10/9/14 | 100.00 | 52.92 | 12.00 | 4.90 |
| 11/5/14 | 20.00 | 44.72 | 8.00 | 9.80 |

## CSHH #7 - West of Old Oil Dock

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 6/11/14 | 227.00 | 0.00 | 260.00 | 0.00 |
| 6/26/14 | 260.00 | ***242.94*** | 13.00 | ***58.14*** |
| 7/9/14 | 82.00 | 169.15 | 18.00 | ***39.33*** |
| 7/23/14 | 26.00 | 82.15 | 17.00 | 15.84 |
| 8/6/14 | 91.00 | 57.89 | 23.00 | 19.16 |
| 8/21/14 | 28.00 | 40.46 | 4.00 | 11.61 |
| 9/17/14 | 25.00 | 26.46 | 10.00 | 6.32 |
| 10/9/14 | 80.00 | 44.72 | 12.00 | 10.95 |
| 11/5/14 | 33.00 | 51.38 | 11.00 | 11.49 |

*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.*

# 2014 In-Harbor Bacteria Data

## CSHH #8 - Glen Cove STP Outfall

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 05/21/14 | 230.00 | 0.00 | 18.00 | 0.00 |
| 05/28/14 | 109.00 | 158.34 | 11.00 | 14.07 |
| 06/04/14 | 350.00 | ***206.26*** | 5.00 | 9.97 |
| 06/11/14 | 218.00 | ***209.13*** | 24.00 | 12.42 |
| 06/18/14 | 127.00 | 189.28 | 37.00 | 15.45 |
| 06/26/14 | 145.00 | 172.59 | 15.00 | 14.89 |
| 07/02/14 | 21.00 | 124.16 | 29.00 | 18.08 |
| 07/09/14 | 173.00 | 107.84 | 52.00 | 28.88 |
| 07/17/14 | 73.00 | 86.65 | 25.00 | 29.12 |
| 07/23/14 | 191.00 | 94.02 | 12.00 | 23.24 |
| 07/30/14 | 73.00 | 81.96 | 31.00 | 26.88 |
| 08/06/14 | 49.00 | 97.09 | 11.00 | 22.14 |
| 08/14/14 | ***1200.00*** | 143.02 | ***400.00*** | 33.30 |
| 8/21/2014 | 17.00 | 106.87 | 12.00 | 28.75 |
| 08/27/14 | 82.00 | 90.24 | 26.00 | 33.56 |
| 09/04/14 | 82.00 | 92.36 | 46.00 | ***36.31*** |
| 09/10/14 | 73.00 | 100.03 | 28.00 | ***43.77*** |
| 09/17/14 | 100.00 | 60.85 | 37.00 | 27.19 |
| 09/24/14 | 62.00 | 78.83 | 32.00 | 33.09 |
| 10/01/14 | 118.00 | 84.78 | 80.00 | ***41.43*** |
| 10/09/14 | 58.00 | 79.11 | 52.00 | ***42.45*** |
| 10/15/14 | 22.00 | 62.23 | 25.00 | ***41.50*** |
| 10/29/14 | 31.00 | 46.48 | 1.00 | 17.96 |
| 11/05/14 | 22.00 | 30.54 | 10.00 | 10.68 |

*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.*

# 2014 In-Harbor Bacteria Data

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

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 05/21/14 | 520.00 | 0.00 | 7.00 | 0.00 |
| 05/28/14 | 64.00 | 182.43 | 17.00 | 10.91 |
| 06/04/14 | 130.00 | 162.95 | 17.00 | 12.65 |
| 06/11/14 | 173.00 | 165.40 | 30.00 | 15.70 |
| 06/18/14 | 109.00 | 152.17 | 49.00 | 19.71 |
| 06/26/14 | 164.00 | 120.81 | 17.00 | 23.54 |
| 07/02/14 | 32.00 | 105.17 | 27.00 | 25.82 |
| 07/09/14 | 118.00 | 103.15 | 35.00 | 29.83 |
| 07/17/14 | 100.00 | 92.44 | 37.00 | 31.11 |
| 07/23/14 | 136.00 | 96.62 | 20.00 | 26.00 |
| 07/30/14 | 91.00 | 85.89 | 35.00 | 30.04 |
| 08/06/14 | 38.00 | 88.89 | 25.00 | 29.58 |
| 08/14/14 | ***2600.00*** | 164.99 | ***800.00*** | ***55.32*** |
| 8/21/2014 | 22.00 | 121.89 | 11.00 | ***43.40*** |
| 08/27/14 | 59.00 | 103.14 | 14.00 | ***40.41*** |
| 09/04/14 | 91.00 | 103.14 | 37.00 | ***40.86*** |
| 09/10/14 | 64.00 | 114.47 | 34.00 | ***43.46*** |
| 09/17/14 | 200.00 | 68.53 | 41.00 | 23.99 |
| 09/24/14 | 32.00 | 73.87 | 28.00 | 28.92 |
| 10/01/14 | 109.00 | 83.52 | 70.00 | ***39.90*** |
| 10/09/14 | 127.00 | 89.27 | 37.00 | ***39.90*** |
| 10/15/14 | 9.00 | 60.30 | 18.00 | ***35.13*** |
| 10/29/14 | 33.00 | 45.03 | 2.00 | 17.47 |
| 11/05/14 | 14.00 | 26.96 | 17.00 | 12.27 |

*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.*

# 2014 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** |
| 05/21/14 | ***2700.00*** | 0.00 | ***520.00*** | 0.00 |
| 05/28/14 | 91.00 | ***495.68*** | 12.00 | ***78.99*** |
| 06/04/14 | ***1170.00*** | ***659.98*** | 25.00 | ***53.83*** |
| 06/11/14 | 109.00 | ***420.73*** | 36.00 | ***48.68*** |
| 06/18/14 | 209.00 | ***365.79*** | ***360.00*** | ***72.63*** |
| 06/26/14 | 182.00 | ***213.29*** | 27.00 | ***40.20*** |
| 07/02/14 | 45.00 | 185.27 | 30.00 | ***48.28*** |
| 07/09/14 | 210.00 | 131.41 | 58.00 | ***57.14*** |
| 07/17/14 | 230.00 | 152.57 | ***440.00*** | ***94.26*** |
| 07/23/14 | 480.00 | 180.17 | 24.00 | ***54.84*** |
| 07/30/14 | 100.00 | 159.84 | 29.00 | ***55.63*** |
| 08/06/14 | 82.00 | 180.22 | 16.00 | ***49.06*** |
| 08/14/14 | ***4200.00*** | ***328.10*** | ***13400.00*** | ***145.70*** |
| 8/21/2014 | 29.00 | ***216.84*** | 4.00 | ***56.91*** |
| 08/27/14 | 43.00 | 133.84 | 17.00 | ***53.12*** |
| 09/04/14 | 91.00 | 131.34 | 29.00 | ***53.12*** |
| 09/10/14 | 109.00 | 139.03 | 38.00 | ***63.15*** |
| 09/17/14 | 109.00 | 66.98 | 35.00 | 19.22 |
| 09/24/14 | 48.00 | 74.08 | 46.00 | 31.33 |
| 10/01/14 | ***1200.00*** | 144.17 | ***120.00*** | ***46.31*** |
| 10/09/14 | 109.00 | 149.47 | 100.00 | ***59.31*** |
| 10/15/14 | 21.00 | 107.52 | 70.00 | ***67.02*** |
| 10/29/14 | 35.00 | 99.02 | 21.00 | ***64.81*** |
| 11/05/14 | 28.00 | 38.70 | 9.00 | 33.91 |

*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.*

# 2014 In-Harbor Bacteria Data

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

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 05/21/14 | 480.00 | 0.00 | 12.00 | 0.00 |
| 05/28/14 | 200.00 | ***309.84*** | 10.00 | 10.95 |
| 06/04/14 | 601.00 | ***386.41*** | 20.00 | 13.39 |
| 06/11/14 | ***1200.00*** | ***512.96*** | ***380.00*** | 30.90 |
| 06/18/14 | 264.00 | ***449.14*** | 39.00 | 32.38 |
| 06/26/14 | 3900.00 | ***682.89*** | ***190.00*** | ***56.25*** |
| 07/02/14 | 181.00 | ***669.39*** | 100.00 | ***89.15*** |
| 07/09/14 | ***1900.00*** | ***842.67*** | 18.00 | ***87.29*** |
| 07/17/14 | ***440.00*** | ***689.46*** | 28.00 | ***51.81*** |
| 07/23/14 | ***10500.00*** | ***1440.22*** | ***38.00*** | ***51.55*** |
| 07/30/14 | 450.00 | ***935.10*** | 18.00 | 32.17 |
| 08/06/14 | 440.00 | ***1116.89*** | 9.00 | 19.88 |
| 08/14/14 | ***3600.00*** | ***1269.18*** | ***1600.00*** | ***48.77*** |
| 08/21/14 | 82.00 | ***906.97*** | 4.00 | 33.04 |
| 08/27/14 | 136.00 | ***380.25*** | 6.00 | 22.84 |
| 09/04/14 | 410.00 | ***373.23*** | 43.00 | 27.19 |
| 09/10/14 | 520.00 | ***385.91*** | 35.00 | ***35.68*** |
| 09/17/14 | 173.00 | ***210.30*** | 21.00 | 15.00 |
| 09/24/14 | 155.00 | ***238.86*** | 50.00 | 24.85 |
| 10/01/14 | ***9800.00*** | ***561.92*** | ***16100.00*** | ***120.53*** |
| 10/09/14 | 210.00 | ***491.55*** | ***230.00*** | ***168.56*** |
| 10/15/14 | 46.00 | ***302.63*** | 40.00 | ***173.13*** |
| 10/29/14 | 200.00 | ***370.94*** | 26.00 | ***249.11*** |
| 11/05/14 | 155.00 | 131.55 | 41.00 | ***55.96*** |

*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.*

# 2014 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** |
| 05/21/14 | 430.00 | 0.00 | 4.00 | 0.00 |
| 05/28/14 | 127.00 | ***233.69*** | 39.00 | 12.49 |
| 06/04/14 | 601.00 | ***320.17*** | 23.00 | 15.31 |
| 06/11/14 | 327.00 | ***321.86*** | ***800.00*** | ***41.16*** |
| 06/18/14 | 100.00 | ***254.76*** | ***110.00*** | ***50.10*** |
| 06/26/14 | ***4800.00*** | ***412.76*** | ***600.00*** | ***136.49*** |
| 07/02/14 | 146.00 | ***424.43*** | 90.00 | ***161.33*** |
| 07/09/14 | ***2300.00*** | ***555.10*** | 34.00 | ***174.45*** |
| 07/17/14 | ***2200.00*** | ***812.73*** | 26.00 | ***87.91*** |
| 07/23/14 | ***15600.00*** | ***2231.38*** | 28.00 | ***66.87*** |
| 07/30/14 | 155.00 | ***1123.03*** | 20.00 | 33.87 |
| 08/06/14 | 91.00 | ***1021.71*** | 14.00 | 23.34 |
| 08/14/14 | ***3800.00*** | ***1129.64*** | ***3000.00*** | ***57.19*** |
| 08/21/14 | 109.00 | ***619.36*** | 70.00 | ***69.71*** |
| 08/27/14 | 330.00 | ***286.43*** | 15.00 | ***61.53*** |
| 09/04/14 | 230.00 | ***309.96*** | 28.00 | ***65.81*** |
| 09/10/14 | 200.00 | ***362.82*** | 30.00 | ***76.65*** |
| 09/17/14 | 230.00 | ***207.05*** | 5.00 | 21.32 |
| 09/24/14 | 127.00 | ***213.48*** | 48.00 | 19.77 |
| 10/01/14 | ***1200.00*** | ***276.37*** | ***570.00*** | ***40.93*** |
| 10/09/14 | 230.00 | ***276.37*** | ***110.00*** | ***53.82*** |
| 10/15/14 | 390.00 | ***315.86*** | ***160.00*** | ***75.22*** |
| 10/29/14 | 300.00 | ***423.91*** | 27.00 | ***128.29*** |
| 11/05/14 | 136.00 | ***245.96*** | 45.00 | ***68.00*** |

*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.*

# 2014 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** |
| 5/21/14 | ***4300.00*** | 0.00 | ***320.00*** | 0.00 |
| 5/28/14 | 230.00 | ***994.48*** | ***210.00*** | ***259.23*** |
| 6/4/14 | 601.00 | ***840.80*** | ***140.00*** | ***211.11*** |
| 6/11/14 | ***2700.00*** | ***1125.53*** | ***2200.00*** | ***379.30*** |
| 6/18/14 | 191.00 | ***789.39*** | ***230.00*** | ***343.19*** |
| 6/26/14 | ***2600.00*** | ***713.83*** | ***220.00*** | ***318.41*** |
| 07/02/14 | 209.00 | ***700.29*** | 37.00 | ***225.00*** |
| 07/09/14 | 209.00 | ***566.93*** | ***370.00*** | ***273.27*** |
| 7/17/14 | 155.00 | ***320.13*** | ***210.00*** | ***170.83*** |
| 7/23/14 | 460.00 | ***381.66*** | 64.00 | ***132.27*** |
| 7/30/14 | 109.00 | ***202.38*** | 29.00 | ***88.19*** |
| 8/6/14 | 290.00 | ***216.08*** | 39.00 | ***89.13*** |
| 8/14/14 | ***4400.00*** | ***397.44*** | ***6300.00*** | ***157.12*** |
| 8/21/14 | 118.00 | ***376.34*** | 49.00 | ***117.45*** |
| 8/27/14 | 250.00 | ***333.13*** | 15.00 | ***87.87*** |
| 9/4/14 | 520.00 | ***455.34*** | ***320.00*** | ***142.03*** |
| 9/10/14 | 210.00 | ***426.87*** | 42.00 | ***144.15*** |
| 9/17/14 | 460.00 | ***271.74*** | 100.00 | ***62.94*** |
| 9/24/14 | 155.00 | ***286.98*** | 66.00 | ***66.80*** |
| 10/1/14 | 550.00 | ***336.00*** | ***460.00*** | ***132.48*** |
| 10/9/14 | 230.00 | ***285.42*** | ***300.00*** | ***130.78*** |
| 10/15/14 | 220.00 | ***288.08*** | 70.00 | ***144.85*** |
| 10/29/14 | 260.00 | ***291.66*** | 34.00 | ***134.62*** |
| 11/5/14 | 210.00 | ***229.26*** | 54.00 | ***78.80*** |

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

| | ***Fecal Coliform*** | | ***Enterococci*** | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 6/11/14 | 23.00 | 0.00 | 42.00 | 0.00 |
| 6/26/14 | 28.00 | 25.38 | 3.00 | 11.22 |
| 7/9/14 | 41.00 | 29.78 | 16.00 | 12.63 |
| 7/23/14 | 17.00 | 26.92 | 5.00 | 6.21 |
| 8/6/14 | 28.00 | 26.92 | 8.00 | 8.62 |
| 8/21/14 | 24.00 | 22.52 | 3.00 | 4.93 |
| 9/17/14 | 25.00 | 24.49 | 4.00 | 3.46 |
| 10/9/14 | 38.00 | 30.82 | 10.00 | 6.32 |

*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.*

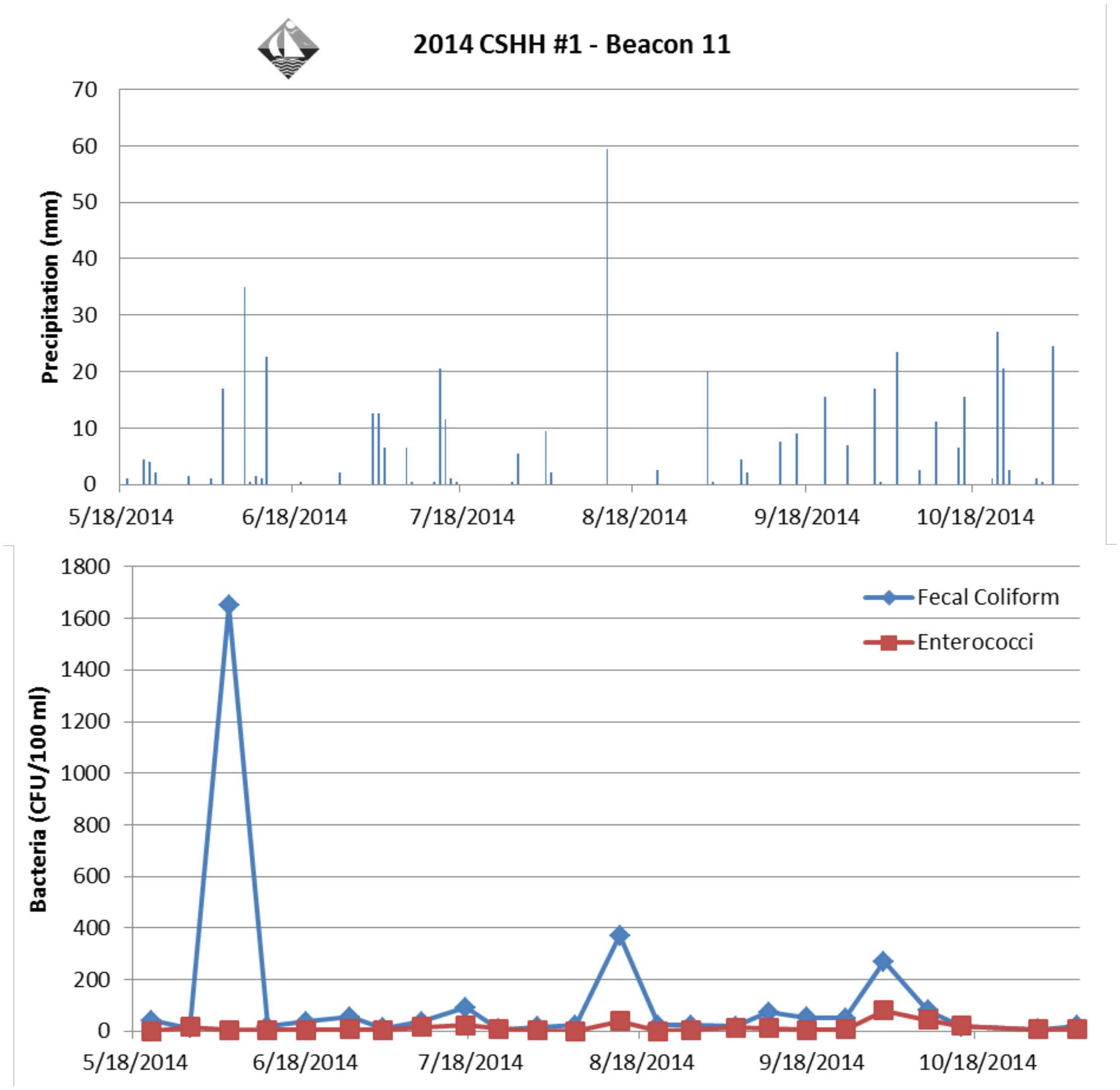
# 2014 In-Harbor Bacteria Data

## CSHH #15 – NW Corner of Tappen Pool

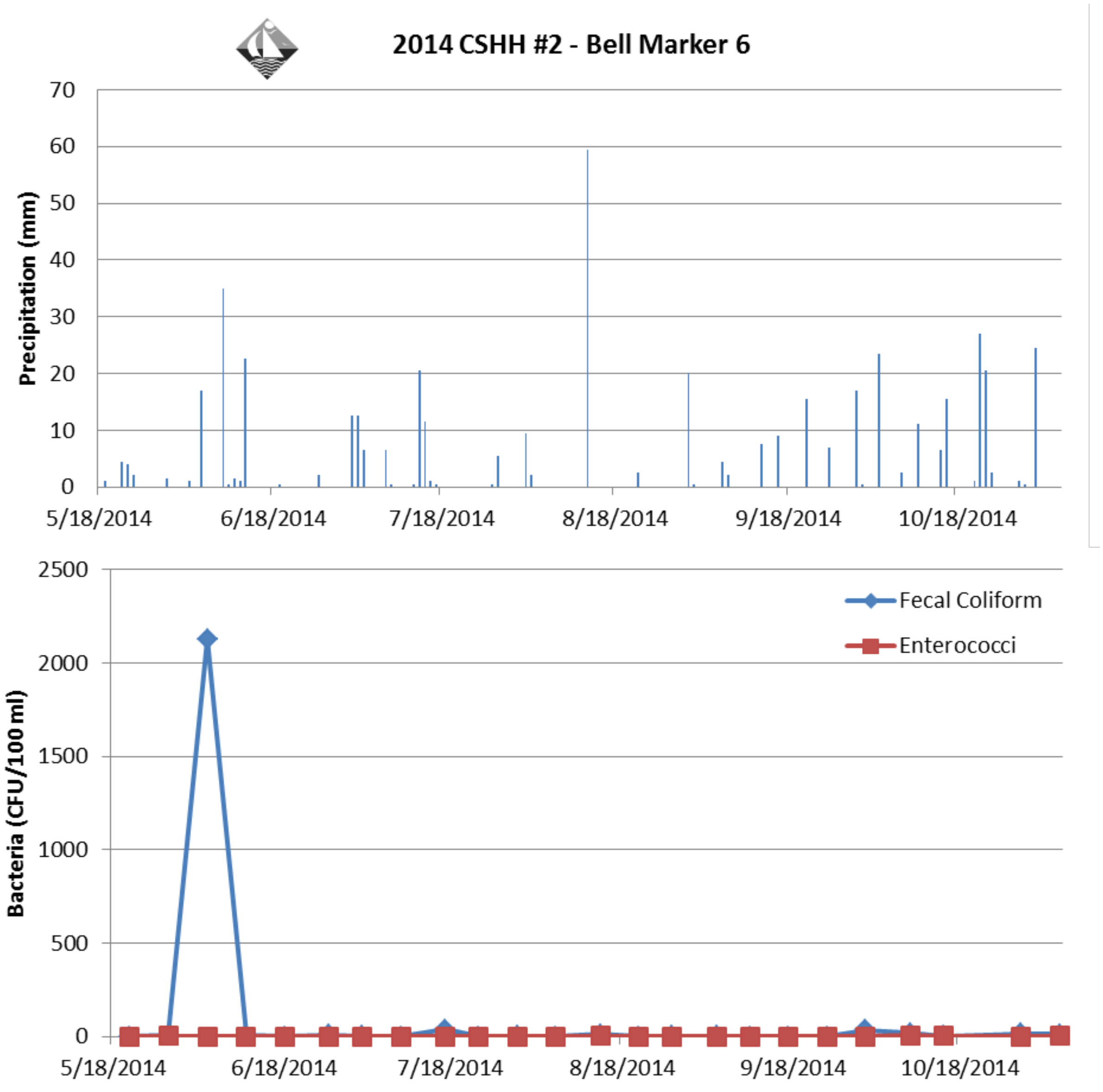
| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 6/11/14 | 209.00 | 0.00 | 72.00 | 0.00 |
| 6/26/14 | 10.00 | 45.72 | 5.00 | 18.97 |
| 7/9/14 | 182.00 | 72.46 | 13.00 | 16.73 |
| 7/23/14 | 31.00 | 38.35 | 11.00 | 8.94 |
| 8/6/14 | 50.00 | 65.58 | 9.00 | 10.88 |
| 8/21/14 | 13.00 | 27.21 | 1.00 | 4.63 |
| 10/9/14 | 59.00 | 0.00 | 4.00 | 0.00 |
| 11/5/14 | 9.00 | 23.04 | 6.00 | 4.90 |

*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.*

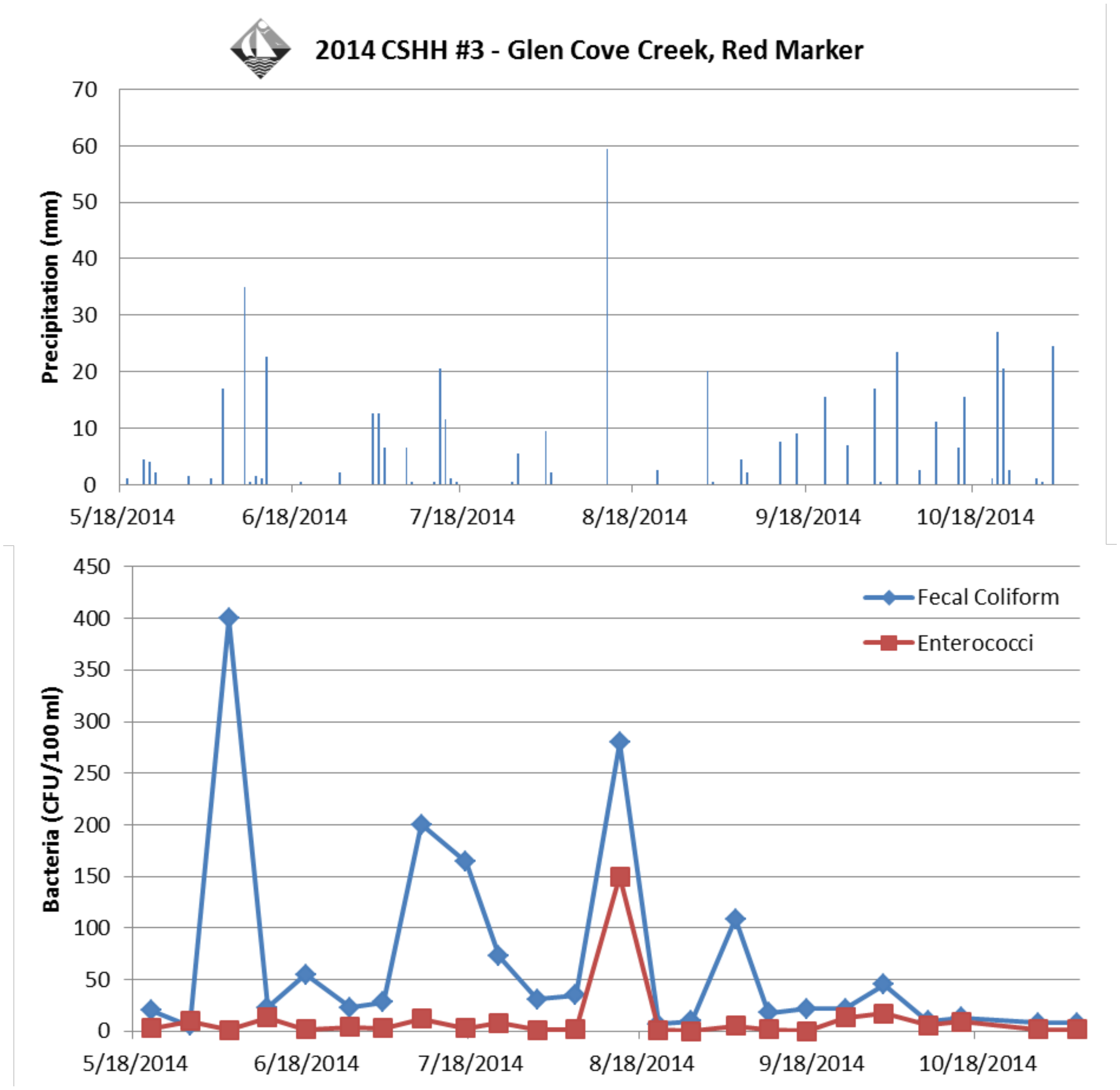
# 2014 In-Harbor Precipitation And Bacteria Graphs



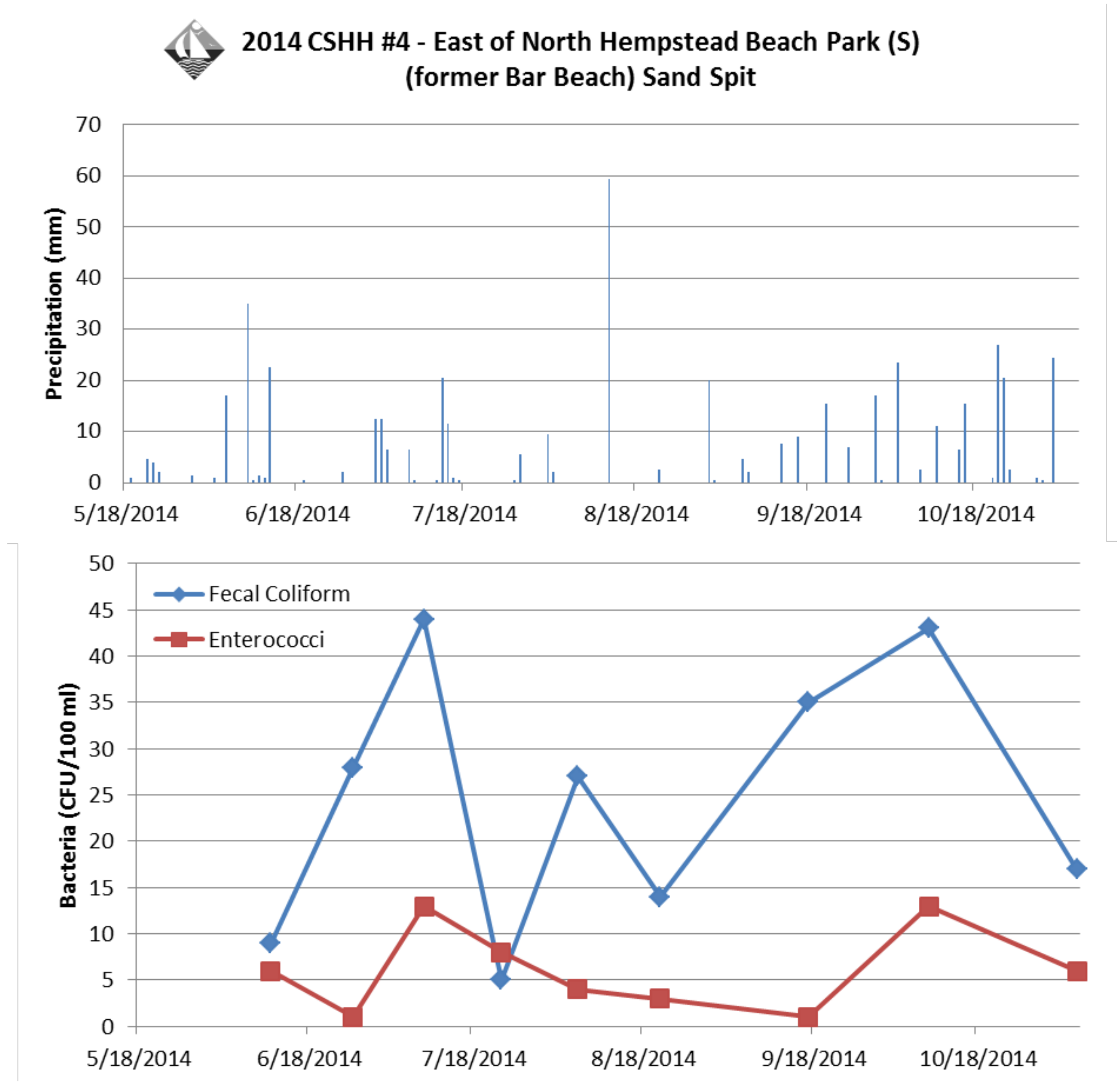
# 2014 In-Harbor Precipitation
# And Bacteria Graphs



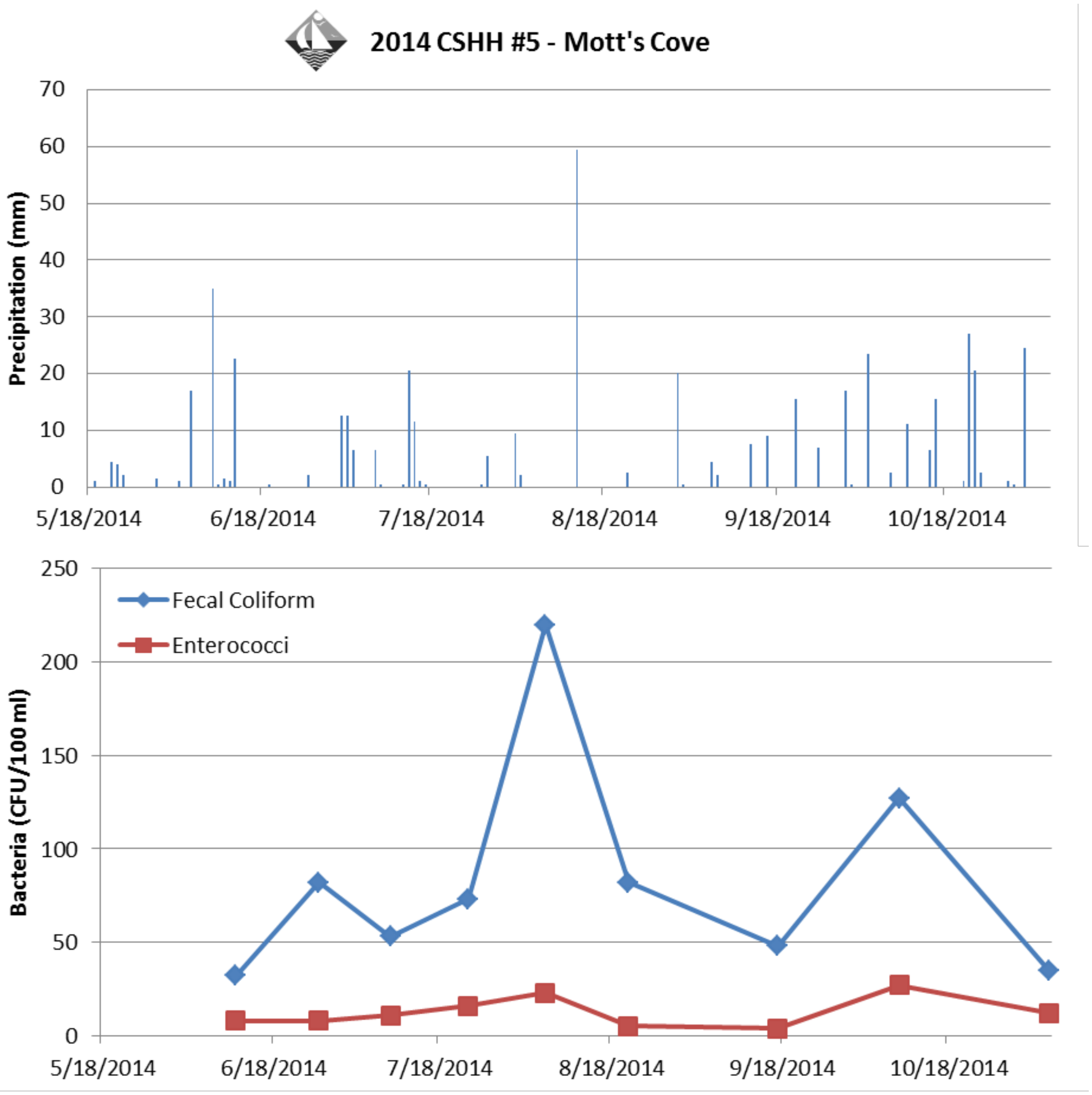
# 2014 In-Harbor Precipitation And Bacteria Graphs



# 2014 In-Harbor Precipitation And Bacteria Graphs



# 2014 In-Harbor Precipitation And Bacteria Graphs



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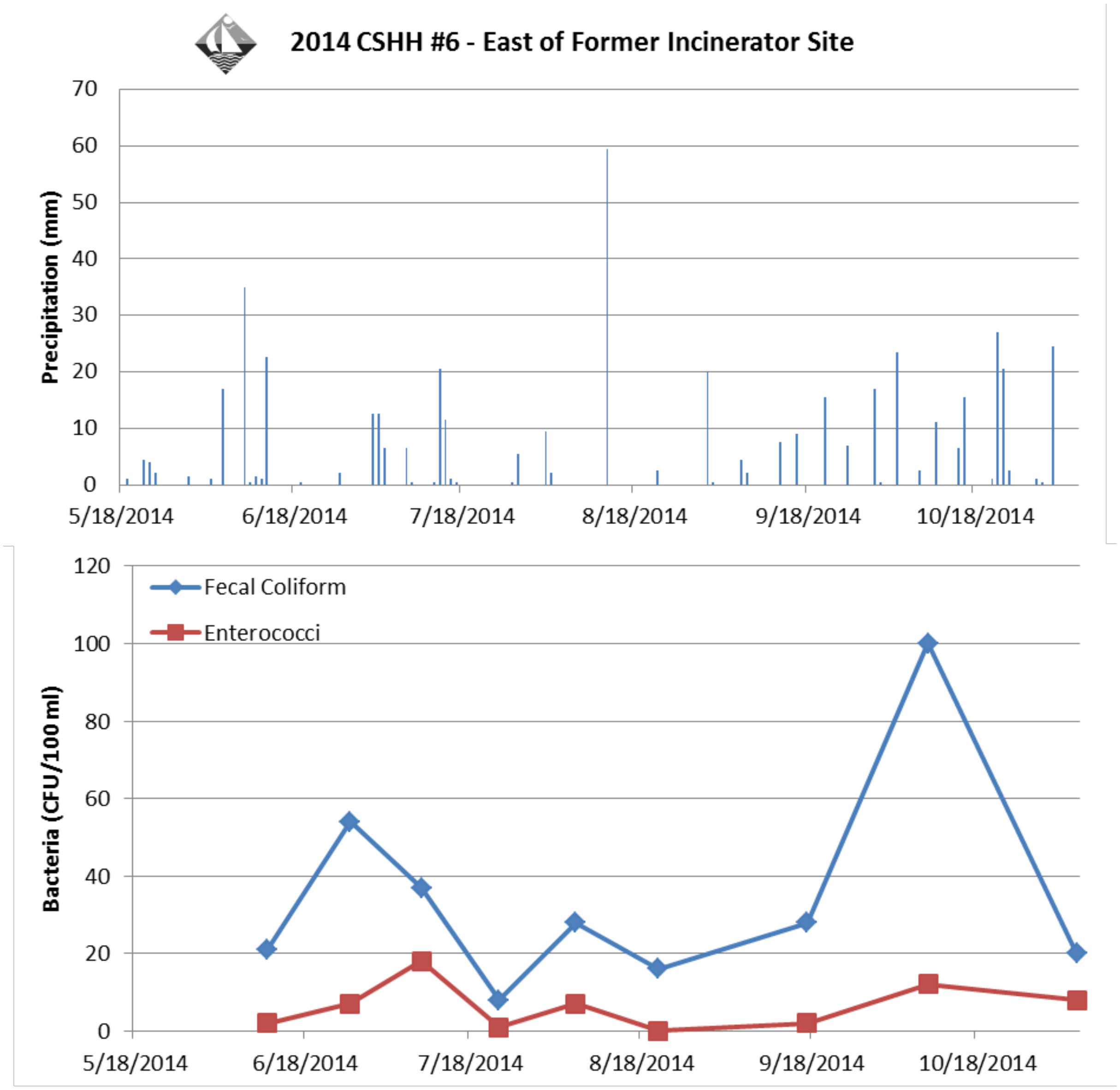
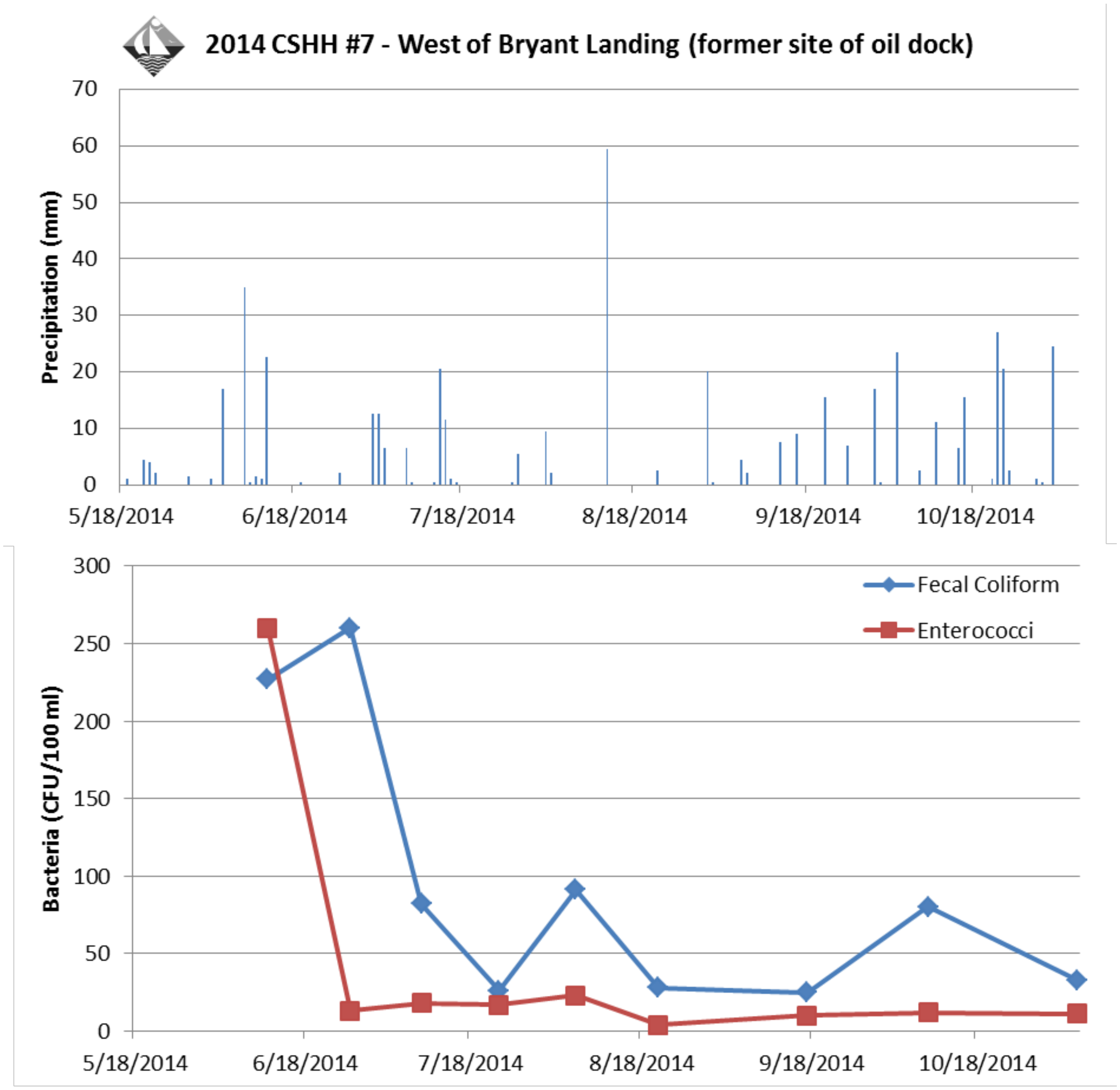
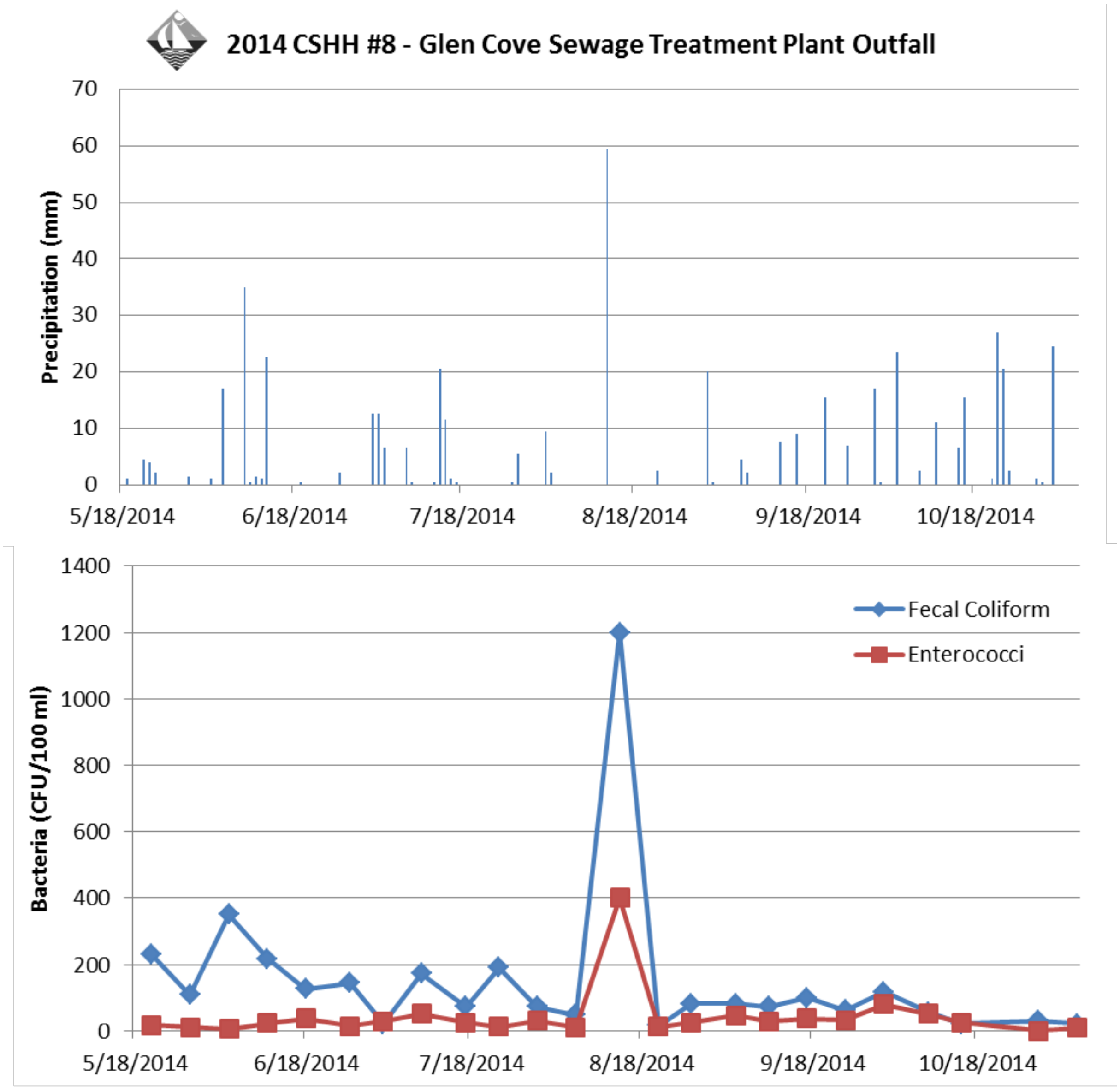
# 2014 In-Harbor Precipitation And Bacteria Graphs



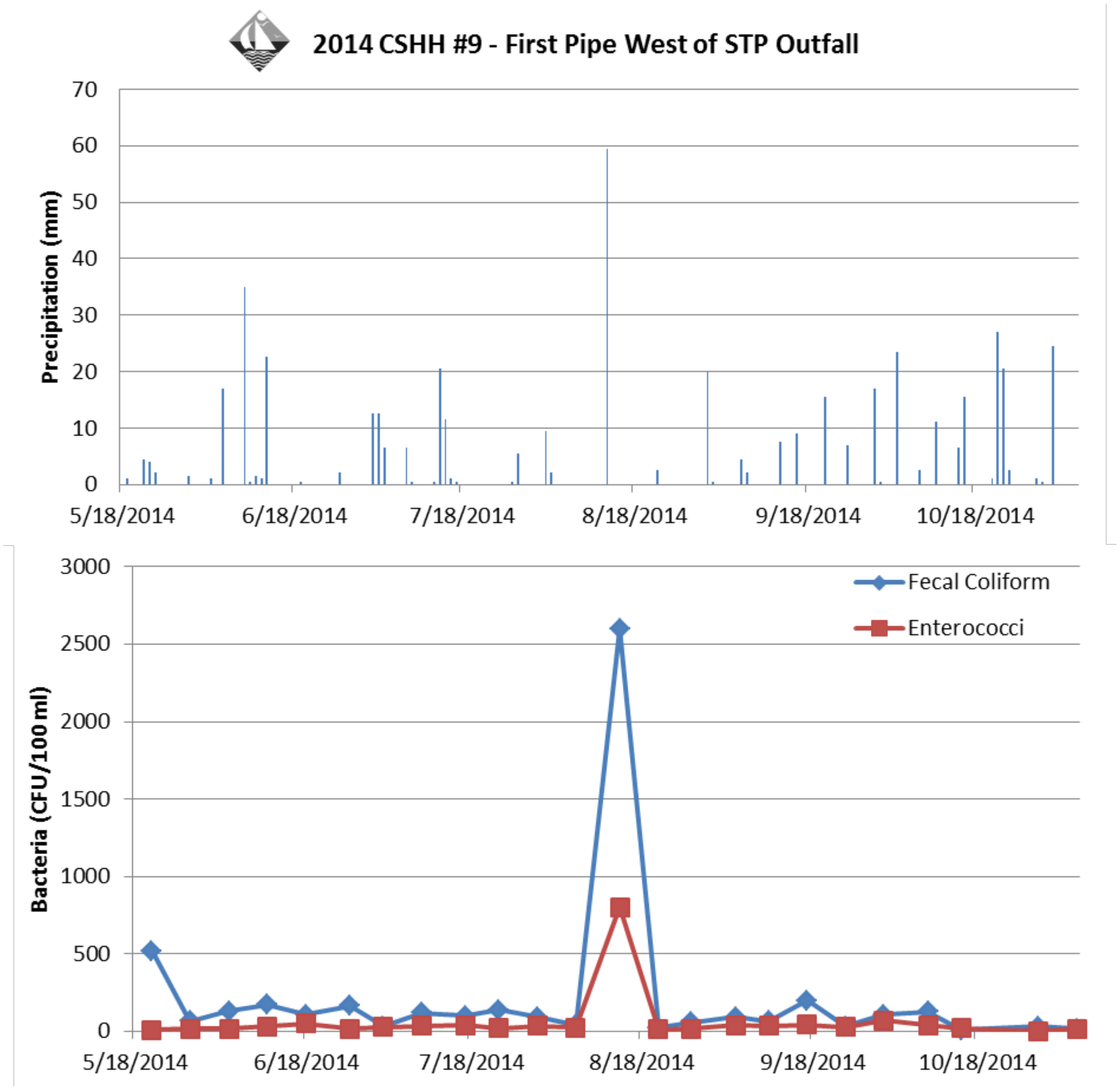
# 2014 In-Harbor Precipitation And Bacteria Graphs



# 2014 In-Harbor Precipitation
# And Bacteria Graphs

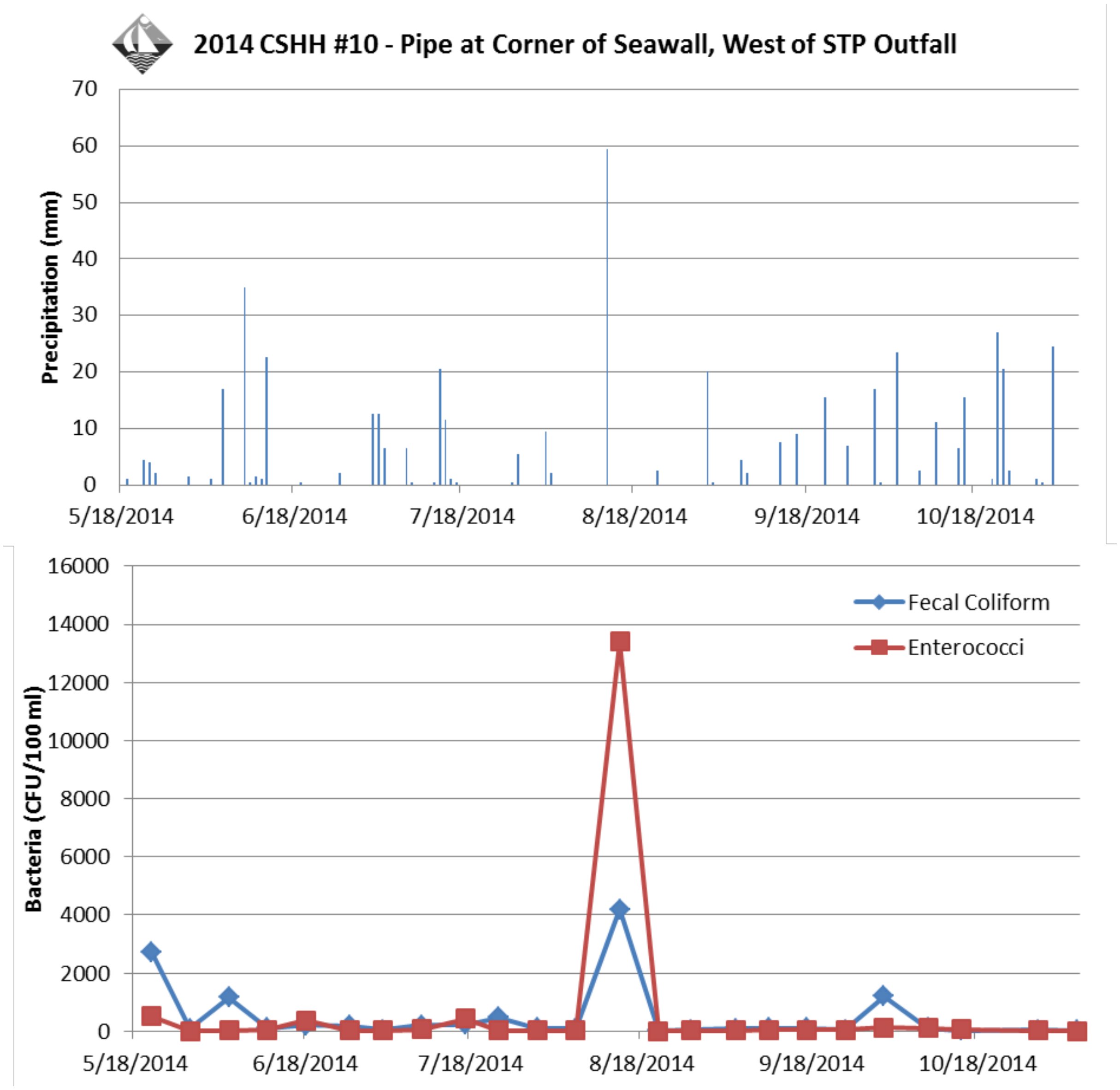


# 2014 In-Harbor Precipitation And Bacteria Graphs

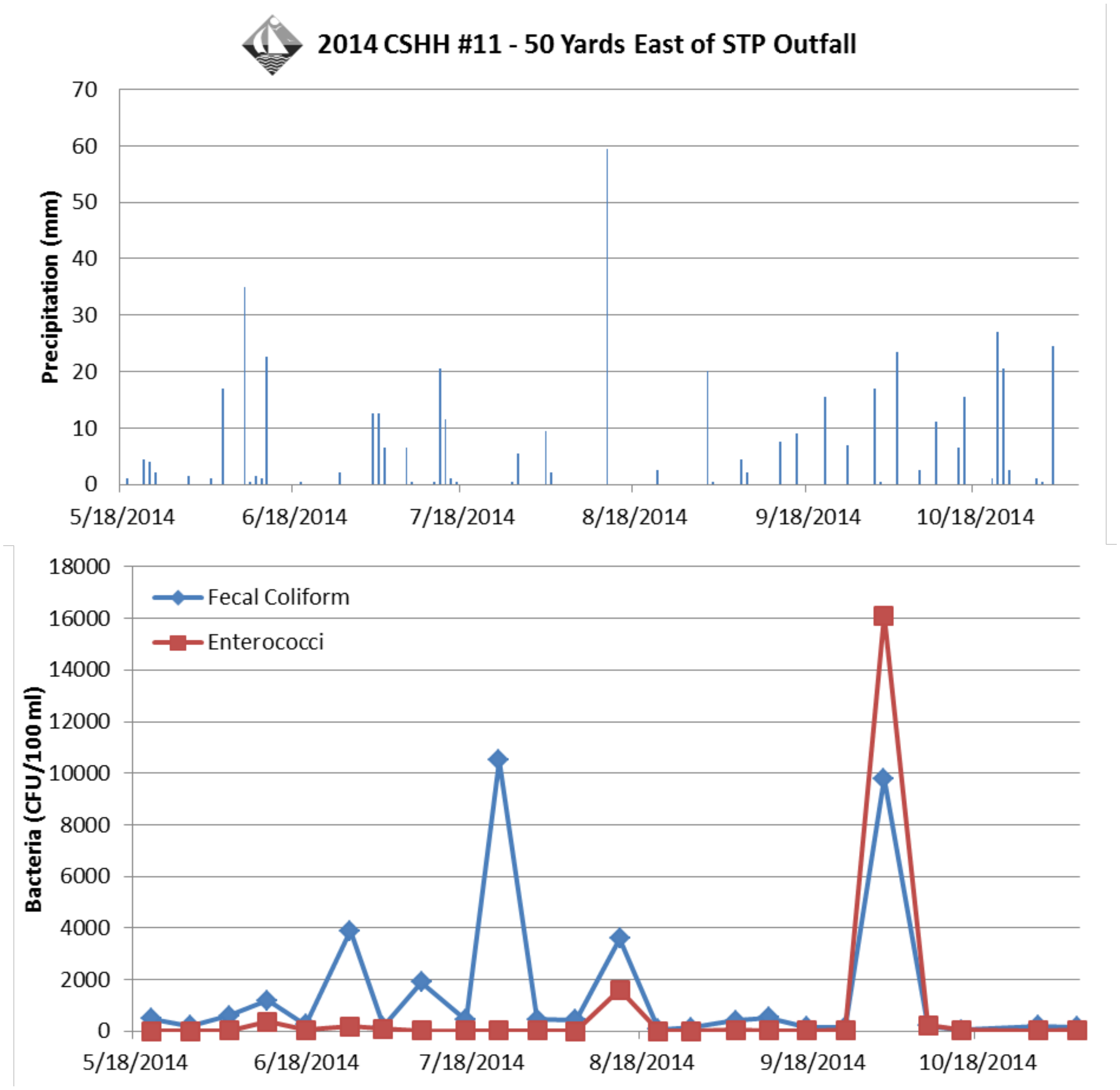


2014 CSHH #9 - First Pipe West of STP Outfall

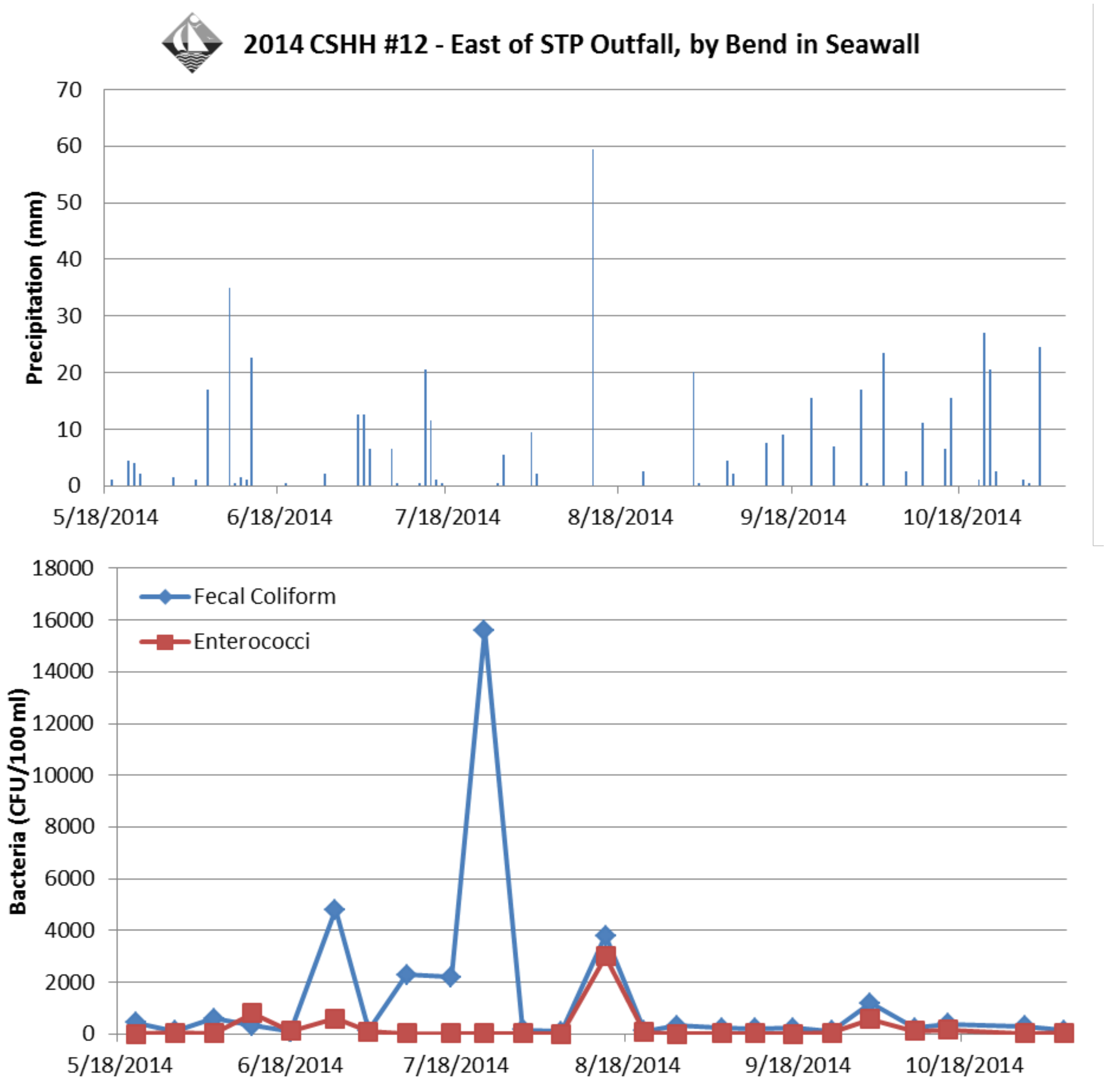
# 2014 In-Harbor Precipitation And Bacteria Graphs



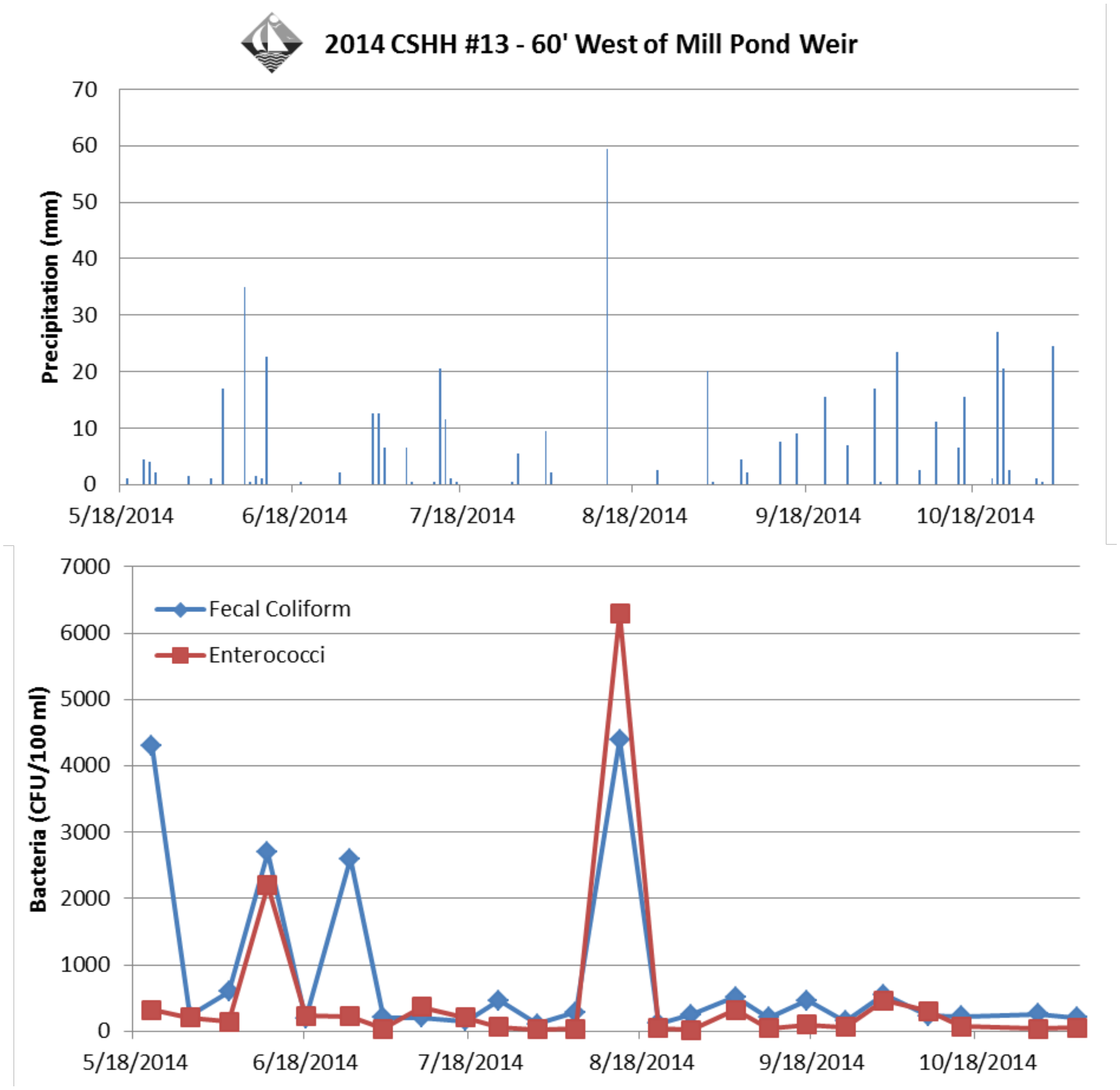
# 2014 In-Harbor Precipitation
And Bacteria Graphs



# 2014 In-Harbor Precipitation And Bacteria Graphs

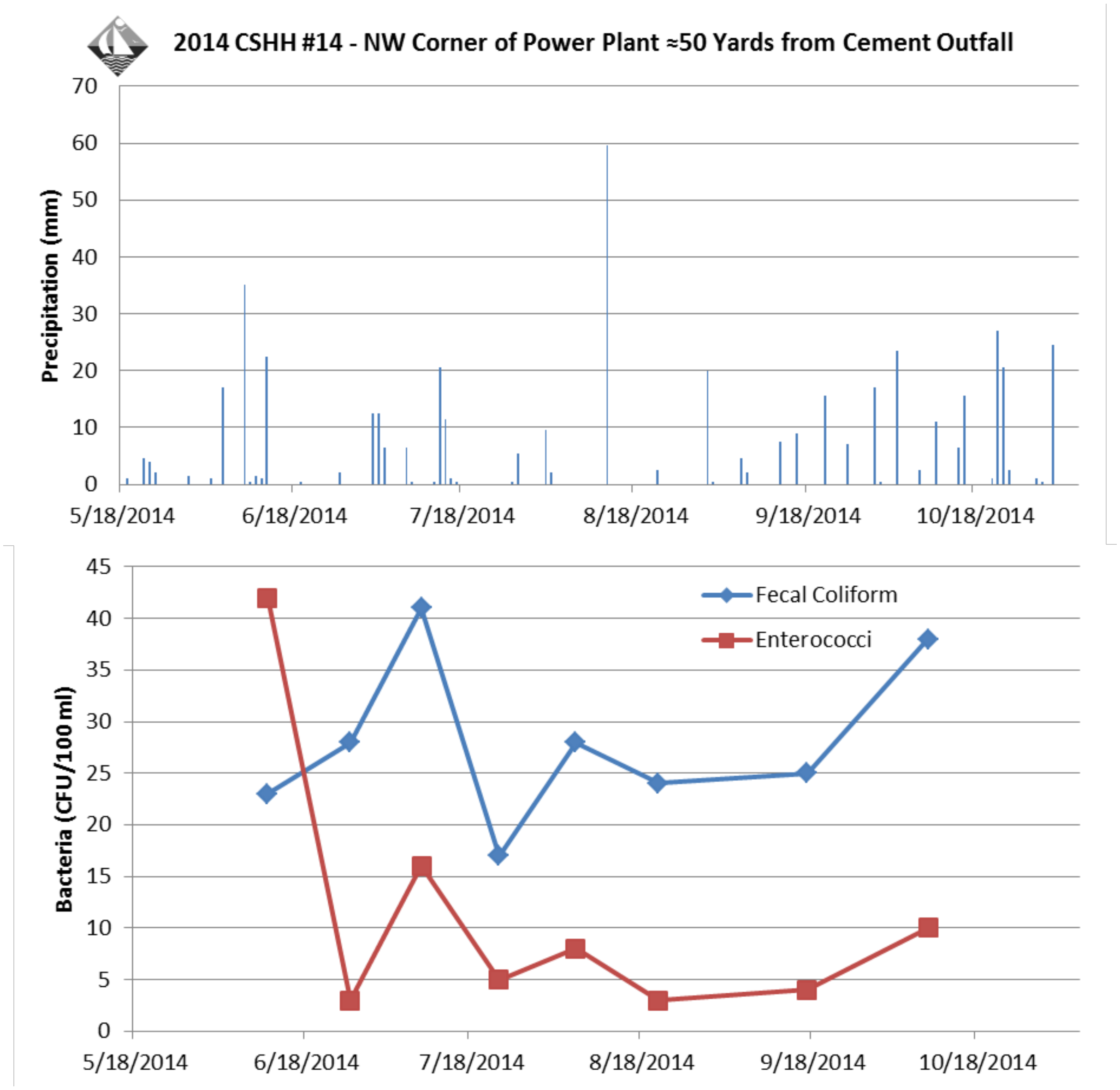


# 2014 In-Harbor Precipitation And Bacteria Graphs

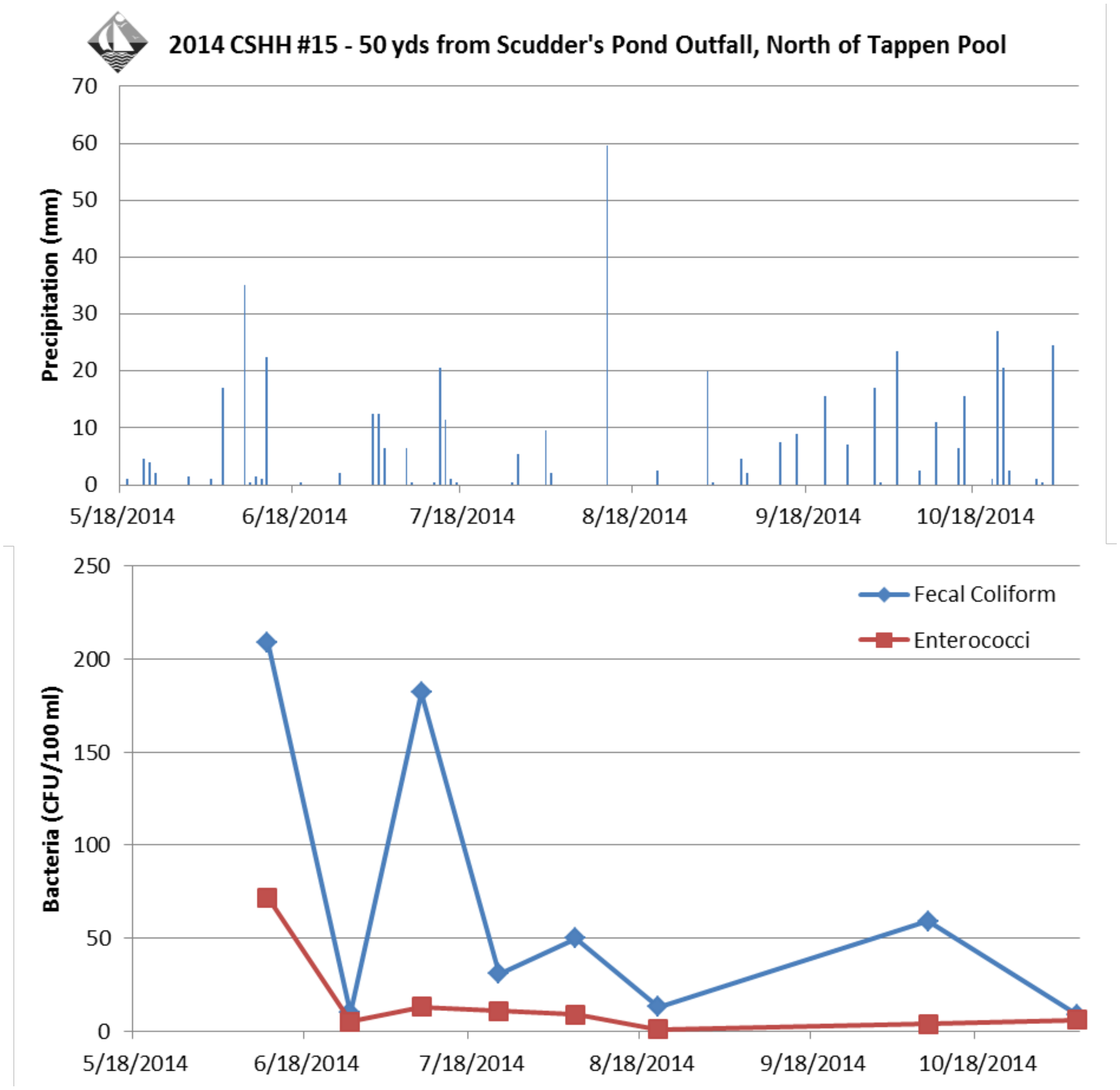


2014 CSHH #13 - 60' West of Mill Pond Weir

# 2014 In-Harbor Precipitation And Bacteria Graphs



# 2014 In-Harbor Precipitation
And Bacteria Graphs



# 2014 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Bacteria Data

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

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 6/4/2014 | 601.00 | 0.00 | ***110.00*** | 0.00 |
| 6/18/2014 | 227.00 | ***369.36*** | ***1300.00*** | ***378.15*** |
| 6/26/2014 | ***1700.00*** | ***614.40*** | ***1000.00*** | ***522.93*** |
| 7/2/2014 | ***1000.00*** | ***693.96*** | ***380.00*** | ***482.81*** |
| 7/9/2014 | 210.00 | ***533.55*** | ***180.00*** | ***546.07*** |
| 7/17/2014 | ***1000.00*** | ***604.98*** | ***800.00*** | ***589.41*** |
| 7/23/2014 | 636.00 | ***743.40*** | ***150.00*** | ***382.69*** |
| 7/30/2014 | ***3100.00*** | ***838.32*** | ***800.00*** | ***365.99*** |

## CSHH #15A - - Scudder's Pond Outfall at Seawall North of Tappen Pool

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 5/21/14 | ***1000.00*** | 0.00 | 49.00 | 0.00 |
| 5/28/14 | 58.00 | ***240.83*** | ***160.00*** | ***88.54*** |
| 6/4/14 | 601.00 | ***326.66*** | 41.00 | ***68.50*** |
| 6/11/14 | 900.00 | ***420.86*** | ***900.00*** | ***130.42*** |
| 6/18/14 | 127.00 | ***331.18*** | ***110.00*** | ***126.05*** |
| 6/26/14 | 91.00 | ***205.06*** | 56.00 | ***129.46*** |
| 07/02/14 | 100.00 | ***228.66*** | ***110.00*** | ***120.12*** |
| 07/09/14 | 191.00 | 181.81 | 80.00 | ***137.30*** |
| 7/17/14 | 64.00 | 107.15 | 37.00 | ***72.52*** |
| 7/23/14 | 38.00 | 84.18 | ***120.00*** | ***73.79*** |
| 7/30/14 | 73.00 | 80.55 | 25.00 | ***62.80*** |
| 8/6/14 | 33.00 | 64.53 | 11.00 | ***39.62*** |
| 8/14/14 | ***1100.00*** | 91.59 | ***1300.00*** | ***69.20*** |
| 8/21/14 | 91.00 | 98.27 | 52.00 | ***74.08*** |
| 8/27/14 | 22.00 | 88.09 | 13.00 | ***47.49*** |
| 9/4/14 | 100.00 | 93.82 | 44.00 | ***53.18*** |
| 9/10/14 | 310.00 | 146.84 | 41.00 | ***69.19*** |
| 9/17/14 | 545.00 | 127.60 | ***140.00*** | ***44.31*** |
| 9/24/14 | 136.00 | 138.28 | 62.00 | ***45.89*** |
| 10/1/14 | ***4500.00*** | ***400.78*** | ***1500.00*** | ***118.62*** |
| 10/9/14 | 100.00 | ***400.78*** | 80.00 | ***133.69*** |
| 10/15/14 | 164.00 | ***352.86*** | 80.00 | ***152.81*** |
| 10/22/14 | 800.00 | ***381.01*** | ***2300.00*** | ***267.47*** |
| 10/29/14 | 100.00 | ***358.29*** | 8.00 | ***177.59*** |
| 11/5/14 | 100.00 | 167.33 | 14.00 | ***69.73*** |

*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.*

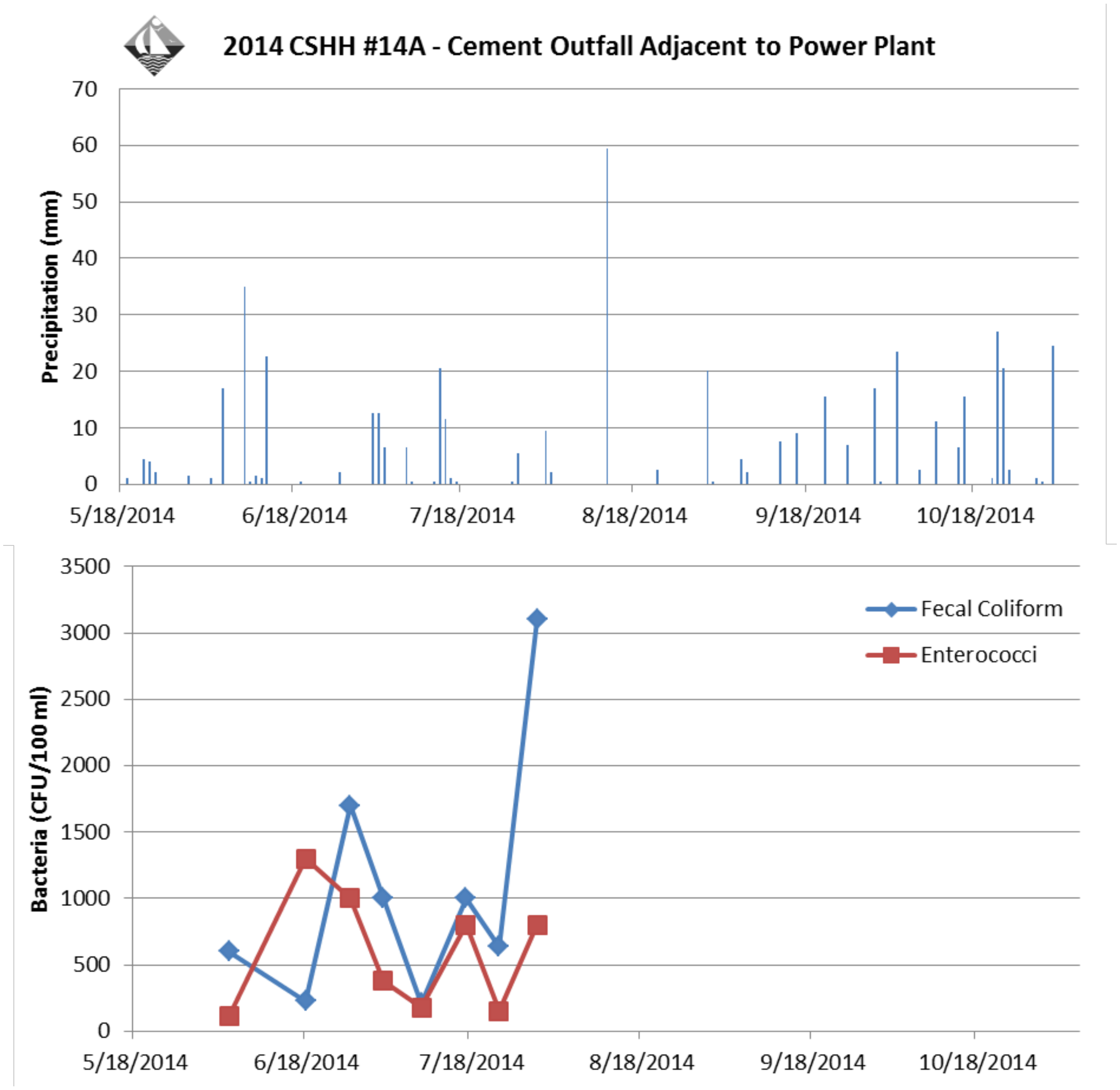
# 2014 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Bacteria Data

## CSHH #15B – Scudder's Pond Weir

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 5/21/14 | 800.00 | 0.00 | 21.00 | 0.00 |
| 5/28/14 | 260.00 | ***456.07*** | ***220.00*** | ***67.97*** |
| 6/4/14 | 601.00 | ***500.01*** | 25.00 | ***48.70*** |
| 6/11/14 | ***1900.00*** | ***698.11*** | ***1100.00*** | ***106.17*** |
| 6/18/14 | 173.00 | ***528.14*** | 35.00 | ***85.04*** |
| 6/26/14 | 136.00 | ***370.54*** | 46.00 | ***99.48*** |
| 7/2/14 | 91.00 | ***300.37*** | ***130.00*** | ***89.54*** |
| 7/9/14 | 127.00 | ***220.11*** | 90.00 | ***115.69*** |
| 7/17/14 | 91.00 | 119.87 | 58.00 | ***64.22*** |
| 7/23/14 | 21.00 | 78.62 | 37.00 | ***64.94*** |
| 7/30/14 | 55.00 | 65.60 | 3.00 | ***37.62*** |
| 8/6/14 | 16.00 | 46.34 | 2.00 | 16.32 |
| 8/14/14 | ***4300.00*** | 93.72 | ***2800.00*** | 32.46 |
| 8/21/14 | 73.00 | 89.68 | 46.00 | 30.99 |
| 8/27/14 | 33.00 | 98.17 | 10.00 | 23.86 |
| 9/4/14 | 127.00 | 116.05 | 38.00 | ***39.64*** |
| 9/10/14 | 440.00 | ***225.17*** | 80.00 | ***82.90*** |
| 9/17/14 | ***1500.00*** | 182.41 | ***200.00*** | ***48.90*** |
| 9/24/14 | 272.00 | ***237.29*** | 37.00 | ***46.82*** |
| 10/1/14 | ***5900.00*** | ***669.50*** | ***3100.00*** | ***147.47*** |
| 10/9/14 | 100.00 | ***638.25*** | 46.00 | ***153.21*** |
| 10/15/14 | 250.00 | ***570.02*** | 90.00 | ***156.86*** |
| 10/22/14 | ***2700.00*** | ***641.13*** | ***1400.00*** | ***231.49*** |
| 10/29/14 | 182.00 | ***591.62*** | 12.00 | ***184.81*** |
| 11/5/14 | 82.00 | ***251.56*** | 12.00 | ***60.86*** |

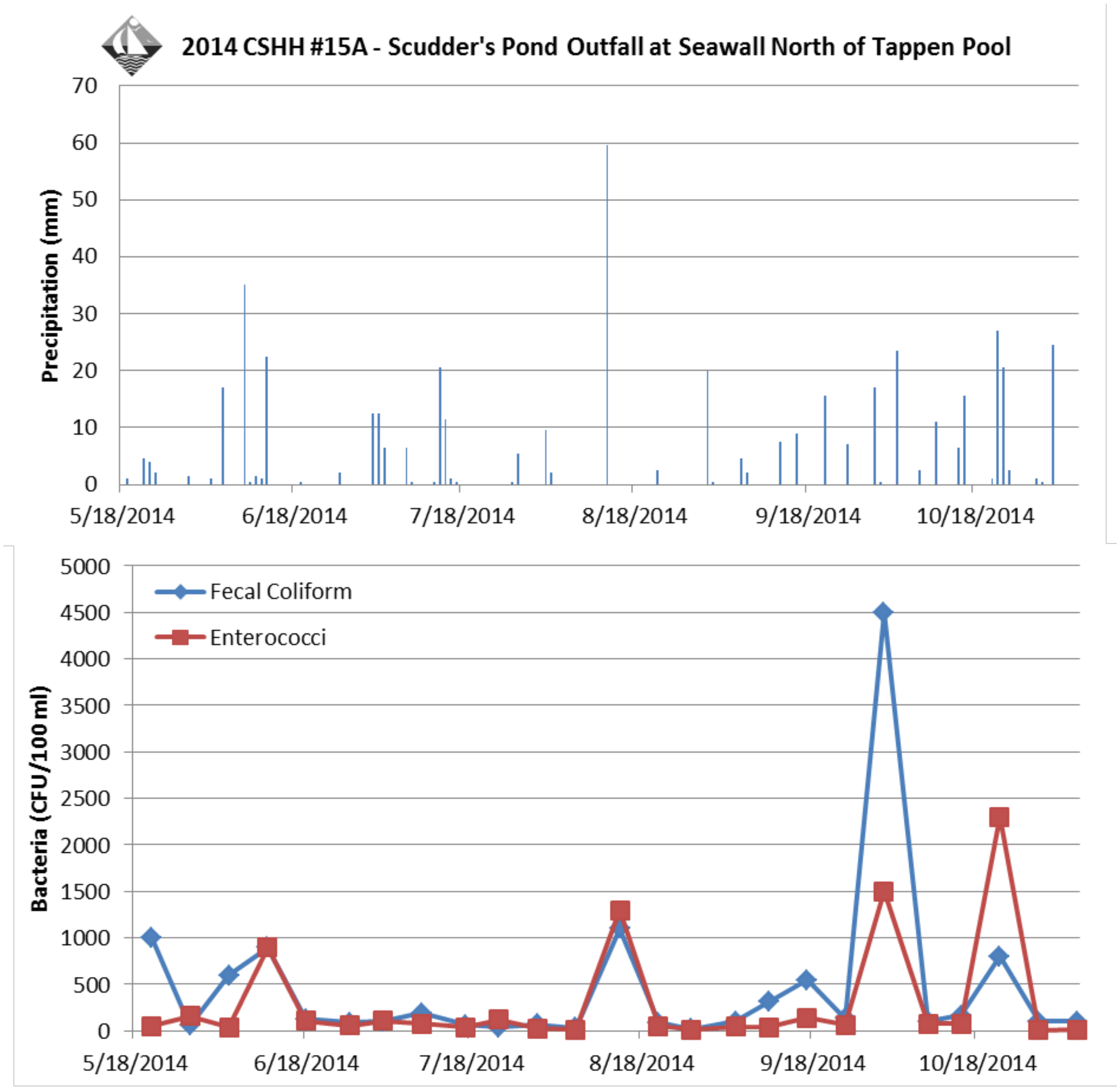
*Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refers to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104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

# 2014 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Precipitation And Bacteria Graphs



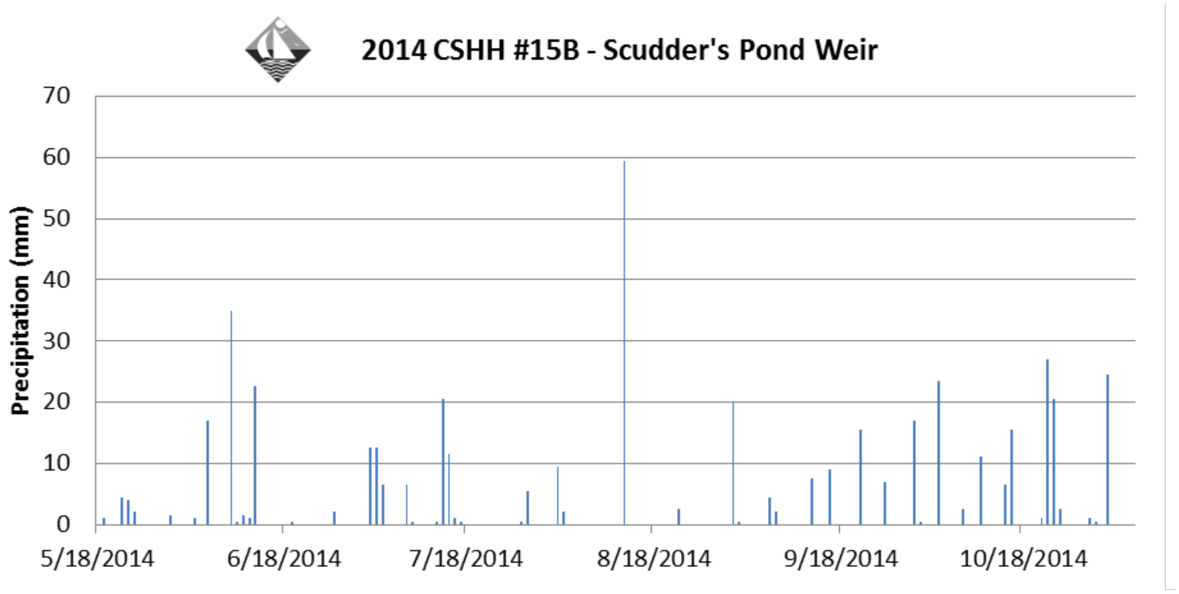
*Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refers to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104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

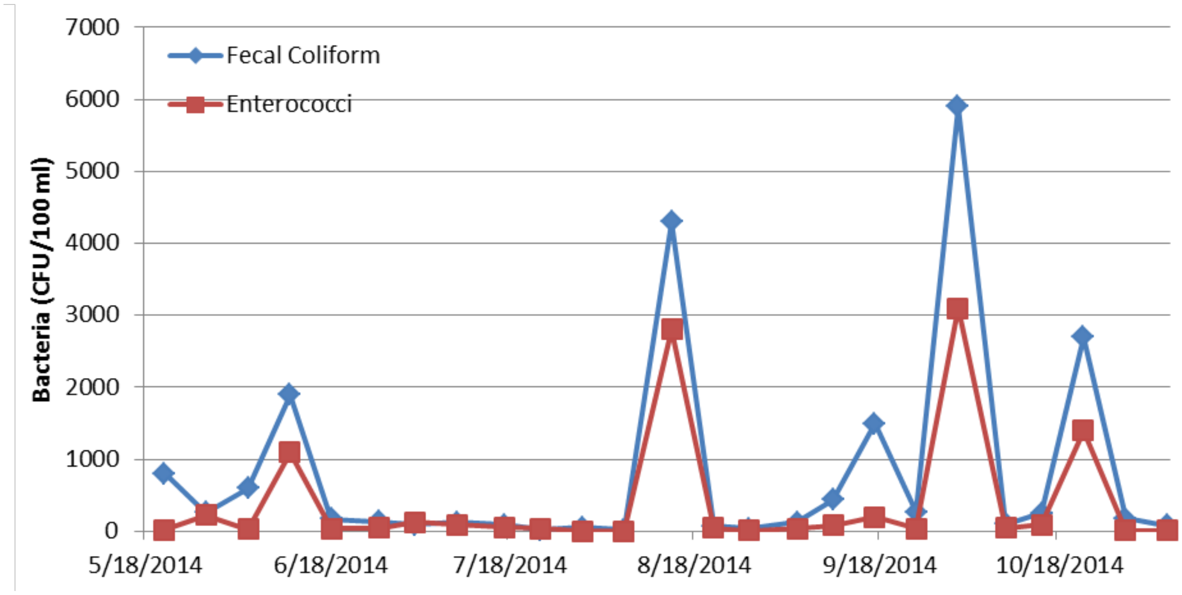
# 2014 Scudder's Pond and Powerhouse Drain Outfalls Regular Season Monitoring Precipitation And Bacteria Graphs



*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.*

# 2014 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.*

# 2014-2015 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** |
| 4/29/2015 | 30.00 | 0.00 | 3.00 | 0.00 |

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

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 11/13/14 | 47.00 | 0.00 | 12.00 | 0.00 |
| 11/18/14 | **1900.00** | **298.83** | **1200.00** | **120.00** |
| 11/25/14 | 91.00 | **201.05** | **140.00** | **126.33** |
| 12/3/14 | 55.00 | 145.40 | 80.00 | **112.69** |
| 12/10/14 | 450.00 | 182.26 | **7800.00** | **262.99** |
| 12/17/14 | 33.00 | 169.82 | 80.00 | **384.34** |
| 12/23/14 | 82.00 | **90.57** | **320.00** | **295.06** |
| 12/31/14 | 52.00 | 80.98 | 12.00 | **180.52** |
| 1/7/15 | 20.00 | 66.15 | 3.00 | **93.61** |
| 1/13/15 | 182.00 | 55.19 | **600.00** | **56.05** |
| 1/21/15 | 22.00 | 50.89 | **140.00** | **62.68** |
| 2/4/15 | 127.00 | 56.47 | 9.00 | **38.81** |
| 2/11/15 | 51.00 | 71.36 | 21.00 | **63.12** |
| 2/18/15 | 136.00 | 66.35 | 47.00 | 33.39 |
| 2/25/15 | 590.00 | 150.99 | 16.00 | 19.42 |
| 3/4/15 | **1300.00** | **232.24** | **380.00** | **35.20** |
| 3/11/15 | 540.00 | **310.21** | **190.00** | **64.77** |
| 3/18/15 | 18.00 | **251.88** | 17.00 | **62.09** |
| 3/25/15 | 44.00 | **200.99** | 15.00 | **49.41** |
| 4/1/15 | 20.00 | 102.15 | 1.00 | 28.38 |
| 4/8/15 | 56.00 | 54.46 | 4.00 | 11.41 |
| 4/15/15 | 16.00 | 26.94 | 3.00 | 4.98 |
| 4/22/15 | 60.00 | 34.28 | 29.00 | 5.54 |
| 4/29/15 | 42.00 | 33.96 | 11.00 | 5.21 |

*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.*

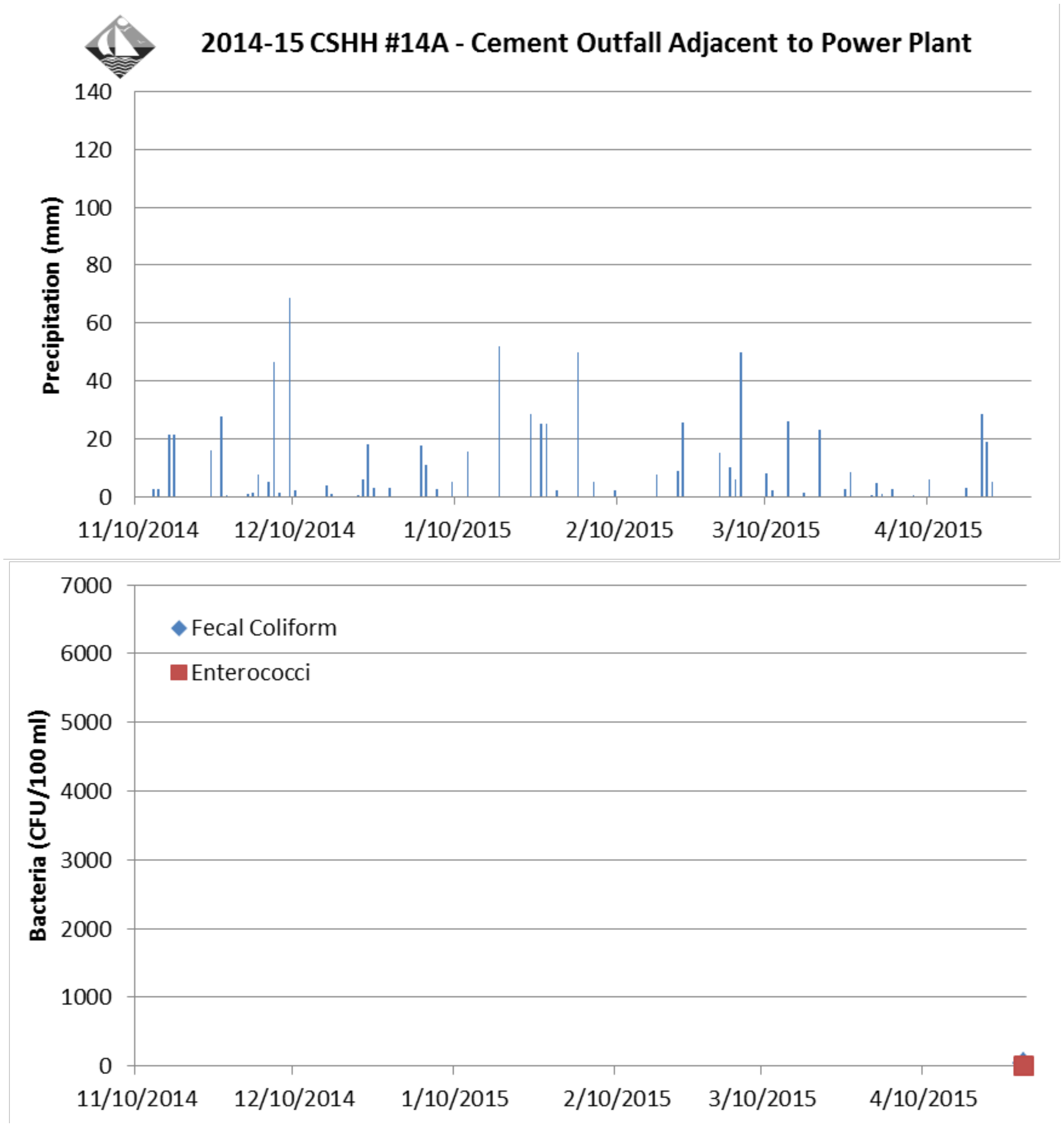
# 2014-2015 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Bacteria Data

## CSHH #15B – Scudder's Pond Weir

| | *Fecal Coliform* | | *Enterococci* | |
|---|---|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgFC** | **CFU/100ml.** | **Log AvgEnt** |
| 11/13/14 | 59.00 | 0.00 | 11.00 | 0.00 |
| 11/18/14 | **2100.00** | **351.99** | **1400.00** | **124.10** |
| 11/25/14 | 91.00 | **224.24** | 90.00 | **111.49** |
| 12/3/14 | 34.00 | 139.93 | 90.00 | **105.68** |
| 12/10/14 | 510.00 | 181.23 | **6200.00** | **238.60** |
| 12/17/14 | 18.00 | 142.93 | 55.00 | **329.21** |
| 12/23/14 | 73.00 | 73.00 | **320.00** | **245.06** |
| 12/31/14 | 58.00 | 66.71 | 18.00 | **177.62** |
| 1/7/15 | 15.00 | 56.64 | 2.00 | **82.95** |
| 1/13/15 | 91.00 | 40.13 | **260.00** | **43.99** |
| 1/21/15 | 44.00 | 47.98 | **180.00** | **55.76** |
| 2/4/15 | 182.00 | 57.50 | 16.00 | 34.98 |
| 2/11/15 | 200.00 | 109.87 | 27.00 | **67.06** |
| 2/18/15 | 220.00 | 137.01 | 59.00 | **46.28** |
| 2/25/15 | **1700.00** | **341.58** | 11.00 | **23.01** |
| 3/4/15 | 530.00 | **372.95** | **230.00** | **36.47** |
| 3/11/15 | 390.00 | **434.36** | **120.00** | **54.56** |
| 3/18/15 | 2.00 | 172.92 | 4.00 | **37.24** |
| 3/25/15 | 58.00 | 132.45 | 22.00 | 30.57 |
| 3/25/15 | 45.00 | 110.64 | 4.00 | 21.78 |
| 4/1/15 | 5.00 | 41.88 | 1.00 | 14.61 |
| 4/8/15 | 44.00 | 27.66 | 5.00 | 7.72 |
| 4/15/15 | 6.00 | 13.79 | 0.10 | 2.37 |
| 4/22/15 | 118.00 | 27.22 | 34.00 | 3.38 |
| 4/29/15 | 85.00 | 26.57 | 12.00 | 2.90 |

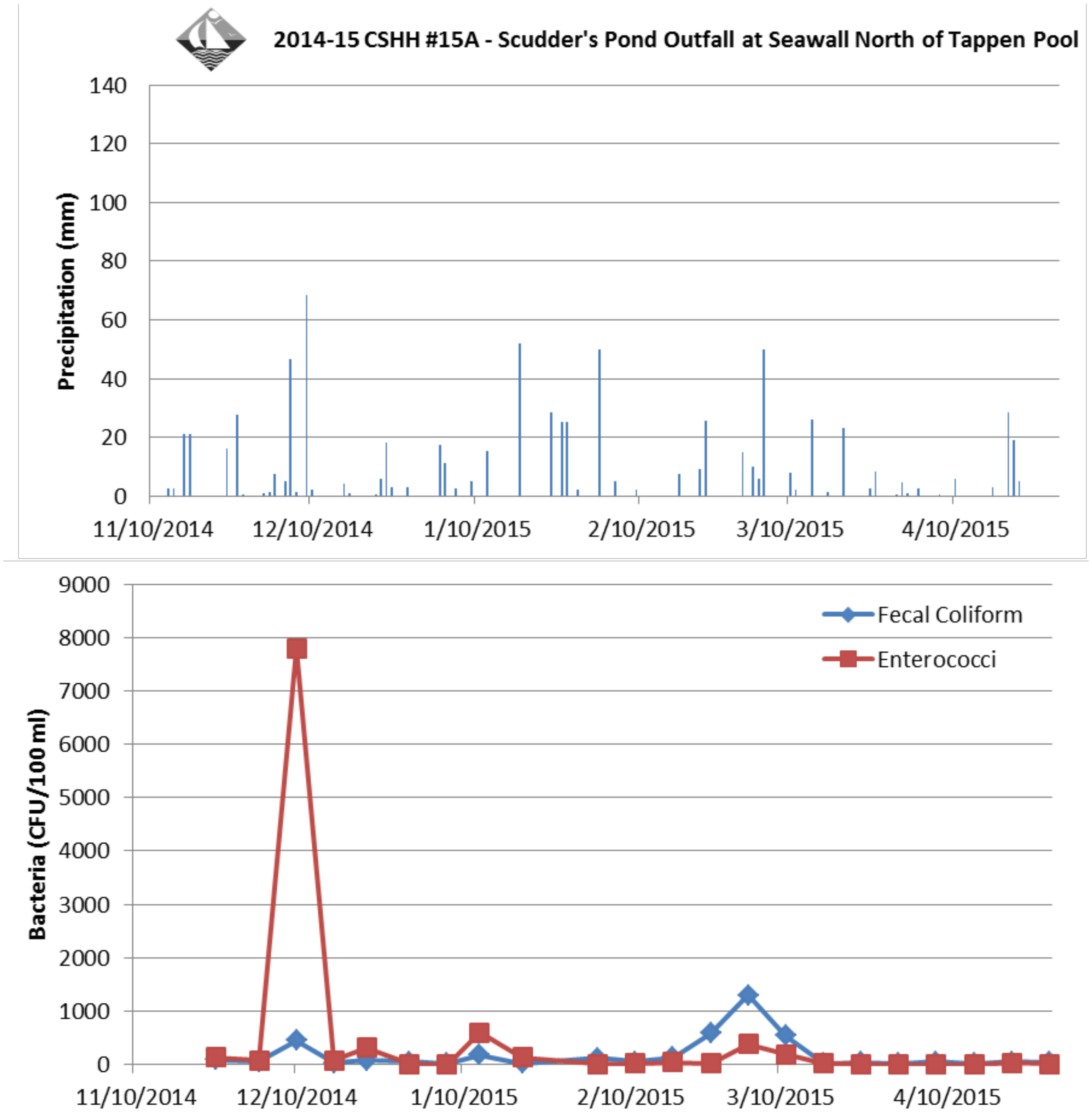
*Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refers to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104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

# 2014-2015 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Precipitation and Bacteria Graphs



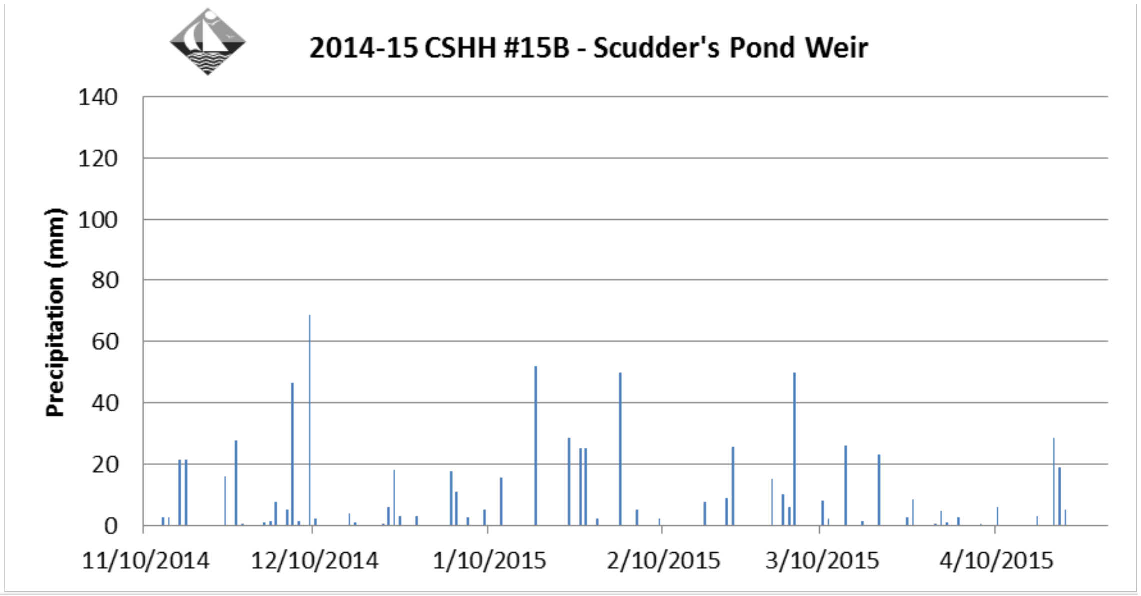
*Note: CFU refers to the number of colony forming units, or the number of bacterial cells in the water sample. Log AvgEnt (log average for enterococci) refers to the running seasonal average of bacteria results at each location. Boldfaced, italicized values exceed the NYS beach closure standards of 104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

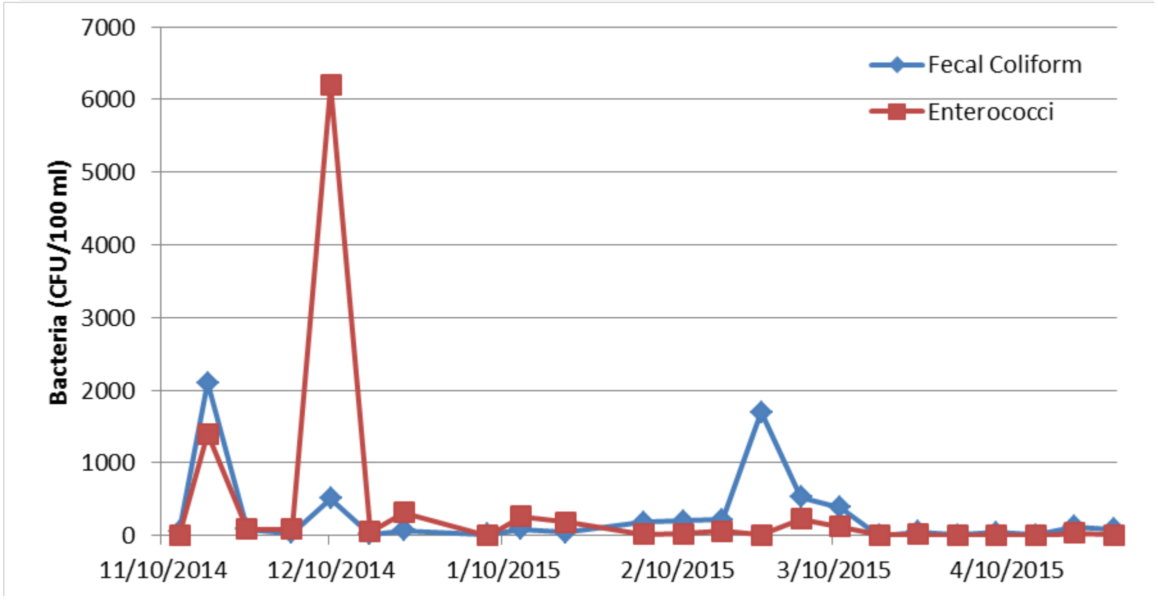
# 2014-2015 Scudder's Pond and Powerhouse Drain Outfalls Winter-Monitoring Precipitation and Bacteria Graphs



*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.*

# 2014-2015 Scudder's Pond and Powerhouse Drain Outfalls Winter-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.*

# 2014 Beach-Monitoring Bacteria Data

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

| Date | *Enterococci* CFU/100ml. | *Enterococci* Log AvgEnt |
|---|---|---|
| 4/14/14 | 2.00 | 0.00 |
| 4/16/14 | 3.00 | 2.45 |
| 4/21/14 | 2.00 | 2.29 |
| 4/23/14 | 49.00 | 4.92 |
| 4/28/14 | 11.00 | 5.78 |
| 4/30/14 | 58.00 | 8.49 |
| 5/5/14 | 6.00 | 8.08 |
| 5/7/14 | 1.00 | 6.22 |
| 5/12/14 | 12.00 | 6.69 |
| 5/14/14 | 15.00 | 7.26 |
| 5/19/14 | 8.00 | 9.34 |
| 5/21/14 | 0.10 | 5.93 |
| 5/28/14 | ***1520.00*** | 9.81 |
| 6/2/14 | 0.10 | 4.36 |
| 6/4/14 | 4.00 | 4.32 |
| 6/9/14 | ***410.00*** | 8.80 |
| 6/11/14 | ***480.00*** | 13.72 |
| 6/16/14 | 3.00 | 11.41 |
| 6/18/14 | 3.00 | 9.84 |
| 6/23/14 | 6.00 | 16.84 |
| 6/25/14 | 15.00 | 16.62 |
| 6/30/14 | 13.00 | 9.79 |
| 7/2/14 | 1.00 | 7.80 |
| 7/7/14 | 0.10 | 8.40 |
| 7/9/14 | 13.00 | 8.77 |
| 7/14/14 | 20.00 | 4.02 |
| 7/16/14 | 33.00 | 4.96 |
| 7/21/14 | 2.00 | 5.02 |
| 7/23/14 | 0.10 | 3.39 |
| 7/28/14 | 2.00 | 2.54 |
| 7/30/14 | 1.00 | 2.32 |
| 8/4/14 | 8.00 | 2.41 |
| 8/6/14 | 14.00 | 2.87 |
| 8/11/14 | 70.00 | 5.03 |
| 8/13/14 | ***1000.00*** | 8.54 |
| 08/18/14 | 1.00 | 5.27 |
| 8/20/14 | 0.10 | 3.55 |
| 8/25/14 | 18.00 | 6.73 |
| 8/27/14 | 3.00 | 6.21 |

*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.*

# 2014 Beach-Monitoring Bacteria Data

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

|  | *Enterococci* |  |
|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgEnt** |
| 04/14/14 | 0.10 | 0.00 |
| 04/16/14 | 6.00 | 0.77 |
| 04/21/14 | 0.10 | 0.39 |
| 04/23/14 | 0.10 | 0.28 |
| 04/28/14 | 10.00 | 0.57 |
| 04/30/14 | 80.00 | 1.30 |
| 05/05/14 | 0.10 | 0.90 |
| 05/07/14 | 0.10 | 0.68 |
| 05/12/14 | 8.00 | 0.90 |
| 05/14/14 | 11.00 | 1.15 |
| 05/19/14 | 0.10 | 0.96 |
| 05/21/14 | 0.10 | 0.77 |
| 05/28/14 | ***260.00*** | 2.30 |
| 06/02/14 | 0.10 | 0.83 |
| 06/04/14 | 4.00 | 0.99 |
| 06/09/14 | ***1500.00*** | 4.39 |
| 06/11/14 | ***310.00*** | 7.04 |
| 06/13/14 | ***350.00*** | 10.72 |
| 06/16/14 | 31.00 | 12.02 |
| 06/18/14 | 3.00 | 10.46 |
| 06/23/14 | 4.00 | 26.43 |
| 06/25/14 | 6.00 | 22.79 |
| 06/30/14 | 9.00 | 16.28 |
| 07/02/14 | 3.00 | 13.96 |
| 07/07/14 | 0.10 | 15.82 |
| 07/09/14 | 11.00 | 15.30 |
| 07/14/14 | 13.00 | 4.57 |
| 07/16/14 | 80.00 | 6.08 |
| 07/21/14 | 4.00 | 5.24 |
| 07/23/14 | 2.00 | 4.76 |
| 07/28/14 | 9.00 | 5.07 |
| 07/30/14 | 1.00 | 4.31 |
| 08/04/14 | 2.00 | 3.80 |
| 08/06/14 | 9.00 | 4.14 |
| 08/11/14 | ***230.00*** | 8.78 |
| 08/13/14 | ***420.00*** | 12.93 |
| 08/18/14 | 1.00 | 7.94 |
| 08/20/14 | 0.10 | 5.13 |
| 08/25/14 | 1.00 | 4.88 |
| 08/27/14 | 5.00 | 4.89 |

*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.*

# 2014 Beach-Monitoring Bacteria Data

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

| | ***Enterococci*** | |
|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgEnt** |
| 4/14/14 | 1.00 | 0.00 |
| 4/16/14 | 7.00 | 2.65 |
| 4/21/14 | 0.10 | 0.89 |
| 4/23/14 | 2.00 | 1.09 |
| 4/28/14 | 0.10 | 0.67 |
| 4/30/14 | 33.00 | 1.29 |
| 5/5/14 | 7.00 | 1.64 |
| 5/7/14 | 0.10 | 1.16 |
| 5/12/14 | 62.00 | 1.80 |
| 5/14/14 | ***150.00*** | 2.80 |
| 5/19/14 | 9.00 | 3.23 |
| 5/21/14 | 0.10 | 2.28 |
| 5/28/14 | 12.00 | 3.95 |
| 6/2/14 | 1.00 | 4.04 |
| 6/4/14 | 23.00 | 4.90 |
| 6/9/14 | ***380.00*** | 13.12 |
| 6/11/14 | ***160.00*** | 17.32 |
| 6/13/14 | ***410.00*** | 21.37 |
| 6/14/14 | 15.00 | 16.54 |
| 6/16/14 | 10.00 | 15.73 |
| 6/18/14 | 7.00 | 14.62 |
| 6/23/14 | 1.00 | 19.31 |
| 6/25/14 | 0.10 | 11.97 |
| 6/30/14 | 4.00 | 10.83 |
| 7/2/14 | 2.00 | 9.41 |
| 7/7/14 | 2.00 | 9.24 |
| 7/9/14 | 2.00 | 8.13 |
| 7/14/14 | 26.00 | 3.12 |
| 7/16/14 | 100.00 | 3.77 |
| 7/21/14 | 10.00 | 3.52 |
| 7/23/14 | 2.00 | 3.33 |
| 7/28/14 | 10.00 | 6.34 |
| 7/30/14 | 1.00 | 5.27 |
| 8/4/14 | 0.10 | 3.90 |
| 8/6/14 | ***300.00*** | 6.02 |
| 8/8/14 | 43.00 | 8.18 |
| 8/11/14 | 4.00 | 8.77 |
| 8/13/14 | ***320.00*** | 12.16 |
| 8/18/14 | 1.00 | 7.11 |
| 8/20/14 | 0.10 | 4.83 |
| 8/25/14 | 1.00 | 4.19 |
| 8/27/14 | 2.00 | 3.91 |

*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.*

# 2014 Beach-Monitoring Bacteria Data

## NSB#5 - Tappen Beach

| | *Enterococci* | |
|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgEnt** |
| 04/14/14 | 1.00 | 0.00 |
| 04/16/14 | 1.00 | 1.00 |
| 04/21/14 | 0.10 | 0.46 |
| 04/23/14 | 17.00 | 1.14 |
| 04/28/14 | 2.00 | 1.28 |
| 04/30/14 | 32.00 | 2.18 |
| 05/05/14 | 31.00 | 3.19 |
| 05/07/14 | 0.10 | 2.07 |
| 05/12/14 | 12.00 | 2.52 |
| 05/14/14 | 38.00 | 3.30 |
| 05/19/14 | 0.10 | 2.92 |
| 05/21/14 | 0.10 | 2.08 |
| 05/28/14 | ***190.00*** | 3.82 |
| 05/30/14 | 28.00 | 5.12 |
| 06/02/14 | 2.00 | 3.76 |
| 06/04/14 | 1.00 | 3.29 |
| 06/09/14 | 33.00 | 4.89 |
| 06/11/14 | ***130.00*** | 6.79 |
| 06/13/14 | ***490.00*** | 9.84 |
| 06/16/14 | 11.00 | 8.69 |
| 06/18/14 | 1.00 | 7.14 |
| 06/23/14 | 48.00 | 20.29 |
| 06/25/14 | 11.00 | 19.19 |
| 06/30/14 | 13.00 | 14.13 |
| 07/02/14 | 8.00 | 13.42 |
| 07/07/14 | 19.00 | 21.79 |
| 07/09/14 | 36.00 | 22.81 |
| 07/14/14 | 80.00 | 14.75 |
| 07/16/14 | 50.00 | 16.67 |
| 07/21/14 | 3.00 | 19.72 |
| 07/23/14 | 1.00 | 14.63 |
| 07/28/14 | 22.00 | 13.85 |
| 07/30/14 | 1.00 | 10.65 |
| 08/04/14 | 47.00 | 12.68 |
| 08/06/14 | 3.00 | 10.98 |
| 08/11/14 | 1.00 | 6.94 |
| 08/13/14 | ***700.00*** | 11.01 |
| 08/18/14 | 1.00 | 5.72 |
| 08/20/14 | 1.00 | 4.80 |
| 08/25/14 | 3.00 | 5.72 |
| 08/27/14 | 18.00 | 6.41 |

*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.*

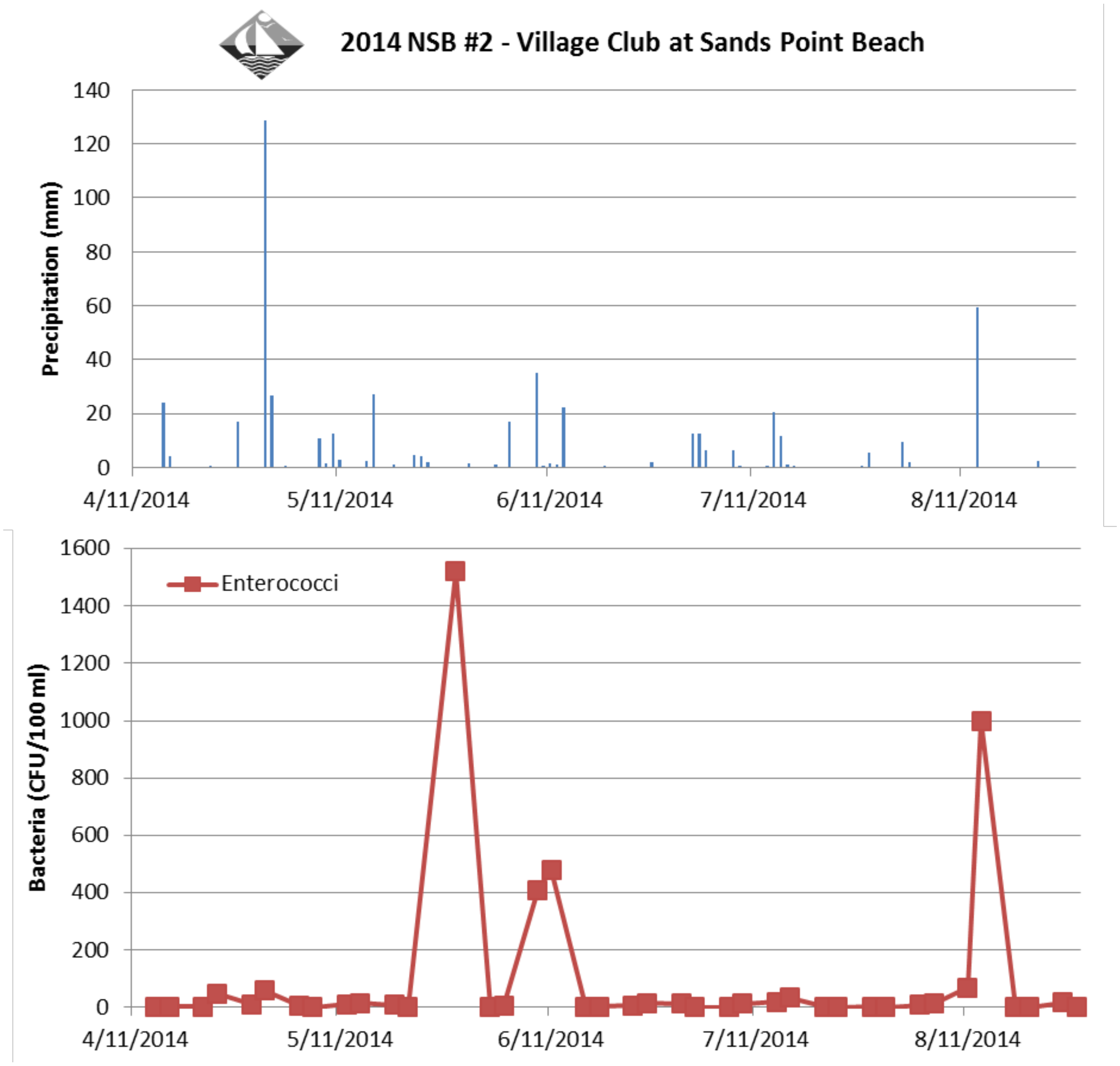
# 2014 Beach-Monitoring Bacteria Data

## NSB#6 - Sea Cliff Village Beach

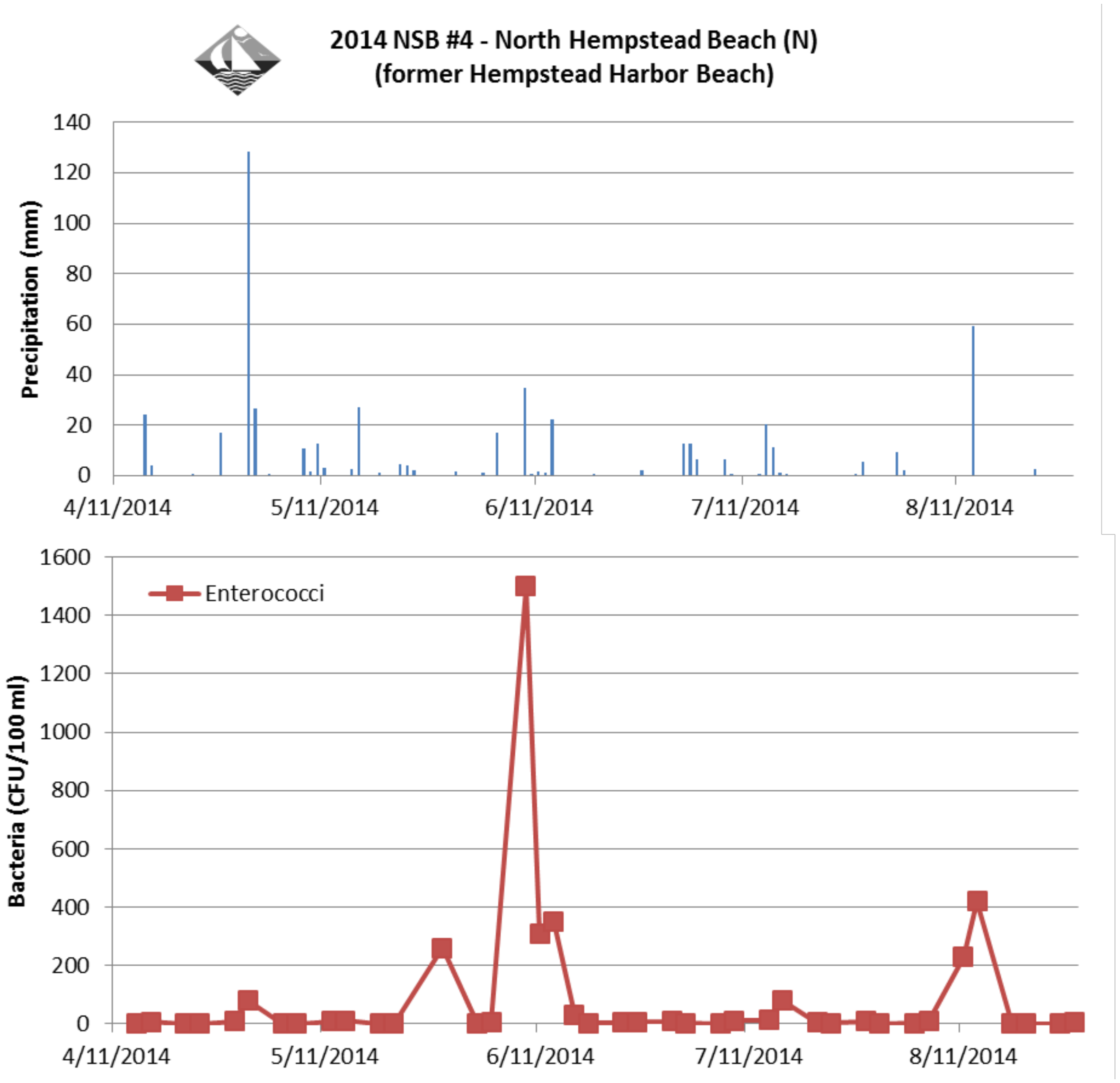
| | *Enterococci* | |
|---|---|---|
| **Date** | **CFU/100ml.** | **Log AvgEnt** |
| 04/14/14 | 2.00 | 0.00 |
| 04/16/14 | 2.00 | 2.00 |
| 04/21/14 | 0.10 | 0.74 |
| 04/23/14 | 0.10 | 0.45 |
| 04/28/14 | 0.10 | 0.33 |
| 04/30/14 | 41.00 | 0.74 |
| 05/05/14 | 0.10 | 0.56 |
| 05/07/14 | 2.00 | 0.65 |
| 05/12/14 | 29.00 | 0.99 |
| 05/14/14 | 22.00 | 1.36 |
| 05/19/14 | 0.10 | 0.93 |
| 05/21/14 | 0.10 | 0.74 |
| 05/28/14 | 19.00 | 1.67 |
| 06/02/14 | 1.00 | 1.49 |
| 06/04/14 | 0.10 | 1.10 |
| 06/09/14 | ***1400.00*** | 3.38 |
| 06/11/14 | ***2600.00*** | 7.07 |
| 06/13/14 | ***290.00*** | 9.13 |
| 06/14/14 | 6.00 | 7.90 |
| 06/16/14 | 8.00 | 7.91 |
| 06/18/14 | 13.00 | 8.28 |
| 06/23/14 | 11.00 | 20.60 |
| 06/25/14 | 5.00 | 18.11 |
| 06/30/14 | 18.00 | 18.02 |
| 07/02/14 | 10.00 | 17.16 |
| 07/07/14 | 15.00 | ***35.04*** |
| 07/09/14 | 28.00 | 34.39 |
| 07/14/14 | 100.00 | 13.85 |
| 07/16/14 | ***110.00*** | 18.52 |
| 07/21/14 | 10.00 | 19.75 |
| 07/23/14 | 7.00 | 17.80 |
| 07/28/14 | 2.00 | 16.97 |
| 07/30/14 | 1.00 | 12.78 |
| 08/04/14 | 1.00 | 9.53 |
| 08/06/14 | 4.00 | 8.74 |
| 08/09/14 | 8.00 | 7.16 |
| 08/11/14 | 5.00 | 6.91 |
| 08/13/14 | ***1100.00*** | 10.95 |
| 08/18/14 | 4.00 | 6.30 |
| 08/20/14 | 6.00 | 6.27 |
| 08/25/14 | 0.10 | 3.91 |
| 08/27/14 | 4.00 | 3.92 |

*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.*

# 2014 Beach-Monitoring Precipitation And Bacteria Graphs

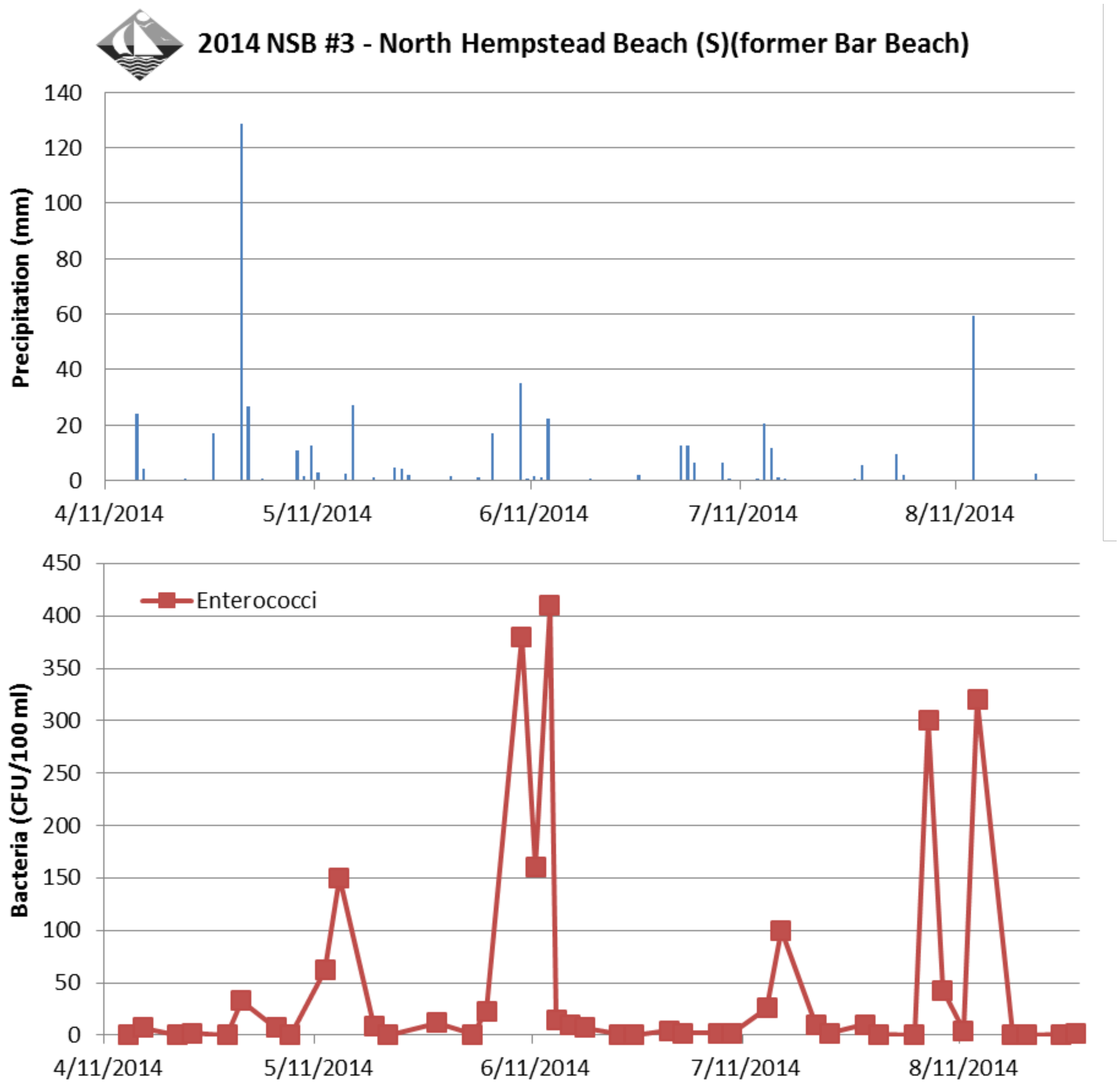


# 2014 Beach-Monitoring Precipitation And Bacteria Graphs



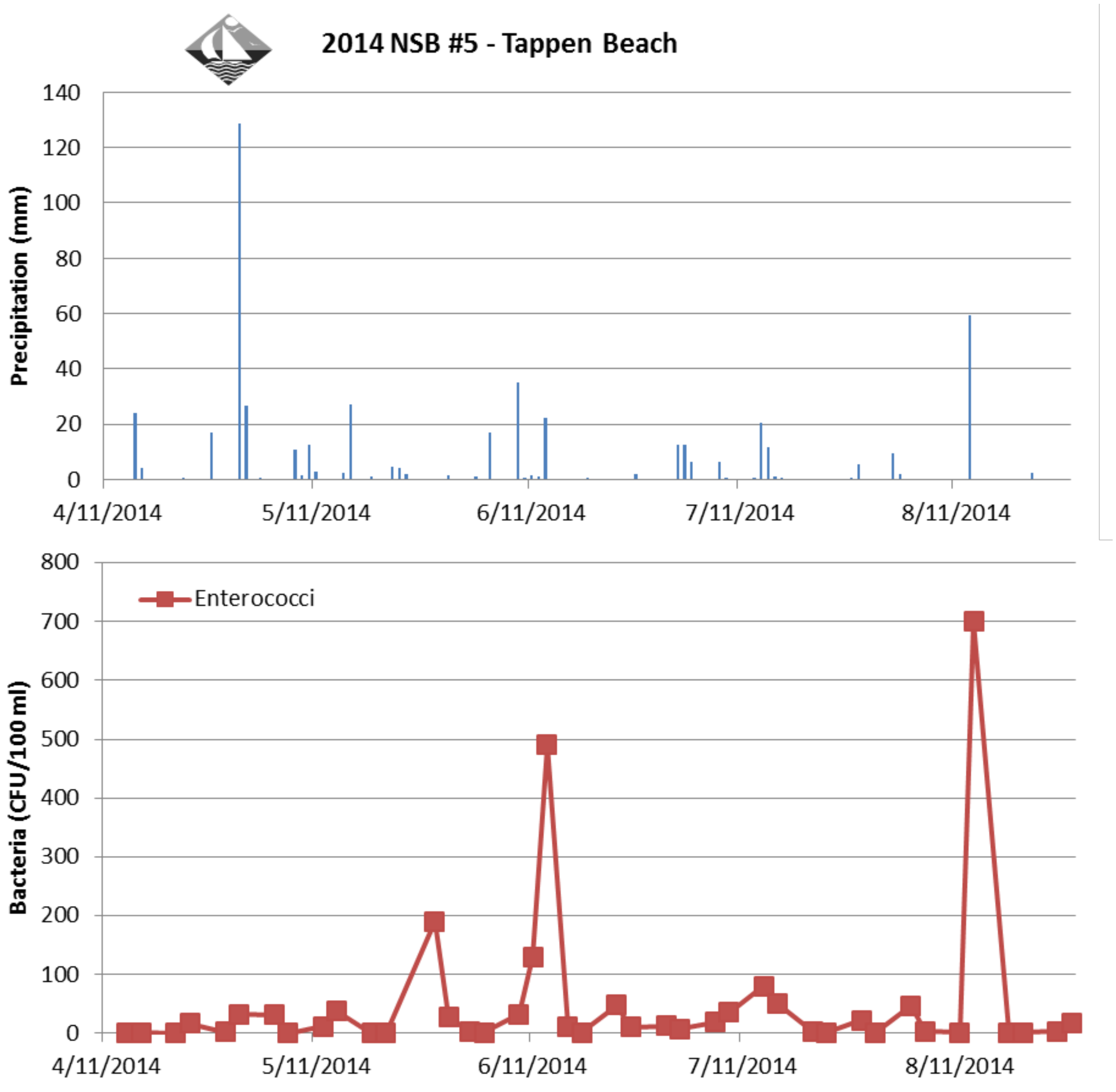
2014 NSB #4 - North Hempstead Beach (N)
(former Hempstead Harbor Beach)

# 2014 Beach-Monitoring Precipitation And Bacteria Graphs

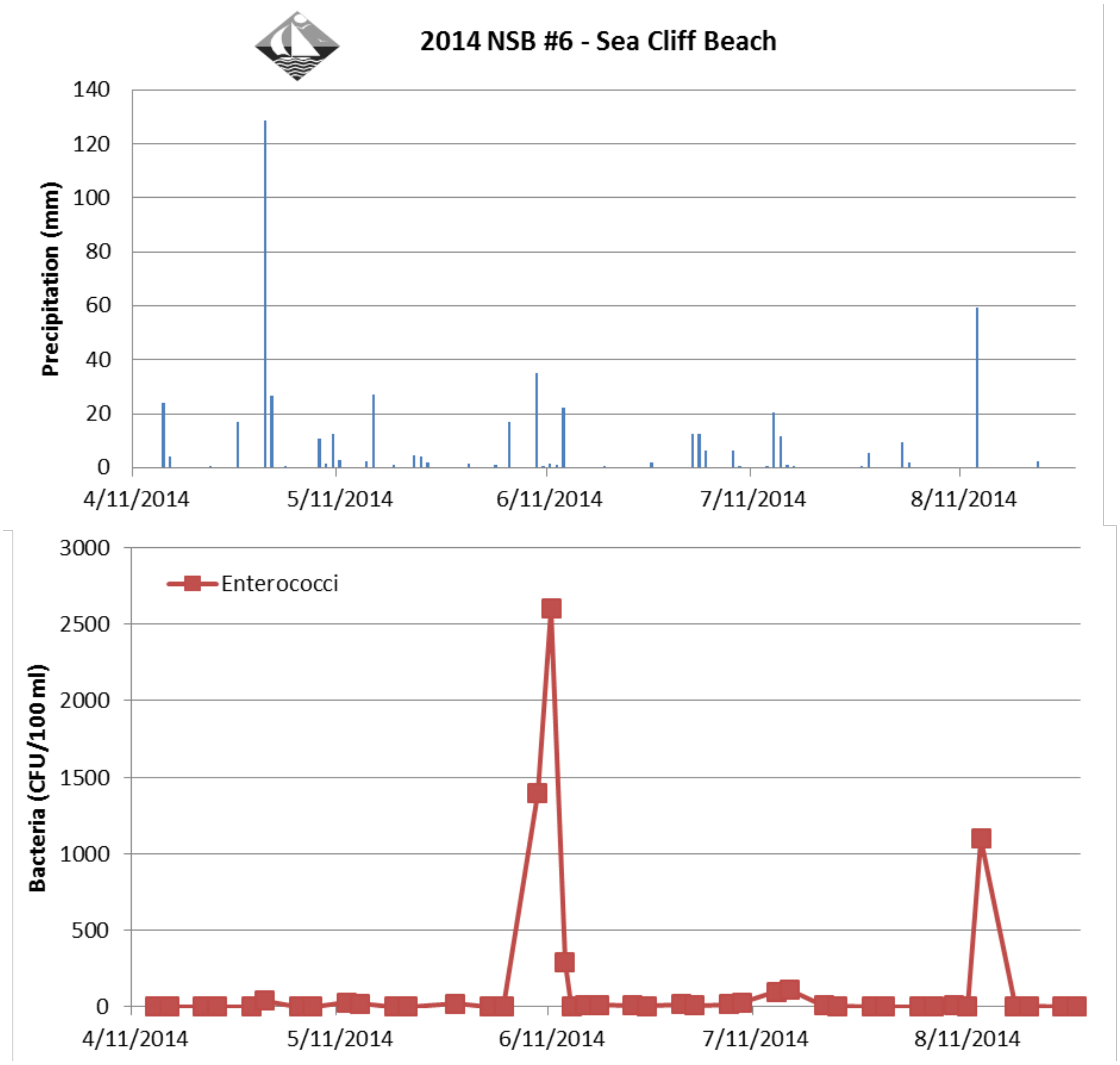


2014 NSB #3 - North Hempstead Beach (S)(former Bar Beach)

# 2014 Beach-Monitoring Precipitation And Bacteria Graphs



# 2014 Beach-Monitoring Precipitation And Bacteria Graphs



# 2014 Sea Cliff Precipitation Data

**CSHH 2014 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)** | **MO/DAY** | **AMT(MM)** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **JAN** | | **MARCH** | | **May, cont.** | | **JULY** | | **Sept., cont.** | | **November** | |
| 2 | 2**** | 3 | trace | 10 | 12.5 | 2 | 12.5 | 6 | 4.5 | 1 | 24.5 |
| 3 | 25**** | 13 | 9 | 11 | 3 | 3 | 12.5 | 7 | 2 | 6 | 11.5 |
| 5 | 2.5 | 19 | 25.5 | 15 | 2.5 | 4 | 6.5 | 13 | 7.5 | 7 | 0.5 |
| 6 | 12 | 20 | 2 | 16 | 27 | 8 | 6.5 | 16 | 9 | 13-14 | 5.5 |
| 10 | 8 | 23 | 34.5 | 19 | 1 | 9 | 0.5 | 21 | 15.5 | 16-17 | 42.5 |
| 11 | 13 | 28 | 1 | 22 | 4.5 | 13 | 0.5 | 25 | 7 | 24 | 16 |
| 14 | 14.5 | 29 | 32 | 23 | 4 | 14 | 20.5C | 29 | trace | 26 | 27.5*** |
| 15 | 1 | 31 | 8*** | 24 | 2 | 15 | 11.5C** | 30 | 17 | 27 | 0.5 |
| 18 | 4*** | **Total** | **112** | 27 | trace | 16 | 1 | **Total** | **59.5** | **Total** | **128.5** |
| 21-22 | 20 | | | 28 | trace | 17 | 0.5 | | | | |
| 25 | 2**** | **APRIL** | | 30 | 1.5 | 27 | 0.5 | **October** | | **December** | |
| 26 | trace | 2 | 0.5 | **Total** | **97.5** | 28 | 5.5 | 1 | 0.5 | 1 | 1.5 |
| 29 | 2**** | 4 | 3.5 | | | **Total** | **78.5** | 4 | 23.5 | 2 | 1 |
| **Total** | **110.5** | 5 | 4.5 | **JUNE** | | | | 7 | trace | 3 | 7.5 |
| | | 7 | 28 | 3 | 1 | **AUGUST** | | 8 | 2.5 | 5 | 5 |
| **FEB** | | 8 | 13.5 | 5 | 17B** | 2 | 9.5 | 10 | trace | 6 | 46.5 |
| 3 | 20**** | 15 | 24 | 9 | 35** | 3 | 2 | 11 | 11 | 7 | 1.5 |
| 5 | 13*** | 16 | 4 | 10 | 0.5 | 12 | trace | 13 | trace | 9 | 68.5 |
| 10 | 5**** | 22 | 0.5 | 11 | 1.5 | 13 | 59.5A** | 15 | 6.5 | 10 | 2*** |
| 13 | 30**** | 26 | 17 | 12 | 1 | 17 | trace | 16 | 15.5 | 16 | 4 |
| 14 | 8**** | 30 | 128.5 | 13 | 22.5C | 21 | trace | 21 | 1 | 17 | 1 |
| 15 | 6**** | **Total** | **220** | 19 | 0.5 | 22 | 2.5 | 22 | 27 | 21 | trace |
| 18 | 5**** | | | 25 | trace | 31 | 20C | 23 | 20.5 | 22 | 0.5 |
| 19 | 6.5 | **MAY** | | 26 | 2 | **Total** | **93.5** | 24 | 2.5 | 23 | 6 |
| 20 | 1 | 1 | 26.5 | **Total** | **81** | | | 29 | 1 | 24 | 18 |
| 21 | 2 | 3 | 0.5 | | | **SEPT** | | 30 | 0.5 | 25 | 3 |
| 24 | ? | 8 | 11 | | | 1 | 0.5** | **Total** | **112** | 28 | 3 |
| 26 | 2**** | 9 | 1.5 | | | | | | | **Total** | **169** |

*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 (7): 6/5, 6/9, 6/14, 7/15, 7/16, 8/13, 9/1.

***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.).

# 2015 Sea Cliff Precipitation Data (partial)

**CSHH 2015 (JANUARY-MAY) 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) | MO/DAY | AMT(MM) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **JAN** | | **MARCH** | | **MAY** | | **JULY** | | **SEPT** | | **NOV** | |
| 3 | 17.5*** | 1 | 15**** | 6 | 1 | | | | | | |
| 4 | 11 | 3 | 10*** | 9 | 1 | | | | | | |
| 6 | 2.5**** | 4 | 6 | 16 | 9.5 | | | | | | |
| 9 | 5**** | 5 | 50*** | 17 | 2.5 | | | | | | |
| 12 | 15.5 | 10 | 8 | 21 | 0.5 | | | | | | |
| 18 | 52 | 11 | 2 | 27 | 1 | | | | | | |
| 22 | trace**** | 14 | 26 | 31 | 53.5 | | | | | | |
| 24 | 28.5*** | 17 | 1.5 | **Total** | **69** | | | | | | |
| 26-27 | 50**** | 20 | 23*** | | | | | | | | |
| 29 | 2**** | 25 | 2.5 | **JUNE** | | | | | | | |
| **Total** | **184** | 26 | 8.5 | | | | | | | | |
| | | 28 | trace*** | | | | | | | | |
| **FEB** | | 29 | trace**** | | | | | | | | |
| 2 | 50*** | 30 | 0.5**** | | | | | | | | |
| 5 | 5**** | 31 | 4.5*** | | | **AUGUST** | | **OCT** | | **DEC** | |
| 9 | 2*** | **Total** | **157.5** | | | | | | | | |
| 12 | trace**** | | | | | | | | | | |
| 15 | trace**** | **APRIL** | | | | | | | | | |
| 17 | 7.5**** | 1 | 1 | | | | | | | | |
| 21 | 9**** | 3 | 2.5 | | | | | | | | |
| 22 | 25.5*** | 7 | 0.5 | | | | | | | | |
| 26 | trace**** | 10 | 6 | | | | | | | | |
| **Total** | **99** | 14 | trace | | | | | | | | |
| | | 17 | 3 | | | | | | | | |
| | | 20 | 28.5 | | | | | | | | |
| | | 21 | 19 | | | | | | | | |
| | | 22 | 5 | | | | | | | | |
| | | **Total** | **65.5** | | | | | | | | |

*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.)

**Advisory/closure for rain dates ( ):

***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.).

# 1997-2014 Monthly Precipitation

*Total Precipitation Per Month*

| | June | July | August | September | October |
|---|---|---|---|---|---|
| **2014** | 81 mm | 78.5 mm | 93.5 mm | 59.5 mm | 112 mm |
| **2013** | 235 | 69 | 59 | 75.5 | 8.5 |
| **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

2008-2014 Nitrogen Data
2014 Nitrogen Graphs
(Nitrate, Nitrite, Ammonia)

# 2008-2014 Nitrogen Data

## CSHH Water-Monitoring Program 2014

| Nitrate as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/21/2014 | 0.04 | 0.04 | 0.03 | | | | | 0.15 | 0.03 | | |
| 5/28/2014 | 0.03 | 0.02 | 0.03 | | | | | 0.03 | 0.04 | | |
| 6/4/2014 | 0.05 | 0.03 | 0.05 | | | | | 0.09 | 0.16 | | |
| 6/11/2014 | 0.05 | 0.03 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.09 | 0.06 | 0.04 | 0.03 |
| 6/18/2014 | 0.05 | 0.02 | 0.04 | | | | | 0.41 | 0.55 | | |
| 6/26/2014 | 0.02 | 0.03 | 0.02 | 0.02 | 0.03 | 0.03 | 0.08 | 0.35 | 0.50 | 0.02 | 0.02 |
| 7/2/2014 | 0.03 | 0.02 | 0.02 | | | | | 0.54 | 0.55 | | |
| 7/9/2014 | 0.03 | 0.01 | 0.02 | 0.04 | 0.10 | 0.03 | 0.04 | 0.41 | 0.55 | 0.02 | 0.02 |
| 7/17/2014 | 0.02 | 0.02 | 0.02 | | | | | 0.18 | 0.03 | | |
| 7/23/2014 | 0.05 | 0.04 | 0.02 | 0.02 | 0.03 | 0.03 | 0.04 | 0.32 | 0.55 | 0.01 | 0.01 |
| 7/30/2014 | 0.04 | 0.05 | 0.05 | | | | | 0.03 | 0.04 | | |
| 8/6/2014 | 0.04 | 0.02 | 0.02 | 0.03 | 0.04 | 0.05 | 0.05 | 0.02 | 0.02 | 0.04 | 0.03 |
| 8/14/2014 | 0.10 | 0.05 | 0.07 | | | | | 0.30 | 0.09 | | |
| 8/21/2014 | 0.03 | 0.03 | 0.03 | 0.03 | 0.06 | 0.06 | 0.11 | 0.20 | 0.28 | 0.04 | 0.04 |
| 8/27/2014 | 0.05 | 0.03 | 0.05 | | | | | 0.12 | 0.50 | | |
| 9/4/2014 | 0.03 | 0.03 | 0.06 | | | | | 0.06 | 0.28 | | |
| 9/10/2014 | 0.03 | 0.04 | 0.05 | | | | | 0.03 | 0.04 | | |
| 9/17/2014 | 0.04 | 0.03 | 0.02 | 0.03 | 0.05 | 0.06 | 0.07 | 0.08 | 0.05 | 0.04 | |
| 9/24/2014 | 0.03 | 0.04 | 0.05 | | | | | 0.03 | 0.04 | | |
| 10/1/2014 | 0.10 | 0.06 | 0.07 | | | | | 0.20 | 0.22 | | |
| 10/9/2014 | 0.11 | 0.04 | 0.03 | 0.05 | 0.08 | 0.07 | 0.08 | 0.32 | 0.45 | 0.22 | 0.04 |
| 10/15/2014 | 0.17 | 0.15 | 0.20 | | | | | 0.34 | 0.35 | | |
| 10/29/2014 | 0.03 | 0.02 | 0.02 | | | | | 0.03 | 0.03 | | |
| 11/5/2014 | 0.22 | 0.16 | 0.16 | 0.15 | 0.21 | 0.22 | 0.01 | 0.55 | 0.55 | | 0.12 |

# 2008-2014 Nitrogen Data

| Nitrite as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/21/2014 | 0.007 | 0.006 | 0.005 | | | | | 0.015 | 0.011 | | |
| 5/28/2014 | 0.011 | 0.006 | 0.005 | | | | | 0.008 | 0.007 | | |
| 6/4/2014 | 0.007 | 0.003 | 0.007 | | | | | 0.008 | 0.011 | | |
| 6/11/2014 | 0.008 | 0.007 | 0.006 | 0.010 | 0.035 | 0.026 | 0.041 | 0.011 | 0.009 | 0.007 | 0.006 |
| 6/18/2014 | 0.008 | 0.003 | 0.008 | | | | | 0.012 | 0.010 | | |
| 6/26/2014 | 0.011 | 0.009 | 0.008 | 0.007 | 0.009 | 0.009 | 0.012 | 0.007 | 0.010 | 0.013 | 0.004 |
| 7/2/2014 | 0.006 | 0.003 | 0.006 | | | | | 0.009 | 0.008 | | |
| 7/9/2014 | 0.006 | 0.005 | 0.003 | 0.007 | 0.008 | 0.008 | 0.010 | 0.010 | 0.013 | 0.008 | 0.007 |
| 7/17/2014 | 0.007 | 0.008 | 0.004 | | | | | 0.006 | 0.010 | | |
| 7/23/2014 | 0.030 | 0.002 | 0.003 | 0.022 | 0.008 | 0.029 | 0.040 | 0.018 | 0.017 | 0.004 | 0.007 |
| 7/30/2014 | 0.012 | 0.012 | 0.008 | | | | | 0.010 | 0.013 | | |
| 8/6/2014 | 0.007 | 0.002 | 0.006 | 0.007 | 0.008 | 0.011 | 0.010 | 0.008 | 0.010 | 0.006 | 0.005 |
| 8/14/2014 | 0.023 | 0.011 | 0.018 | | | | | 0.018 | 0.010 | | |
| 8/21/2014 | 0.007 | 0.004 | 0.005 | 0.008 | 0.010 | 0.013 | 0.011 | 0.008 | 0.013 | 0.008 | 0.007 |
| 8/27/2014 | 0.008 | 0.002 | 0.005 | | | | | 0.008 | 0.009 | | |
| 9/4/2014 | 0.007 | 0.005 | 0.013 | | | | | 0.014 | 0.013 | | |
| 9/10/2014 | 0.012 | 0.012 | 0.008 | | | | | 0.010 | 0.013 | | |
| 9/17/2014 | 0.007 | 0.006 | 0.005 | 0.010 | 0.034 | 0.026 | 0.040 | 0.012 | 0.008 | 0.007 | |
| 9/24/2014 | 0.011 | 0.012 | 0.008 | | | | | 0.010 | 0.012 | | |
| 10/1/2014 | 0.02 | 0.012 | 0.017 | | | | | 0.018 | 0.015 | | |
| 10/9/2014 | 0.013 | 0.01 | 0.004 | 0.014 | 0.015 | 0.014 | 0.013 | 0.008 | 0.017 | 0.018 | 0.010 |
| 10/15/2014 | 0.053 | 0.053 | 0.041 | | | | | 0.046 | 0.037 | | |
| 10/29/2014 | 0.021 | 0.013 | 0.02 | | | | | 0.023 | 0.014 | | |
| 11/5/2014 | 0.023 | 0.024 | 0.015 | 0.026 | 0.022 | 0.017 | 0.020 | 0.027 | 0.012 | | 0.019 |

# 2008-2014 Nitrogen Data

| | | | | | Ammonia-Nitrogen | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/21/2014 | 0 | | | | | | | 0 | | | |
| 5/28/2014 | 0 | | | | | | | 0 | | | |
| 6/4/2014 | 0 | | | | | | | | | | |
| 6/11/2014 | 0 | | | | | | | 0 | | | |
| 6/18/2014 | | | | | | | | | | | |
| 6/26/2014 | 0 | | | | | | | 0 | | | |
| 7/2/2014 | 0 | | | | | | | 0 | | | |
| 7/9/2014 | 0 | | | | | | | 0 | | | |
| 7/17/2014 | 0 | | | | | | | 0 | | | |
| 7/23/2014 | 0.25 | 0.25 | | | | | 0.25 | 0 | | | |
| 7/30/2014 | 0 | | | | | | | 0 | | | |
| 8/6/2014 | 0 | | | | | | 0 | 0 | | | |
| 8/14/2014 | 0 | | | | | | | 0.25 | | | |
| 8/21/2014 | 0 | | | | | | 0 | 0 | | | |
| 8/27/2014 | 0 | | | | | | | 0 | | | |
| 9/4/2014 | 0 | | | | | | | 0 | | | |
| 9/10/2014 | 0 | | | | | | | 0 | | | |
| 9/17/2014 | 0 | | | | | | 0 | 0.25 | | | |
| 9/24/2014 | 0 | | | | | | | 0 | | | |
| 10/1/2014 | 0 | | | | | | | 0 | | | |
| 10/9/2014 | 0 | | | | | | | 0 | | | |
| 10/15/2014 | 0 | | | | | | | 0 | | | |
| 10/29/2014 | 0 | | | | | | | 0 | | | |
| 11/5/2014 | 0 | | | | | | 0 | 0 | | | |

# 2008-2014 Nitrogen Data

| Total Inorganic Nitrogen (TIN)* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/21/2014 | 0.05 | | | | | | | 0.17 | | | |
| 5/28/2014 | 0.04 | | | | | | | 0.04 | | | |
| 6/4/2014 | 0.06 | | | | | | | | | | |
| 6/11/2014 | 0.06 | | | | | | | 0.10 | | | |
| 6/18/2014 | | | | | | | | | | | |
| 6/26/2014 | 0.03 | | | | | | | 0.36 | | | |
| 7/2/2014 | 0.04 | | | | | | | 0.55 | | | |
| 7/9/2014 | 0.04 | | | | | | | 0.42 | | | |
| 7/17/2014 | 0.03 | | | | | | | 0.19 | | | |
| 7/23/2014 | 0.33 | 0.29 | | | | | 0.33 | 0.34 | | | |
| 7/30/2014 | 0.05 | | | | | | | 0.04 | | | |
| 8/6/2014 | 0.05 | | | | | | 0.06 | 0.03 | | | |
| 8/14/2014 | 0.12 | | | | | | | 0.57 | | | |
| 8/21/2014 | 0.04 | | | | | | 0.12 | 0.21 | | | |
| 8/27/2014 | 0.06 | | | | | | | 0.13 | | | |
| 9/4/2014 | 0.04 | | | | | | | 0.07 | | | |
| 9/10/2014 | 0.04 | | | | | | | 0.04 | | | |
| 9/17/2014 | 0.05 | | | | | | 0.11 | 0.34 | | | |
| 9/24/2014 | 0.04 | | | | | | | 0.04 | | | |
| 10/1/2014 | 0.12 | | | | | | | 0.22 | | | |
| 10/9/2014 | 0.12 | | | | | | | 0.33 | | | |
| 10/15/2014 | 0.22 | | | | | | | 0.39 | | | |
| 10/29/2014 | 0.05 | | | | | | | 0.05 | | | |
| 11/5/2014 | 0.24 | | | | | | 0.03 | 0.58 | | | |

* TIN = Nitrate + Nitrite + Ammonia (when samples have been collected for all three)

# 2008-2014 Nitrogen Data

## CSHH Water-Monitoring Program 2013

| | | | | | Nitrite as N (mg/L) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/10/2013 | | 0.008 | 0.007 | | | | | 0.010 | 0.017 | | |
| 5/15/2013 | 0.011 | 0.005 | 0.007 | | | | | 0.011 | 0.014 | | |
| 5/31/2013 | 0.008 | 0.008 | 0.008 | | | | | 0.008 | 0.009 | | |
| 6/5/2013 | 0.007 | 0.005 | 0.004 | 0.008 | 0.007 | 0.008 | 0.011 | 0.009 | | 0.024 | |
| 6/12/2013 | 0.005 | 0.003 | 0.005 | | | | | 0.020 | 0.032 | 0.021 | |
| 6/19/2013 | 0.006 | 0.003 | 0.005 | 0.004 | 0.005 | 0.006 | 0.017 | 0.005 | 0.008 | 0.002 | |
| 6/26/2013 | 0.003 | 0.002 | 0.003 | | | | | 0.026 | 0.010 | | |
| 7/3/2013 | 0.005 | 0.007 | 0.007 | 0.009 | 0.009 | 0.002 | 0.008 | 0.008 | 0.019 | 0.007 | 0.009 |
| 7/17/2013 | 0.002 | 0.003 | 0.003 | | | | | 0.006 | 0.011 | | |
| 7/24/2013 | 0.007 | 0.005 | 0.006 | | | | | 0.019 | 0.026 | | |
| 7/31/2013 | 0.005 | 0.005 | 0.005 | 0.005 | 0.008 | 0.009 | 0.012 | 0.022 | 0.019 | 0.010 | |
| 8/8/2013 | 0.026 | | 0.022 | 0.015 | 0.024 | 0.019 | 0.021 | 0.013 | 0.024 | 0.019 | 0.021 |
| 8/14/2013 | 0.009 | | 0.008 | | | | | 0.016 | 0.016 | | |
| 8/21/2013 | 0.006 | | 0.005 | | | | | 0.009 | 0.010 | | |
| 8/28/2013 | 0.007 | 0.005 | 0.005 | | | | | 0.006 | 0.007 | | |
| 9/4/2013 | 0.011 | 0.007 | 0.008 | | | | | 0.010 | 0.011 | | |
| 9/18/2013 | 0.030 | 0.020 | 0.028 | 0.027 | 0.027 | 0.025 | 0.031 | 0.029 | 0.027 | 0.026 | 0.026 |
| 9/25/2013 | 0.020 | 0.007 | 0.011 | | | | | 0.010 | 0.012 | | |
| 10/1/2013 | 0.013 | 0.009 | 0.003 | 0.014 | 0.016 | 0.013 | 0.013 | 0.007 | 0.016 | 0.017 | 0.009 |
| 10/8/2013 | 0.021 | 0.013 | 0.018 | | | | | 0.017 | 0.016 | | |
| 10/15/2013 | 0.024 | 0.020 | 0.021 | 0.027 | 0.023 | 0.025 | 0.027 | 0.023 | 0.018 | 0.024 | 0.023 |
| 10/22/2013 | 0.035 | 0.040 | 0.035 | | | | | 0.033 | 0.019 | | |
| 10/29/2013 | 0.034 | 0.038 | 0.040 | 0.035 | 0.035 | 0.031 | 0.032 | 0.032 | 0.033 | 0.037 | 0.037 |
| 11/6/2013 | 0.033 | 0.036 | 0.035 | | | | | 0.030 | 0.022 | | |
| 11/13/2013 | 0.032 | | | 0.029 | 0.026 | 0.029 | 0.034 | 0.025 | 0.021 | | |

# 2008-2014 Nitrogen Data

| | Nitrate as N (mg/L) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/10/2013 | | 0.04 | 0.04 | | | | | 0.03 | 0.03 | | |
| 5/15/2013 | 0.04 | 0.04 | 0.04 | | | | | 0.03 | 0.03 | | |
| 5/31/2013 | 0.04 | 0.02 | 0.03 | | | | | 0.13 | 0.05 | | |
| 6/5/2013 | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 | 0.04 | 0.13 | | 0.04 | |
| 6/12/2013 | 0.04 | 0.02 | 0.02 | | | | | 0.54 | 0.54 | 0.54 | |
| 6/19/2013 | 0.01 | 0.02 | 0.03 | 0.02 | 0.02 | 0.03 | 0.27 | 0.25 | 0.02 | 0.01 | |
| 6/26/2013 | 0.02 | 0.03 | 0.01 | | | | | 0.03 | 0.01 | | |
| 7/3/2013 | 0.04 | 0.02 | 0.02 | 0.03 | 0.06 | 0.06 | 0.04 | 0.38 | 0.21 | 0.05 | 0.02 |
| 7/17/2013 | 0.02 | 0.01 | 0.02 | | | | | 0.15 | 0.12 | | |
| 7/24/2013 | 0.03 | 0.01 | 0.02 | | | | | 0.23 | 0.39 | | |
| 7/31/2013 | 0.03 | 0.03 | 0.04 | 0.03 | 0.03 | 0.03 | 0.05 | 0.35 | 0.20 | 0.07 | |
| 8/8/2013 | 0.06 | | 0.03 | 0.03 | 0.02 | 0.03 | 0.03 | 0.32 | 0.54 | 0.03 | 0.04 |
| 8/14/2013 | 0.03 | | 0.02 | | | | | 0.30 | 0.47 | | |
| 8/21/2013 | 0.04 | | 0.03 | | | | | 0.03 | 0.08 | | |
| 8/28/2013 | 0.03 | 0.02 | 0.01 | | | | | 0.02 | 0.16 | | |
| 9/4/2013 | 0.04 | 0.03 | 0.03 | | | | | 0.36 | 1.06 | | |
| 9/18/2013 | 0.13 | 0.11 | 0.08 | 0.03 | 0.11 | 0.03 | 0.12 | 0.23 | 0.17 | 0.08 | 0.02 |
| 9/25/2013 | 0.08 | 0.04 | 0.06 | | | | | 0.10 | 0.04 | | |
| 10/1/2013 | 0.11 | 0.04 | 0.02 | 0.05 | 0.09 | 0.06 | 0.09 | 0.32 | 0.46 | 0.22 | 0.04 |
| 10/8/2013 | 0.10 | 0.06 | 0.08 | | | | | 0.21 | 0.23 | | |
| 10/15/2013 | 0.16 | 0.15 | 0.10 | 0.11 | 0.14 | 0.17 | 0.28 | 0.28 | 0.48 | 0.09 | 0.07 |
| 10/22/2013 | 0.16 | 0.15 | 0.10 | | | | | 0.11 | 0.14 | | |
| 10/29/2013 | 0.15 | 0.14 | 0.13 | 0.16 | 0.10 | 0.12 | 0.11 | 0.13 | 0.11 | 0.13 | 0.13 |
| 11/6/2013 | 0.18 | 0.11 | 0.18 | | | | | 0.40 | 0.72 | | |
| 11/13/2013 | 0.21 | | | 0.18 | 0.43 | 0.24 | 0.49 | 0.29 | 0.26 | | |
| >0.55 = 0.54 | | | | | | | | | | | |

# 2008-2014 Nitrogen Data

| Ammonia-Nitrogen | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/10/2013 | 0 | 0 | | | | | | | | | |
| 5/15/2013 | 0 | | | | | | | 0 | | | |
| 5/31/2013 | 0 | | | | | | | 0 | | | |
| 6/5/2013 | 0 | | | | | | | 0 | | | |
| 6/12/2013 | 0 | | | | | | | 0 | | | |
| 6/19/2013 | 0 | | | | | | | 0 | | | |
| 6/26/2013 | 0 | | | | | | | | 0 | | |
| 7/3/2013 | 0.15 | | | | | | 0.15 | 0.25 | | | 0.15 |
| 7/17/2013 | 0 | | | | | | | 0 | | | |
| 7/24/2013 | 0 | | | | | | | 0 | | | |
| 7/31/2013 | 0 | | | | | | | 0 | | | |
| 8/8/2013 | 0.5 | 0.25 | 0.25 | 0.25 | 0.25 | | 0.5 | 0.5 | 0.25 | | |
| 8/14/2013 | 2.5 | | | | | | | 0.15 | | | |
| 8/21/2013 | 0.1 | | 0.25 | | | | | 0.25 | 0.25 | | |
| 8/28/2013 | 0.04 | 0 | | | | | | 0 | | | |
| 9/4/2013 | 0 | 0.25 | 0 | | | | | | | | |
| 9/18/2013 | 0.25 | | 0.25 | | | 0.25 | | 0.25 | 0.25 | 0.25 | |
| 9/25/2013 | 0 | | | | | | | 0 | | | |
| 10/1/2013 | 0 | | | | | | | 0 | | | |
| 10/8/2013 | 0.25 | | 0.25 | | | | | 0 | 0.25 | | |
| 10/15/2013 | 0 | | | | | | 0 | 0 | | | |
| 10/22/2013 | 0 | | | | | | | 0.25 | | | |
| 10/29/2013 | 0 | | | | | | | 0 | | | |
| 11/6/2013 | 0 | | | | | | | 0 | | | |
| 11/13/2013 | | | | | | | | 0 | | | |
| <0.05 = 0.04 | | | | | | | | | | | |

# 2008-2014 Nitrogen Data

| Total Inorganic Nitrogen (TIN)* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/10/2013 | | 0.05 | | | | | | | | | |
| 5/15/2013 | 0.05 | | | | | | | 0.04 | | | |
| 5/31/2013 | 0.05 | | | | | | | 0.14 | | | |
| 6/5/2013 | 0.04 | | | | | | | 0.14 | | | |
| 6/12/2013 | 0.05 | | | | | | | 0.56 | | | |
| 6/19/2013 | 0.02 | | | | | | | 0.26 | | | |
| 6/26/2013 | 0.02 | | | | | | | | 0.02 | | |
| 7/3/2013 | 0.20 | | | | | | 0.20 | 0.64 | | | 0.18 |
| 7/17/2013 | 0.02 | | | | | | | 0.16 | | | |
| 7/24/2013 | 0.04 | | | | | | | 0.25 | | | |
| 7/31/2013 | 0.04 | | | | | | | 0.37 | | | |
| 8/8/2013 | 0.59 | | 0.30 | 0.30 | 0.29 | | 0.55 | 0.83 | 0.81 | | |
| 8/14/2013 | 2.54 | | | | | | | 0.47 | | | |
| 8/21/2013 | 0.15 | | 0.29 | | | | | 0.29 | 0.34 | | |
| 8/28/2013 | 0.08 | 0.03 | | | | | | 0.03 | | | |
| 9/4/2013 | 0.05 | 0.29 | 0.04 | | | | | | | | |
| 9/18/2013 | 0.41 | | 0.36 | | | 0.31 | | 0.51 | 0.45 | 0.36 | |
| 9/25/2013 | 0.10 | | | | | | | 0.11 | | | |
| 10/1/2013 | 0.12 | | | | | | | 0.33 | | | |
| 10/8/2013 | 0.37 | | 0.35 | | | | | 0.23 | 0.50 | | |
| 10/15/2013 | 0.18 | | | | | | 0.31 | 0.30 | | | |
| 10/22/2013 | 0.20 | | | | | | | 0.39 | | | |
| 10/29/2013 | 0.18 | | | | | | | 0.16 | | | |
| 11/6/2013 | 0.21 | | | | | | | 0.43 | | | |
| 11/13/2013 | | | | | | | | 0.32 | | | |

* TIN = Nitrate + Nitrite + Ammonia (when samples have been collected for all three)

# 2008-2014 Nitrogen Data

## CSHH Water-Monitoring Program 2012

| Nitrite as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/30/2012 | | | | | | | | | | | |
| 6/6/2012 | | | | | | | | | | | |
| 6/13/2012 | 0.008 | 0.005 | 0.007 | 0.008 | 0.010 | 0.015 | 0.024 | 0.011 | 0.023 | 0.014 | |
| 6/20/2012 | 0.006 | 0.003 | 0.003 | | | | | 0.005 | 0.013 | | |
| 6/27/2012 | 0.008 | 0.008 | 0.007 | | | | | 0.011 | 0.020 | | |
| 7/3/2012 | 0.007 | 0.005 | 0.006 | 0.005 | 0.006 | 0.008 | 0.007 | 0.007 | 0.013 | 0.006 | 0.003 |
| 7/11/2012 | 0.008 | 0.008 | 0.008 | | | | | 0.009 | 0.012 | | |
| 7/18/2012 | 0.006 | 0.005 | 0.004 | 0.006 | 0.007 | 0.005 | 0.014 | 0.009 | 0.010 | 0.008 | 0.005 |
| 7/25/2012 | 0.007 | 0.007 | 0.005 | | | | | 0.011 | 0.009 | | |
| 8/1/2012 | 0.010 | 0.004 | 0.009 | 0.007 | 0.008 | 0.021 | 0.019 | 0.010 | 0.014 | 0.011 | 0.008 |
| 8/8/2012 | 0.012 | 0.004 | 0.004 | | | | | 0.012 | 0.011 | | |
| 8/16/2012 | 0.015 | 0.010 | 0.010 | 0.011 | 0.016 | 0.013 | 0.018 | 0.014 | 0.015 | 0.017 | NA |
| 8/22/2012 | 0.026 | 0.024 | 0.021 | | | | | 0.024 | 0.019 | | |
| 8/29/2012 | 0.016 | 0.030 | 0.023 | 0.018 | 0.021 | 0.024 | 0.032 | 0.023 | 0.015 | 0.018 | 0.018 |
| 9/7/2012 | 0.025 | 0.030 | 0.022 | | | | | 0.021 | 0.029 | | |
| 9/12/2012 | 0.040 | 0.040 | 0.034 | 0.045 | 0.036 | 0.037 | 0.107 | | 0.028 | 0.048 | 0.033 |
| 9/20/2012 | 0.052 | 0.055 | 0.055 | | | | | 0.050 | 0.046 | | |
| 10/5/2012 | 0.054 | 0.051 | 0.046 | | | | | 0.051 | 0.020 | | |
| 10/12/2012 | 0.075 | 0.078 | 0.075 | | | | | 0.064 | 0.026 | | |
| 10/18/2012 | 0.086 | 0.107 | 0.090 | | | | | 0.065 | 0.060 | | |
| 10/25/2012 | 0.088 | 0.093 | 0.089 | | | | | 0.076 | 0.024 | | |

# 2008-2014 Nitrogen Data

| | Nitrate as N (mg/L) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/30/2012 | | | | | | | | | | | |
| 6/6/2012 | | | | | | | | | | | |
| 6/13/2012 | 0.02 | 0.01 | 0.02 | 0.02 | 0.04 | 0.04 | 0.06 | 0.03 | 0.05 | 0.02 | |
| 6/20/2012 | 0.05 | 0.06 | 0.05 | | | | | 0.06 | 0.07 | | |
| 6/27/2012 | 0.04 | 0.03 | 0.02 | | | | | 0.2 | 0.37 | | |
| 7/3/2012 | 0.02 | 0.02 | 0.02 | 0.03 | 0.04 | 0.03 | 0.05 | 0.1 | 0.27 | 0.03 | 0.02 |
| 7/11/2012 | 0.02 | 0.02 | 0.02 | | | | | 0.02 | 0.02 | | |
| 7/18/2012 | 0.02 | 0.02 | 0.03 | 0.02 | 0.06 | 0.02 | 0.11 | 0.4 | 0.27 | 0.03 | 0.02 |
| 7/25/2012 | 0.04 | 0.03 | 0.02 | | | | | 0.08 | 0.26 | | |
| 8/1/2012 | 0.04 | 0 | 0.01 | 0.02 | 0.03 | 0.06 | 0.19 | 0.05 | 0.2 | 0.03 | 0.02 |
| 8/8/2012 | 0.03 | 0.02 | 0.03 | | | | | 0.16 | 0.12 | | |
| 8/16/2012 | 0.08 | 0.03 | 0.07 | 0.07 | 0.09 | 0.05 | 0.06 | 0.04 | 0.51 | 0.07 | NA |
| 8/22/2012 | 0.03 | 0.03 | 0.04 | | | | | 0.04 | 0.04 | | |
| 8/29/2012 | 0.04 | 0.07 | 0.08 | 0.06 | 0.14 | 0.07 | 0.07 | 0.14 | 0.1 | 0.06 | 0.04 |
| 9/7/2012 | 0.1 | 0.07 | 0.08 | | | | | 0.2 | 0.36 | | |
| 9/12/2012 | 0.09 | 0.11 | 0.07 | 0.11 | 0.13 | 0.13 | 0.23 | | 0.37 | 0.14 | 0.09 |
| 9/20/2012 | 0.03 | 0.03 | 0.02 | | | | | 0.02 | 0.02 | | |
| 10/5/2012 | 0.12 | 0.1 | 0.14 | | | | | 0.47 | 0.02 | | |
| 10/12/2012 | 0.15 | 0.13 | 0.18 | | | | | 0.48 | 0.55 | | |
| 10/18/2012 | 0.22 | 0.19 | 0.27 | | | | | 0.55 | 0.28 | | |
| 10/25/2012 | 0.17 | 0.16 | 0.22 | | | | | 0.38 | 0.55 | | |

# 2008-2014 Nitrogen Data

| | Ammonia-Nitrogen | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/30/2012 | 0.05 | 1.00 | 0.05 | | | | | 0.00 | 0.00 | | |
| 6/6/2012 | 0.25 | 0.10 | 0.25 | | | | | 0.25 | 0.25 | | |
| 6/13/2012 | 0.00 | | | | | | 0.00 | 0.00 | | | |
| 6/20/2012 | 0.00 | 0.00 | | | | | | 0.00 | | | |
| 6/27/2012 | 0.00 | | | | | | | 0.00 | | | |
| 7/3/2012 | 0.00 | 0.00 | 0.00 | | | | 0.00 | 0.00 | | | |
| 7/11/2012 | 0.25 | 0.25 | 0.25 | | | | | 0.25 | 0.00 | | |
| 7/18/2012 | 0.25 | 0.25 | 0.00 | 0.00 | 0.00 | | 0.25 | 0.25 | 0.00 | 0.25 | 0.25 |
| 7/25/2012 | 0.25 | 0.25 | 0.25 | | | | | 0.25 | 0.25 | | |
| 8/1/2012 | 0.25 | 0.25 | 0.25 | | | | | 0.25 | 0.25 | | 0.25 |
| 8/8/2012 | 0.50 | 0.25 | 0.25 | | | | | 0.50 | 0.15 | | |
| 8/16/2012 | 0.50 | | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| 8/22/2012 | 0.25 | 0.25 | 0.25 | | | | | 0.50 | 0.25 | | |
| 8/29/2012 | 0.50 | 0.25 | | 0.50 | 0.25 | | 0.00 | 0.25 | 0.25 | 0.25 | 0.25 |
| 9/7/2012 | 0.50 | 0.25 | 0.50 | | | | | 0.50 | | | |
| 9/12/2012 | 0.25 | 0.25 | 0.50 | 0.25 | 0.25 | | 0.25 | 0.25 | | 0.25 | 0.25 |
| 9/20/2012 | 0.50 | 0.50 | 0.50 | | | | | 0.50 | | | |
| 10/5/2012 | 1.00 | | | | | | | | 0.50 | | |
| 10/12/2012 | 0.00 | 0.00 | 0.00 | | | | | | | | |
| 10/18/2012 | 0.00 | 0.25 | 0.00 | | | | | 0.00 | 0.25 | | |
| 10/25/2012 | 0.25 | 0.25 | 0.25 | | | | | 0.25 | 0.00 | | |

# 2008-2014 Nitrogen Data

| Total Inorganic Nitrogen (TIN)* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/30/2012 | | | | | | | | | | | |
| 6/6/2012 | | | | | | | | | | | |
| 6/13/2012 | 0.03 | | | | | | 0.08 | 0.04 | | | |
| 6/20/2012 | 0.06 | 0.06 | | | | | | 0.07 | | | |
| 6/27/2012 | 0.05 | | | | | | | 0.21 | | | |
| 7/3/2012 | 0.03 | 0.03 | 0.03 | | | | 0.06 | 0.11 | | | |
| 7/11/2012 | 0.28 | 0.28 | 0.28 | | | | | 0.28 | 0.03 | | |
| 7/18/2012 | 0.28 | 0.28 | 0.03 | 0.03 | 0.07 | | 0.37 | 0.66 | 0.28 | 0.29 | 0.28 |
| 7/25/2012 | 0.30 | 0.29 | 0.28 | | | | | 0.34 | 0.52 | | |
| 8/1/2012 | 0.30 | 0.25 | 0.27 | | | | | 0.31 | 0.46 | | 0.28 |
| 8/8/2012 | 0.54 | 0.27 | 0.28 | | | | | 0.67 | 0.28 | | |
| 8/16/2012 | 0.60 | | 0.33 | 0.33 | 0.36 | 0.31 | 0.33 | 0.30 | 0.78 | 0.34 | |
| 8/22/2012 | 0.31 | 0.30 | 0.31 | | | | | 0.56 | 0.31 | | |
| 8/29/2012 | 0.56 | 0.35 | | 0.58 | 0.41 | | 0.10 | 0.41 | 0.37 | 0.33 | 0.31 |
| 9/7/2012 | 0.63 | 0.35 | 0.60 | | | | | 0.72 | | | |
| 9/12/2012 | 0.38 | 0.40 | 0.60 | 0.41 | 0.42 | | 0.59 | | | 0.44 | 0.37 |
| 9/20/2012 | 0.58 | 0.59 | 0.58 | | | | | 0.57 | | | |
| 10/5/2012 | 1.17 | | | | | | | | 0.54 | | |
| 10/12/2012 | 0.23 | 0.21 | 0.26 | | | | | | | | |
| 10/18/2012 | 0.31 | 0.55 | 0.36 | | | | | 0.62 | 0.59 | | |
| 10/25/2012 | 0.51 | 0.50 | 0.56 | | | | | 0.71 | 0.57 | | |

* TIN = Nitrate + Nitrite + Ammonia (when samples have been collected for all three)

# 2008-2014 Nitrogen Data

## CSHH Water-Monitoring Program 2011

| Nitrite as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/26/2011 | 0.018 | 0.024 | 0.017 | 0.018 | 0.015 | 0.018 | 0.017 | 0.018 | 0.016 | 0.018 | 0.017 |
| 6/1/2011 | 0.007 | 0.002 | 0.009 | | | | | 0.007 | | | |
| 6/8/2011 | 0.007 | 0.004 | 0.009 | | | | | 0.010 | 0.010 | | |
| 6/15/2011 | 0.006 | 0.002 | 0.009 | 0.008 | | | | 0.010 | 0.008 | 0.008 | |
| 6/22/2011 | 0.005 | 0.005 | 0.013 | | | | | 0.009 | 0.021 | | |
| 6/29/2011 | 0.011 | 0.007 | 0.005 | 0.012 | 0.009 | 0.005 | 0.015 | 0.011 | 0.011 | 0.027 | 0.004 |
| 7/6/2011 | 0.007 | 0.007 | 0.006 | | | | | 0.011 | 0.008 | | |
| 7/14/2011 | 0.008 | 0.005 | 0.007 | 0.009 | 0.008 | 0.014 | 0.018 | 0.011 | 0.011 | 0.008 | 0.011 |
| 7/21/2011 | 0.006 | 0.003 | 0.007 | | | | | 0.008 | 0.010 | | |
| 7/27/2011 | 0.007 | 0.006 | 0.004 | 0.014 | 0.006 | 0.007 | 0.018 | 0.029 | 0.012 | 0.003 | 0.008 |
| 8/3/2011 | 0.008 | 0.007 | 0.007 | | | | | 0.011 | 0.017 | | |
| 8/17/2011 | 0.016 | 0.008 | 0.009 | | | | | 0.013 | 0.018 | | |
| 8/24/2011 | 0.005 | NA | 0.007 | 0.007 | 0.009 | 0.012 | 0.011 | 0.010 | 0.010 | 0.006 | 0.007 |
| 8/31/2011 | 0.021 | 0.020 | 0.020 | | | | | 0.021 | 0.020 | | |
| 9/14/2011 | 0.028 | 0.034 | 0.032 | | | | | 0.032 | 0.017 | | |
| 9/21/2011 | 0.017 | 0.024 | 0.013 | | | | | 0.013 | 0.016 | | |
| 9/28/2011 | 0.022 | 0.019 | 0.016 | 0.015 | 0.019 | 0.022 | 0.028 | 0.023 | 0.023 | 0.017 | 0.017 |
| 10/6/2011 | 0.034 | 0.032 | 0.030 | 0.035 | 0.035 | 0.043 | 0.039 | 0.038 | 0.032 | 0.036 | 0.035 |
| 10/12/2011 | 0.013 | 0.022 | 0.028 | | | | | 0.026 | 0.009 | | |
| 10/20/2011 | 0.035 | 0.041 | 0.045 | | | | | 0.026 | 0.016 | | |
| 10/26/2011 | 0.016 | 0.049 | 0.016 | 0.018 | 0.030 | NA | 0.023 | 0.032 | 0.034 | 0.032 | 0.024 |
| 11/2/2011 | 0.043 | 0.038 | 0.031 | | | | | 0.044 | 0.035 | | |
| 11/9/2011 | 0.038 | NA | 0.038 | 0.037 | 0.035 | 0.035 | 0.035 | 0.021 | 0.020 | 0.036 | 0.034 |

## 2008-2014 Nitrogen Data

| | Nitrate as N (mg/L) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/26/2011 | 0.03 | 0.02 | 0.03 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.04 | 0.03 |
| 6/1/2011 | 0.04 | 0.02 | 0.03 | | | | | 0.03 | | | |
| 6/8/2011 | 0.02 | 0.02 | 0.02 | | | | | 0.03 | 0.03 | | |
| 6/15/2011 | 0.03 | 0.01 | 0.03 | 0.02 | | | | 0.03 | 0.03 | 0.03 | |
| 6/22/2011 | 0.02 | 0.02 | 0.01 | | | | | 0.01 | 0.01 | | |
| 6/29/2011 | 0.05 | 0.03 | 0.03 | 0.04 | 0.03 | 0.03 | 0.06 | 0.03 | 0.02 | 0.06 | 0.03 |
| 7/6/2011 | 0.03 | 0.03 | 0.03 | | | | | 0.03 | 0.03 | | |
| 7/14/2011 | 0.03 | 0.03 | 0.02 | 0.05 | 0.03 | 0.04 | 0.07 | 0.12 | 0.21 | 0.03 | 0.04 |
| 7/21/2011 | 0.02 | 0.02 | 0.03 | | | | | 0.09 | 0.54 | | |
| 7/27/2011 | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.02 | 0.25 | 0.27 | 0.25 | 0.01 | 0.02 |
| 8/3/2011 | 0.02 | 0.03 | 0.03 | | | | | 0.04 | 0.06 | | |
| 8/17/2011 | 0.05 | 0.04 | 0.03 | | | | | 0.03 | 0.04 | | |
| 8/24/2011 | 0.03 | NA | 0.04 | 0.02 | 0.03 | 0.04 | 0.03 | 0.02 | 0.01 | 0.03 | 0.02 |
| 8/31/2011 | 0.08 | 0.05 | 0.06 | | | | | 0.16 | 0.18 | | |
| 9/14/2011 | 0.03 | 0.03 | 0.03 | | | | | 0.03 | 0.02 | | |
| 9/21/2011 | 0.04 | 0.08 | 0.07 | | | | | 0.07 | 0.11 | | |
| 9/28/2011 | 0.07 | 0.07 | 0.06 | 0.02 | 0.03 | 0.02 | 0.06 | 0.13 | 0.20 | 0.02 | 0.03 |
| 10/6/2011 | 0.04 | 0.03 | 0.04 | 0.03 | 0.04 | 0.04 | 0.04 | 0.05 | 0.03 | 0.03 | 0.03 |
| 10/12/2011 | 0.04 | 0.06 | 0.06 | | | | | 0.02 | 0.02 | | |
| 10/20/2011 | 0.08 | 0.14 | 0.08 | | | | | 0.38 | 0.54 | | |
| 10/26/2011 | 0.05 | 0.12 | 0.05 | 0.07 | 0.12 | NA | 0.09 | 0.18 | 0.36 | 0.02 | 0.07 |
| 11/2/2011 | 0.02 | 0.02 | 0.04 | | | | | 0.02 | 0.01 | | |
| 11/9/2011 | 0.17 | NA | 0.12 | 0.11 | 0.17 | 0.04 | 0.28 | 0.21 | 0.03 | 0.11 | 0.04 |
| >0.55 = 0.54 | | | | | | | | | | | |

# 2008-2014 Nitrogen Data

| Ammonia-Nitrogen | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/26/2011 | 0 | | | | | | | | | | |
| 6/1/2011 | 0 | | | | | | | | | | |
| 6/8/2011 | 0 | | | | | | | 0 | | | |
| 6/15/2011 | 0 | | | | | | | 0 | | | |
| 6/22/2011 | 0 | | | | | | | 0 | | | |
| 6/29/2011 | 0 | | | | | | 0 | 0 | | | |
| 7/6/2011 | 0 | | | | | | | | | | |
| 7/14/2011 | | | 0 | | | | | 0 | | | |
| 7/21/2011 | 0 | | | | | | | 0 | | | |
| 7/27/2011 | 0 | | | | | | 0 | 0 | | | |
| 8/3/2011 | 0 | | | | | | | 0 | | | |
| 8/17/2011 | 0 | | | | | | | 0 | | | |
| 8/24/2011 | 0 | | | | | | 0 | 0 | | | |
| 8/31/2011 | 0 | | | | | | | 0 | | | |
| 9/14/2011 | 0.25 | 0 | 0 | | | | | 0 | | | |
| 9/21/2011 | 0 | | | | | | | 0.25 | | | |
| 9/28/2011 | 0.25 | 0.25 | 0.25 | | 0.25 | | 0.5 | 0.25 | 0.25 | | |
| 10/6/2011 | 0.25 | 0 | 0 | 0 | 0.1 | 0.25 | 0.25 | 0 | 0 | | 0 |
| 10/12/2011 | 0 | | | | | | | 0.25 | | | |
| 10/20/2011 | 0 | | | | | | | 0 | | | |
| 10/26/2011 | 0 | | | | | | 0 | 0.25 | | | |
| 11/2/2011 | 0 | | | | | | | 0.25 | | | |
| 11/9/2011 | 0 | | | | | | 0 | 0 | | | |
| **Salicylate result | | | | | | | | | | | |

# 2008-2014 Nitrogen Data

| Total Inorganic Nitrogen (TIN)* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/26/2011 | 0.05 | | | | | | | | | | |
| 6/1/2011 | 0.05 | | | | | | | | | | |
| 6/8/2011 | 0.03 | | | | | | | 0.04 | | | |
| 6/15/2011 | 0.04 | | | | | | | 0.04 | | | |
| 6/22/2011 | 0.03 | | | | | | | 0.02 | | | |
| 6/29/2011 | 0.06 | | | | | | 0.08 | 0.04 | | | |
| 7/6/2011 | 0.04 | | | | | | | | | | |
| 7/14/2011 | | | 0.03 | | | | | 0.13 | | | |
| 7/21/2011 | 0.03 | | | | | | | 0.10 | | | |
| 7/27/2011 | 0.04 | | | | | | 0.27 | 0.30 | | | |
| 8/3/2011 | 0.03 | | | | | | | 0.05 | | | |
| 8/17/2011 | 0.07 | | | | | | | 0.04 | | | |
| 8/24/2011 | 0.04 | | | | | | 0.04 | 0.03 | | | |
| 8/31/2011 | 0.10 | | | | | | | 0.18 | | | |
| 9/14/2011 | 0.31 | 0.06 | 0.06 | | | | | 0.06 | | | |
| 9/21/2011 | 0.06 | | | | | | | 0.33 | | | |
| 9/28/2011 | 0.34 | 0.34 | 0.33 | | 0.30 | | 0.59 | 0.40 | 0.47 | | |
| 10/6/2011 | 0.32 | 0.06 | 0.07 | 0.07 | 0.18 | 0.33 | 0.33 | 0.09 | 0.06 | | 0.07 |
| 10/12/2011 | 0.05 | | | | | | | 0.30 | | | |
| 10/20/2011 | 0.12 | | | | | | | 0.41 | | | |
| 10/26/2011 | 0.07 | | | | | | 0.11 | 0.46 | | | |
| 11/2/2011 | 0.06 | | | | | | | 0.31 | | | |
| 11/9/2011 | 0.21 | | | | | | 0.32 | 0.23 | | | |

* TIN = Nitrate + Nitrite + Ammonia (when samples have been collected for all three)

## CSHH Water-Monitoring Program 2010

| Nitrite as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/20/2010 | 0.017 | 0.024 | 0.015 | | | | | 0.019 | | | |
| 5/26/2010 | 0.030 | 0.010 | 0.010 | | | | | 0.015 | | | |
| 6/2/2010 | 0.011 | 0.007 | 0.008 | | | | | 0.011 | 0.012 | | |
| 6/9/2010 | 0.008 | NA | 0.007 | | | | | 0.005 | 0.007 | | |
| 6/16/2010 | 0.008 | 0.003 | 0.007 | | | | | 0.006 | 0.010 | | |
| 6/23/2010 | 0.008 | 0.003 | 0.005 | | | | | 0.012 | 0.019 | | |
| 6/30/2010 | 0.009 | 0.013 | 0.002 | | | | | 0.008 | 0.012 | | |
| 7/7/2010 | 0.005 | 0.005 | 0.002 | | | | | 0.007 | 0.004 | | |
| 7/15/2010 | 0.007 | 0.025 | 0.004 | | | | | 0.005 | | | |
| 7/21/2010 | 0.005 | 0.004 | 0.005 | | | | | 0.007 | 0.010 | | |
| 7/28/2010 | 0.007 | 0.005 | 0.005 | | | | | 0.011 | 0.011 | | |
| 8/4/2010 | 0.008 | 0.004 | 0.005 | | | | | 0.009 | 0.005 | | |
| 8/11/2010 | 0.012 | 0.007 | 0.007 | | | | | 0.009 | 0.015 | | |
| 8/18/2010 | 0.013 | 0.005 | 0.008 | | | | | 0.008 | 0.012 | | |
| 8/26/2010 | 0.030 | 0.018 | 0.021 | . | | | | 0.018 | 0.017 | | |
| 9/2/2010 | 0.012 | 0.020 | 0.011 | | | | | 0.018 | 0.011 | | |
| 9/8/2010 | 0.043 | 0.033 | 0.039 | 0.038 | 0.040 | 0.042 | 0.044 | 0.037 | | 0.035 | 0.038 |
| 9/15/2010 | 0.039 | 0.061 | 0.039 | | | | | 0.023 | 0.015 | | |
| 9/22/2010 | 0.024 | 0.029 | 0.021 | | | | | 0.013 | 0.018 | | |
| 9/29/2010 | 0.027 | 0.024 | 0.025 | | | | | NA | 0.013 | | |
| 10/13/2010 | 0.058 | 0.058 | 0.056 | | | | | 0.035 | 0.042 | | |
| 10/20/2010 | 0.075 | 0.069 | 0.070 | | | | | 0.059 | 0.051 | | |
| 10/28/2010 | 0.053 | 0.051 | 0.056 | | | | | 0.031 | 0.013 | | |
| 11/3/2010 | 0.053 | 0.050 | 0.052 | 0.054 | 0.050 | 0.052 | 0.049 | 0.047 | 0.024 | 0.051 | 0.050 |

# 2008-2014 Nitrogen Data

| | Nitrate as N (mg/L) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/20/2010 | 0.01 | 0.01 | 0.09 | | | | | 0.01 | | | |
| 5/26/2010 | 0.02 | 0.02 | 0.03 | | | | | 0.02 | | | |
| 6/2/2010 | 0.03 | 0.02 | 0.03 | | | | | 0.05 | 0.04 | | |
| 6/9/2010 | 0.04 | NA | 0.03 | | | | | 0.04 | 0.04 | | |
| 6/16/2010 | 0.02 | 0.01 | 0.01 | | | | | 0.06 | 0.02 | | |
| 6/23/2010 | 0.03 | 0.02 | 0.03 | | | | | 0.01 | 0.55 | | |
| 6/30/2010 | 0.03 | 0.03 | 0.03 | | | | | 0.02 | 0.01 | | |
| 7/7/2010 | 0.02 | 0.02 | 0.02 | | | | | 0.02 | 0.02 | | |
| 7/15/2010 | 0.03 | 0.03 | 0.03 | | | | | 0.03 | | | |
| 7/21/2010 | 0.03 | 0.02 | 0.03 | | | | | 0.03 | 0.03 | | |
| 7/28/2010 | 0.07 | 0.02 | 0.03 | | | | | 0.04 | 0.02 | | |
| 8/4/2010 | 0.02 | 0.02 | 0.01 | | | | | 0.02 | 0.03 | | |
| 8/11/2010 | 0.04 | 0.02 | 0.04 | | | | | 0.02 | 0.04 | | |
| 8/18/2010 | 0.04 | 0.04 | 0.05 | | | | | 0.05 | 0.05 | | |
| 8/26/2010 | 0.02 | 0.02 | 0.02 | | | | | 0.02 | 0.01 | | |
| 9/2/2010 | 0.05 | 0.03 | 0.04 | | | | | 0.04 | 0.02 | | |
| 9/8/2010 | 0.03 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.02 | | 0.05 | 0.02 |
| 9/15/2010 | 0.03 | 0.01 | 0.03 | | | | | 0.03 | 0.02 | | |
| 9/22/2010 | 0.02 | 0.02 | 0.01 | | | | | 0 | 0.01 | | |
| 9/29/2010 | 0.01 | 0 | 0.01 | | | | | NA | 0 | | |
| 10/13/2010 | 0.03 | 0.03 | 0.02 | | | | | 0.02 | 0.03 | | |
| 10/20/2010 | 0.03 | 0.02 | 0.02 | | | | | 0.02 | 0.04 | | |
| 10/28/2010 | 0.03 | 0.01 | 0.01 | | | | | 0.03 | 0.01 | | |
| 11/3/2010 | 0.02 | 0.02 | 0.01 | 0.03 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 |

# 2008-2014 Nitrogen Data

| Ammonia-Nitrogen | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/20/2010 | 0 | 0.2 | 0 | | | | | 0 | | | |
| 5/26/2010 | 0 | 0 | 0 | | | | | 0 | | | |
| 6/2/2010 | 0 | | 0 | | | | | 0 | 0 | | |
| 6/9/2010 | 0 | | | | | | 0 | 0 | | | |
| 6/16/2010 | 0 | 0 | | | | | | 0 | | | |
| 6/23/2010 | 1 | 0 | | | | | | 0 | 0 | | |
| 6/30/2010 | 0 | | | | | | | 0 | NA | | |
| 7/7/2010 | 0 | | | | | | | 0.10 | 0.05 | | |
| 7/15/2010 | 0.1 | 0 | | | | | | 0 | | | |
| 7/21/2010 | 0 | 0 | | | | | 0 | 0 | 0 | | |
| 7/28/2010 | 0 | | | | | | | 0 | | | |
| 8/4/2010 | 0 | | | | | | | 0 | | | |
| 8/11/2010 | 0 | | | | | | 0 | 0 | NA | | NA |
| 8/18/2010 | 0 | 0 | | | | | | 0 | 0 | | |
| 8/26/2010 | 0 | | | | | | | 0 | | | |
| 9/2/2010 | 0 | | 0 | | | | | 0 | | | |
| 9/8/2010 | 0 | | | | | | 0 | NA | NA | | |
| 9/15/2010 | 0 | | | | | | | 0 | | | |
| 9/22/2010 | 0 | | | | | | | 0 | 0 | | |
| 9/29/2010 | 0 | | | | | | | 0 | 0 | | |
| 10/13/2010 | 0 | | | | | | | 0 | NA | | |
| 10/20/2010 | 0 | | | | | | | 0 | 0 | | |
| 10/28/2010 | 0 | | | | | | | NA | NA | | |
| 11/3/2010 | 0 | NA | NA | | NA | NA | 0 | 0 | | | |
| **Salicylate result | | | | | | | | | | | |

# 2008-2014 Nitrogen Data

| Total Inorganic Nitrogen (TIN)* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/20/2010 | 0.03 | 0.23 | 0.11 | | | | | 0.03 | | | |
| 5/26/2010 | 0.05 | 0.03 | 0.04 | | | | | 0.04 | | | |
| 6/2/2010 | 0.04 | | 0.04 | | | | | 0.06 | 0.05 | | |
| 6/9/2010 | 0.05 | | | | | | | 0.05 | | | |
| 6/16/2010 | 0.03 | 0.01 | | | | | | 0.07 | | | |
| 6/23/2010 | 1.04 | 0.02 | | | | | | 0.02 | 0.57 | | |
| 6/30/2010 | 0.04 | | | | | | | 0.03 | | | |
| 7/7/2010 | 0.03 | | | | | | | 0.13 | 0.07 | | |
| 7/15/2010 | 0.14 | 0.06 | | | | | | 0.04 | | | |
| 7/21/2010 | 0.04 | 0.02 | | | | | | 0.04 | 0.04 | | |
| 7/28/2010 | 0.08 | | | | | | | 0.05 | | | |
| 8/4/2010 | 0.03 | | | | | | | 0.03 | | | |
| 8/11/2010 | 0.05 | | | | | | | 0.03 | | | |
| 8/18/2010 | 0.05 | 0.05 | | | | | | 0.06 | 0.06 | | |
| 8/26/2010 | 0.05 | | | | | | | 0.04 | | | |
| 9/2/2010 | 0.06 | | 0.05 | | | | | 0.06 | | | |
| 9/8/2010 | 0.07 | | | | | | 0.07 | | | | |
| 9/15/2010 | 0.07 | | | | | | | 0.05 | | | |
| 9/22/2010 | 0.04 | | | | | | | 0.01 | 0.03 | | |
| 9/29/2010 | 0.04 | | | | | | | | 0.01 | | |
| 10/13/2010 | 0.09 | | | | | | | 0.06 | | | |
| 10/20/2010 | 0.11 | | | | | | | 0.08 | 0.09 | | |
| 10/28/2010 | 0.08 | | | | | | | | | | |
| 11/3/2010 | 0.07 | | | | | | 0.07 | 0.07 | | | |

* TIN = Nitrate + Nitrite + Ammonia (when samples have been collected for all three)

# 2008-2014 Nitrogen Data

## CSHH Water-Monitoring Program 2009

| Nitrite as N (mg/L) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** | **CSHH#10A** |
| 5/13/2009 | 0.003 | 0 | 0 | | | | | 0 | 0.001 | | | |
| 5/20/2009 | 0.009 | 0.006 | 0.008 | | | | | 0.008 | 0.014 | | | |
| 5/27/2009 | 0.012 | 0.020 | 0.009 | | | | | 0.010 | 0.008 | | | |
| 6/3/2009 | 0.031 | 0.010 | 0.011 | | | | | 0.018 | 0.016 | | | |
| 6/10/2009 | 0.010 | 0.009 | 0.008 | | | | | 0.012 | 0.016 | | | |
| 6/17/2009 | 0.006 | 0.006 | 0.005 | | | | | 0.008 | 0.015 | | | |
| 6/24/2009 | 0.009 | 0.005 | 0.012 | | | | | 0.014 | 0.016 | | | |
| 7/1/2009 | 0.008 | 0.004 | 0.005 | | | | | 0.009 | 0.007 | | | |
| 7/8/2009 | 0.005 | 0.010 | 0.005 | | | | | 0.031 | 0.018 | | | |
| 7/15/2009 | 0.008 | 0.003 | 0.014 | | | | | 0.013 | 0.012 | | | 0.014 |
| 7/22/2009 | 0.006 | 0.005 | 0.006 | | | | | 0.005 | 0.008 | | | |
| 7/29/2009 | 0.006 | 0.004 | 0.006 | | | | | 0.011 | 0.013 | | | |
| 8/5/2009 | 0.008 | 0.003 | 0.004 | | | | | 0.010 | 0.008 | | | |
| 8/12/2009 | 0.016 | 0.004 | 0.014 | | | | | 0.013 | NA | | | |
| 8/19/2009 | 0.010 | 0.006 | 0.009 | | | | | 0.011 | 0.014 | | | |
| 8/26/2009 | 0.003 | 0.005 | 0.007 | | | | | 0.006 | 0.016 | | | |
| 9/2/2009 | 0.006 | 0.010 | 0.004 | | | | | 0.010 | 0.010 | 0.007 | 0.009 | |
| 9/9/2009 | 0.019 | 0.015 | 0.008 | | | | | 0.008 | 0.011 | | | |
| 9/16/2009 | 0.032 | NA | 0.025 | | | | | 0.017 | 0.017 | 0.025 | 0.017 | |
| 9/23/2009 | 0.064 | 0.068 | 0.038 | | | | | 0.021 | 0.020 | | | |
| 9/30/2009 | 0.037 | NA | 0.044 | | | | | 0.020 | 0.012 | | | |
| 10/8/2009 | 0.046 | NA | 0.052 | | | | | 0.017 | 0.014 | | | |
| 10/14/2009 | 0.037 | 0.048 | 0.051 | | | | | 0.043 | 0.046 | | | |
| 10/21/2009 | 0.034 | 0.036 | 0.030 | | | | | 0.033 | 0.025 | | | |
| 10/30/2009 | 0.045 | 0.036 | 0.042 | | | | | 0.036 | 0.041 | | NA | |

## 2008-2014 Nitrogen Data

| | Nitrate as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** | **CSHH#10A** |
| 5/13/2009 | 0 | 0 | 0 | | | | | 0 | 0 | | | |
| 5/20/2009 | 0.04 | 0.03 | 0.04 | | | | | 0.03 | 0.02 | | | |
| 5/27/2009 | 0.06 | 0.05 | 0.05 | | | | | 0.04 | 0.04 | | | |
| 6/3/2009 | 0.03 | 0.03 | 0.04 | | | | | 0.03 | 0.03 | | | |
| 6/10/2009 | 0.05 | 0.03 | 0.04 | | | | | 0.02 | 0.02 | | | |
| 6/17/2009 | 0.03 | 0.02 | 0.02 | | | | | 0.03 | 0.03 | | | |
| 6/24/2009 | 0.03 | 0.03 | 0.03 | | | | | 0.02 | 0.02 | | | |
| 7/1/2009 | 0.02 | 0.02 | 0.02 | | | | | 0.03 | 0.01 | | | |
| 7/8/2009 | 0.03 | 0.03 | 0.03 | | | | | 0.06 | 0.04 | | | |
| 7/15/2009 | 0.04 | 0.03 | 0.03 | | | | | 0.04 | 0.02 | | | 0.03 |
| 7/22/2009 | 0.03 | 0.02 | 0.02 | | | | | 0.02 | 0 | | | |
| 7/29/2009 | 0.01 | 0.02 | 0.02 | | | | | 0.01 | 0.01 | | | |
| 8/5/2009 | 0.03 | 0.02 | 0.04 | | | | | 0.01 | 0.02 | | | |
| 8/12/2009 | 0.03 | 0.03 | 0.04 | | | | | 0.03 | NA | | | |
| 8/19/2009 | 0.04 | 0.04 | 0.03 | | | | | 0.05 | 0.05 | | | |
| 8/26/2009 | 0.04 | 0.02 | 0.02 | | | | | 0.03 | 0.03 | | | |
| 9/2/2009 | 0.04 | 0.02 | 0.03 | | | | | 0.02 | 0.03 | 0.04 | 0.04 | |
| 9/9/2009 | 0.05 | 0.04 | 0.05 | | | | | 0.05 | 0.06 | | | |
| 9/16/2009 | 0.02 | NA | 0.01 | | | | | 0.02 | 0.02 | 0.02 | 0.02 | |
| 9/23/2009 | 0.02 | 0.02 | 0.02 | | | | | 0.01 | 0.03 | | | |
| 9/30/2009 | 0.01 | NA | 0.03 | | | | | 0.01 | 0.01 | | | |
| 10/8/2009 | 0.03 | NA | 0.02 | | | | | 0.02 | 0.01 | | | |
| 10/14/2009 | 0.05 | 0.02 | 0.03 | | | | | 0.06 | 0.07 | | | |
| 10/21/2009 | 0.07 | 0.02 | 0.07 | | | | | 0.01 | 0.01 | | | |
| 10/30/2009 | 0.02 | 0.02 | 0.03 | | | | | 0.02 | 0.02 | | NA | |

# 2008-2014 Nitrogen Data

**Ammonia-Nitrogen**

| Date | CSHH#1 | CSHH#2 | CSHH#3 | CSHH#4 | CSHH#5 | CSHH#6 | CSHH#7 | CSHH#8 | CSHH#13 | CSHH#14 | CSHH#15 | CSHH#10A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/13/2009 | 0 | 0 | 0 | | | | | 0 | NA | | | |
| 5/20/2009 | 0 | 0 | 0 | | | | | 0.025 | NA | | | |
| 5/27/2009 | 0.25 | 0.1 | 0.1 | | | | | 0.1 | 0.25 | | | |
| 6/3/2009 | 0 | 0.05 | 0 | | | | | 0 | NA | | | |
| 6/10/2009 | 0 | 0 | 0 | | | | | 0.25 | 0.25 | | | |
| 6/17/2009 | 0 | 0 | 0 | | | | | 0 | 0 | | | |
| 6/24/2009 | 0 | 0 | 0 | | | | | 0 | 0 | | | |
| 7/1/2009 | 1 | 0 | NA | | | | | 1 | NA | | | |
| 7/8/2009 | 0 | 0 | 0 | | | | | 0 | NA | | | |
| 7/15/2009 | 0 | 0 | 0 | | | | | 6.1 | 0 | | | 0.5 |
| 7/22/2009 | 0 | 0 | 0 | | | | | NA | 0 | | | |
| 7/29/2009 | 0 | 0 | 0 | | | | | 0 | 0 | | | |
| 8/5/2009 | 0 | 0 | 0 | | | | | 0 | 0 | | | |
| 8/12/2009 | 0 | 0 | 0 | | | | | 0 | 0 | | | |
| 8/19/2009 | 0 | 0 | 0 | | | | | 0 | 0.25 | | | |
| 8/26/2009 | 0 | 0 | NA | | | | | 0 | 0 | | | |
| 9/2/2009 | 0 | 0 | 0 | | | | | 0 | NA | 0 | 0 | |
| 9/9/2009 | 0 | 0 | 0 | | | | | 0.25 | NA | | | |
| 9/16/2009 | 0 | NA | NA | | | | | 0.25 | NA | NA | 0 | |
| 9/23/2009 | 0 | 0 | 0 | | | | | 0.10 | 0 | | | |
| 9/30/2009 | 0 | NA | 0 | | | | | 0 | 0 | | | |
| 10/8/2009 | 0.25 | NA | 0 | | | | | 0.25 | 0.25 | | | |
| 10/14/2009 | 0 | 0 | 0 | | | | | 0 | 0.10 | | | |
| 10/21/2009 | 0.25 | 0 | 0 | | | | | 0 | 0 | | | |
| 10/30/2009 | 0 | 0.05 | 0.10 | | | | | 0 | 0 | | 0.25 | |

# 2008-2014 Nitrogen Data

**Total Inorganic Nitrogen (TIN)***

| Date | CSHH#1 | CSHH#2 | CSHH#3 | CSHH#4 | CSHH#5 | CSHH#6 | CSHH#7 | CSHH#8 | CSHH#13 | CSHH#14 | CSHH#15 | CSHH#10A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/13/2009 | 0.00 | 0.00 | 0.00 | | | | | 0.00 | | | | |
| 5/20/2009 | 0.05 | 0.04 | 0.05 | | | | | 0.06 | | | | |
| 5/27/2009 | 0.32 | 0.17 | 0.16 | | | | | 0.15 | 0.30 | | | |
| 6/3/2009 | 0.06 | 0.09 | 0.05 | | | | | 0.05 | | | | |
| 6/10/2009 | 0.06 | 0.04 | 0.05 | | | | | 0.28 | 0.29 | | | |
| 6/17/2009 | 0.04 | 0.03 | 0.03 | | | | | 0.04 | 0.05 | | | |
| 6/24/2009 | 0.04 | 0.04 | 0.04 | | | | | 0.03 | 0.04 | | | |
| 7/1/2009 | 1.03 | 0.02 | | | | | | 1.04 | | | | |
| 7/8/2009 | 0.04 | 0.04 | 0.04 | | | | | 0.09 | | | | |
| 7/15/2009 | 0.05 | 0.03 | 0.04 | | | | | 6.15 | 0.03 | | | 0.54 |
| 7/22/2009 | 0.04 | 0.03 | 0.03 | | | | | | 0.01 | | | |
| 7/29/2009 | 0.02 | 0.02 | 0.03 | | | | | 0.02 | 0.02 | | | |
| 8/5/2009 | 0.04 | 0.02 | 0.04 | | | | | 0.02 | 0.03 | | | |
| 8/12/2009 | 0.05 | 0.03 | 0.05 | | | | | 0.04 | | | | |
| 8/19/2009 | 0.05 | 0.05 | 0.04 | | | | | 0.06 | 0.31 | | | |
| 8/26/2009 | 0.04 | 0.03 | | | | | | 0.04 | 0.05 | | | |
| 9/2/2009 | 0.05 | 0.03 | 0.03 | | | | | 0.03 | | 0.05 | 0.05 | |
| 9/9/2009 | 0.07 | 0.06 | 0.06 | | | | | 0.31 | | | | |
| 9/16/2009 | 0.05 | | | | | | | 0.29 | | | 0.04 | |
| 9/23/2009 | 0.08 | 0.09 | 0.06 | | | | | 0.13 | 0.05 | | | |
| 9/30/2009 | 0.05 | | 0.07 | | | | | 0.03 | 0.02 | | | |
| 10/8/2009 | 0.33 | | 0.07 | | | | | 0.29 | 0.27 | | | |
| 10/14/2009 | 0.09 | 0.07 | 0.08 | | | | | 0.10 | 0.22 | | | |
| 10/21/2009 | 0.35 | 0.06 | 0.10 | | | | | 0.04 | 0.04 | | | |
| 10/30/2009 | 0.07 | 0.11 | 0.17 | | | | | 0.06 | 0.06 | | | |

* TIN = Nitrate + Nitrite + Ammonia (when samples have been collected for all three)

# 2008-2014 Nitrogen Data

## CSHH Water-Monitoring Program 2008

| Nitrite as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/21/2008 | 0.140 | NA | 0.012 | 0.016 | NA | NA | NA | NA | | | |
| 6/11/2008 | NA | 0.011 | 0.009 | NA | NA | NA | NA | 0.008 | | | |
| 6/19/2008 | 0.014 | 0.009 | 0.008 | NA | NA | NA | NA | 0.017 | | | |
| 6/25/2008 | 0.009 | 0.009 | 0.009 | NA | NA | NA | NA | 0.008 | | | |
| 7/2/2008 | 0.008 | 0.010 | 0.008 | NA | NA | NA | NA | 0.011 | | | |
| 7/9/2008 | 0.006 | 0.007 | 0.009 | NA | NA | NA | NA | 0.006 | | | |
| 7/17/2008 | 0.008 | 0.004 | 0.006 | NA | NA | NA | NA | 0.010 | | | |
| 7/30/2008 | NA | 0.009 | 0.007 | NA | NA | NA | NA | 0.006 | | | |
| 8/6/2008 | 0.011 | 0.011 | 0.011 | NA | NA | NA | NA | 0.007 | 0.017 | | |
| 8/13/2008 | 0.012 | 0.005 | 0.007 | NA | NA | NA | NA | 0.011 | 0.013 | | |
| 8/20/2008 | 0.011 | 0.008 | 0.007 | NA | NA | NA | NA | 0.009 | 0.008 | | |
| 8/27/2008 | 0.01 | 0.005 | NA | NA | NA | NA | NA | 0.008 | 0.007 | | |
| 9/3/2008 | 0.011 | 0.008 | 0.008 | NA | NA | NA | NA | 0.008 | 0.013 | | |
| 9/10/2008 | 0.01 | 0.006 | 0.009 | NA | NA | NA | NA | 0.008 | 0.012 | | |
| 9/17/2008 | 0.02 | 0.016 | 0.016 | NA | NA | NA | NA | 0.006 | 0.011 | | |
| 9/24/2008 | 0.006 | 0.007 | 0.006 | NA | NA | NA | NA | 0.010 | 0.009 | | |
| 10/2/2008 | 0.035 | NA | 0.009 | NA | NA | NA | NA | 0.015 | NA | | |
| 10/8/2008 | 0.043 | 0.065 | 0.049 | NA | NA | NA | NA | 0.039 | 0.015 | | |
| 10/16/2008 | 0.069 | 0.075 | 0.073 | NA | NA | NA | NA | 0.035 | 0.031 | | |
| 10/22/2008 | 0.049 | NA | 0.046 | NA | NA | NA | NA | 0.024 | 0.015 | | |
| 10/31/2008 | 0.035 | 0.038 | 0.038 | NA | NA | NA | NA | 0.037 | 0.012 | | |
| 11/5/2008 | 0.036 | 0.039 | 0.033 | NA | NA | NA | NA | 0.025 | 0.026 | | |

# 2008-2014 Nitrogen Data

| | Nitrate as N (mg/L) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/21/2008 | 0.02 | NA | 0.03 | 0.04 | NA | NA | NA | NA | | | |
| 6/11/2008 | NA | 0.03 | 0.04 | NA | NA | NA | NA | 0.03 | | | |
| 6/19/2008 | 0.03 | 0.04 | 0.04 | NA | NA | NA | NA | 0.04 | | | |
| 6/25/2008 | 0.04 | 0.04 | 0.03 | NA | NA | NA | NA | 0.15 | | | |
| 7/2/2008 | 0.05 | 0.05 | 0.04 | NA | NA | NA | NA | 0.04 | | | |
| 7/9/2008 | 0.03 | 0.03 | 0.04 | NA | NA | NA | NA | 0.02 | | | |
| 7/17/2008 | 0.05 | 0.03 | 0.02 | NA | NA | NA | NA | 0.03 | | | |
| 7/30/2008 | NA | 0.06 | 0.03 | NA | NA | NA | NA | 0.04 | | | |
| 8/6/2008 | 0.05 | 0.03 | 0.04 | NA | NA | NA | NA | 0.03 | 0.02 | | |
| 8/13/2008 | 0.05 | 0.03 | 0.03 | NA | NA | NA | NA | 0.03 | 0.03 | | |
| 8/20/2008 | 0.06 | 0.04 | 0.05 | NA | NA | NA | NA | 0.03 | 0.04 | | |
| 8/27/2008 | 0.04 | 0.03 | NA | NA | NA | NA | NA | 0.03 | 0.03 | | |
| 9/3/2008 | 0.05 | 0.03 | 0.04 | NA | NA | NA | NA | 0.03 | 0.02 | | |
| 9/10/2008 | 0.03 | 0.03 | 0.03 | NA | NA | NA | NA | 0.03 | 0.04 | | |
| 9/17/2008 | 0.03 | 0.03 | 0.04 | NA | NA | NA | NA | 0.03 | 0.03 | | |
| 9/24/2008 | 0.04 | 0.07 | 0.04 | NA | NA | NA | NA | 0.04 | 0.04 | | |
| 10/2/2008 | 0.03 | NA | 0.04 | NA | NA | NA | NA | 0.04 | NA | | |
| 10/8/2008 | 0.02 | 0.02 | 0.02 | NA | NA | NA | NA | 0.02 | 0.02 | | |
| 10/16/2008 | 0.04 | 0.02 | 0.03 | NA | NA | NA | NA | 0.02 | 0.02 | | |
| 10/22/2008 | 0.05 | NA | 0.04 | NA | NA | NA | NA | 0.03 | 0.02 | | |
| 10/31/2008 | 0.03 | 0.02 | 0.03 | NA | NA | NA | NA | 0.02 | 0.01 | | |
| 11/5/2008 | 0.02 | 0.02 | 0.03 | NA | NA | NA | NA | 0.02 | 0.02 | | |

# 2008-2014 Nitrogen Data

| Ammonia-Nitrogen | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/21/2008 | | | | | | | | | | | |
| 6/11/2008 | | | | | | | | | | | |
| 6/19/2008 | | | | | | | | | | | |
| 6/25/2008 | | | | | | | | | | | |
| 7/2/2008 | | | | | | | | | | | |
| 7/9/2008 | | | | | | | | | | | |
| 7/17/2008 | | | | | | | | | | | |
| 7/30/2008 | | | | | | | | | | | |
| 8/6/2008 | | | | | | | | | | | |
| 8/13/2008 | | | | | | | | | | | |
| 8/20/2008 | | | | | | | | | | | |
| 8/27/2008 | | | | | | | | | | | |
| 9/3/2008 | | | | | | | | | | | |
| 9/10/2008 | | | | | | | | | | | |
| 9/17/2008 | | | | | | | | | | | |
| 9/24/2008 | | | | | | | | | | | |
| 10/2/2008 | | | | | | | | | | | |
| 10/8/2008 | | | | | | | | | | | |
| 10/16/2008 | | | | | | | | | | | |
| 10/22/2008 | | | | | | | | | | | |
| 10/31/2008 | | | | | | | | | | | |
| 11/5/2008 | | | | | | | | | | | |

# 2008-2014 Nitrogen Data

| Total Inorganic Nitrogen (TIN)* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 5/21/2008 | | | | | | | | | | | |
| 6/11/2008 | | | | | | | | | | | |
| 6/19/2008 | | | | | | | | | | | |
| 6/25/2008 | | | | | | | | | | | |
| 7/2/2008 | | | | | | | | | | | |
| 7/9/2008 | | | | | | | | | | | |
| 7/17/2008 | | | | | | | | | | | |
| 7/30/2008 | | | | | | | | | | | |
| 8/6/2008 | | | | | | | | | | | |
| 8/13/2008 | | | | | | | | | | | |
| 8/20/2008 | | | | | | | | | | | |
| 8/27/2008 | | | | | | | | | | | |
| 9/3/2008 | | | | | | | | | | | |
| 9/10/2008 | | | | | | | | | | | |
| 9/17/2008 | | | | | | | | | | | |
| 9/24/2008 | | | | | | | | | | | |
| 10/2/2008 | | | | | | | | | | | |
| 10/8/2008 | | | | | | | | | | | |
| 10/16/2008 | | | | | | | | | | | |
| 10/22/2008 | | | | | | | | | | | |
| 10/31/2008 | | | | | | | | | | | |
| 11/5/2008 | | | | | | | | | | | |

* TIN = Nitrate + Nitrite + Ammonia (when samples have been collected for all three)

## CSHH Water-Monitoring Program 2007

| Nitrite as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/21/2007 | 0.011 | 0.007 | 0.007 | NA | NA | NA | NA | 0.013 | | | |
| 6/27/2007 | 0.013 | 0.010 | 0.012 | NA | NA | NA | NA | 0.014 | | | |
| 7/5/2007 | 0.009 | 0.004 | 0.011 | NA | NA | NA | NA | 0.028 | | | |
| 7/16/2007 | 0.006 | 0.007 | 0.004 | NA | NA | NA | NA | 0.006 | | | |
| 7/20/2007 | 0.008 | 0.003 | 0.012 | NA | NA | NA | NA | 0.011 | | | |
| 7/25/2007 | 0.011 | NA | 0.024 | NA | NA | NA | NA | 0.009 | | | |
| 8/15/2007 | 0.008 | 0.006 | 0.008 | NA | NA | NA | NA | 0.010 | | | |
| 8/22/2007 | 0.016 | 0.018 | 0.016 | NA | NA | NA | NA | 0.014 | | | |
| 8/29/2007 | 0.016 | 0.027 | 0.018 | NA | NA | NA | NA | 0.011 | | | |
| 9/5/2007 | 0.013 | 0.011 | 0.011 | NA | NA | NA | NA | 0.010 | | | |
| 9/13/2007 | 0.029 | 0.029 | 0.024 | NA | NA | NA | NA | 0.025 | | | |
| 9/19/2007 | 0.038 | 0.056 | 0.046 | NA | NA | NA | NA | 0.040 | | | |
| 9/27/2007 | 0.052 | 0.056 | 0.051 | NA | NA | NA | NA | 0.026 | | | |
| 10/3/2007 | 0.039 | 0.035 | 0.030 | NA | NA | NA | NA | 0.025 | | | |
| 10/10/2007 | 0.032 | 0.028 | 0.028 | NA | NA | NA | NA | 0.029 | | | |
| 10/17/2007 | 0.021 | 0.019 | 0.026 | NA | NA | NA | NA | 0.016 | | | |
| 10/24/2007 | 0.024 | 0.024 | 0.037 | NA | NA | NA | NA | 0.021 | | | |
| 10/31/2007 | 0.021 | 0.024 | 0.024 | NA | NA | NA | NA | 0.018 | | | |

# 2008-2014 Nitrogen Data

| Nitrate as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/21/2007 | 0.04 | 0.04 | 0.04 | NA | NA | NA | NA | 0.66 | | | |
| 6/27/2007 | 0.04 | 0.04 | 0.04 | NA | NA | NA | NA | 0.23 | | | |
| 7/5/2007 | 0.02 | 0.03 | 0.03 | NA | NA | NA | NA | 0.07 | | | |
| 7/16/2007 | 0.02 | 0.03 | 0.04 | NA | NA | NA | NA | 0.29 | | | |
| 7/20/2007 | 0.04 | 0.03 | 0.03 | NA | NA | NA | NA | 0.07 | | | |
| 7/25/2007 | 0.03 | NA | 0.04 | NA | NA | NA | NA | 0.03 | | | |
| 8/15/2007 | 0.04 | 0.02 | 0.02 | NA | NA | NA | NA | 0.04 | | | |
| 8/22/2007 | 0.02 | 0.02 | 0.02 | NA | NA | NA | NA | 0.02 | | | |
| 8/29/2007 | 0.03 | 0.02 | 0.03 | NA | NA | NA | NA | 0.02 | | | |
| 9/5/2007 | 0.04 | 0.03 | 0.03 | NA | NA | NA | NA | 0.02 | | | |
| 9/13/2007 | 0.03 | 0.02 | 0.02 | NA | NA | NA | NA | 0.02 | | | |
| 9/19/2007 | 0.03 | 0.04 | 0.04 | NA | NA | NA | NA | 0.03 | | | |
| 9/27/2007 | 0.04 | 0.03 | 0.03 | NA | NA | NA | NA | 0.03 | | | |
| 10/3/2007 | 0.02 | 0.02 | 0.02 | NA | NA | NA | NA | 0.02 | | | |
| 10/10/2007 | 0.02 | 0.02 | 0.02 | NA | NA | NA | NA | 0.04 | | | |
| 10/17/2007 | 0.12 | 0.10 | 0.11 | NA | NA | NA | NA | 0.17 | | | |
| 10/24/2007 | 0.09 | 0.08 | 0.11 | NA | NA | NA | NA | 0.27 | | | |
| 10/31/2007 | 0.12 | 0.07 | 0.15 | NA | NA | NA | NA | 0.02 | | | |

# 2008-2014 Nitrogen Data

| Ammonia-Nitrogen | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/21/2007 | 3.2 | 2.72 | 3.2 | NA | NA | NA | NA | 1.36 | | | |
| 6/27/2007 | | | | | | | | | | | |
| 7/5/2007 | | | | | | | | | | | |
| 7/16/2007 | | | | | | | | | | | |
| 7/20/2007 | | | | | | | | | | | |
| 7/25/2007 | | | | | | | | | | | |
| 8/15/2007 | | | | | | | | | | | |
| 8/22/2007 | | | | | | | | | | | |
| 8/29/2007 | | | | | | | | | | | |
| 9/5/2007 | | | | | | | | | | | |
| 9/13/2007 | | | | | | | | | | | |
| 9/19/2007 | | | | | | | | | | | |
| 9/27/2007 | | | | | | | | | | | |
| 10/3/2007 | | | | | | | | | | | |
| 10/10/2007 | | | | | | | | | | | |
| 10/17/2007 | | | | | | | | | | | |
| 10/24/2007 | | | | | | | | | | | |
| 10/31/2007 | | | | | | | | | | | |

# 2008-2014 Nitrogen Data

| Total Inorganic Nitrogen (TIN)* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/21/2007 | 3.25 | 2.77 | 3.25 | | | | | 2.03 | | | |
| 6/27/2007 | | | | | | | | | | | |
| 7/5/2007 | | | | | | | | | | | |
| 7/16/2007 | | | | | | | | | | | |
| 7/20/2007 | | | | | | | | | | | |
| 7/25/2007 | | | | | | | | | | | |
| 8/15/2007 | | | | | | | | | | | |
| 8/22/2007 | | | | | | | | | | | |
| 8/29/2007 | | | | | | | | | | | |
| 9/5/2007 | | | | | | | | | | | |
| 9/13/2007 | | | | | | | | | | | |
| 9/19/2007 | | | | | | | | | | | |
| 9/27/2007 | | | | | | | | | | | |
| 10/3/2007 | | | | | | | | | | | |
| 10/10/2007 | | | | | | | | | | | |
| 10/17/2007 | | | | | | | | | | | |
| 10/24/2007 | | | | | | | | | | | |
| 10/31/2007 | | | | | | | | | | | |
| * TIN = Nitrate + Nitrite + Ammonia (when samples have been collected for all three) | | | | | | | | | | | |

## CSHH Water-Monitoring Program 2006

| Nitrite as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/1/2006 | 0.002 | 0.005 | 0.003 | NA | NA | NA | NA | 0.001 | | | |
| 6/8/2006 | 0.016 | 0.025 | 0.010 | NA | NA | NA | NA | 0.015 | | | |
| 6/15/2006 | 0.014 | 0.016 | 0.015 | NA | NA | NA | NA | 0.016 | | | |
| 6/22/2006 | 0.006 | 0.013 | 0.007 | NA | NA | NA | NA | 0.003 | | | |
| 6/29/2006 | 0.015 | 0.009 | 0.001 | NA | NA | NA | NA | 0.005 | | | |
| 7/7/2006 | 0.009 | 0.013 | 0.007 | NA | NA | NA | NA | 0.015 | | | |
| 7/13/2006 | 0 | 0 | 0.001 | NA | NA | NA | NA | 0.012 | | | |
| 7/20/2006 | 0.014 | 0.014 | 0.006 | NA | NA | NA | NA | 0.010 | | | |
| 7/27/2006 | 0.008 | 0.005 | 0.006 | NA | NA | NA | NA | 0.005 | | | |
| 8/2/2006 | 0.010 | 0.006 | 0.007 | NA | NA | NA | NA | 0.003 | | | |
| 8/10/2006 | 0.010 | 0.013 | 0.015 | NA | NA | NA | NA | 0.022 | | | |
| 8/17/2006 | 0.004 | 0.004 | 0.013 | NA | NA | NA | NA | 0.002 | | | |
| 8/24/2006 | 0.008 | 0.013 | 0.008 | NA | NA | NA | NA | 0.008 | | | |
| 8/31/2006 | 0.030 | NA | 0.018 | NA | NA | NA | NA | 0.016 | | | |
| 9/7/2006 | 0.029 | 0.014 | 0.024 | NA | NA | NA | NA | 0.014 | | | |
| 9/14/2006 | 0.012 | 0.012 | 0.013 | NA | NA | NA | NA | 0.015 | | | |
| 9/21/2006 | 0.010 | 0.008 | 0.010 | 0.009 | 0.011 | 0.010 | 0.016 | NA | | | |
| 9/28/2006 | 0.009 | 0.015 | 0.011 | NA | NA | NA | NA | 0.013 | | | |
| 10/5/2006 | 0.010 | 0.009 | 0.008 | NA | NA | NA | NA | 0.008 | | | |
| 10/12/2006 | 0.008 | 0.007 | 0.009 | NA | NA | NA | NA | 0.011 | | | |

# 2008-2014 Nitrogen Data

| Nitrate as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/1/2006 | 0.04 | 0.06 | 0.06 | NA | NA | NA | NA | 0.09 | | | |
| 6/8/2006 | 0.07 | 0.07 | 0.07 | NA | NA | NA | NA | 0.11 | | | |
| 6/15/2006 | 0.09 | 0.01 | 0.02 | NA | NA | NA | NA | 0.82 | | | |
| 6/22/2006 | 0.03 | 0.02 | 0.01 | NA | NA | NA | NA | 0.31 | | | |
| 6/29/2006 | 0.15 | 0.07 | 0.12 | NA | NA | NA | NA | 0.48 | | | |
| 7/7/2006 | 0.03 | 0.04 | 0.03 | NA | NA | NA | NA | 0.83 | | | |
| 7/13/2006 | 0.05 | 0.04 | 0.05 | NA | NA | NA | NA | 0.02 | | | |
| 7/20/2006 | 0.05 | 0.07 | 0.03 | NA | NA | NA | NA | 0.10 | | | |
| 7/27/2006 | 0.02 | 0.05 | 0.03 | NA | NA | NA | NA | 0.04 | | | |
| 8/2/2006 | 0.04 | 0.05 | 0.08 | NA | NA | NA | NA | 0.72 | | | |
| 8/10/2006 | 0.03 | 0.03 | 0.08 | NA | NA | NA | NA | 0.94 | | | |
| 8/17/2006 | 0.06 | 0.03 | 0.05 | NA | NA | NA | NA | 0.19 | | | |
| 8/24/2006 | 0.07 | 0.02 | 0.09 | NA | NA | NA | NA | 0.31 | | | |
| 8/31/2006 | 0.04 | NA | 0.01 | NA | NA | NA | NA | 0.04 | | | |
| 9/7/2006 | 0.05 | 0.07 | 0.05 | NA | NA | NA | NA | 0.01 | | | |
| 9/14/2006 | 0.04 | 0.03 | 0.08 | NA | NA | NA | NA | 0.38 | | | |
| 9/21/2006 | 0.04 | 0.03 | 0.14 | 0.04 | 0.06 | 0.02 | 0.10 | NA | | | |
| 9/28/2006 | 0.03 | 0.03 | 0.03 | NA | NA | NA | NA | 0.32 | | | |
| 10/5/2006 | 0.03 | 0.04 | 0.17 | NA | NA | NA | NA | 0.29 | | | |
| 10/12/2006 | 0.07 | 0.03 | 0.05 | NA | NA | NA | NA | 0.25 | | | |

# 2008-2014 Nitrogen Data

| Ammonia-Nitrogen | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/1/2006 | 2.72 | 4.24 | 2.72 | NA | NA | NA | NA | 1.52 | | | |
| 6/8/2006 | 1.20 | 1.28 | 1.12 | NA | NA | NA | NA | 0.96 | | | |
| 6/15/2006 | 1.44 | 2.32 | 1.12 | NA | NA | NA | NA | 1.44 | | | |
| 6/22/2006 | 2.56 | 1.68 | 2.64 | NA | NA | NA | NA | 1.68 | | | |
| 6/29/2006 | 2.00 | 1.68 | 2.56 | NA | NA | NA | NA | 0.88 | | | |
| 7/7/2006 | 2.24 | 1.36 | 2.08 | NA | NA | NA | NA | 2.16 | | | |
| 7/13/2006 | 1.92 | 2.32 | 2.56 | NA | NA | NA | NA | 1.36 | | | |
| 7/20/2006 | 1.36 | 1.60 | 2.00 | NA | NA | NA | NA | 1.92 | | | |
| 7/27/2006 | 2.32 | 1.92 | 2.40 | NA | NA | NA | NA | 1.12 | | | |
| 8/2/2006 | 2.40 | 2.80 | 2.88 | NA | NA | NA | NA | 1.76 | | | |
| 8/10/2006 | 0.96 | 2.64 | 1.68 | NA | NA | NA | NA | 1.68 | | | |
| 8/17/2006 | 2.16 | 1.52 | 2.16 | NA | NA | NA | NA | 1.52 | | | |
| 8/24/2006 | 1.84 | 2.00 | 1.52 | NA | NA | NA | NA | 1.60 | | | |
| 8/31/2006 | 2.16 | NA | 2.40 | NA | NA | NA | NA | 1.52 | | | |
| 9/7/2006 | 2.40 | 2.80 | 2.16 | NA | NA | NA | NA | 1.60 | | | |
| 9/14/2006 | 2.56 | 2.56 | 2.80 | NA | NA | NA | NA | 1.84 | | | |
| 9/21/2006 | 2.40 | 1.84 | 2.32 | 2.48 | 2.72 | 2.40 | 2.48 | NA | | | |
| 9/28/2006 | 2.32 | 2.00 | 3.12 | NA | NA | NA | NA | 2.08 | | | |
| 10/5/2006 | 1.84 | 2.00 | 2.00 | NA | NA | NA | NA | 1.60 | | | |
| 10/12/2006 | 2.64 | 2.40 | 2.00 | NA | NA | NA | NA | 1.76 | | | |

# 2008-2014 Nitrogen Data

| Total Inorganic Nitrogen (TIN)* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/1/2006 | 2.76 | 4.31 | 2.78 | | | | | 1.61 | | | |
| 6/8/2006 | 1.29 | 1.38 | 1.20 | | | | | 1.09 | | | |
| 6/15/2006 | 1.54 | 2.35 | 1.16 | | | | | 2.28 | | | |
| 6/22/2006 | 2.60 | 1.71 | 2.66 | | | | | 1.99 | | | |
| 6/29/2006 | 2.17 | 1.76 | 2.68 | | | | | 1.37 | | | |
| 7/7/2006 | 2.28 | 1.41 | 2.12 | | | | | 3.01 | | | |
| 7/13/2006 | 1.97 | 2.36 | 2.61 | | | | | 1.39 | | | |
| 7/20/2006 | 1.42 | 1.68 | 2.04 | | | | | 2.03 | | | |
| 7/27/2006 | 2.35 | 1.98 | 2.44 | | | | | 1.17 | | | |
| 8/2/2006 | 2.45 | 2.86 | 2.97 | | | | | 2.48 | | | |
| 8/10/2006 | 1.00 | 2.68 | 1.78 | | | | | 2.64 | | | |
| 8/17/2006 | 2.22 | 1.55 | 2.22 | | | | | 1.71 | | | |
| 8/24/2006 | 1.92 | 2.03 | 1.62 | | | | | 1.92 | | | |
| 8/31/2006 | 2.23 | | 2.43 | | | | | 1.58 | | | |
| 9/7/2006 | 2.48 | 2.88 | 2.23 | | | | | 1.62 | | | |
| 9/14/2006 | 2.61 | 2.60 | 2.89 | | | | | 2.24 | | | |
| 9/21/2006 | 2.45 | 1.88 | 2.47 | 2.53 | 2.79 | 2.43 | 2.60 | | | | |
| 9/28/2006 | 2.36 | 2.05 | 3.16 | | | | | 2.41 | | | |
| 10/5/2006 | 1.88 | 2.05 | 2.18 | | | | | 1.90 | | | |
| 10/12/2006 | 2.72 | 2.44 | 2.06 | | | | | 2.02 | | | |

* TIN = Nitrate + Nitrite + Ammonia (when samples have been collected for all three)

## CSHH Water-Monitoring Program 2005

| Nitrite as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/2/2005 | 0.011 | 0.009 | 0.012 | 0.019 | 0.011 | 0.017 | 0.011 | 0.019 | | | |
| 6/9/2005 | 0 | 0 | 0.006 | NA | NA | NA | NA | 0.007 | | | |
| 6/16/2005 | 0.004 | 0.010 | 0.017 | NA | NA | NA | NA | NA | | | |
| 6/23/2005 | 0.017 | 0.011 | 0.010 | NA | NA | NA | NA | 0.032 | | | |
| 6/30/2005 | 0.015 | 0.006 | 0.011 | NA | NA | NA | NA | 0.025 | | | |
| 7/7/2005 | 0.005 | 0 | 0.004 | NA | NA | NA | NA | 0 | | | |
| 7/14/2005 | 0.005 | 0.001 | 0.002 | NA | NA | NA | NA | 0.005 | | | |
| 7/21/2005 | 0.014 | 0.015 | 0.004 | NA | NA | NA | NA | 0.011 | | | |
| 7/28/2005 | 0.002 | 0.002 | 0.003 | NA | NA | NA | NA | 0 | | | |
| 8/11/2005 | 0.013 | 0.006 | 0.010 | 0.018 | NA | NA | NA | 0.007 | | | |
| 8/18/2005 | 0.004 | 0 | 0 | NA | NA | NA | NA | 0.003 | | | |
| 8/25/2005 | 0.025 | NA | 0.011 | NA | NA | NA | NA | 0.008 | | | |
| 9/1/2005 | 0.015 | 0.018 | 0.019 | 0.011 | 0.028 | 0.020 | 0.016 | 0.021 | | | |
| 9/8/2005 | 0.010 | 0.007 | 0 | NA | NA | NA | NA | 0.006 | | | |
| 9/22/2005 | 0.024 | 0.017 | 0.017 | NA | NA | NA | NA | 0.023 | | | |
| 9/29/2005 | 0.021 | 0.016 | 0.021 | NA | NA | NA | NA | 0.010 | | | |
| 10/6/2005 | 0.036 | 0.032 | 0.021 | NA | NA | NA | NA | 0.019 | | | |
| 10/20/2005 | 0.023 | 0.031 | 0.024 | NA | NA | NA | NA | 0.020 | | | |
| 10/27/2005 | 0.038 | 0.047 | 0.039 | NA | NA | NA | NA | 0.028 | | | |
| 11/3/2005 | 0.053 | 0.066 | 0.053 | NA | NA | NA | NA | 0.040 | | | |

# 2008-2014 Nitrogen Data

| | Nitrate as N (mg/L) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/2/2005 | 0.03 | 0.07 | 0.09 | 0.02 | 0.10 | 0.09 | 0.09 | 0.23 | | | |
| 6/9/2005 | 0.01 | 0.06 | 0.03 | NA | NA | NA | NA | 0.07 | | | |
| 6/16/2005 | 0.02 | 0.04 | 0.01 | NA | NA | NA | NA | NA | | | |
| 6/23/2005 | 0.01 | 0.03 | 0 | NA | NA | NA | NA | 0.07 | | | |
| 6/30/2005 | 0.03 | 0.01 | 0.05 | NA | NA | NA | NA | 0.19 | | | |
| 7/7/2005 | 0.01 | 0.02 | 0.01 | NA | NA | NA | NA | 0.24 | | | |
| 7/14/2005 | 0.02 | 0 | 0.22 | NA | NA | NA | NA | 0.28 | | | |
| 7/21/2005 | 0.03 | 0 | 0 | NA | NA | NA | NA | 0.38 | | | |
| 7/28/2005 | 0.05 | 0.03 | 0.06 | NA | NA | NA | NA | 0.30 | | | |
| 8/11/2005 | 0 | 0 | 0.09 | 0.01 | NA | NA | NA | 0.40 | | | |
| 8/18/2005 | 0 | 0.03 | 0 | NA | NA | NA | NA | 0.23 | | | |
| 8/25/2005 | 0.07 | NA | 0.07 | NA | NA | NA | NA | 0.33 | | | |
| 9/1/2005 | 0.04 | 0.05 | 0 | 0.04 | 0.03 | 0.07 | 0.01 | 0.55 | | | |
| 9/8/2005 | 0.04 | 0.03 | 0.04 | NA | NA | NA | NA | 0.10 | | | |
| 9/22/2005 | 0.11 | 0.09 | 0.13 | NA | NA | NA | NA | 0.45 | | | |
| 9/29/2005 | 0.09 | 0.05 | 0.07 | NA | NA | NA | NA | 0.16 | | | |
| 10/6/2005 | 0.05 | 0.07 | 0.10 | NA | NA | NA | NA | 0.12 | | | |
| 10/20/2005 | 0.03 | 0.01 | 0.04 | NA | NA | NA | NA | 0.01 | | | |
| 10/27/2005 | 0.02 | 0.03 | 0.01 | NA | NA | NA | NA | 1.20 | | | |
| 11/3/2005 | 0 | 0.03 | 0.19 | NA | NA | NA | NA | 0.56 | | | |

# 2008-2014 Nitrogen Data

| Ammonia-Nitrogen | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/2/2005 | 0.40 | 1.12 | 0.56 | 1.04 | 1.52 | 0.56 | 0.72 | 1.04 | | | |
| 6/9/2005 | 1.12 | 0.80 | 0.88 | NA | NA | NA | NA | 0.96 | | | |
| 6/16/2005 | 0.40 | 1.12 | 0.72 | NA | NA | NA | NA | NA | | | |
| 6/23/2005 | 1.20 | 0.64 | 1.12 | NA | NA | NA | NA | 1.36 | | | |
| 6/30/2005 | 1.28 | 1.12 | 1.84 | NA | NA | NA | NA | 1.60 | | | |
| 7/7/2005 | 0.16 | 0.48 | 0.64 | NA | NA | NA | NA | 1.28 | | | |
| 7/14/2005 | 0.64 | 0.24 | 0.64 | NA | NA | NA | NA | 0.56 | | | |
| 7/21/2005 | 0.80 | 0.56 | 1.12 | NA | NA | NA | NA | 1.12 | | | |
| 7/28/2005 | 1.28 | 1.20 | 1.20 | NA | NA | NA | NA | 1.68 | | | |
| 8/11/2005 | 0.96 | 1.76 | 0.96 | 1.36 | NA | NA | NA | 0.80 | | | |
| 8/18/2005 | 0.72 | 0.80 | 1.44 | NA | NA | NA | NA | 1.12 | | | |
| 8/25/2005 | 0.88 | NA | 0.40 | NA | NA | NA | NA | 1.04 | | | |
| 9/1/2005 | 2.24 | 1.28 | 1.68 | 1.76 | 2.00 | 2.00 | 1.92 | 1.68 | | | |
| 9/8/2005 | 0.24 | 0.64 | 0.32 | NA | NA | NA | NA | 0.96 | | | |
| 9/22/2005 | 1.28 | 1.12 | 1.28 | NA | NA | NA | NA | 0.88 | | | |
| 9/29/2005 | 0.8 | 1.04 | 1.36 | NA | NA | NA | NA | 0.88 | | | |
| 10/6/2005 | 1.04 | 1.52 | 0.64 | NA | NA | NA | NA | 1.6 | | | |
| 10/20/2005 | 1.6 | 1.52 | 0.96 | NA | NA | NA | NA | 1.60 | | | |
| 10/27/2005 | 1.76 | 1.36 | 1.12 | NA | NA | NA | NA | 1.68 | | | |
| 11/3/2005 | 0.16 | 0.96 | 0.40 | NA | NA | NA | NA | 0.96 | | | |

# 2008-2014 Nitrogen Data

| Total Inorganic Nitrogen (TIN)* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/2/2005 | 0.44 | 1.20 | 0.66 | 1.08 | 1.63 | 0.67 | 0.82 | 1.29 | | | |
| 6/9/2005 | 1.13 | 0.86 | 0.92 | | | | | 1.04 | | | |
| 6/16/2005 | 0.42 | 1.17 | 0.75 | | | | | | | | |
| 6/23/2005 | 1.23 | 0.68 | 1.13 | | | | | 1.46 | | | |
| 6/30/2005 | 1.33 | 1.14 | 1.90 | | | | | 1.82 | | | |
| 7/7/2005 | 0.18 | 0.50 | 0.65 | | | | | 1.52 | | | |
| 7/14/2005 | 0.67 | 0.24 | 0.86 | | | | | 0.85 | | | |
| 7/21/2005 | 0.84 | 0.58 | 1.12 | | | | | 1.51 | | | |
| 7/28/2005 | 1.33 | 1.23 | 1.26 | | | | | 1.98 | | | |
| 8/11/2005 | 0.97 | 1.77 | 1.06 | 1.39 | | | | 1.21 | | | |
| 8/18/2005 | 0.72 | 0.83 | 1.44 | | | | | 1.35 | | | |
| 8/25/2005 | 0.98 | | 0.48 | | | | | 1.38 | | | |
| 9/1/2005 | 2.30 | 1.35 | 1.70 | 1.81 | 2.06 | 2.09 | 1.95 | 2.25 | | | |
| 9/8/2005 | 0.29 | 0.68 | 0.36 | | | | | 1.07 | | | |
| 9/22/2005 | 1.41 | 1.23 | 1.43 | | | | | 1.35 | | | |
| 9/29/2005 | 0.91 | 1.11 | 1.45 | | | | | 1.05 | | | |
| 10/6/2005 | 1.13 | 1.62 | 0.76 | | | | | 1.74 | | | |
| 10/20/2005 | 1.65 | 1.56 | 1.02 | | | | | 1.63 | | | |
| 10/27/2005 | 1.82 | 1.44 | 1.17 | | | | | 2.91 | | | |
| 11/3/2005 | 0.21 | 1.06 | 0.64 | | | | | 1.56 | | | |

* TIN = Nitrate + Nitrite + Ammonia (when samples have been collected for all three)

# 2008-2014 Nitrogen Data

## CSHH Water-Monitoring Program 2004

| Nitrite as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/3/2004 | 0.003 | 0.019 | 0.007 | 0.009 | 0.009 | 0.003 | 0.002 | 0.019 | | | |
| 6/10/2004 | 0.017 | 0.017 | 0.012 | 0.017 | 0.018 | 0.021 | 0.014 | 0.011 | | | |
| 6/18/2004 | 0.008 | 0.003 | 0.019 | 0.006 | 0.008 | 0.009 | 0.013 | 0.007 | | | |
| 6/24/2004 | 0.012 | 0.006 | 0.001 | NA | NA | NA | NA | 0.013 | | | |
| 7/14/2004 | 0.021 | 0.007 | 0.003 | 0.009 | 0.018 | 0.007 | 0.025 | 0.011 | | | |
| 7/22/2004 | 0.009 | 0.015 | 0.006 | NA | NA | NA | NA | 0.007 | | | |
| 7/29/2004 | 0.005 | 0.008 | 0.002 | 0.008 | 0.002 | 0.009 | 0.017 | 0.015 | | | |
| 8/5/2004 | 0.008 | 0.012 | 0.008 | NA | NA | NA | NA | 0.007 | | | |
| 8/11/2004 | 0.007 | 0.006 | 0.001 | NA | NA | NA | NA | 0.008 | | | |
| 8/19/2004 | 0.002 | 0 | 0.009 | NA | NA | NA | NA | 0.006 | | | |
| 8/26/2004 | 0.003 | 0.015 | 0.010 | 0.002 | 0.015 | 0.004 | 0.007 | 0.002 | | | |
| 9/2/2004 | 0.012 | 0.006 | 0.009 | NA | NA | NA | NA | 0.011 | | | |
| 9/8/2004 | 0.012 | NA | 0.021 | NA | NA | NA | NA | 0.035 | | | |
| 9/15/2004 | 0.016 | 0.016 | 0.020 | 0.012 | 0.019 | 0.023 | 0.022 | 0.011 | | | |
| 9/22/2004 | 0.024 | 0.032 | 0.020 | NA | NA | NA | NA | 0.023 | | | |
| 9/30/2004 | 0.005 | 0.005 | 0.004 | NA | NA | NA | NA | 0.010 | | | |
| 10/7/2004 | 0.020 | 0.019 | 0.031 | NA | NA | NA | NA | 0.046 | | | |
| 10/14/2004 | 0.014 | 0.014 | 0.016 | NA | NA | NA | NA | 0.024 | | | |
| 10/21/2004 | 0.015 | 0.008 | 0.011 | NA | NA | NA | NA | 0.011 | | | |
| 10/28/2004 | 0.014 | NA | 0.016 | NA | NA | NA | NA | 0.020 | | | |
| 11/4/2004 | 0.025 | 0.018 | 0.028 | NA | NA | NA | NA | 0.012 | | | |
| 11/10/2004 | 0.019 | 0.028 | 0.019 | NA | NA | NA | NA | 0.019 | | | |

# 2008-2014 Nitrogen Data

| Nitrate as N (mg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/3/2004 | 0.12 | 0.05 | 0.04 | 0.08 | 0.11 | 0.09 | 0.11 | 0.84 | | | |
| 6/10/2004 | 0.11 | 0.05 | 0.19 | 0.1 | 0.25 | 0.15 | 0.47 | 0.94 | | | |
| 6/18/2004 | 0.05 | 0.05 | 0.01 | 0.1 | 0.07 | 0.08 | 0.07 | 0.48 | | | |
| 6/24/2004 | 0.07 | 0.01 | 0.06 | NA | NA | NA | NA | 0.48 | | | |
| 7/14/2004 | 0.03 | 0.06 | 0.02 | 0.05 | 0.08 | 0.15 | 0.55 | 0.20 | | | |
| 7/22/2004 | 0.05 | 0.03 | 0.01 | NA | NA | NA | NA | 0.22 | | | |
| 7/29/2004 | 0.08 | 0.05 | 0.08 | 0.06 | 0.20 | 0.03 | 0.01 | 0.03 | | | |
| 8/5/2004 | 0.03 | 0.04 | 0.02 | NA | NA | NA | NA | 0.12 | | | |
| 8/11/2004 | 0.03 | 0.04 | 0.01 | NA | NA | NA | NA | 0.09 | | | |
| 8/19/2004 | 0.07 | 0.03 | 0.02 | NA | NA | NA | NA | 0.39 | | | |
| 8/26/2004 | 0.01 | 0.01 | 0.08 | 0.02 | 0.65 | 0.04 | 0.27 | 0.07 | | | |
| 9/2/2004 | 0.06 | 0.02 | 0 | NA | NA | NA | NA | 0.38 | | | |
| 9/8/2004 | 0.04 | NA | 0.07 | NA | NA | NA | NA | 0.11 | | | |
| 9/15/2004 | 0.11 | 0.05 | 0.08 | 0.09 | 0.05 | 0.06 | 0.07 | 0.38 | | | |
| 9/22/2004 | 0.12 | 0.16 | 0.11 | NA | NA | NA | NA | 0.43 | | | |
| 9/30/2004 | 0.14 | 0.15 | 0.16 | NA | NA | NA | NA | 0.74 | | | |
| 10/7/2004 | 0 | 0.07 | 0.11 | NA | NA | NA | NA | 0.22 | | | |
| 10/14/2004 | 0.11 | 0.04 | 0.11 | NA | NA | NA | NA | 0.23 | | | |
| 10/21/2004 | 0.15 | 0.05 | 0.04 | NA | NA | NA | NA | 0.53 | | | |
| 10/28/2004 | 0.09 | NA | 0.03 | NA | NA | NA | NA | 0.05 | | | |
| 11/4/2004 | 0.06 | 0.07 | 0.12 | NA | NA | NA | NA | 0.53 | | | |
| 11/10/2004 | 0 | 0.07 | 0.05 | NA | NA | NA | NA | 0.71 | | | |

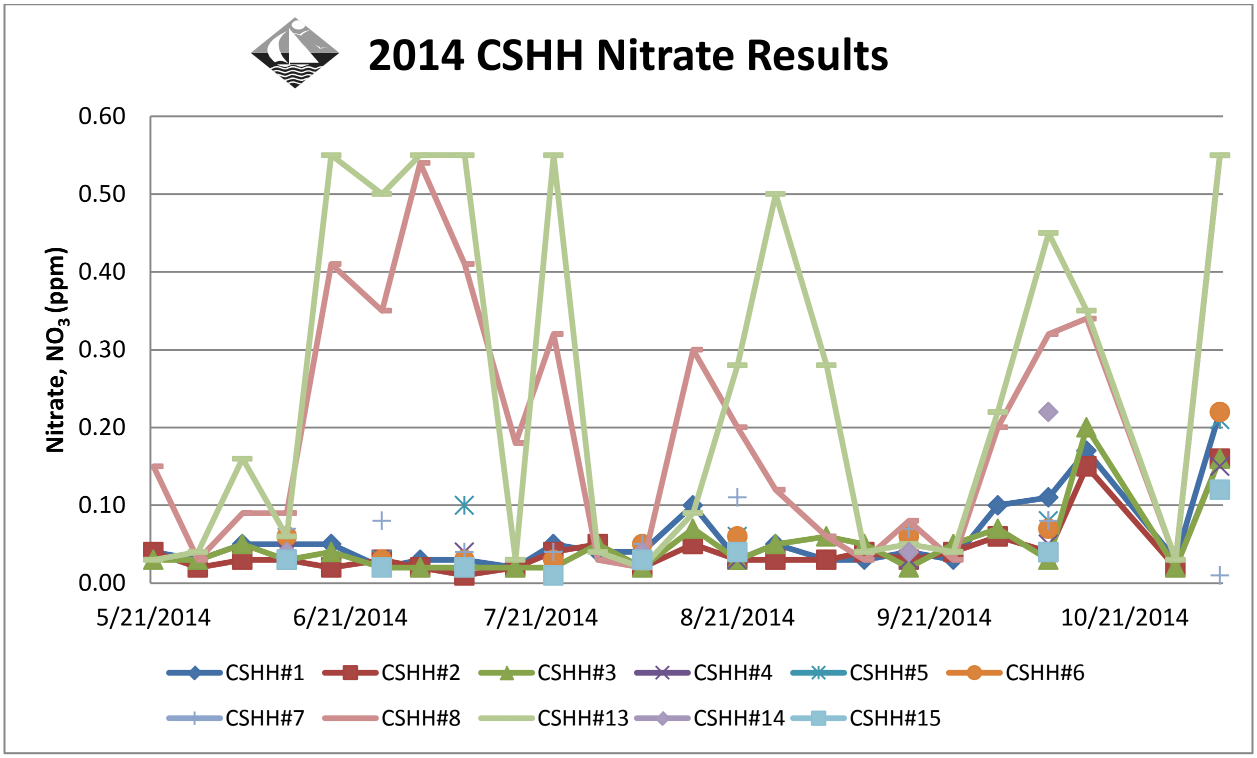
# 2008-2014 Nitrogen Data

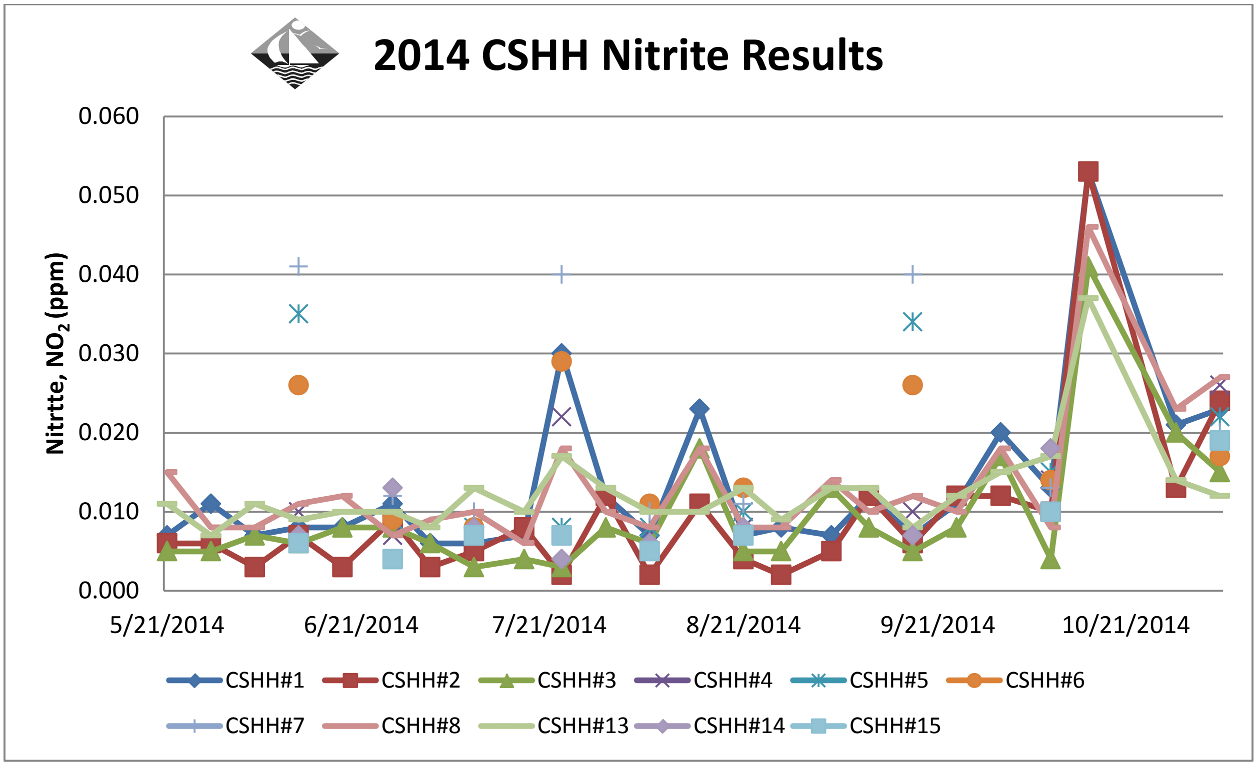
| Ammonia-Nitrogen | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/3/2004 | 2.16 | 1.92 | 1.68 | 1.68 | 1.68 | 1.52 | 2 | 2.08 | | | |
| 6/10/2004 | 1.60 | 1.44 | 1.60 | 1.44 | 1.20 | 1.28 | 1.52 | 1.44 | | | |
| 6/18/2004 | 1.12 | 1.12 | 0.88 | 0.96 | 0.64 | 0.96 | 1.04 | 0.96 | | | |
| 6/24/2004 | NA | NA | NA | NA | NA | NA | NA | NA | | | |
| 7/14/2004 | 1.92 | 1.84 | 1.52 | 2.00 | 1.84 | 2.32 | 2.56 | 2.24 | | | |
| 7/22/2004 | NA | NA | NA | NA | NA | NA | NA | NA | | | |
| 7/29/2004 | 0.88 | 0.24 | 1.60 | 1.44 | 1.60 | 1.76 | 2.24 | 1.12 | | | |
| 8/5/2004 | 1.52 | 1.28 | 1.76 | NA | NA | NA | NA | 1.52 | | | |
| 8/11/2004 | 0.56 | 0.88 | 0.96 | NA | NA | NA | NA | 1.12 | | | |
| 8/19/2004 | 1.44 | 1.52 | 1.52 | NA | NA | NA | NA | 0.96 | | | |
| 8/26/2004 | 0.72 | 0.48 | 0.96 | 0.72 | 0.96 | 0.88 | 1.36 | 1.28 | | | |
| 9/2/2004 | 1.04 | 1.28 | 1.36 | NA | NA | NA | NA | 1.6 | | | |
| 9/8/2004 | 1.52 | NA | 1.60 | NA | NA | NA | NA | 1.20 | | | |
| 9/15/2004 | 0.96 | 0.88 | 0.88 | 0.88 | 0.88 | 0.96 | 0.48 | 0.72 | | | |
| 9/22/2004 | 1.76 | 1.36 | 2.08 | NA | NA | NA | NA | 1.52 | | | |
| 9/30/2004 | 1.52 | 0.48 | 1.28 | NA | NA | NA | NA | 0.96 | | | |
| 10/7/2004 | 2.16 | 1.28 | 1.28 | NA | NA | NA | NA | 1.44 | | | |
| 10/14/2004 | 1.28 | 1.04 | 1.04 | NA | NA | NA | NA | 1.44 | | | |
| 10/21/2004 | 1.52 | 1.52 | 1.28 | NA | NA | NA | NA | 2.16 | | | |
| 10/28/2004 | 1.20 | NA | 1.52 | NA | NA | NA | NA | 0.88 | | | |
| 11/4/2004 | 1.20 | 0.64 | 1.28 | NA | NA | NA | NA | 1.04 | | | |
| 11/10/2004 | 0.88 | 1.12 | 1.12 | NA | NA | NA | NA | 1.68 | | | |

# 2008-2014 Nitrogen Data

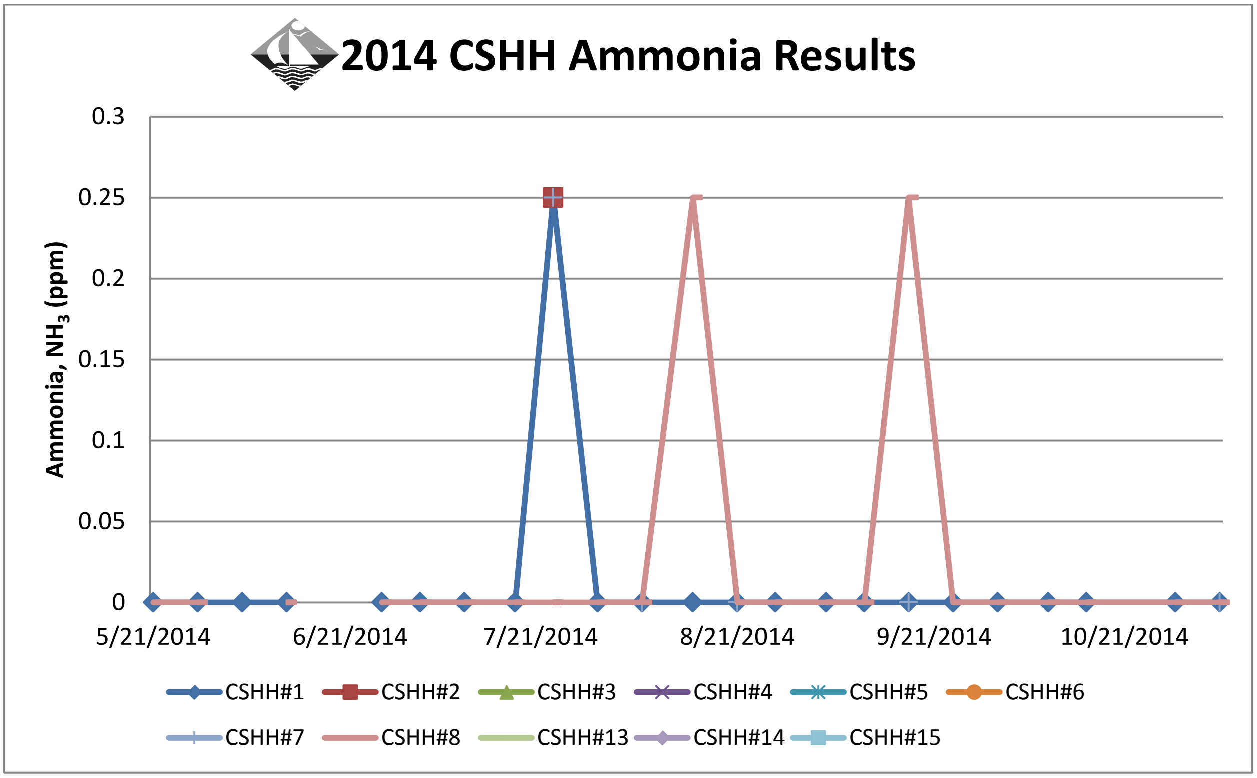
| Total Inorganic Nitrogen (TIN)* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **CSHH#1** | **CSHH#2** | **CSHH#3** | **CSHH#4** | **CSHH#5** | **CSHH#6** | **CSHH#7** | **CSHH#8** | **CSHH#13** | **CSHH#14** | **CSHH#15** |
| 6/3/2004 | 2.28 | 1.99 | 1.73 | 1.77 | 1.80 | 1.61 | 2.11 | 2.94 | | | |
| 6/10/2004 | 1.73 | 1.51 | 1.80 | 1.56 | 1.47 | 1.45 | 2.00 | 2.39 | | | |
| 6/18/2004 | 1.18 | 1.17 | 0.91 | 1.07 | 0.72 | 1.05 | 1.12 | 1.45 | | | |
| 6/24/2004 | | | | | | | | | | | |
| 7/14/2004 | 1.97 | 1.91 | 1.54 | 2.06 | 1.94 | 2.48 | 3.14 | 2.45 | | | |
| 7/22/2004 | | | | | | | | | | | |
| 7/29/2004 | 0.97 | 0.30 | 1.68 | 1.51 | 1.80 | 1.80 | 2.27 | 1.17 | | | |
| 8/5/2004 | 1.56 | 1.33 | 1.79 | | | | | 1.65 | | | |
| 8/11/2004 | 0.60 | 0.93 | 0.97 | | | | | 1.22 | | | |
| 8/19/2004 | 1.51 | 1.55 | 1.55 | | | | | 1.36 | | | |
| 8/26/2004 | 0.73 | 0.51 | 1.05 | 0.74 | 1.63 | 0.92 | 1.64 | 1.35 | | | |
| 9/2/2004 | 1.11 | 1.31 | 1.37 | | | | | 1.99 | | | |
| 9/8/2004 | 1.57 | | 1.69 | | | | | 1.35 | | | |
| 9/15/2004 | 1.09 | 0.95 | 0.98 | 0.98 | 0.95 | 1.04 | 0.57 | 1.11 | | | |
| 9/22/2004 | 1.90 | 1.55 | 2.21 | | | | | 1.97 | | | |
| 9/30/2004 | 1.67 | 0.64 | 1.44 | | | | | 1.71 | | | |
| 10/7/2004 | 2.18 | 1.37 | 1.42 | | | | | 1.71 | | | |
| 10/14/2004 | 1.40 | 1.09 | 1.17 | | | | | 1.69 | | | |
| 10/21/2004 | 1.69 | 1.58 | 1.33 | | | | | 2.70 | | | |
| 10/28/2004 | 1.30 | | 1.57 | | | | | 0.95 | | | |
| 11/4/2004 | 1.29 | 0.73 | 1.43 | | | | | 1.58 | | | |
| 11/10/2004 | 0.90 | 1.22 | 1.19 | | | | | 2.41 | | | |

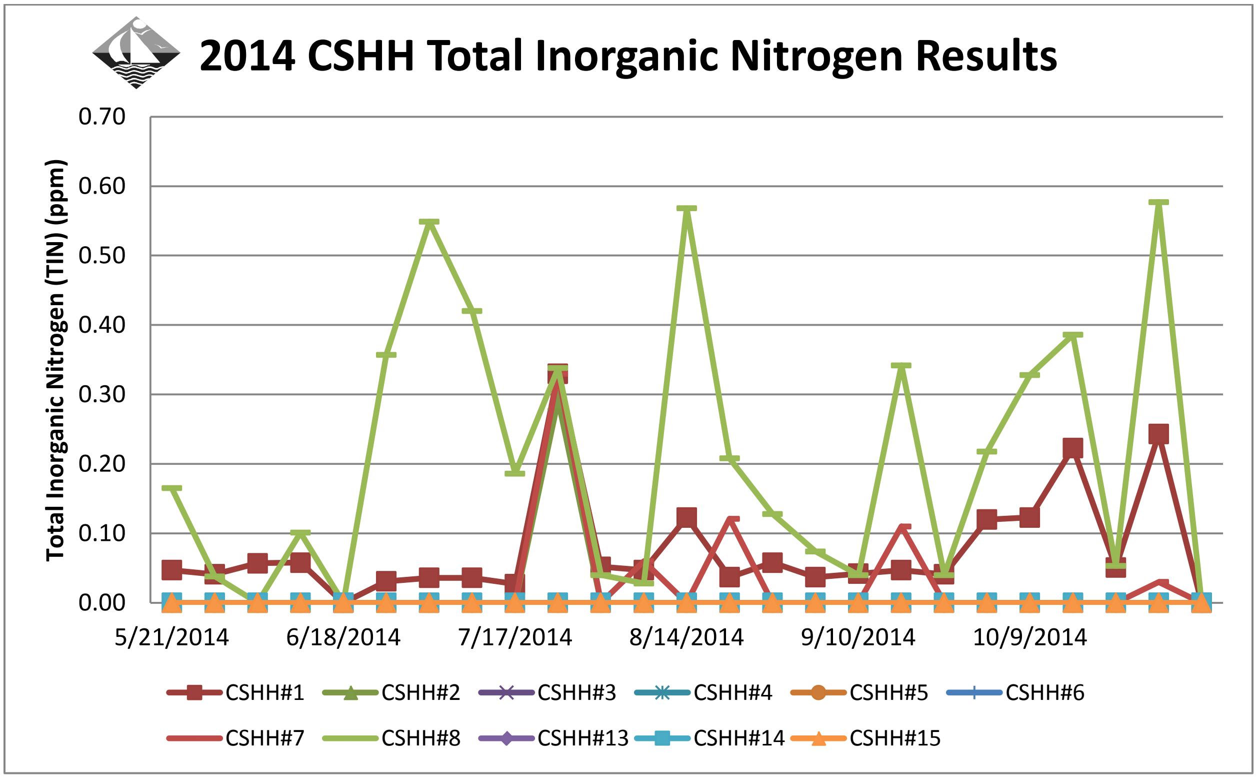
## *2014 Nitrogen Graphs*





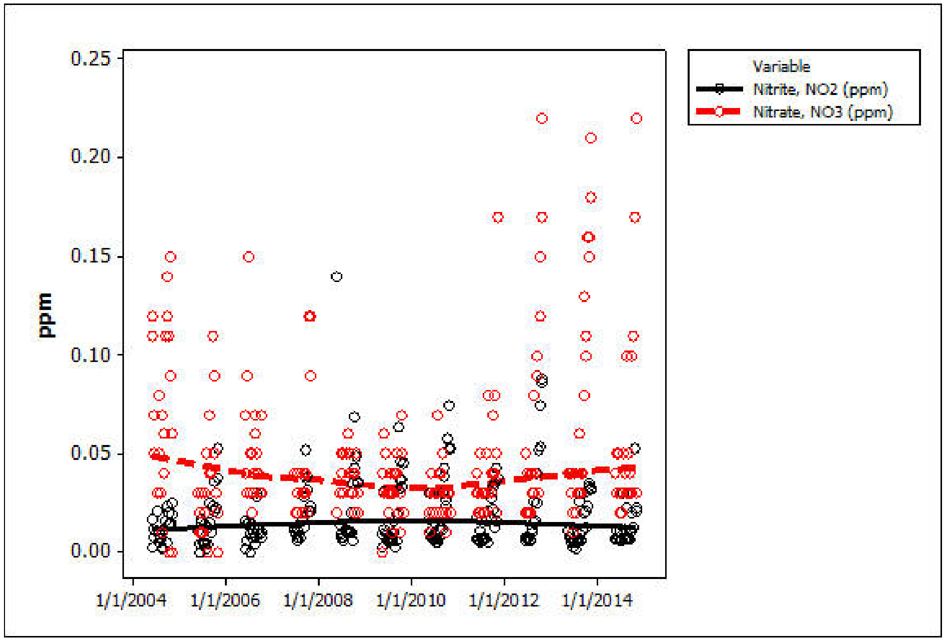
# *2014 Nitrogen Graphs*



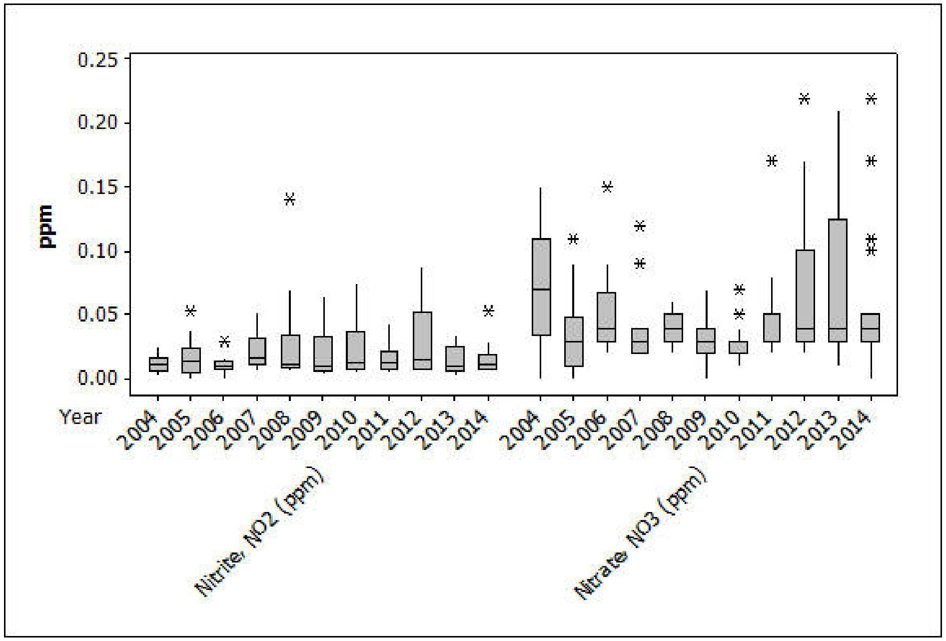


# 2014 Nitrogen Graphs

## CSHH #1 –Beacon 11



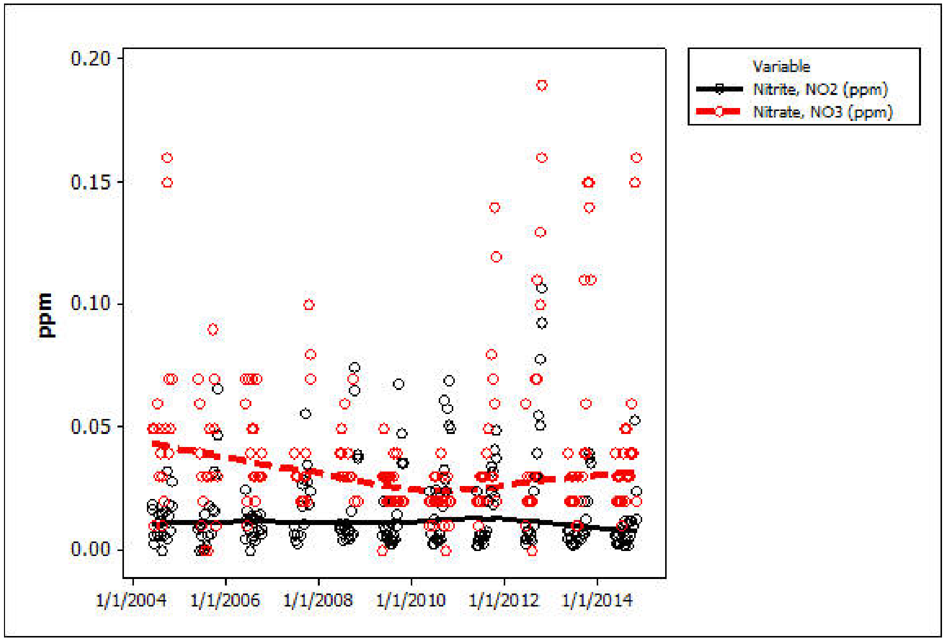
Data with LOWESS (smoothing) line



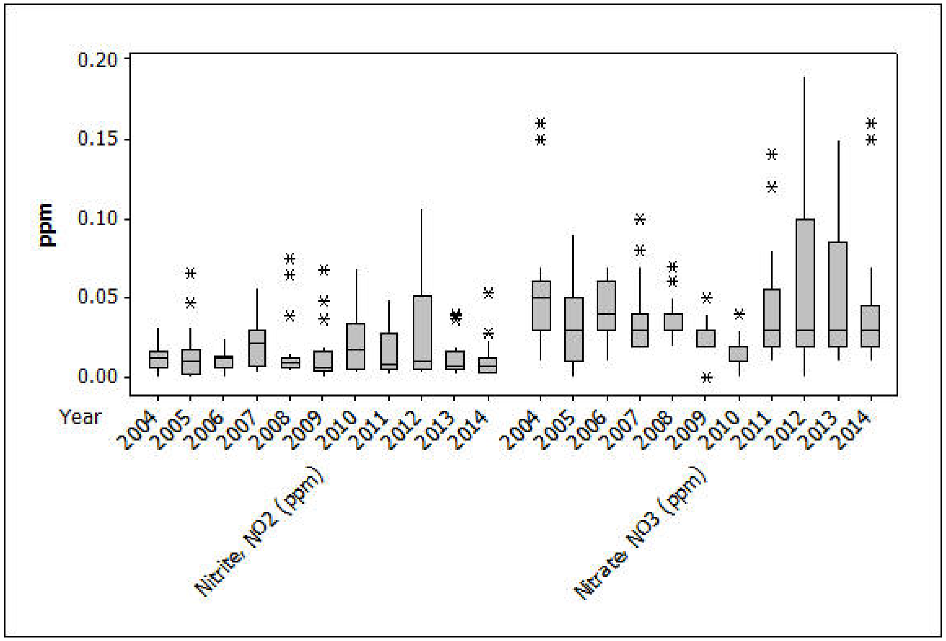
Boxplot

# 2014 Nitrogen Graphs

## CSHH #2 –Bell Marker 6



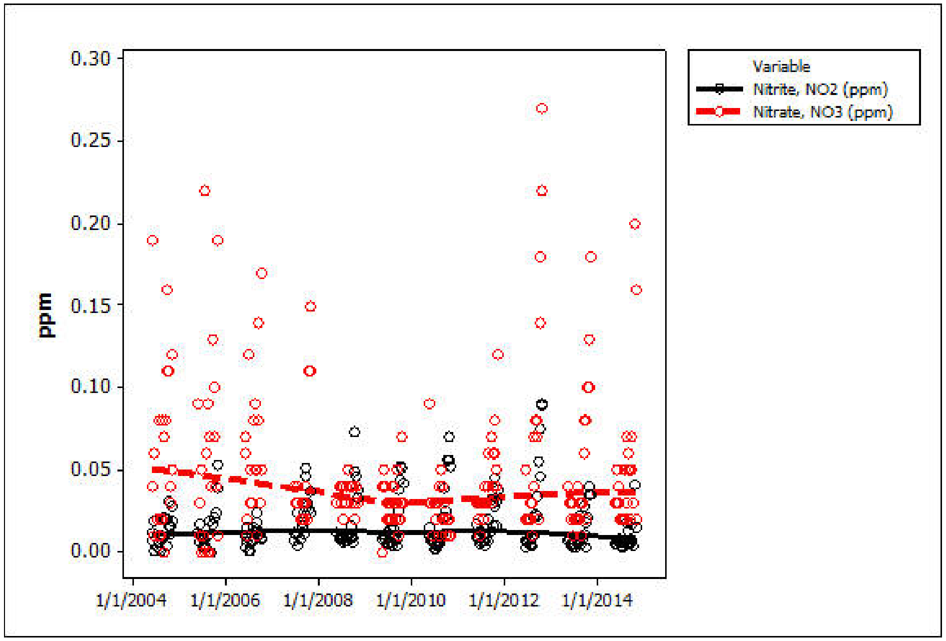
*Data with LOWESS (smoothing) line*



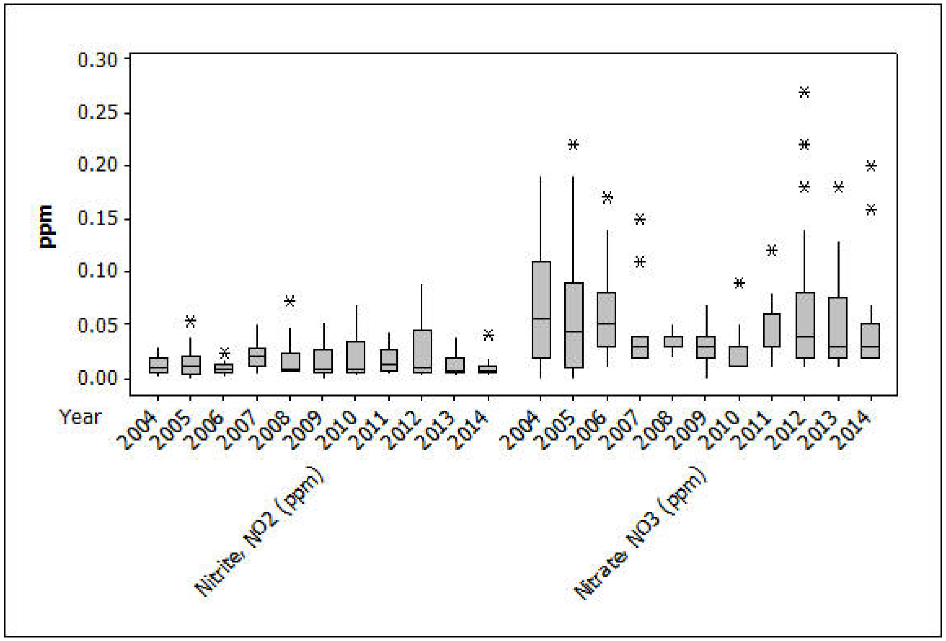
*Boxplot*

# *2014 Nitrogen Graphs*

## CSHH #3 – Glen Cove Creek, Red Marker



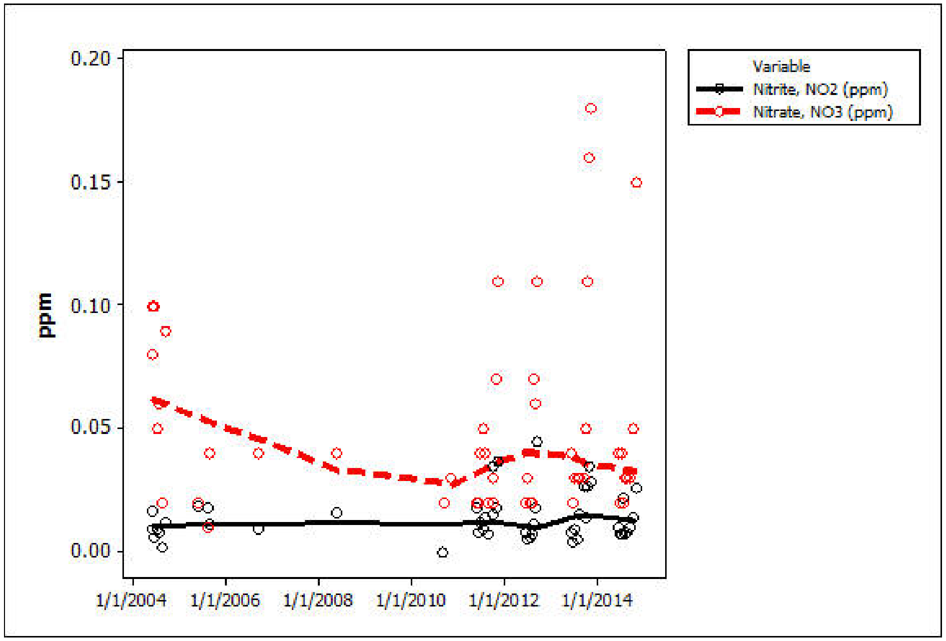
*Data with LOWESS (smoothing) line*



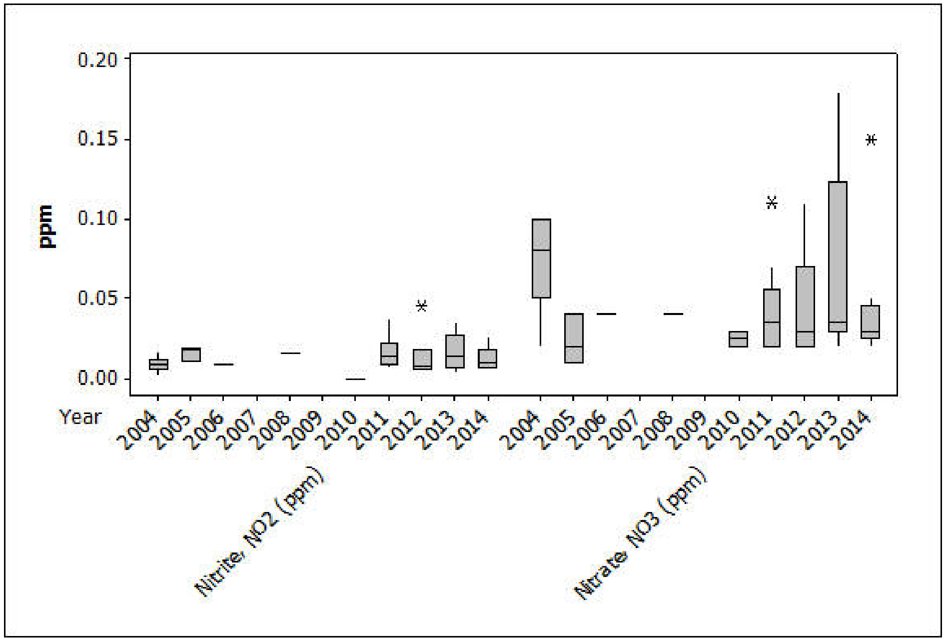
*Boxplot*

# *2014 Nitrogen Graphs*

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



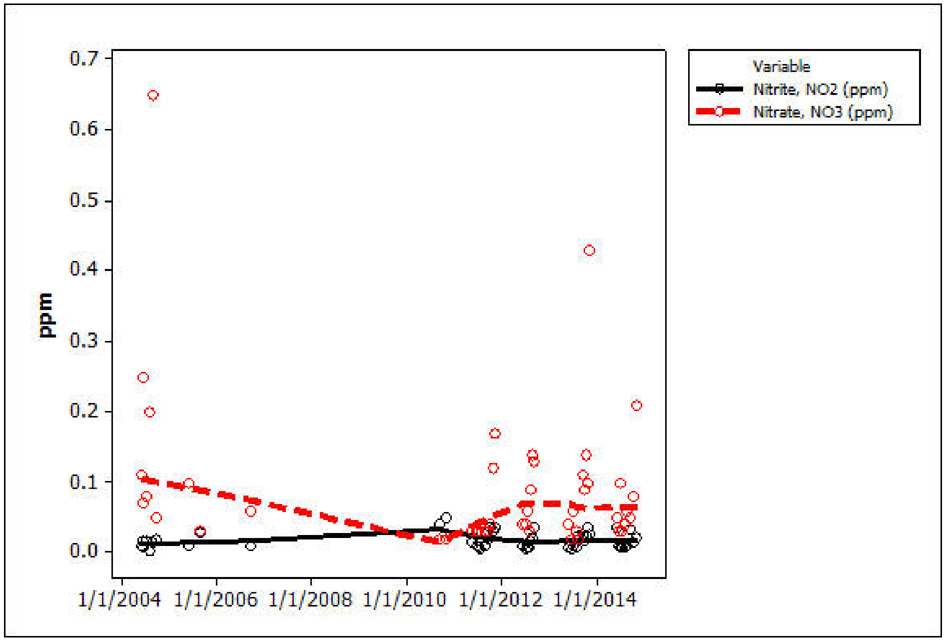
*Data with LOWESS (smoothing) line*



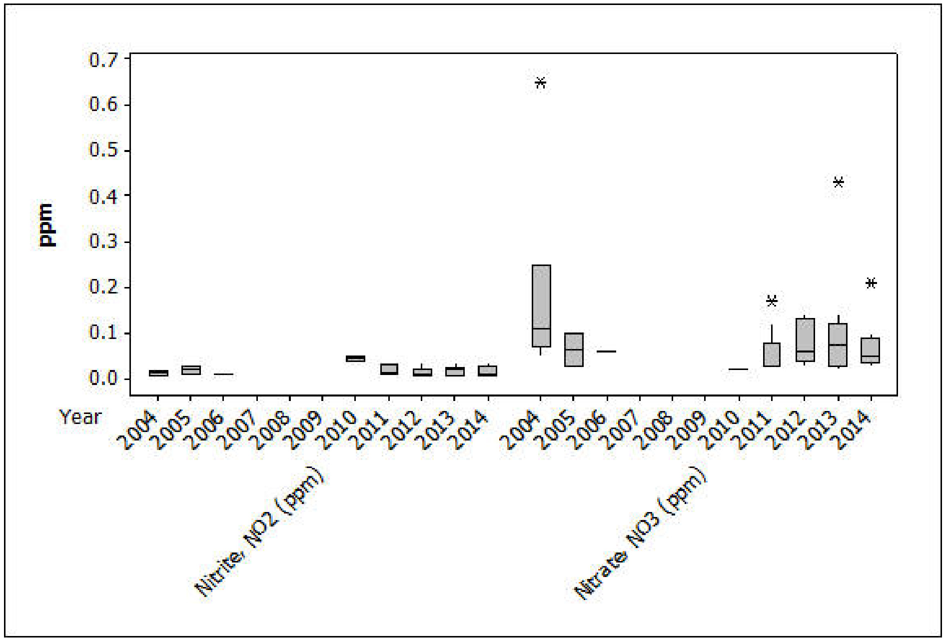
*Boxplot*

# *2014 Nitrogen Graphs*

## CSHH #5 - Mott's Cove



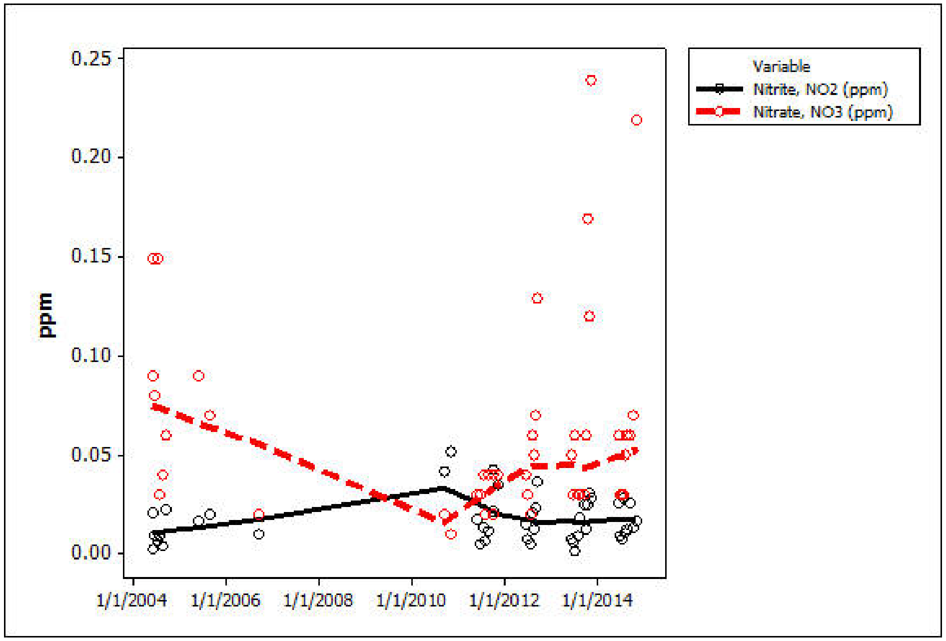
*Data with LOWESS (smoothing) line*



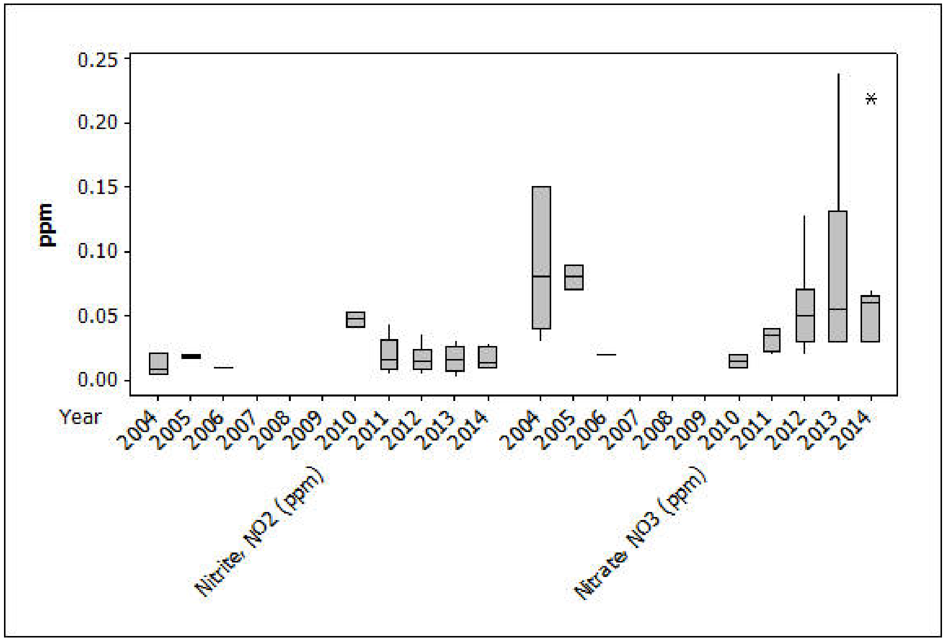
*Boxplot*

# 2014 Nitrogen Graphs

## CSHH #6 - East of Former Incinerator Site



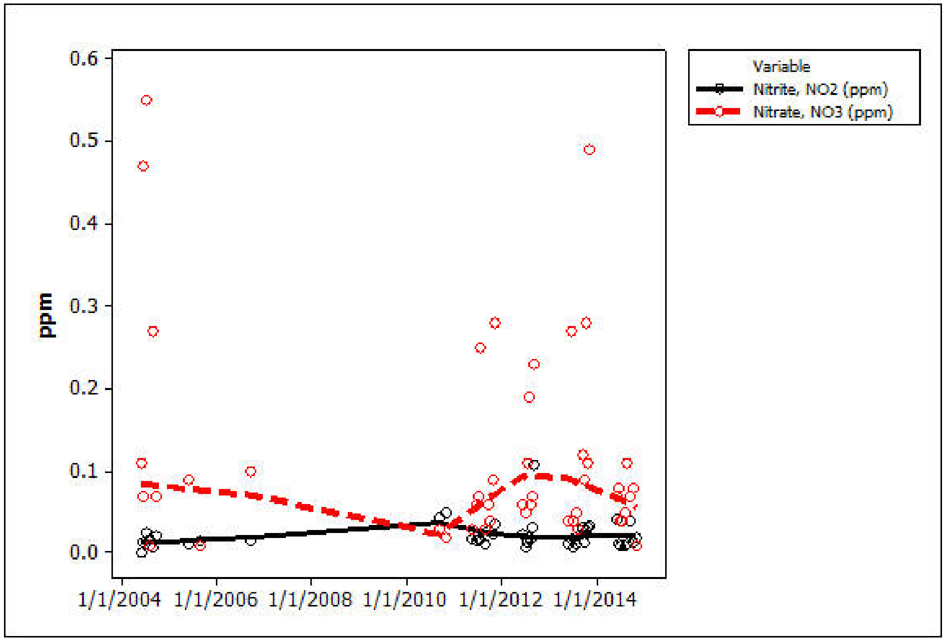
*Data with LOWESS (smoothing) line*



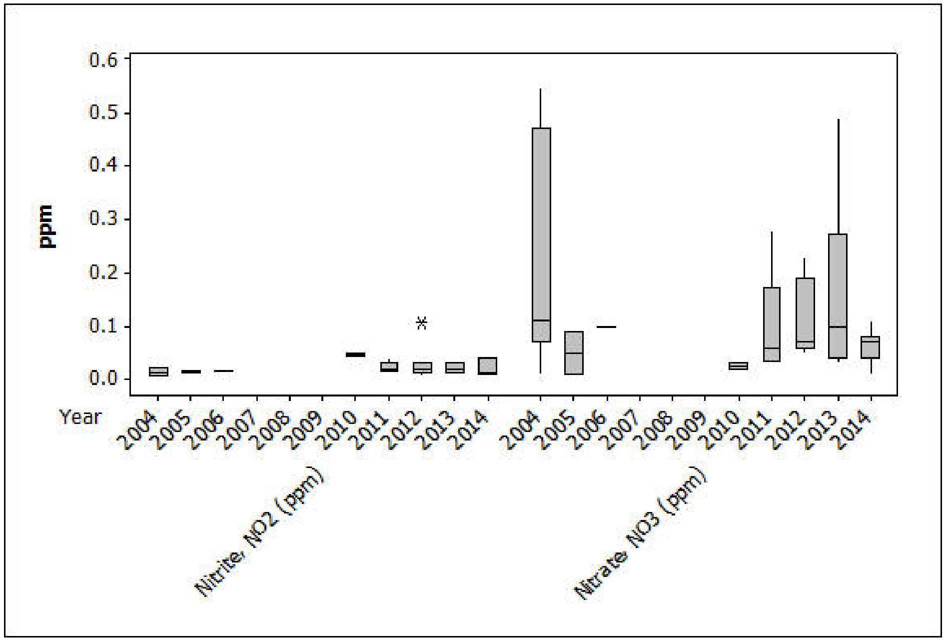
*Boxplot*

# *2014 Nitrogen Graphs*

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



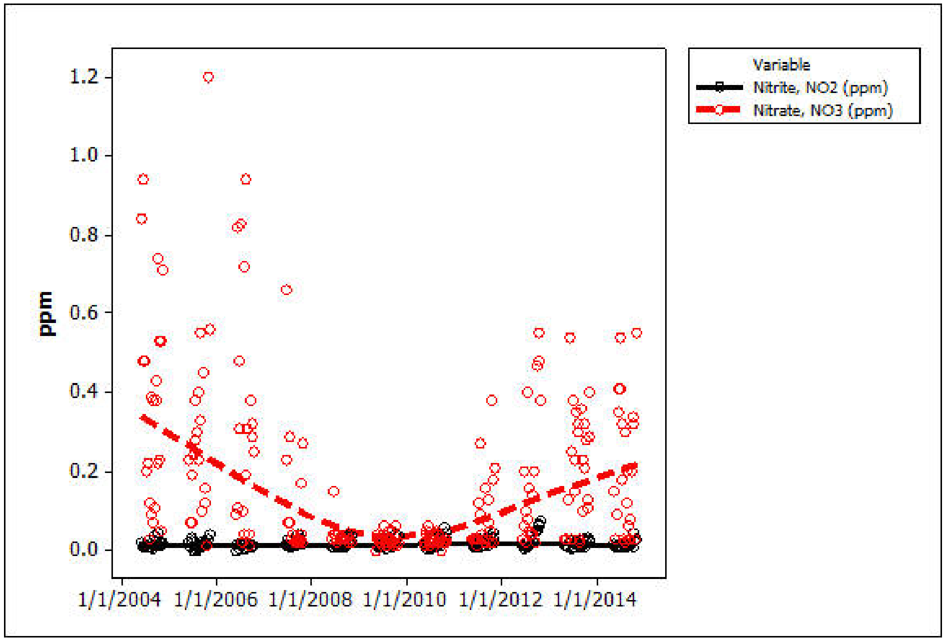
*Data with LOWESS (smoothing) line*



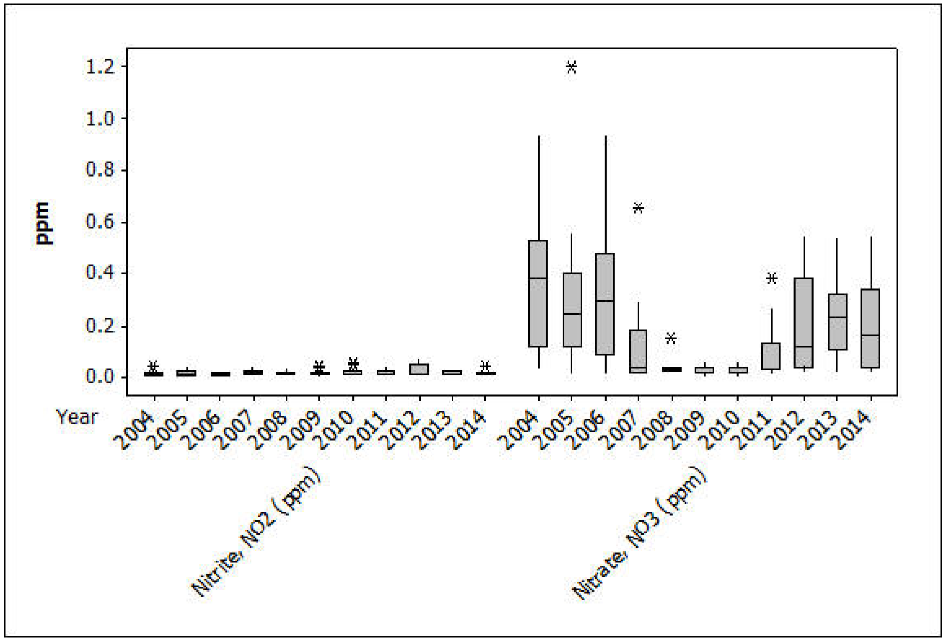
*Boxplot*

# *2014 Nitrogen Graphs*

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



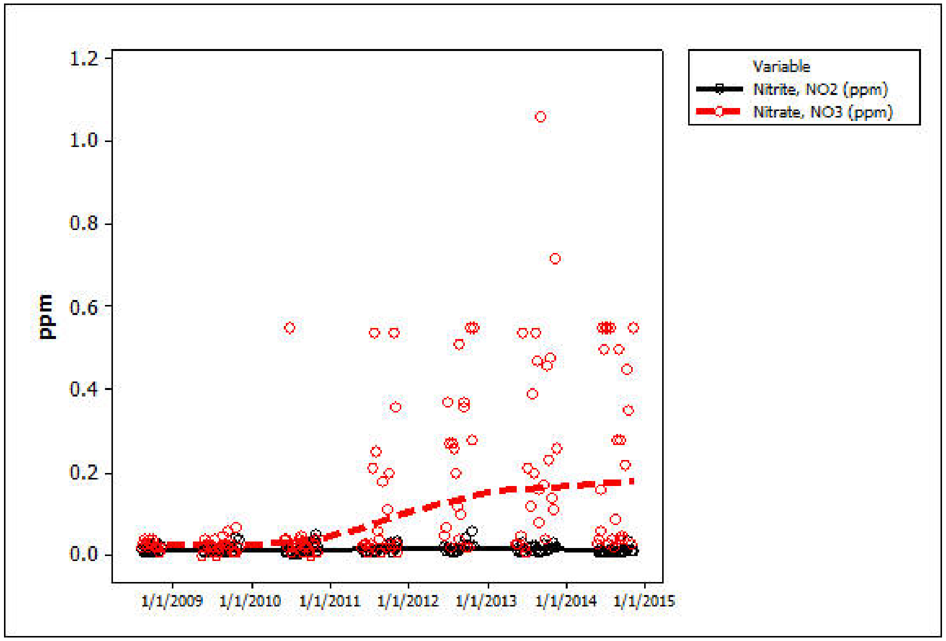
*Data with LOWESS (smoothing) line*



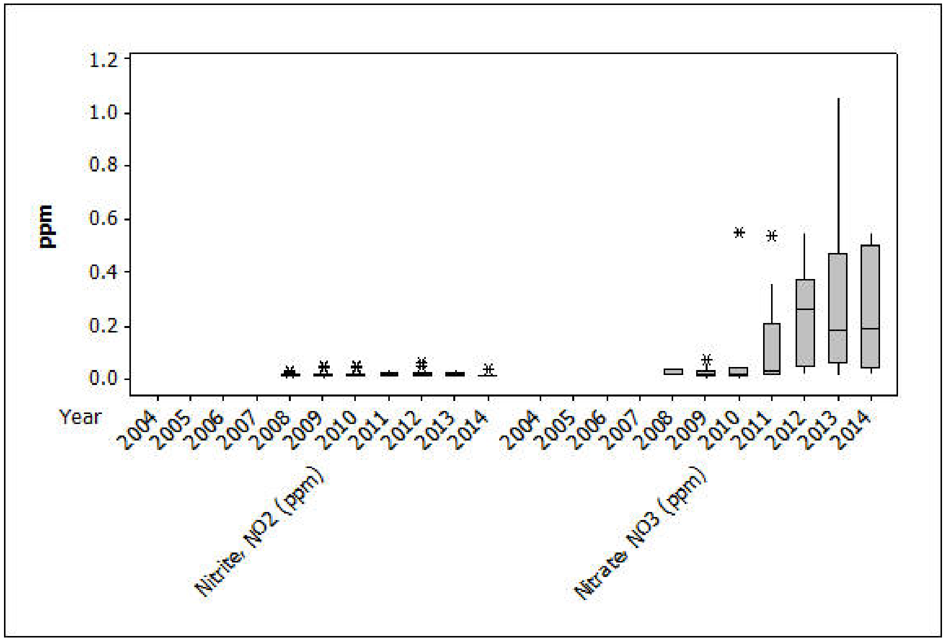
*Boxplot*

# *2014 Nitrogen Graphs*

## CSHH #13 - 60' West of Mill Pond Weir



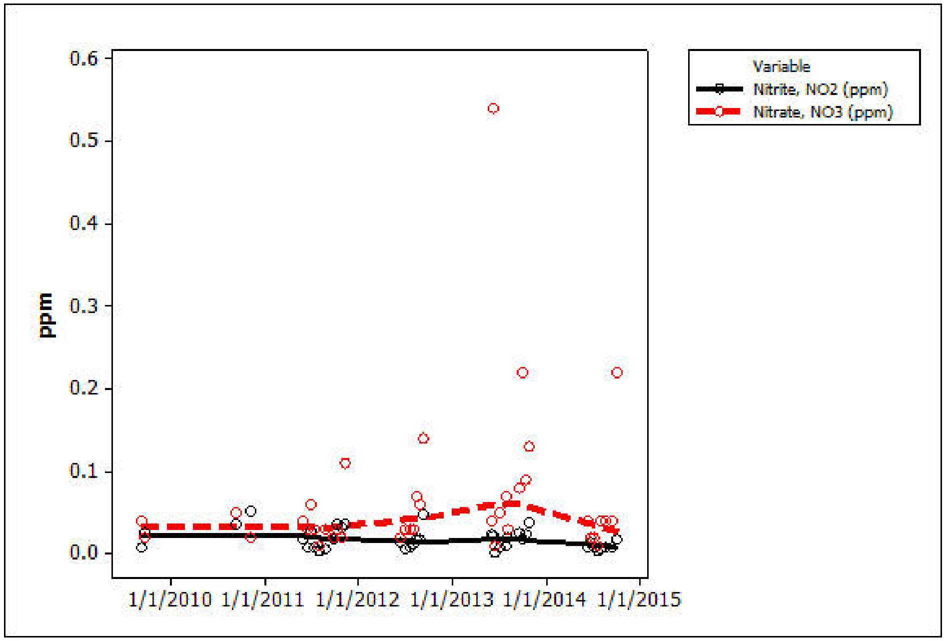
*Data with LOWESS (smoothing) line*



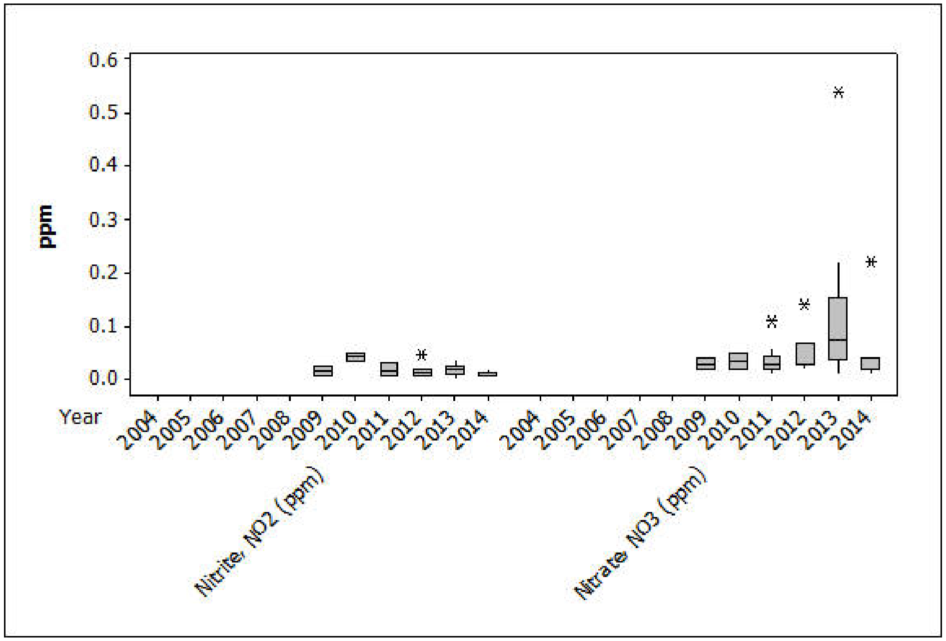
*Boxplot*

# 2014 Nitrogen Graphs

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



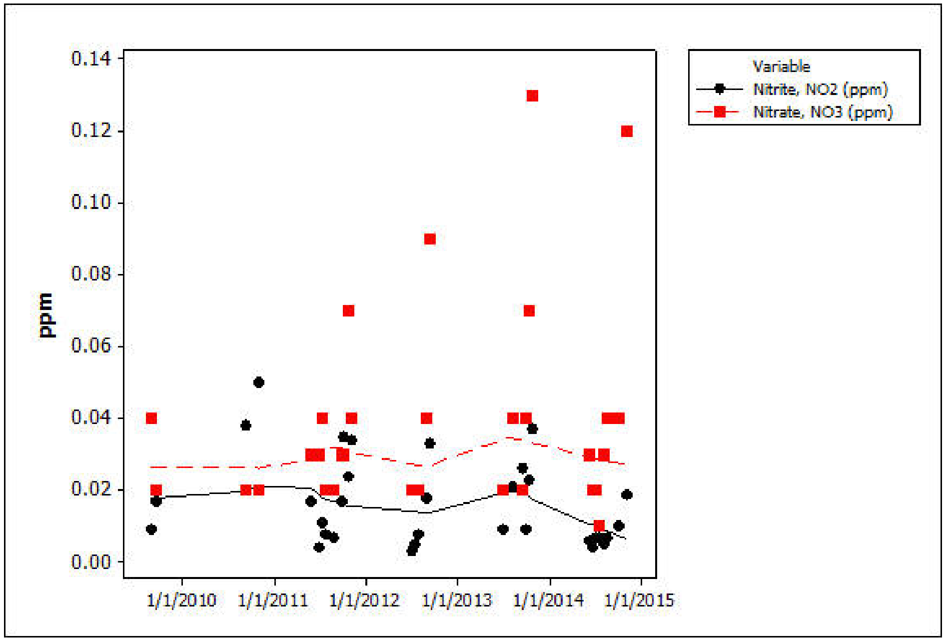
*Data with LOWESS (smoothing) line*



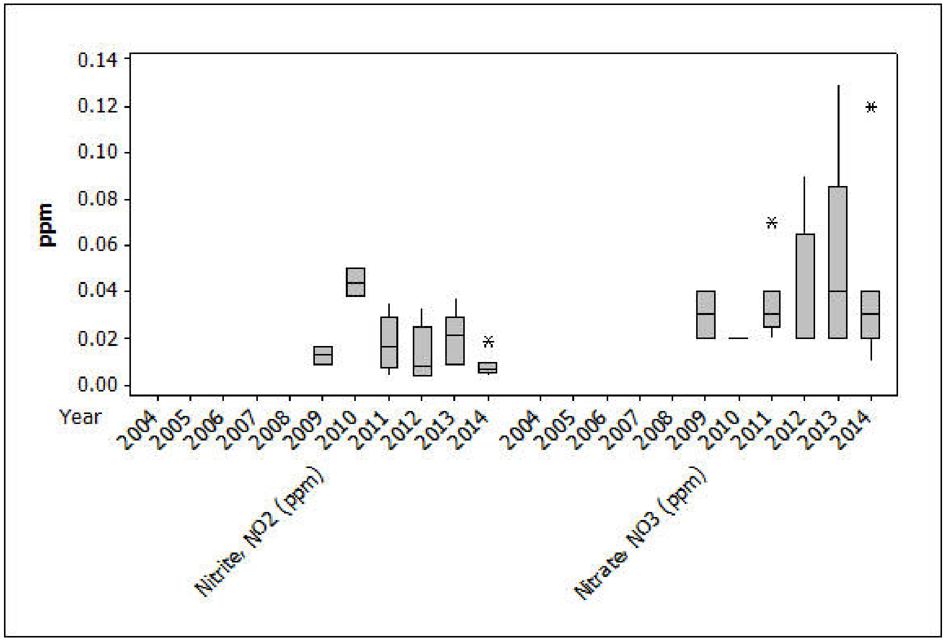
*Boxplot*

# *2014 Nitrogen Graphs*

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



*Data with LOWESS (smoothing) line*



*Boxplot*

# Appendix D

## Comparison of Averaged Indicator Bacteria Data for Beaches
## 1995-2014 Water-Quality Data Summary
## Seasonal Averages for Selected Water-Quality Parameters

# Comparison of Averaged Indicator Bacteria Data for Beaches

## 2014

| | 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 | 20.83 | 16.05 | 7.20 | 8.85 | 7.55 |
| **May** | Enterococci | 223.16 | 39.91 | 34.31 | 37.41 | 10.33 |
| **June** | Enterococci | 103.79 | 221.71 | 91.92 | 74.00 | 395.65 |
| **July** | Enterococci | 8.02 | 13.68 | 17.22 | 24.44 | 31.44 |
| **August** | Enterococci | 139.26 | 83.51 | 74.58 | 96.75 | 125.79 |
| ***Season Averages **** | *Enterococci* | *97.63* | *84.60* | *50.49* | *50.89* | *140.11* |

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

## 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.

# Comparison of Averaged Indicator Bacteria Data for Beaches

## 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.

## 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.

# Comparison of Averaged Indicator Bacteria Data for Beaches

## 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.

## 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.

# Comparison of Averaged Indicator Bacteria Data for Beaches

## 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.

## 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*** |

# Comparison of Averaged Indicator Bacteria Data for Beaches

## 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*** |

## 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*** |

# Comparison of Averaged Indicator Bacteria Data for Beaches

## 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*** |

## 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*** |

# Comparison of Averaged Indicator Bacteria Data for Beaches

## 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*** |

## 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*** |

# 1995-2014 Water-Quality Data Summary

## CSHH #1 - Beacon 11

| | 2014 | | | | | 2013 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 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* | 16.08 | 7.92 | 24.14 | 17.00 | 2.61 | 14.79 | 7.71 | 25.82 | 21.17 | 3.43 |
| June | 18.59 | 4.52 | 24.28 | 22.00 | 3.31 | 19.49 | 7.93 | 25.07 | 21.10 | 3.12 |
| July | 20.62 | 3.92 | 25.39 | 23.22 | 4.53 | 22.84 | 4.73 | 25.33 | 25.18 | 1.72 |
| Aug. | 22.65 | 2.96 | 25.77 | 21.65 | 2.78 | 22.64 | 4.10 | 26.31 | 22.88 | 1.95 |
| Sept. | 21.81 | 4.46 | 26.07 | 18.38 | 4.08 | 20.75 | 7.42 | 26.60 | 15.90 | 3.19 |
| Oct. | 17.73 | 6.05 | 26.20 | 17.75 | 2.73 | 17.40 | 6.83 | 26.81 | 12.68 | 1.49 |
| Nov.* | 12.15 | 8.55 | 27.02 | 15.00 | 1.88 | 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

# 1995-2014 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

# 1995-2014 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

# 1995-2014 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

# 1995-2014 Water-Quality Data Summary

## CSHH #2 - Bell Marker 6

| | 2014 | | | | | 2013 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 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* | 14.88 | 8.23 | 24.64 | 16.35 | 1.60 | 14.36 | 8.97 | 26.16 | 22.27 | 2.52 |
| June | 17.48 | 4.80 | 24.86 | 17.03 | 1.57 | 17.96 | 6.51 | 25.77 | 20.88 | 1.73 |
| July | 20.16 | 3.15 | 25.97 | 24.98 | 2.11 | 22.49 | 3.10 | 25.89 | 26.33 | 1.09 |
| Aug. | 22.53 | 3.73 | 26.58 | 23.48 | 1.83 | 22.51 | 4.18 | 26.87 | 26.45 | 1.33 |
| Sept. | 22.04 | 4.41 | 26.85 | 19.35 | 2.16 | 21.42 | 6.86 | 27.70 | 18.27 | 2.50 |
| Oct. | 18.00 | 6.59 | 26.97 | 18.88 | 1.55 | 17.17 | 7.63 | 27.29 | 15.30 | 0.97 |
| Nov.* | 13.10 | 8.65 | 27.75 | 17.60 | 1.99 | 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

# 1995-2014 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

# 1995-2014 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

# 1995-2014 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

# 1995-2014 Water-Quality Data Summary

## CSHH #3 - Glen Cove Creek

| | 2014 | | | | | 2013 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 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* | 15.88 | 9.35 | 24.17 | 16.45 | 2.01 | 15.04 | 8.06 | 26.04 | 21.87 | 2.52 |
| June | 18.83 | 6.29 | 24.36 | 22.55 | 2.53 | 19.69 | 9.74 | 25.28 | 19.45 | 1.69 |
| July | 21.04 | 4.65 | 25.64 | 25.10 | 3.05 | 23.37 | 6.93 | 25.65 | 27.18 | 1.32 |
| Aug. | 22.89 | 4.22 | 26.10 | 24.33 | 2.12 | 22.87 | 5.98 | 26.52 | 27.10 | 1.78 |
| Sept. | 22.14 | 4.73 | 26.42 | 20.40 | 2.65 | 21.25 | 6.62 | 27.42 | 18.07 | 2.68 |
| Oct. | 17.86 | 6.57 | 26.50 | 18.98 | 1.94 | 17.62 | 7.37 | 27.06 | 15.72 | 1.14 |
| Nov.* | 12.30 | 8.54 | 27.27 | 16.80 | 1.15 | 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

# 1995-2014 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

# 1995-2014 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

# 1995-2014 Water-Quality Data Summary

## CSHH #3 - Glen Cove Creek

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

* Average based on less than full month

# 1999-2014 Water-Quality Data Summary

## CSHH #8- Glen Cove Creek STP Outfall

| | 2014 | | | | | 2013 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 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* | 16.70 | 9.43 | 21.84 | 18.40 | 2.61 | 15.85 | 8.59 | 22.92 | 24.20 | 3.51 |
| June | 19.53 | 5.58 | 23.45 | 23.78 | 3.47 | 20.19 | 8.64 | 20.44 | 23.45 | 2.78 |
| July | 21.77 | 3.64 | 21.98 | 26.34 | 4.35 | 23.58 | 7.08 | 24.14 | 28.55 | 2.36 |
| Aug. | 23.13 | 5.17 | 23.73 | 24.50 | 3.19 | 23.28 | 5.52 | 25.81 | 25.78 | 1.91 |
| Sept. | 22.35 | 5.52 | 25.09 | 20.73 | 2.96 | 21.16 | 7.47 | 26.29 | 18.60 | 3.34 |
| Oct. | 17.83 | 6.07 | 24.18 | 19.05 | 3.25 | 17.91 | 6.85 | 26.27 | 16.24 | 1.05 |
| Nov.* | 12.70 | 8.54 | 24.02 | 17.80 | 1.23 | 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

# 1999-2014 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

# 1999-2014 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** |
|---|---|---|---|---|
| **2014** | 25.48 ppt | 26.22 ppt | 25.72 ppt | 23.48 ppt |
| **2013** | 26.01 | 26.59 | 26.34 | 24.45 |
| **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** |
|---|---|---|---|---|
| **2014** | 4.83 ppm | 4.96 ppm | 5.74 ppm | 5.62 ppm |
| **2013** | 6.42 | 6.28 | 7.49 | 7.29 |
| **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 |
|---|---|---|---|---|
| **2014** | 3.39ntu | 1.84 ntu | 2.36 ntu | 3.27 ntu |
| **2013** | 2.32 | 1.61 | 1.71 | 2.26 |
| **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 |
|---|---|---|---|---|
| **2014** | 19.60ºC | 19.41ºC | 19.84ºC | 20.26ºC |
| **2013** | 19.39 | 18.84 | 19.58 | 19.66 |
| **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** |
|---|---|---|---|---|
| **2014** | 20.18ºC | 20.57ºC | 21.68ºC | 22.44ºC |
| **2013** | 19.20 | 20.80 | 20.85 | 21.47 |
| **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 |