NJ Department of Environmental Protection
Water Monitoring and Standards

Reappraisal Report of Shellfish Growing Area NE1 (Raritan Bay – Sandy Hook Bay)

January 2013

State of New Jersey
Chris Christie, Governor
Kim Guadagno, Lt. Governor

NJ Department of Environmental Protection
Bob Martin, Commissioner

Reappraisal Report of Shellfish Growing Area NE1

(Raritan Bay – Sandy Hook Bay)

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Acknowledgements:
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Cover Photo –by Julie Nguyen

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EXECUTIVE SUMMARY

Shellfish growing area NE1 lies within the New York-New Jersey Harbor Estuary. This Estuary is one of the largest and most diversified communities on the east coast; home to millions of residents, ports, industries, and transportation complexes. The New York-New Jersey Harbor Estuary includes the waters of New York Harbor and the tidally influenced portions of all rivers and streams that empty into the Harbor. Raritan and Sandy Hook Bays form the southeastern portion of the New York -New Jersey Harbor between the southern shoreline of Staten Island, New York, and the northern shoreline of Monmouth County, New Jersey. This report focuses on the waters of the Raritan Bay and Sandy Hook Bay that lies within New Jersey jurisdiction.

The general outline of this growing area includes a portion of the Raritan River, Raritan Bay, and Arthur Kill that lies south of the New Jersey/New York boundary, Sandy Hook Bay, and a portion of the Shrewsbury River. The current shellfish classifications are *Special Restricted* and *Prohibited.* There is no direct market of shellfish harvested from this growing area, due to the high levels of bacteria that are found in these waters. Shellfish harvested from these waters must undergo depuration before they are marketable. Depuration is a process that purifies the shellfish by pumping UV treated bacteria-free water through clams in holding tanks for a minimum of 48 hours. Thus rendering a product that will be safe for consumption. Depuration is used in all of the hard clams harvested from the *Special Restricted* waters of this growing area.

Water Monitoring & Standards, Bureau of Marine Water Monitoring (WM&S/BMWM) monitor this area in accordance with the National Shellfish Sanitation Program (NSSP). Water sampling is based on the Adverse Pollution Condition (APC) sampling strategy due to the discharge of treated wastewater effluent to the Raritan Bay by the Middlesex County Utility Authority (MCUA). Between 2009 and 2011, 1,337 water samples were collected from 53 monitoring sites and analyzed for total coliform. Data were assessed against NSSP Special Restricted criteria and all monitoring stations were found to be in compliance. Seasonal and rainfall assessment suggested summer related activities and rainfall can highly influence the bacteria levels that are found in some areas of the bays. The water quality of this shellfish growing area is not only influenced by the runoffs that occurs within this area, but is also affected by the discharges that occur in New York.

Overall, the bacteriological data do show water quality improvement in Sandy Hook Bay. Sandy Hook Bay is the only area that has the potential to be upgraded in the future if water quality continues to improve. The data do support the existing shellfish classification; therefore, no modification required.

GROWING AREA PROFILE

Location and Description

Shellfish growing area NE1 lies within the New York-New Jersey Harbor Estuary. This Estuary is one of the largest and most diversified communities on the east coast; home to millions of residents, ports, industries, and transportation complexes. The New York-New Jersey Harbor Estuary includes the waters of New York Harbor and the tidally influenced portions of all rivers and streams that empty into the Harbor.

Raritan-Sandy Hook Bay Complex

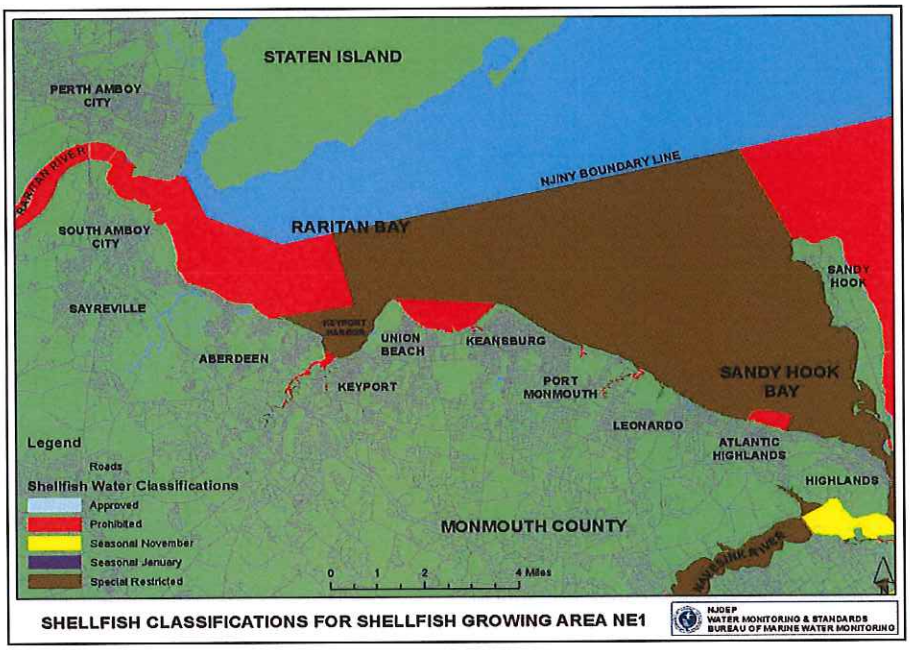
Raritan and Sandy Hook Bays form the southeastern portion of the New York - New Jersey Harbor between the southern shoreline of Staten Island, New York, and the northern shoreline of Monmouth County, New Jersey. This complex receives direct inflow from the Raritan River, the Shrewsbury and Navesink Rivers, and numerous smaller tributaries along the shorelines of Staten Island and New Jersey. The bays also receive indirect inflow from the Hudson through Lower New York Bay and the Passaic and Hackensack Rivers via Newark Bay and the Arthur Kill.

LOCATION OF SHELLFISH GROWING AREA NE1

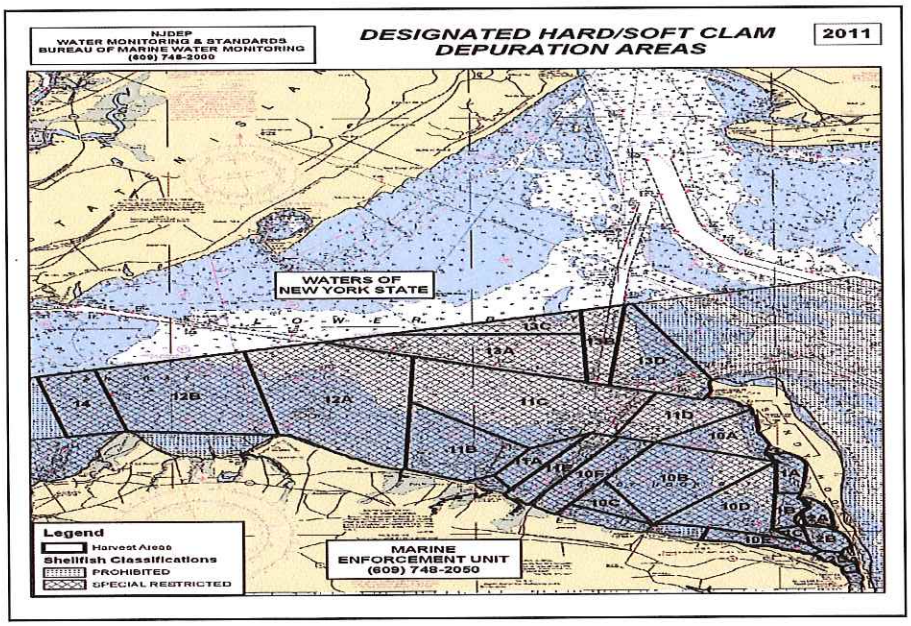
This report focuses on the waters of the Raritan Bay and Sandy Hook Bay that are within New Jersey jurisdiction. The approximate size of this shellfish growing area is thirty-three thousands acres. The general outline of this growing area includes a portion of the Raritan River, Raritan Bay, and Arthur Kill that lies south of the New Jersey/New York boundary, Sandy Hook Bay, and a portion of the Shrewsbury River.

Growing Area Classification Summary

The current shellfish classifications for this area are *Special Restricted and Prohibited. Special Restricted* accounts for approximately 81% of all the shellfish waters in this area. This included the 2010 upgrade of Keyport Harbor from *Prohibited* to *Special Restricted*. Areas that are classified as *Special Restricted* include Sandy Hook Bay (except for the buffer zone that surrounds the Atlantic Highlands Municipal Yacht Basin, which is classified as *Prohibited)*. The *Prohibited* areas can be found in the Raritan River, portions of Raritan Bay, Union and Belvedere Beaches, Atlantic Highlands Municipal Yacht Basin, and Keyport Harbor. The shellfish classifications for this growing area can also be found on the 2011 State of New Jersey Shellfish Growing Water Classification Charts # 1 and 2 or on WM&S/BMWM website at http://www.state.nj.us/dep/bmw/.



There is no direct market of shellfish harvested from this growing area due to the high levels of bacteria that are found in these waters. Shellfish harvested from these waters must undergo depuration before they are marketable. Depuration is a process that purifies the shellfish by pumping UV treated bacteria-free water through clams in holding tanks for a minimum of 48 hours. Thus rendering a product that will be safe for consumption. Clammers who wish to harvest shellfish from these waters must obtain a valid shellfish license and permit. Harvesters can only harvest in designated areas.

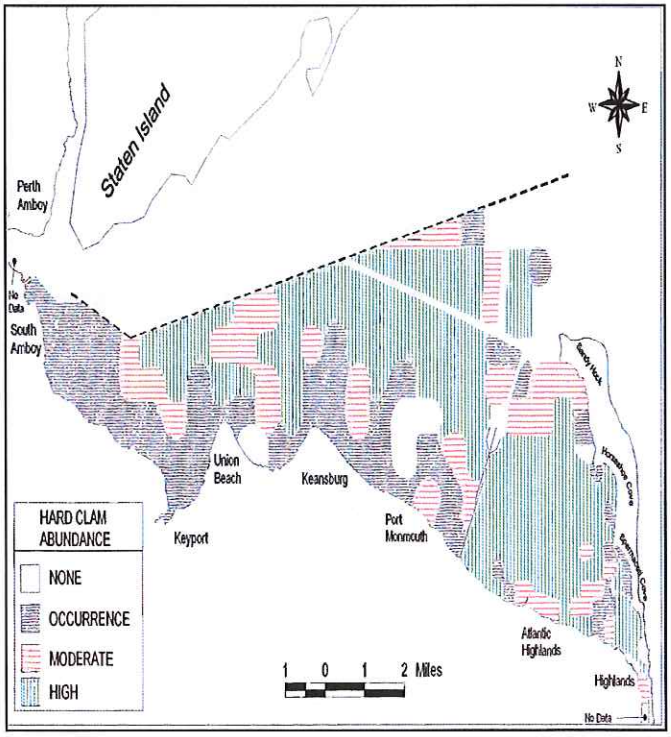


Evaluation of Biological Resources

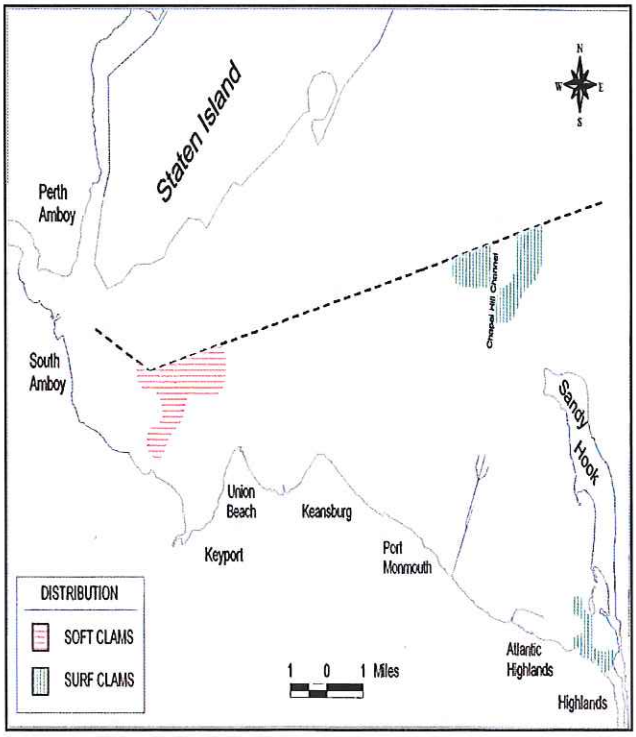
There are an abundance of biological resources that are beneficial to New Jerseys' economy. New Jersey is considered as one of the U.S. major ports for commercial fishery landings. The five major fishing ports in New Jersey are Belford, Point Pleasant, Barnegat Light, Atlantic City, and Cape May. Four of these ports are ranked among the top 50 ports in the nation based on harvest value. The surf clam (*Spisula solidissima*) fishery is one of New Jersey's most valuable fisheries. More than 80% of the total Mid-Atlantic and New England area catch of surf clams are landed in New Jersey (NJDEP, Bureau of Shellfisheries). The 2007 commercial fisheries statistics show over 10.9 million pounds of clams and bivalves harvested, with a dockside value of over 5.8 million dollars (NOAA-NMFS).

In 2000, NJDEP Bureau of Shellfisheries conducted a hard clam (*Mercenaria mercenaria*) stock assessment of the Raritan and Sandy Hook bays, an area which provides over 50% of the state's commercial hard clam landing through the depuration program. They found high density of hard clams in the Raritan and Sandy Hook bays, estimated at 601.7 million and 342.7 million, respectively. Compared to the 1983 study, hard clam resource in the Raritan and Sandy Hook bays have increased by 37% and 50%, respectively. The study also indicated the presence of soft clams (*Mya arenaria*), blue mussels (*Mytilus edulis*), eastern oysters (*Crassostrea virginica*), and Atlantic surf clams (*Spisula solidissima*). The shellfish density maps for hard, soft, and surf clams are shown below. These maps were generated base on the 2000 stock assessment of the bays.

2000 Shellfish Inventory of Hard Clams in the Raritan and Sandy Hook Bay



2000 Shellfish Inventory of Surf and Soft Clams in the Raritan and Sandy Hook Bay



Shoreline Survey: Evaluation of Potential Pollution Sources

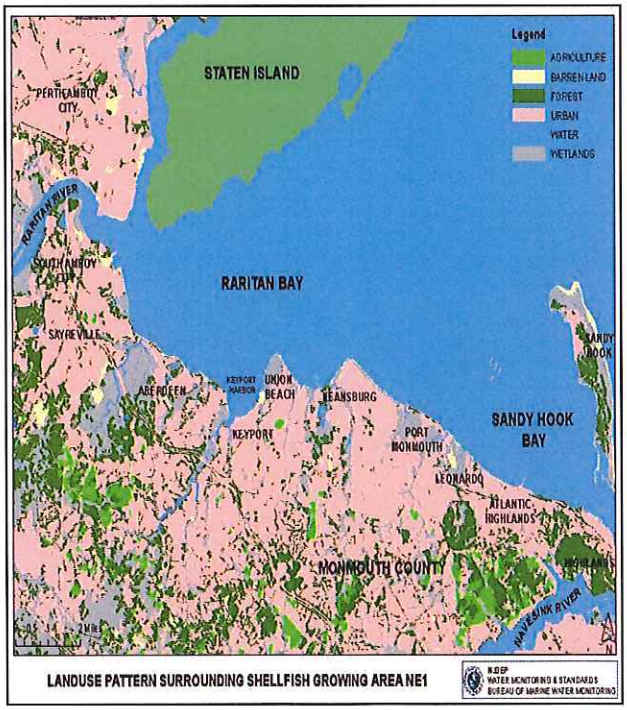
Shoreline surveys or site-specific tours of areas nearby or abutting shellfish growing waters can provide insight as to the location and nature of land use, surface water discharges, marinas, unpermitted discharges, and stormwater inputs. Shoreline survey of NE1was conducted in 2011. The following sections detail information derived collectively from those surveys, and those that preceded them.

Land Use

Shellfish growing area NE1 is adjacent to the following Watershed Management Areas (WMA), WMA 07-Arthur Kill, WMA 09-Lower Raritan, and WMA 12-Monmouth. These are heavily populated areas, with numerous industries and transportation complexes. Urban development makes up the majority of landuse in this area. As population grows and more urban lands are needed, forest, wetland, and agriculture landscape are being redeveloped into urban areas. This is especially true in WMA 9 and WMA 12 where the net change in urban land from 1995 to 2007 had increased approximately 13% and 14%, respectively.

As more forest, wetland, and agriculture are being redeveloped to urban areas, it puts stress on the surrounding ecosystem. The process of urbanization impacts the ecosystems through the conversion of natural land covers to impervious surfaces. The displacement of cropland, grassland, and forested areas by paved surfaces and buildings greatly intensifies stormwater runoff, diminishes groundwater recharge, and promotes urban heat formation. These factors were identified by the Environmental Protection Agency as being the most significant threat to water resources. The toxic and pathogenic pollutants transported from impervious surfaces to watersheds in the form of non-point source pollution have been shown to substantially degrade streams, rivers, and lakes (EPA).

Land Use Type	1995 (Acres)	2007 (Acres)	% Net Change (Acres)
WMA 12 (MONMOUTH)			
Agriculture	16,776	11,665	-30%
Barren Land	4,045	3,167	-22%
Forest	36,399	31,169	-14%
Urban Land	99,237	112,862	14%
Water	97,554	97,865	0%
Wetlands	43,593	40,876	-6%
WMA 9 (LOWER RARITAN)			
Agriculture	15,644	10,471	-33%
Barren Land	4,707	3,722	-21%
Forest	40,575	34,693	-14%
Urban Land	114,638	129,911	13%
Water	5,683	5,987	5%
Wetlands	43,794	40,257	-8%
WMA 7 (ARTHUR KILL)			
Agriculture	123	103	-16%
Barren Land	694	1,064	53%
Forest	10,367	7,683	-26%
Urban Land	88,108	83,807	-5%
Water	10,679	4,180	-61%
Wetlands	4,939	4,410	-11%

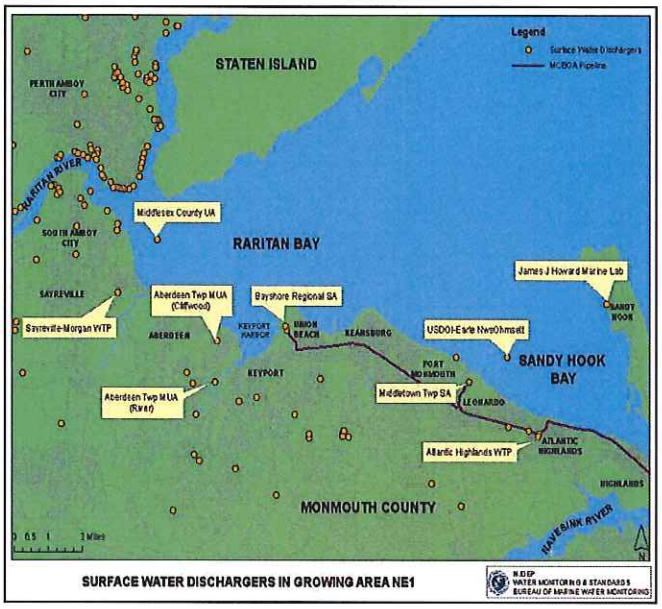


LANDUSE PATTERN SURROUNDING SHELLFISH GROWING AREA NE1

Surface Water Dischargers

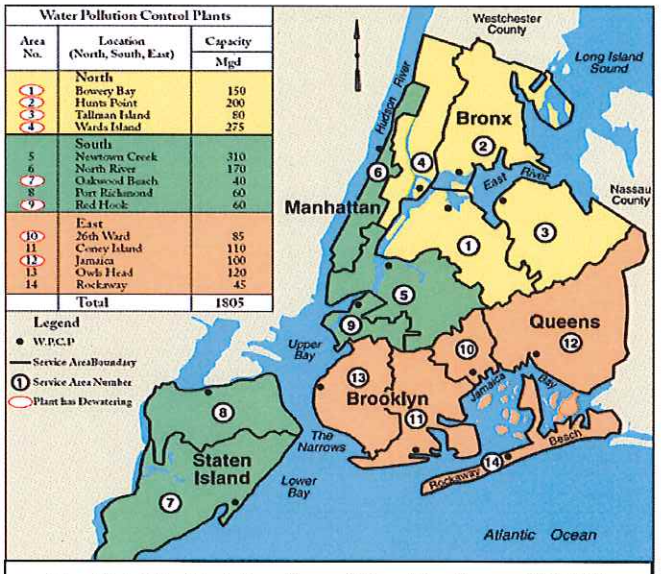
A surface water discharge involves the release of treated effluent from various municipal and industrial facilities directly into a river, stream, or the ocean. The discharge of pollutants from a point source is authorized under New Jersey Pollutant Elimination System (NJPDES), and the regulations are found at N.J.A.C. 7:14A. The main purpose of the NJPDES program is to ensure proper treatment and discharges of wastewater. By doing so, the permit limits the amount or concentration of pollutants that can be discharged into ground water, streams, rivers, and the ocean.

Major focuses are on the wastewater treatment facilities that are permitted to discharge directly into shellfish waters because they have the greatest potential to impair water quality. The Middlesex County Utilities Authority (MCUA) is the only facility in this shellfish growing area that has a permit to discharge treated wastewater effluent into the bay. The other wastewater treatment facilities are connected to the Monmouth County Bayshore Outfall Authority (MCBOA). The MCBOA operates a 14-mile pipeline from Union Beach to Sandy Hook. The pipeline is used to transport treated wastewater effluent from three local wastewater facilities (Bayshore Regional Sewerage Authority, Middletown Sewage Authority, and Atlantic Highlands Wastewater Treatment Plant) and releasing them into the Atlantic Ocean, approximately one mile east of Highlands Beach.



SURFACE WATER DISCHARGERS IN GROWING AREA NE1

Water Pollution Control Plants		
Area No.	Location (North, South, East)	Capacity Mgd
	North	
1	Bowery Bay	150
2	Hunts Point	200
3	Tallman Island	80
4	Wards Island	275
	South	
5	Newtown Creek	310
6	North River	170
7	Oakwood Beach	40
8	Port Richmond	60
9	Red Hook	60
	East	
10	26th Ward	85
11	Coney Island	110
12	Jamaica	100
13	Owls Head	120
14	Rockaway	45
	Total	1805

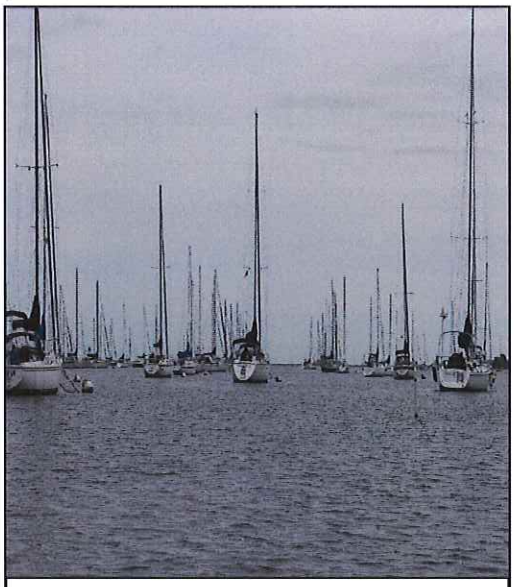


New York City Plants Location and Capacities (Source: NYDEC)

The water quality of this shellfish growing area is influenced not just by the contaminants generated in New Jersey, but can also be impaired by the discharges that occur in New York City. According to the Interstate Environmental Commission (IEC) annual reports, over 200 bypass events occur annually in New York. The common causes of a Bypass event are power outage, blockage, equipment failure, broken pipe, system overflows, and wet weather. Majority of the Bypasses are wet weather related. When there is rain, the flows to wastewater treatment plants increase. If the flow is greater than the plant's design flow, part of the flow bypasses all or certain treatment steps, resulting in the discharges of raw or partially treated sewage. (IEC)

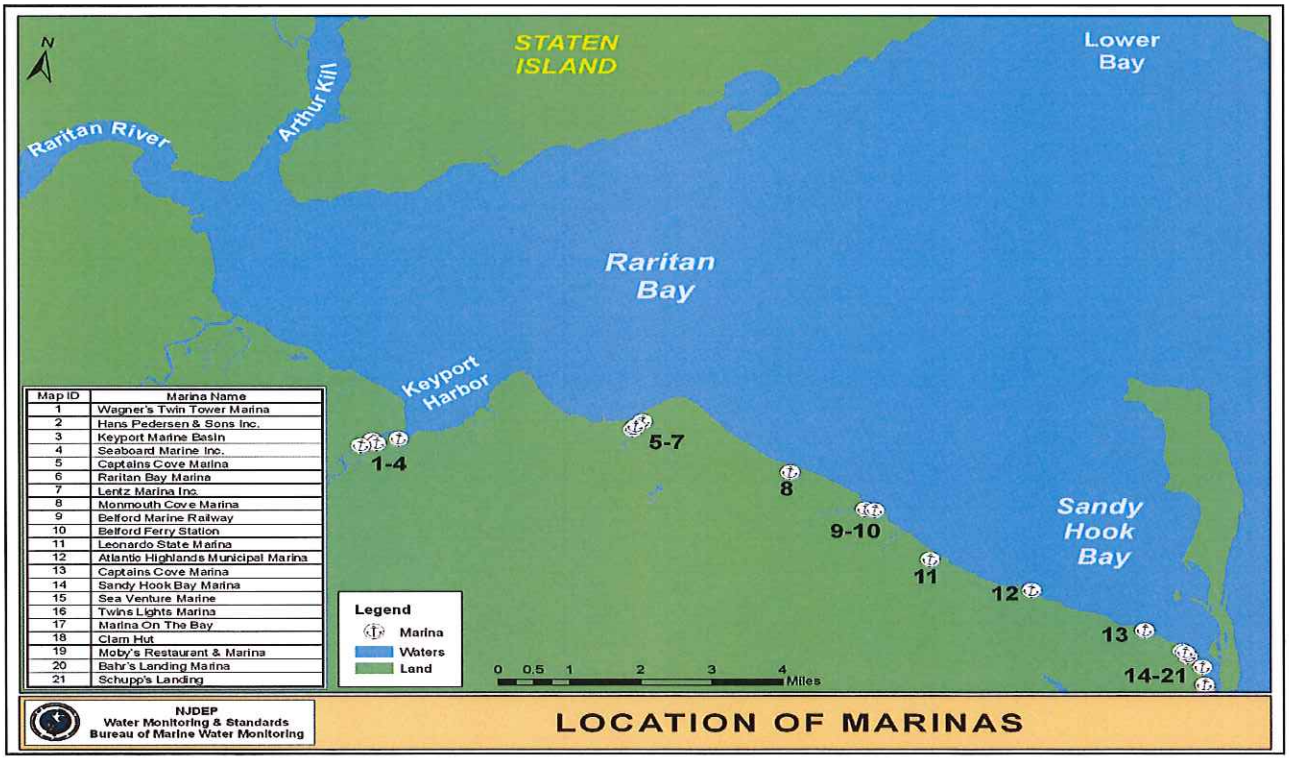
Marinas

The discharge of sewage from vessels into the waterways can contribute to the degradation of the marine environment by introducing disease-causing microorganisms (pathogens), such as bacteria, protozoan, and viruses, into the marine environment. Chemical compounds, such as oil and gasoline resulting from spills, leaks, and pressure washing from vessels can poison fish and other marine organisms. Research has shown that by-products from the biological breakdown of petroleum products can harm fish and wildlife, and pose threats to human health if ingested. (NOAA) For this reason, waters within the marina basin are restricted to shellfish harvesting.



Sail Boats in Keyport Harbor (Picture By: Julie Nguyen)

The waters enclosed by the marina, (the marina basin) are classified as *Prohibited*. Depending on the size of the marina, the water quality, flushing rates and water depth, shellfish waters immediately adjacent to each marina, known as the buffer zone, may be classified as *Prohibited*, *Special Restricted* or *Seasonally Approved* (no harvest during summer months when the marina is normally active). Marina buffers are calculated using the NJ Marina Buffer Equation. For additional information on the marina buffer equation, see the Shellfish Growing Area Report Guidance Document 2011.



Map ID	Marina Name
1	Wagner's Twin Tower Marina
2	Hans Pedersen & Sons Inc.
3	Keyport Marine Basin
4	Seaboard Marine Inc.
5	Captains Cove Marina
6	Raritan Bay Marina
7	Lentz Marina Inc.
8	Monmouth Cove Marina
9	Belford Marine Railway
10	Belford Ferry Station
11	Leonardo State Marina
12	Atlantic Highlands Municipal Marina
13	Captains Cove Marina
14	Sandy Hook Bay Marina
15	Sea Venture Marine
16	Twins Lights Marina
17	Marina On The Bay
18	Clam Hut
19	Moby's Restaurant & Marina
20	Bahr's Landing Marina
21	Schupp's Landing

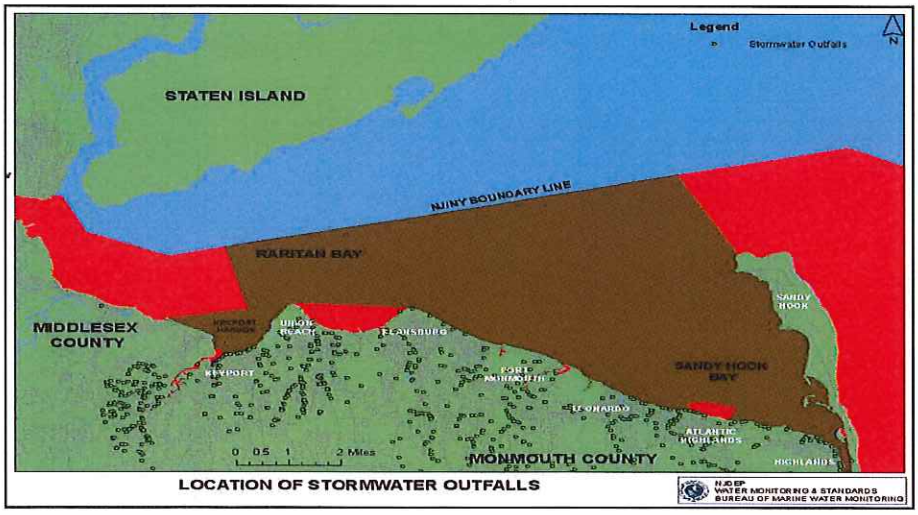
Spills, Unpermitted Discharges, and closure

Indirect discharges are groundwater discharge, malfunctioning septic systems, known contaminated sites, spills, dredging projects, and impacts from wildlife areas. Under normal circumstances, these indirect discharges do not routinely affect water quality. However, on occasion they do result in the closure of shellfish waters due to accidental discharge that result in higher than normal bacteria counts. During this reporting period, there were many reports of unpermitted discharges including manhole's that overflowed as a result of heavy rain, oil/chemical spills, and floatable. Most of the spills were terminated within a few hours and the discharges usually flow into nearby creek and/or lagoons. By the time the pollutants reaches shellfish water, the bacteria levels had diminished. Only one closure was issued during this report period. A closure was issued for the entire state due to Hurricane Irene in 2011. Shellfish waters in the Raritan and Sandy Hook bays were closed from August 26th, 2011 to September 9th, 2011.

Storm Water Discharges

Non-point source pressures on shellfish beds in New Jersey originate in materials that enter the water via stormwater. Stormwater runoffs are generated when precipitation from rain and snowmelt flows over land or impervious surfaces and does not percolate into the ground. As the runoff flows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality if the runoff is discharged untreated. The typical pollutants that are associated with stormwater run-off are bacteria, heavy metals, pesticides, herbicides, chlorides, petroleum, and nutrients (NJStormwater.Org).

Stormwater outfalls in this area usually discharges to nearby creeks, but there are some that discharges directly to shellfish waters. The highest emphases are placed on the stormwater outfalls that discharge directly to shellfish waters. The figure below shows the location of stormwater outfalls located within this shellfish growing area.



LOCATION OF STORMWATER OUTFALLS

NJDEP WATER MONITORING & STANDARDS BUREAU OF MARINE WATER MONITORING

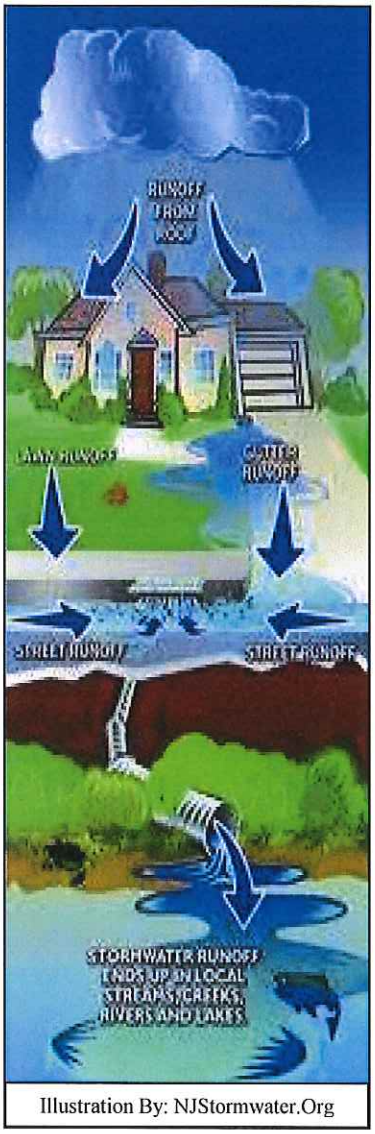


Illustration By: NJStormwater.Org

WATER QUALITIES STUDIES

Sampling Strategy

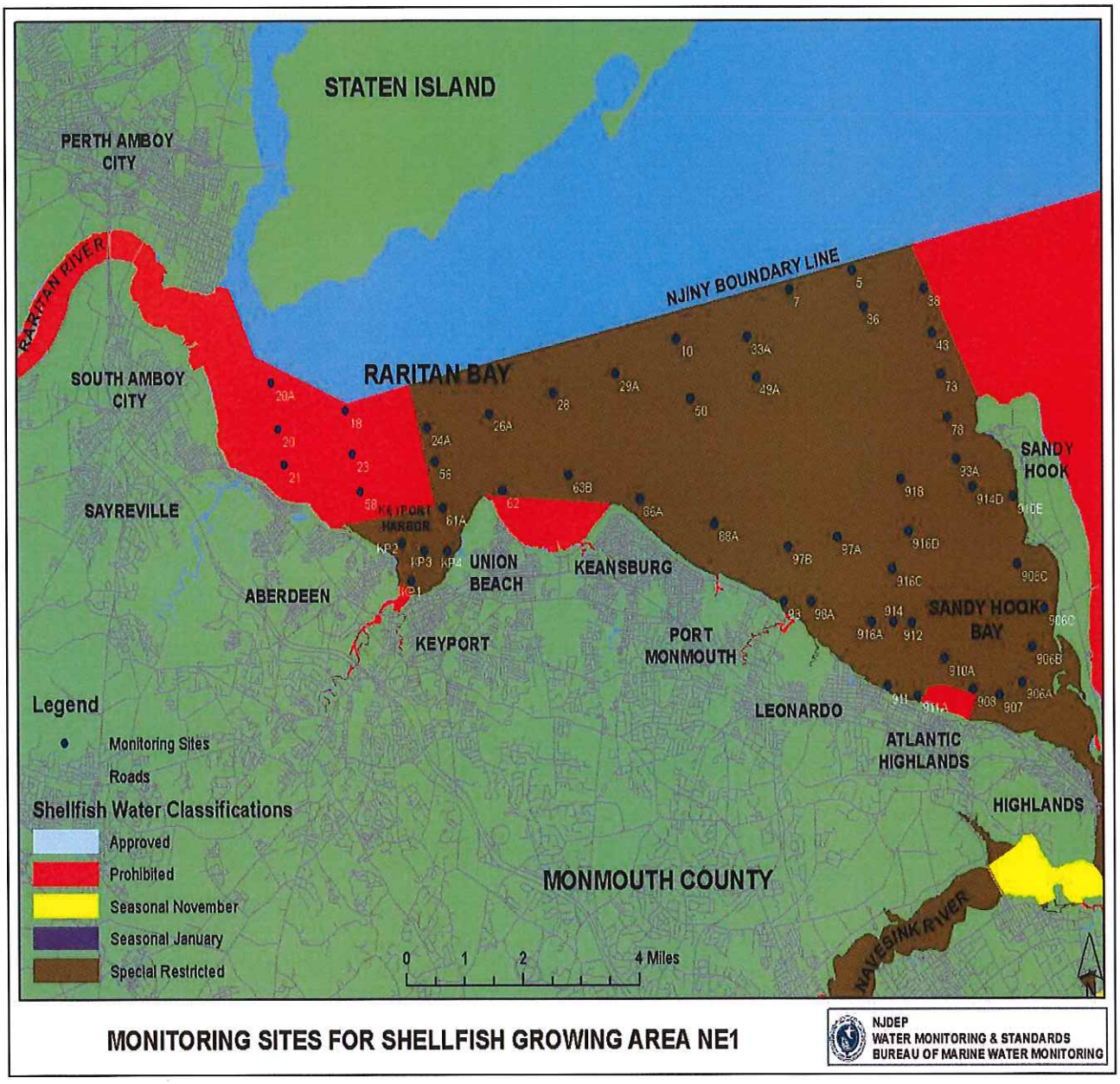
The State Shellfish Control Authority has the option of choosing one of two water monitoring sampling strategies for each growing area. For additional information on the types of sampling strategies, see the *Shellfish Growing Area Report Guidance Document, 2011.* This shellfish growing area uses the Adverse Pollution Condition Sampling Strategy (APC) because of the treated wastewater effluent discharges to the Raritan Bay.

Each shellfish producing state is directed to adopt either the total coliform or fecal coliform criterion to classify its waters. The criteria were developed to ensure that shellfish harvested from designated waters would be free of pathogenic (disease-producing) bacteria. Combinations of these criteria may also be used. With the exception of ocean water analysis where fecal coliform criterion is used, New Jersey has determined its remaining shellfish growing water classifications with total coliform analysis.

Each classification criterion is composed of a measure of the statistical 'central tendency' (geometric mean) and the relative variability of the data set. For the Adverse Pollution Condition sampling strategy, variability is expressed as the percentage that exceeds the variability criteria. An area to be approved under the *Seasonal* classification must be sampled and meet the criterion during the time of year that it is approved for the harvest of shellfish. The table on the following page shows the statistical criteria for the APC sampling strategy.

Statistical Criteria for Adverse Pollution Condition Sampling Strategy (APC)				
Classification	Total Coliform Criteria		Fecal Coliform Criteria	
	Geometric Mean (MPN/100 mL)	No More Than 10% Of The Samples Can Exceed (MPN/100 mL)	Geometric Mean (MPN/100 mL)	Maximum 90th Percentile (MPN/100 mL)
Approved	70	330	14	49
Special Restricted	700	3300	88	300

Water sampling was performed in accordance with the Field Procedures Manual (NJDEP, 2005). From 2009 through 2011, approximately 1,337 water samples were collected for total coliform bacteria from 53 monitoring stations. The locations of these stations are shown in the map below. These samples were analyzed by the standard three-tube MPN method (APHA, 1970). Water quality sampling, shoreline and watershed surveys were conducted in accordance with the NSSP *Guide for the Control of Molluscan Shellfish,* Revision 2009. Data management and analysis was accomplished using database applications developed for the Bureau. Mapping of pollution data was performed with the Geographic Information System (GIS: ARCMap).

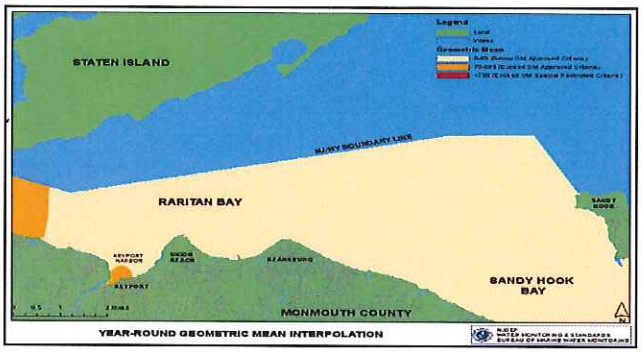


BACTERIOLOGICAL QUALITY

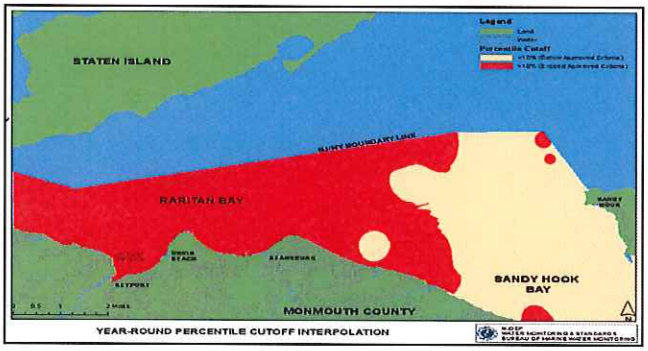
Compliance with NSSP APC Criteria

Since there are no *Approved* waters in this growing area, total coliform results were compared against NSSP Special Restricted criteria. Based on the dataset analyzed in this report, all stations were in compliance with NSSP Special Restricted criteria. All stations met both the geometric mean and the ten percentile cutoff criteria. Therefore, all monitoring stations in this shellfish growing area met their respective shellfish classifications.

Although there are no *Approved* waters, WM&S/BMWM do evaluate these data against NSSP Approved criteria to determine if an upgrade is possible. When assessing these data against the Approved criteria, fifty-five percent of the monitoring stations exceeded the criteria. As shown in the figures below, the shellfish waters of Raritan Bay, Keyport Harbor, and a small portion of Sandy Hook Bay currently do not meet the ten percentile cutoff criteria, but would have been in compliance if it was only based on geometric means. In general, the water quality in Sandy Hook Bay to some extent is better than the water quality in the Raritan Bay and Keyport Harbor. Therefore, Sandy Hook Bay has the greatest potential to be upgraded if the water quality trend continues to improve.



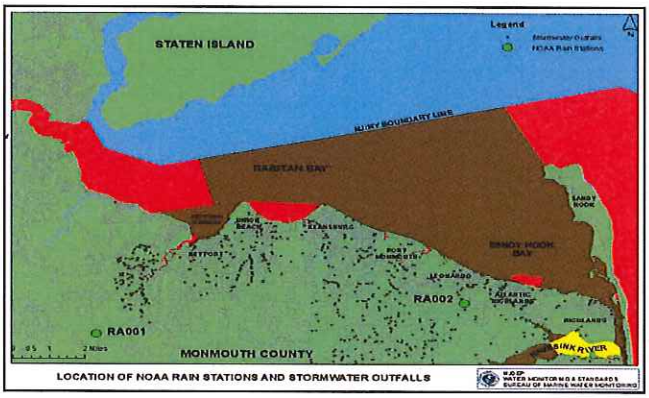
YEAR-ROUND GEOMETRIC MEAN INTERPOLATION



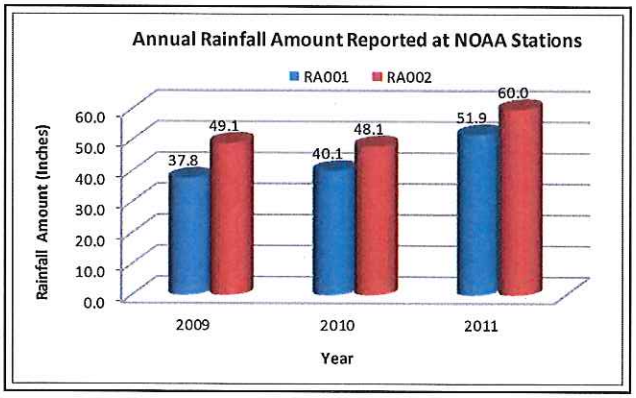
YEAR-ROUND PERCENTILE CUTOFF INTERPOLATION

Rainfall Effect

Precipitation inputs to this area were provided by Middle Atlantic River Forecast Center (MARFC), an office in the National Weather Service (NWS). The MARFC provides 24 hour estimated precipitation based on a Multi-Sensor Precipitation Estimation (MPE) calculation using data collected from NWS' NEXRAD radar, together with rain gage observations and recordings. Precipitation assessment for this shellfish growing area was based on rainfall data collected at Station RA001 and RA002. The annual precipitations reported at Station RA001 and RA002 between 2009 through 2011 are shown in the chart below.



LOCATION OF NOAA RAIN STATIONS AND STORMWATER OUTFALLS

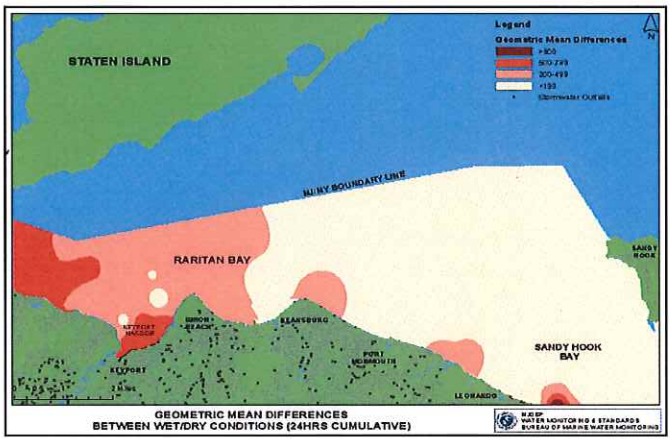


To determine whether rain can influence water quality, WM&S/BMWM uses the t-test method to assess rainfall effects. This method compares the total coliform MPN values from samples collected during dry weather to samples collected during wet weather and identify areas where runoffs can potentially affect water quality. The Wet/Dry Cutoff determines whether a sample was collected under wet or dry condition. For this growing area, the Wet/Dry Cutoff criterion was set at 0.2 inches, which is the typical standard used for assessing rainfall effects. The t-test calculated the statistical probability for each station based on 24, 48, and 72 hours of rainfall cumulative. Any stations with a t-statistical probability of less than 0.05 are believed to be impacted.

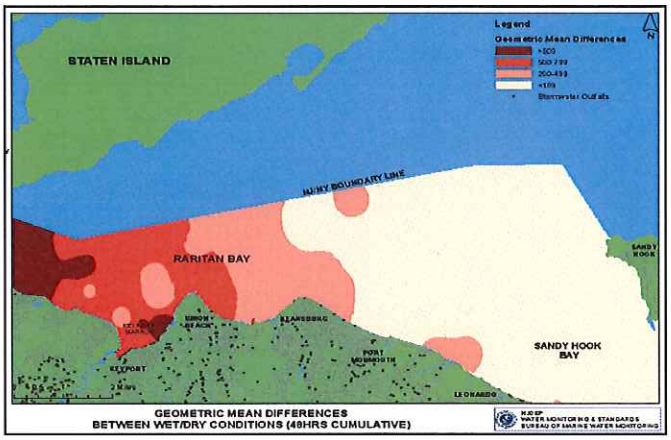
The 24 hours rainfall t-test had nine percent of the monitoring stations impacted by rainfall. All of the impacted stations were in Sandy Hook Bay. The 48 hours rainfall t-test shows eighty-seven percent of the monitoring stations impacted. This includes all monitoring stations in Sandy Hook Bay, Keyport Harbor, and approximately eighty-four percent of the Raritan Bay stations. The percentage of monitoring stations impacted by rain at 48 and 72 hours were alike.

Stations that are impacted by rain tend to have a higher geometric mean during wet condition. In some areas, there are substantial differences in the wet and dry geometric means. The figures show the geometric mean differences at 24, 48, and 72 hours cumulative. Areas highlighted in dark red are areas that have significant differences in geometric mean, indicating sensitivity to rain.

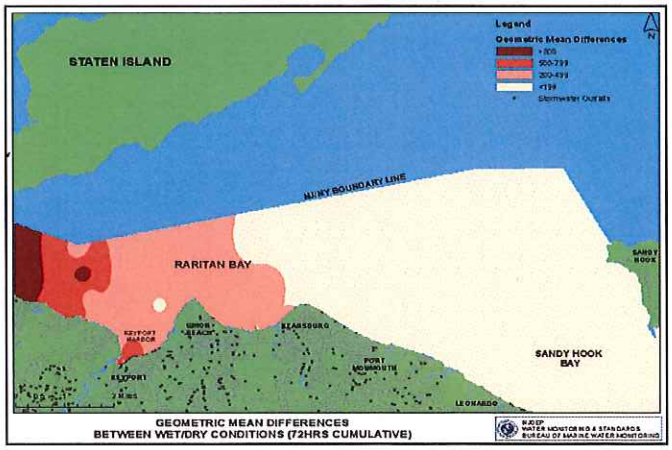
Based on these three t-tests, it was determined that rain would immediately impact Sandy Hook Bay with influences coming from Shrewsbury River and runoffs from nearby stormwater outfalls. Raritan Bay and Keyport Harbor were also impacted by rain, but had a delayed effect. It is believed that influences to Sandy Hook Bay and Keyport Harbor are from local contaminants, while Raritan Bay is highly influence by runoffs coming out of Raritan River, Arthur Kills, and Lower Bay.



GEOMETRIC MEAN DIFFERENCES
BETWEEN WET/DRY CONDITIONS (24HRS CUMULATIVE)



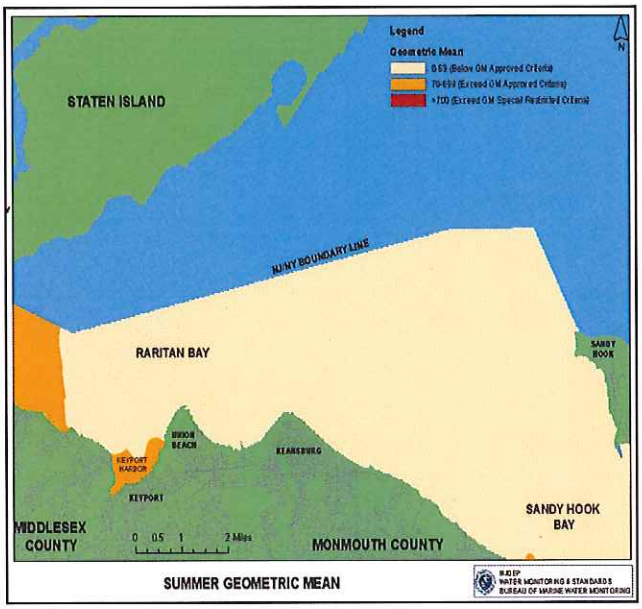
GEOMETRIC MEAN DIFFERENCES
BETWEEN WET/DRY CONDITIONS (48HRS CUMULATIVE)

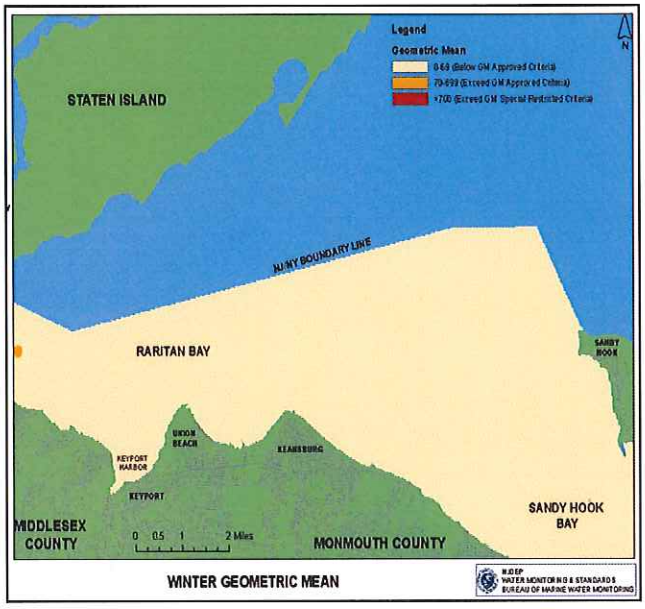


GEOMETRIC MEAN DIFFERENCES
BETWEEN WET/DRY CONDITIONS (72HRS CUMULATIVE)

Seasonal Effects

Seasonal variation may affect water quality due to the change in weather pattern that result in specific agricultural land-use practices, biological activity, stream flow and/or sediment. WM&S/BMWM uses a t-test method to determine which areas may be influenced by seasonal variation by comparing the summer and winter total coliform values. Any stations with a t-statistical probability of less than 0.05 are believed to be impacted. About eight percent of the monitoring stations in this area were impacted by seasonal variation. These impacted stations had higher bacteria level during the summer. The figures below are summer and winter geometric mean interpolation maps. Summer geometric mean tends to be higher than winter geometric mean, especially in the western portion of Raritan Bay, Keyport Harbor, and a small area in Sandy Hook Bay by the Atlantic Highland Marina. During the summer season, these areas are bustling with summer related activities, such as boating and harvesters.



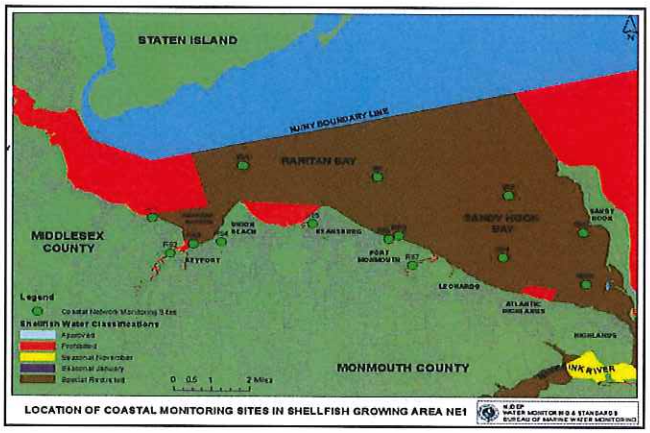


RELATED STUDIES

Nutrients

WM&S/BMWM perform additional water quality studies related to the bacteriological monitoring program. Nutrient monitoring and the collection of nutrient data as part of the NJ Coastal Monitoring Network is an example of one of those studies. Nutrient stations are sampled on a quarterly basis. There are approximately 250 nutrient sampling stations within the coastal and inner coastal waters of New Jersey. Twenty-four of those stations are located within the ocean waters off the New Jersey coast. The 226 remaining nutrient stations are spread throughout the States back-bay waters. At these nutrient monitoring sites, various parameters were measured including water temperature, salinity levels, secchi depth, total suspended solids, dissolved oxygen levels, ammonia levels, nitrate and nitrite levels, orthophosphate levels, total nitrogen levels, and the inorganic nitrogen to phosphorus ratios.

Within this shellfish growing area there are fourteen nutrient monitoring sites. Between 2009 and 2011, 1,003 water samples were analyzed for various nutrient parameters. The map displays the location of the nutrient monitoring sites within this shellfish growing area. WM&S/BMWM compiles the results of nutrient levels from such stations and then prepares a separate report. For full nutrient assessment, see the Estuarine Monitoring Reports, available electronically at: http://www.state.nj.us/dep/bmw/ .



LOCATION OF COASTAL MONITORING SITES IN SHELLFISH GROWING AREA NE1

Cooperative Coastal Monitoring Program

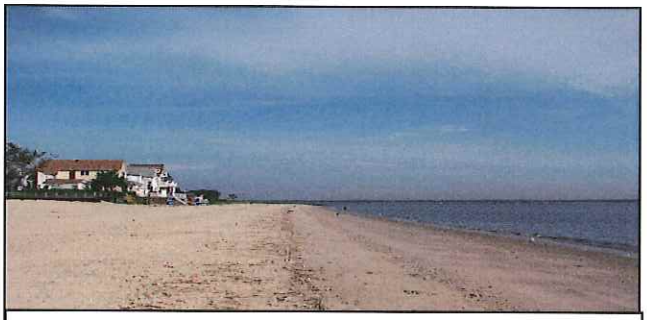
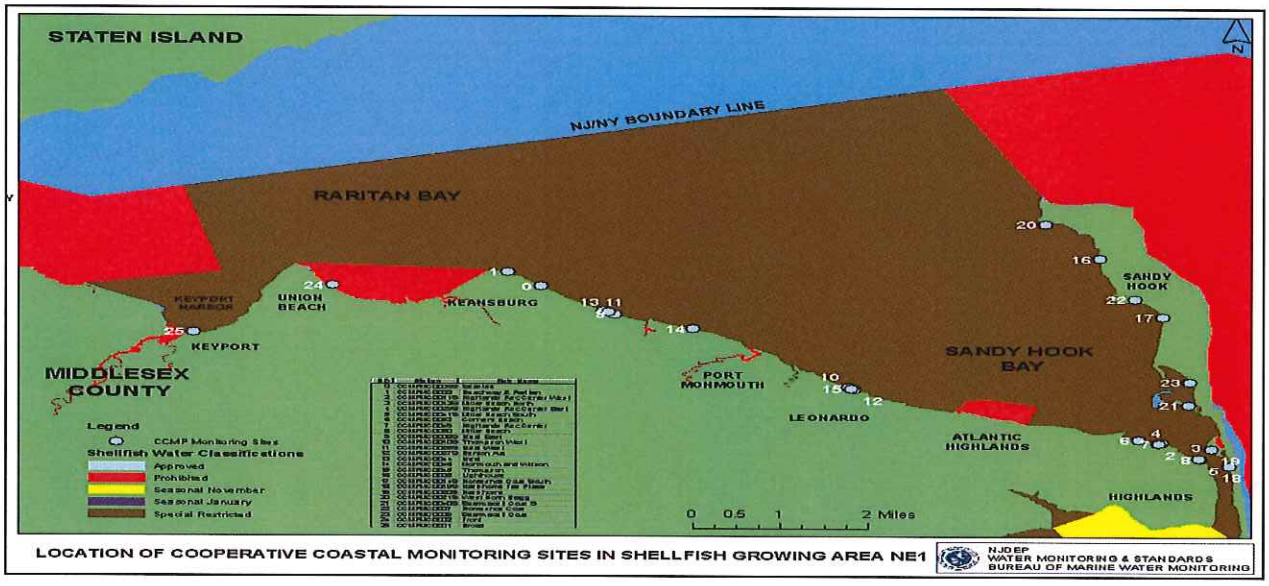


Photo of Union Beach Taken By Mike McCullough

NJDEP, along with the New Jersey Department of Health and Senior Services and local health agencies, implements the Cooperative Coastal Monitoring Program (CCMP) which is responsible for conducting sanitary surveys of beaches and monitors the concentration of bacteria in coastal and estuarine waters that are open to the public for recreational bathing. Samples are taken once a week, usually on Monday, for the entire summer. There are approximately 218 (ocean and bay) sampling stations throughout the state. The samples collected at these sites are tested for Enterococci. Local health agencies and law enforcement may close a beach at any time if the results exceeded the State Sanitary Code of 104 Enterococci per 100mL. WM&S/BMWM utilizes these data as adjunct information. The closure of shellfish waters does not necessarily correspond to these results. For more information regarding this program, bathing beach data, and closures, see http://www.nj.gov/dep/beaches/monitoring_results.htm.



LOCATION OF COOPERATIVE COASTAL MONITORING SITES IN SHELLFISH GROWING AREA NE1

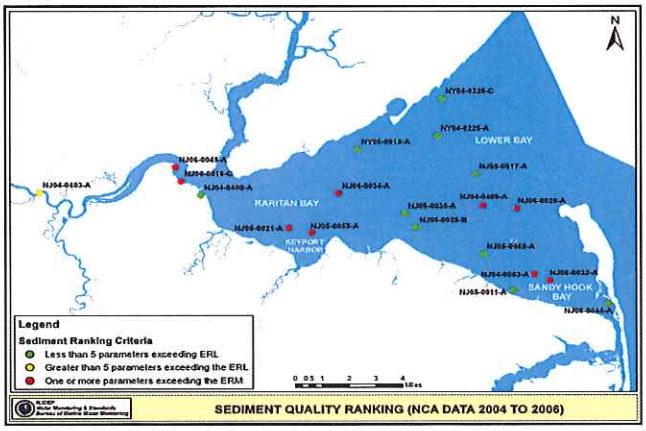
NJDEP WATER MONITORING & STANDARDS BUREAU OF MARINE WATER MONITORING

National Coastal Assessment

USEPA National Coastal Assessment (NCA) EMAP and its partners began sampling in the coastal and estuarine water of the United States in 1990. Data collected include water column parameters, sediment chemistry & toxicity, benthic communities, and tissue contaminants. Since there were no FDA criteria for assessing sediment contaminants, trace metals and organic compounds can be evaluated using an effects-based method developed by Long et al. (1995), which estimates the percent incidence at which adverse biological effects occur to aquatic organisms at specific contaminant concentrations. For each chemical, effects range-low (ERL) and effects range-medium (ERM) are used that correspond to the likelihood of adverse effects: when concentrations are less than the ERL, adverse effects are rare; when they fall between the ERL and ERM, adverse effects are occasional, and when they are greater than the ERM, adverse effects are frequent. The criteria for assessing sediment contaminants by site are shown in the table below.

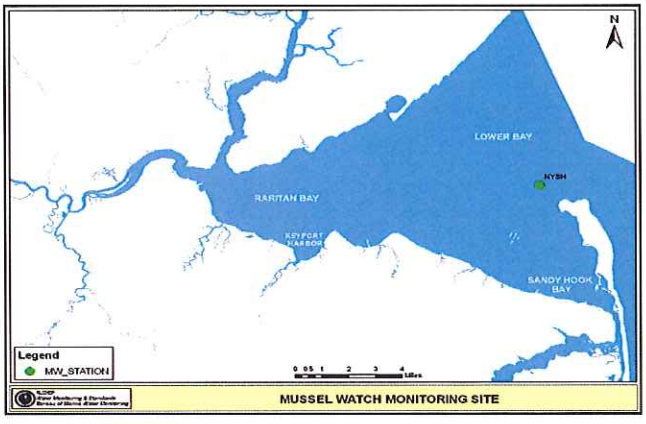
Criteria for Assessing Sediment Contaminants by Site (Source: USEPA, National Coastal Condition Report III, December 2008, Table 1-12, Page 18)	
Rating	**Criteria**
Good	No ERM concentrations are exceeded, and less than five ERL concentrations are exceeded.
Fair	No ERM concentrations are exceeded, and five or more ERL concentrations are exceeded.
Poor	An ERM concentration is exceeded for one or more contaminants.

There were several NCA monitoring stations located in this shellfish growing area. The most recent sediment data available for public viewing are from 2006. The figure displays the sediment ranking for the area where sample was taken. The stations that were ranked as "Poor" had exceeded in Mercury, with the exception of the two stations located at the mouth of the Raritan River, they also exceeded Copper, and 4,4-DDE. For additional NCA data or program information, visit http://www.epa.gov/emap/nca/index.html



Mussel Watch Contaminants Monitoring Program

NOAA Mussel Watch Contaminants Monitoring Program began collecting sediment and tissue samples since 1986 for biological contaminant trends in sediments and bivalve tissues. The most recent data collected in this area are from 2007 at Station NYSH. The 2007 tissue data indicated no of parameters had exceeded FDA criteria. For additional NCA data or program information, visit http://ccma.nos.noaa.gov/about/coast/nsandt/musselwatch.aspx



CONCLUSIONS

The following conclusions are based on total coliform data collected between January 2009 and December 2011. Since there are no *Approved* or *Seasonally Approved* waters within this shellfish growing area, all data were compared to NSSP Special Restricted criteria. Based on the statistical analysis, all monitoring stations were found to be in compliance with NSSP; therefore, meeting their respective shellfish classifications.

Several areas were influenced by seasonal variation, especially in areas where there are marinas. Overall, summer geometric mean tends to be higher than winter geometric mean, which is likely due to summer related, marinas, and wildlife activities that occur more frequently during the summer season. The rainfall assessment determined that rain would immediately impact Sandy Hook Bay, possibly due to influences coming from Shrewsbury River and runoffs from nearby stormwater outfalls. Raritan Bay and Keyport Harbor were also impacted by rain, but had a delayed effect. It is believed that influences to Sandy Hook Bay and Keyport Harbor are from local contaminants, while Raritan Bay is highly influence by runoffs coming out of Raritan River, Arthur Kills, and Lower Bay.

Overall, the water quality in this shellfish growing area has been consistent with previous years. Sandy Hook Bay to some extent is better than the water quality in the Raritan Bay and Keyport Harbor. After reviewing all the data, it's clear that Sandy Hook Bay has the greatest potential to be upgraded if the water quality trend continues to improve.

RECOMMENDATION

No downgrade of waters was recommended because all stations were in compliance with NSSP. Even though, the data show water quality improvement in Sandy Hook Bay, it is not appropriate at this time to upgrade these waters. WM&S/BMWM will continue to monitor the area under the same sampling protocol. When there are sufficient data to support an upgrade, WM&S/BMWM will upgrade these water accordingly.

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NY/NJ Baykeeper, http://www.nynjbaykeeper.org/

US Army Corps of Engineers-New York Distinct, http://www.nan.usace.army.mil/

USEAP, National Coastal Assessment, http://www.epa.gov/emap/nca/index.html

NOAA Fisheries, Office of Science & Technology, http://www.st.nmfs.noaa.gov/st1/commercial/

Interstate Environmental Commission, http://www.iec-nynjct.org/

U.S. Census Bureau, www.census.gov/

US Geological Survey, www.usgs.gov/

NJDEP, Bureau of Geographic Information, http://www.nj.gov/dep/gis/

NJDEP, Data Miner, http://datamine2.state.nj.us/dep/DEP_OPRA/

NJDEP, Bureau of Marine Water Monitoring, http://www.nj.state.nj.us/dep/bmw

NJDEP, Division of Fish and Wildlife, http://www.nj.gov/dep/fgw

NJDEP, Clean Marina Program, http://www.njcleanmarina.org/

Supporting Documentation

Data Sheets - Reappraisal Report for Shellfish Growing Area NE1 (Raritan-Sandy Hook Bays), see the Shellfish Growing Area Reports section at *www.state.nj.us/dep/wms/bmw*.

Shoreline survey field notes and pictures - Reappraisal Report for Shellfish Growing Area NE1 (Raritan-Sandy Hook Bays), see the Shellfish Growing Area Reports section at *www.state.nj.us/dep/wms/bmw*.