



**NJ Department of Environmental Protection
Water Monitoring and Standards**

**Reappraisal Report of Shellfish Growing Area SE3
(Lakes Bay to Peck Bay)**



July 2013

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

NJ Department of Environmental Protection
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Reappraisal Report of Shellfish Growing Area SE3 (Lakes Bay to Peck Bay)

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Cover Photo –by Julie Nguyen

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EXECUTIVE SUMMARY

Shellfish Growing Area SE3 is situated in southern New Jersey's Atlantic Coastal Plain, between Atlantic and Cape May County. This area also lies within the Great Egg Harbor Estuary Complex. The Great Egg Harbor Estuary Complex includes the entire Great Egg Harbor River, Great Egg Harbor Bay, Peck Bay, and the adjacent salt marsh habitat from the mouth of the river to the inlet. The Great Egg Harbor Bay is part of New Jersey back-barrier lagoon system. This area is characterized by open water, salt marsh, and sandy shoreline habitat.

The approximate size of this shellfish growing area is about 15,200 acres. The shellfish waters are classified as *Approved*, *Seasonally Approved*, *Special Restricted*, and *Prohibited*. In 2009, 786 acres of water in Lakes Bay were upgraded from *Seasonally Approved* to *Approved* year-round. The reclassification of shellfish waters did not increase the overall percentage of harvestable shellfish waters for this area, but instead opened up more waters for year-round harvesting. As the result, sixty-eight percent of shellfish waters in this area are classified as harvestable and the remaining shellfish waters are either closed or require a special permit.

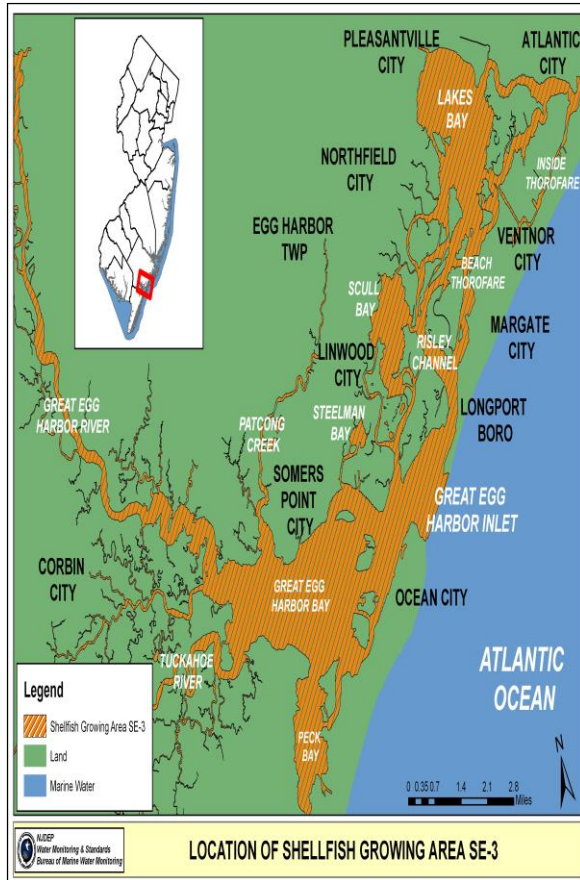
All of the adjacent city/municipalities are connected to city sewer system and are serviced by the Atlantic County Utilities Authority (ACUA) or Ocean City Regional Wastewater Treatment Facility (OCRWTF). These facilities discharge its treated wastewater effluent to the Atlantic Ocean. Therefore, there are no direct discharges of treated wastewater effluent to shellfish waters. There are several facilities that possess a NJPDES permits for stormwater and industrial discharge. One major surface water discharger is the Atlantic Electric-BL England Generating Power Plant. This facility is permitted to discharge the plant cooling water to the Great Egg Harbor Bay, which may contain chemicals such as heavy metals and PCBs. According to USEPA Toxic Release Inventory (TRI), the release of heavy metals and PCBs to surface water had declined dramatically since 2004. The only chemical that is still being released to surface water is ammonia, at minimal quantity.

This report was based on data collected from January 2008 to December 2012. There were approximately 5,512 samples analyzed for this report, which were collected from 170 sampling sites. This shellfish growing area is divided into two sampling strategies. Stations in the north (Lakes Bay to Great Egg Harbor Inlet) are sampled under the Adverse Pollution Condition (APC) strategy due to predetermine point source. Stations in the south (Great Egg Harbor Inlet to Peck Bay) are sampled under the Systematic Random Strategy (SRS) due to impact by non-point source. Based on the NSSP APC and SRS approved and special restricted criteria, the majority of the sampling stations do meet their respective shellfish classifications. The annual total coliform geometric mean trend continues to decline, which means water quality is continuing to improve. Stormwater runoff still poses problems in certain areas. Trace of metals, pesticides, and polycyclic aromatic hydrocarbons (PAHs) were found to be presence in sediment and tissue samples. However, the contaminants levels were below federal guidelines. The sediment qualities within this growing area were ranked as either "Good" or "Fair", depending on sediment location. Better sediment quality was found to coincide with area where there is better waters quality.

Based on the data collected and analysis for this growing area, there are no upgrades or downgrades of shellfish waters recommended at this time.

GROWING AREA PROFILE

Location and Description



Shellfish Growing Area SE3 is located in southern New Jersey's Atlantic Coastal Plain, between Atlantic and Cape May County. The primary waterbodies in this growing area include: Lakes Bay, Shelter Island Bay, Scull Bay, Steelman Bay, Great Egg Harbor Bay and River, and Peck Bay. There are several large fresh water tributaries that flow into the Great Egg Harbor Bay; and they are, the Great Egg Harbor River, Patcong Creek, and Tuckahoe River.

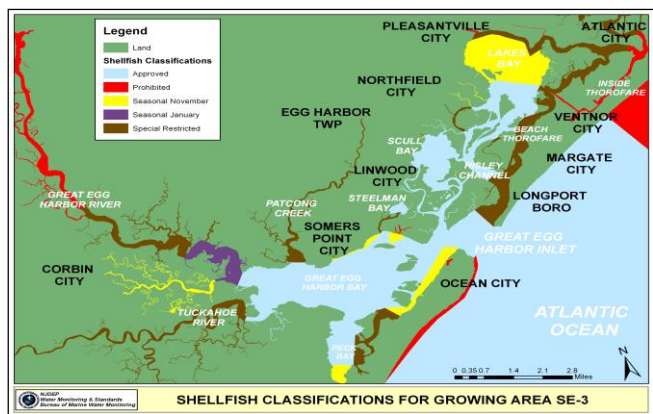
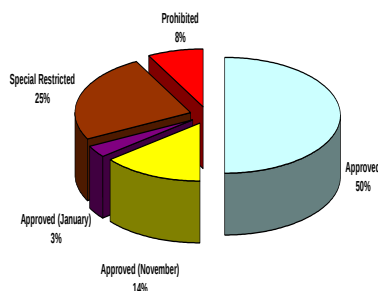
The Great Egg Harbor Bay is part of New Jersey back-barrier lagoon system. This area is characterized by open water, salt marsh, and sandy shoreline habitat. Water depth varies from less than 3 feet in shallow areas to greater than 33 feet in the deeper channel. Tidal influence to this growing area is through the Great Egg Harbor Inlet. Extensive sand flats and mudflats occur in the bay due to the movement of sand through this inlet. This bay is also influenced by the freshwater flow that comes from the Great Egg Harbor River. The Great Egg Harbor River is one of the longest rivers (approximately 59 miles) in New Jersey and drains an area of about 304 square miles. It originates in Camden County and is joined by tributaries in Gloucester and Atlantic County before draining into Great Egg Harbor Bay. The river is tidal up to the dam, which is located in Mays Landing, Atlantic County. (National Park Service)

Growing Area Classification Summary

The approximate size of this shellfish growing area is about 15,200 acres. The current shellfish classifications are as follows: *Approved*, *Seasonally Approved*, *Special Restricted*, and *Prohibited*. The majority of shellfish waters in this area are classified as *Approved* year round.

The Great Egg Harbor Bay, Scull Bay, Steelman Bay, portion of Peck Bay, and Ship and Risley Channel are classified as *Approved*, meaning harvesting of shellfish within these areas is permitted year round. The *Seasonally Approved (November to April)* areas are located in Lakes Bay, Peck Bay, and along the shoreline in Somers Point and Ocean City. The only *Seasonally Approved (January to April)* area is in the Great Egg Harbor River. This area is approximately two miles upstream from its mouth on the Great Egg

Shellfish Classification Status



Harbor

Bay.

Beach Thorofare, Great Thorofare, Back Thorofare, Patcong Creek, Tuckahoe River, and section of Great Egg Harbor River are classified as *Special Restricted*. *Prohibited* areas can be found in the upper portion of the Great Egg Harbor River.

The figure below illustrates the shellfish classifications for this growing area. It is also on the 2012 State of New Jersey Shellfish Growing Water Classification Charts or on WM&S/BMWM website at <http://www.state.nj.us/dep/bmw/>

Evaluation of Biological Resources

Shellfish growing area SE3 is situated within the Great Egg Harbor Estuary Complex. Within this complex are several state operated wildlife management areas, including the Lester G. McNamara Wildlife Management Area (aka Tuckahoe Wildlife Management Area), Pork Island Wildlife Management Area, Malibu Beach Wildlife Management Area, and Cape May Coastal Wetlands Wildlife Management Area. Approximately, 99% of the eligible waterways and adjacent lands in this complex are part of the Pinelands National Reserve. The Pinelands National Reserve is part of the Atlantic Coastal Plain Biosphere Reserve designated by UNESCO under the Man and Biosphere program. In 1992, President Bush signed a bill designating 129 miles of the Great Egg Harbor River and its tributaries as National Wild and Scenic Rivers. (www.nps.gov)



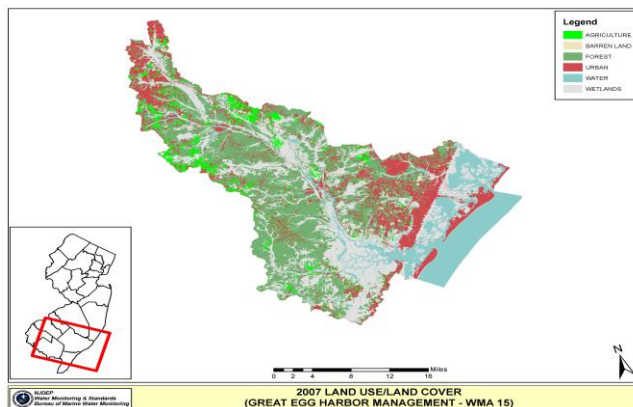
Due to its undisturbed and relatively pristine waterways, it provides a rich habitat for several threatened and endangered plant and animal species, including the bald eagle, the peregrine falcon, and the Pine Barrens tree frogs. The freshwater and tidal wetlands serve as resting, feeding, and breeding areas for waterfowl throughout the year.

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 surveys of SE3 were conducted in 2013. The following sections detail information derived collectively from those surveys, and those that preceded them.

Land Use

Shellfish growing area SE3 is situated within the Great Egg Harbor Watershed Management Area. Majority of this watershed are forest and wetlands. According to the 2007 landuse statistic, all landuse type saw a decline in the number of designated acreage, except for urban landuse. In 2007 survey, urban landuse was calculated to be approximately 73,432 acres, a nine percent increase from 2002. As more lands are being converted to urban areas, more runoffs will likely occur as the natural landscapes are being replaced with impervious surface.



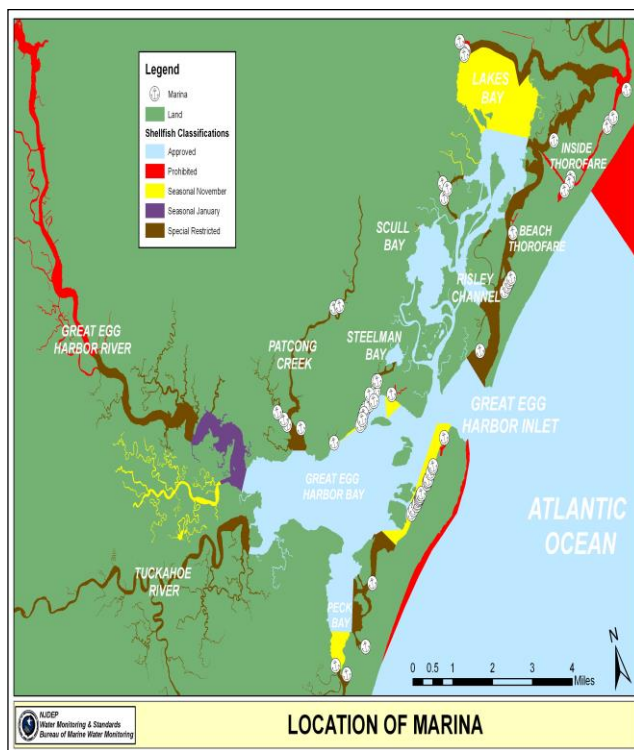
Surface water dischargers

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 pollutant 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.

Within this area are several major surface water dischargers that have the potential to impair water quality. This includes the Ocean City Regional Wastewater Treatment Facility (OCRWTF), located in Ocean City. The OCRWTF discharges their treated wastewater effluents to the Atlantic Ocean, which minimize bacteria loading to this growing area. However, due to its location and proximity to shellfish waters, there is the risk of accidental spill and/or unplanned discharges to shellfish waters. For this reason, the shellfish waters that are adjacent to this facility are classified as *Special Restricted* or *Prohibited*. Another major surface water discharger is the Atlantic Electric-BL England Power Station, located at Beesley's Point. This plant is permitted to discharge its cooling water to the Great Egg Harbor Bay. The health concerns are the amount of chemicals that are being released through the plant's cooling water, which may resulted in the contamination of sediment and shellfish tissue. For this reason, WM&S/BMWM has been assessing tissue and sediment samples in the Great Egg Harbor Bay area. So far, none of the data assessed shows high level of contaminants in sediment or tissue samples.

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. 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*. 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 2012.

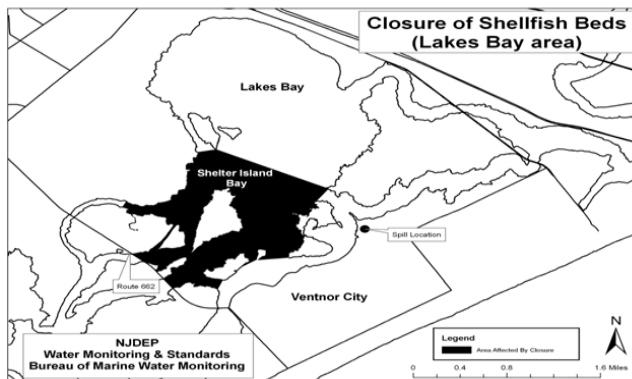


Spills, Unpermitted Discharges, and Closure

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.

In August of 2008, a closure was issued in the vicinity of Shelter Island Bay due to a broken sewage main located in Inside Thorofare. All of the *Approved* shellfish waters north of the Margate Bridge (Rt. 662) including Shelter Island Bay were closed for harvesting. These waters remained closed for approximately one month until repairs were completed and bacteria levels had returned to its normal state.

In August of 2011 and October of 2012, a closure was issued for the state of New Jersey due to Hurricane Irene and Hurricane Sandy, respectively. The entire growing area was closed for several weeks on each incident.



Storm Water Discharges

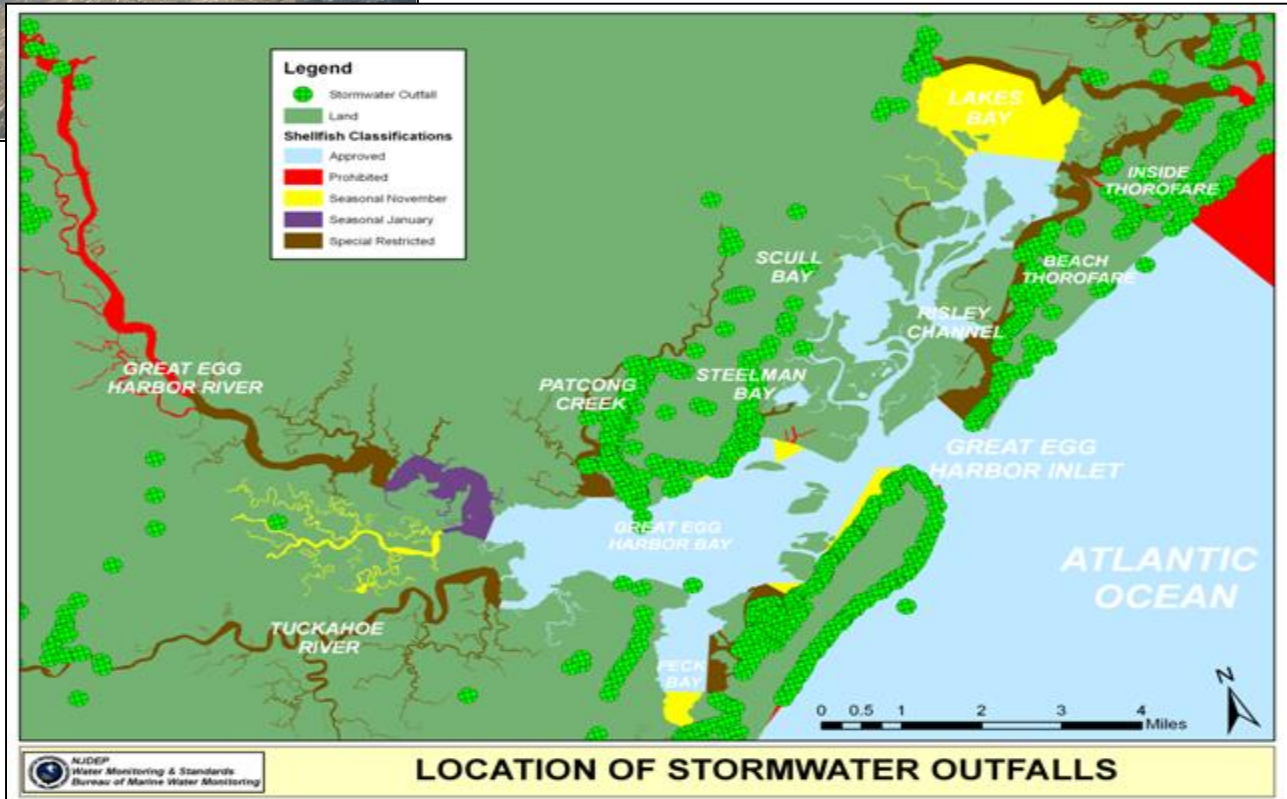


Non-point source pressures on shellfish beds in New Jersey originate in materials that enter the water via stormwater. Stormwater runoff is generated when precipitation from rain and snowmelt flows over land or impervious surfaces and does not percolate into the ground. As the runoff flows over the land 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)

River and Bay



WM&S/BMWM have identified several potential stormwater impacted areas. These areas included Beach Thorofare, Great Channel, and Inside Thorofare. The bacteriological levels in these areas tend to be much higher after a rainfall event. Areas impacted by stormwater are usually classified as *Special Restricted*, *Prohibited* or *Seasonally Approved*.



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, 2012*. This shellfish growing area is divided into two sampling strategy. Stations in the north (Lakes Bay to Great Egg Harbor Inlet) are sampled under the Adverse Pollution Condition (APC) strategy due to predetermine point source. Stations in the south (Great Egg Harbor Inlet to Peck Bay) are sampled under the Systematic Random Strategy (SRS) due to impact by non-point source.

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. In the past, New Jersey shellfish growing water classifications were based on total coliform analysis. In 2012, New Jersey adopted the fecal coliform criterion as their method of assessing shellfish waters. For additional information, see *Shellfish Growing Area Report Guidance Document, 2012*.

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. For the Systematic Random Sampling Strategy, variability is expressed as the 90th percentile.

Criteria for Adverse Pollution Condition Sampling Strategy (APC)		
Classification	Fecal Coliform Criteria	
	Geometric Mean (MPN/100 mL)	No more than 10% can exceed (MPN/100 mL)
Approved	14	49
Special Restricted	88	300

Statistical Criteria for Systematic Random Sampling Strategy (SRS)		
Classification	Fecal Coliform Criteria	
	Geometric Mean (MPN/100 mL)	Maximum 90 th Percentile (MPN/100 mL)
Approved	14	49
Special Restricted	88	300

Water sampling was performed in accordance with the Field Procedures Manual (NJDEP, 2005). From 2008 to 2012, 5,512 water samples were collected for total coliform bacteria from 170 monitoring stations. The locations of these stations are shown in the map below. 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).

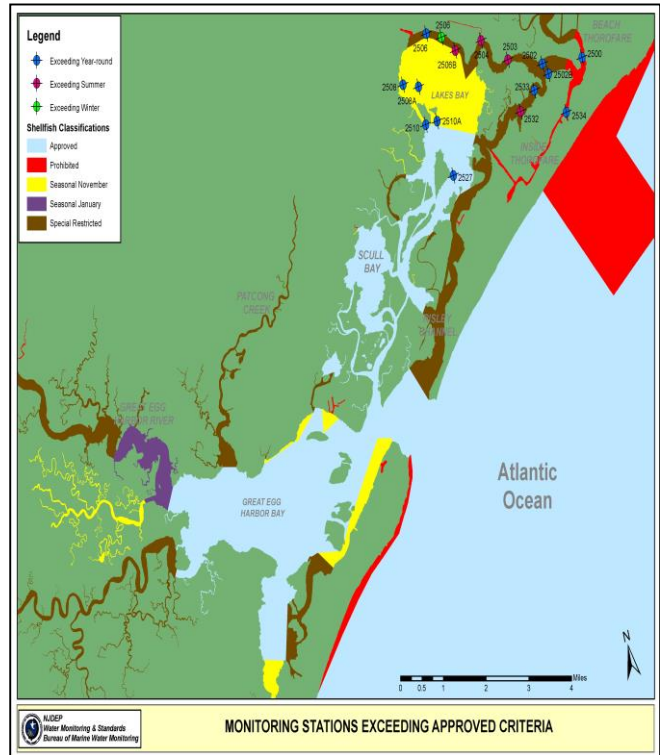
BACTERIOLOGICAL QUALITY

Compliance with NSSP Criteria

Each shellfish growing area is sampled either under the APC or SRS sampling strategy. However, there are a few shellfish growing areas that are sampled under both sampling strategies. This shellfish growing area is one of those areas. Stations that were sampled under the APC sampling strategy will be assessed using the NSSP APC criteria and SRS stations will be evaluated under the NSSP SRS criteria.

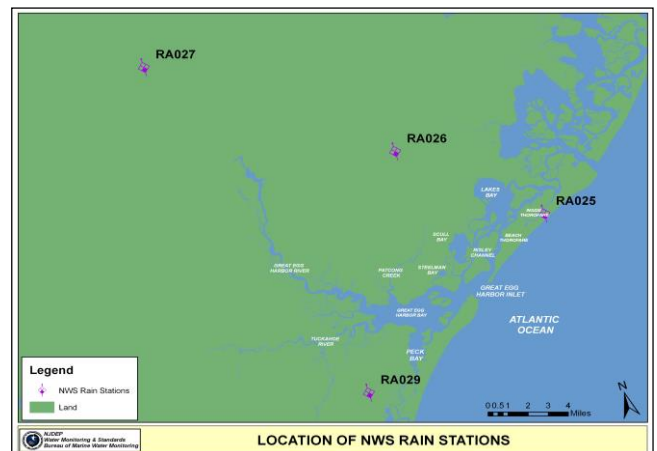
Based on the data analyzed for this report, none of the SRS sampling stations exceeded the year-round NSSP SRS approved or special restricted criteria. All 106 SRS sampling stations meet their respective shellfish classifications.

Several APC stations failed to meet the NSSP APC approved criteria. Majority of these stations are situated in *Special Restricted*, *Prohibited*, or *Seasonal* waters of Lakes Bay (see map). Only one station (2527), located in the *Approved* waters of Shelter Island Bay did not meet its current shellfish classification. This station failed to meet the ten percent cutoff criteria. Even though this station exceeded the approved criteria, no downgrade of waters is recommended. The coliform levels have always been considerably low in this area. Occasionally, there will be one or two spiked samples with results above standard level. Due to the fact that this is an APC station, it only takes two samples above standard to exceed the ten percent cutoff criteria. Inspection of the area indicated there was no point source of pollution. The higher than normal bacteria level was likely due to wildlife activity and runoffs.

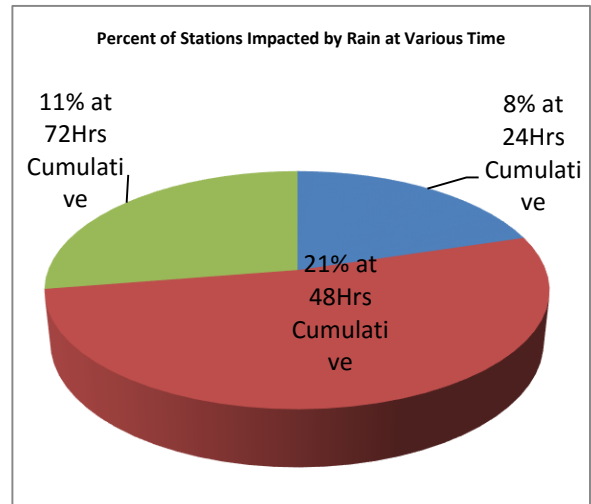


Rainfall Effect

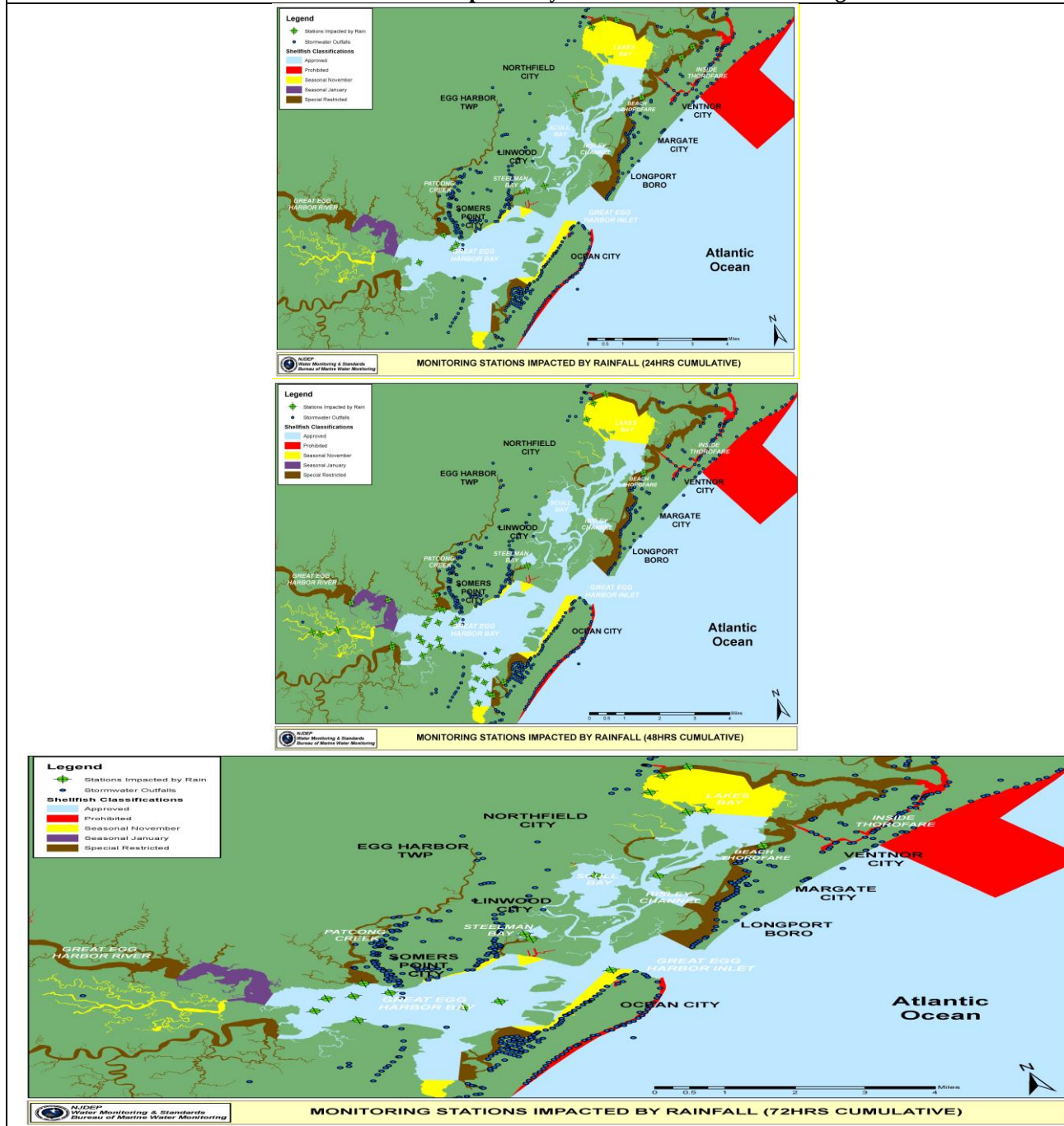
Precipitation inputs to this area were provided by Middle Atlantic River Forecast Center (MARFC), an office in the National Weather Service (NWS). The MARFC provides 24 hour estimated precipitation based on a Multi-Sensor Precipitation Estimation (MPE) calculation using data collected from NWS' NEXRAD radar, together with rain gage observations and recordings. Precipitation assessment for this shellfish growing area was based on rainfall data collected at Station RA025, RA026, RA027, and RA029. Rainfall data collected from these stations were used in the t-test to determine which monitoring station is impacted by rainfall.



WM&S/BMWM used 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 station with a t-statistical probability of less than 0.05 is believed to be impacted. Even if, a station is found to be impacted it does not necessarily mean it is also out of compliance with NSSP. Stations that are impacted by rainfall are shown on the maps. The highest percentage of stations impacted was from 48 hours rainfall cumulative. This finding suggested that there is a delayed rainfall effects to shellfish waters.



Location of the Stations Impacted by Rainfall at Various Time Stage

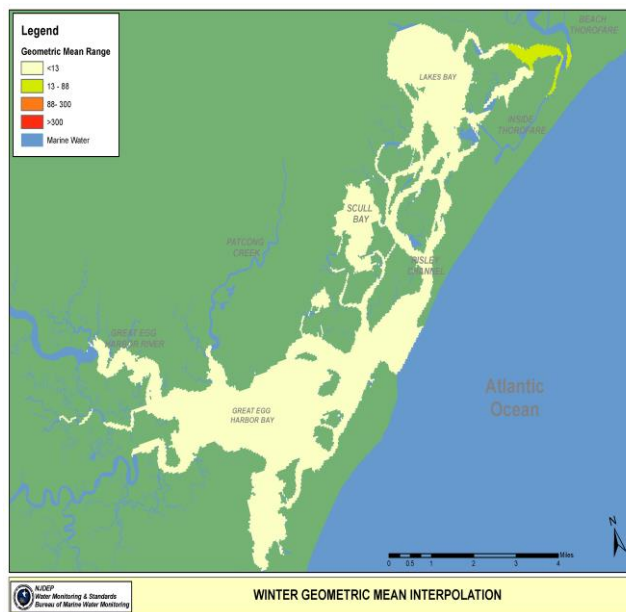
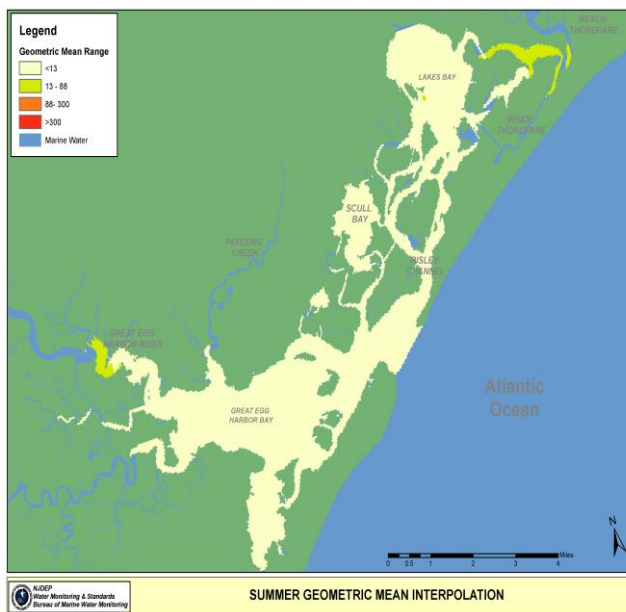
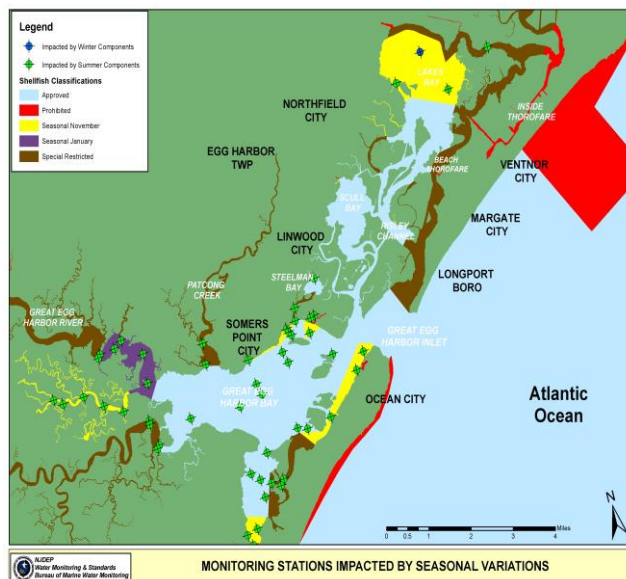


Seasonal Effects

To determine seasonal effects, WM&S/BMWM uses the t-test to compare the total coliform MPN values from samples collected during the summer season (May thru October) versus samples collected during the winter months (November thru April). Any station with a t-probability of less than 0.05 is believed to be impacted by seasonal components.

Seasonal statistics show 54 sampling stations impacted by seasonal components. Majority of these stations were influenced by the summer season. Most of these stations are located in the Great Egg Harbor Bay area. Only one station was influenced by winter components. This station was situated in Lakes Bay.

Summer and winter geometric means are relatively similar throughout the bay, with the exception of Great Egg Harbor River, Beach Thorofare, and Great Thorofare. The geometric mean in the Great Egg Harbor River is slightly higher during the summer than winter. Areas like Beach Thorofare and Great Thorofare are marginally higher throughout the year (see maps below).



Nutrients

Legend

- Nutrient Monitoring Site
- Land

Shellfish Classifications

- Approved
- Prohibited
- Seasonal November
- Seasonal January
- Special Restricted

Map Labels:

- GREAT EGG HARBOR
- TUCKAHOE RIVER
- PATCONG CREEK
- SCULL BAY
- STEELMAN BAY
- WISLEY CHANNEL
- LAKES BAY
- INSIDE THOROFARE
- BEACH THOROFARE
- GREAT EGG HARBOR INLET
- GREAT EGG HARBOR BAY
- ATLANTIC OCEAN

Scale: 0 0.5 1 2 3 4 Miles

Source: NJDEP Water Monitoring & Standards Bureau of Marine Water Monitoring

Legend

- Bathing Beach/Environmental Monitoring Sites
- Land
- Shellfish Classifications
 - Approved
 - Prohibited
 - Seasonal November
 - Seasonal January
 - Special Restricted

Map labels include: GREAT EGG HARBOR RIVER, TUCKAHOE RIVER, PATCONG CREEK, SCULL BAY, STEELMAN BAY, GREAT EGG HARBOR BAY, PRECIPITATION BAY, LAKES BAY, INSIDE THORFARE, BEACH THORFARE, GREAT EGG HARBOR INLET, and ATLANTIC OCEAN.

Monitoring site codes: CCMPC0001, CCMPC0002, CCMPC0004, CCMPC0005, CCMPC0008, CCMPC0009, CCMPC0010, CCMPC0011, CCMPC0012.

Scale: 0 0.5 1 2 3 4 Miles

Source: NJDEP Water Monitoring & Standards Bureau of Marine Water Monitoring

BATHING BEACH/ENVIRONMENTAL MONITORING SITES

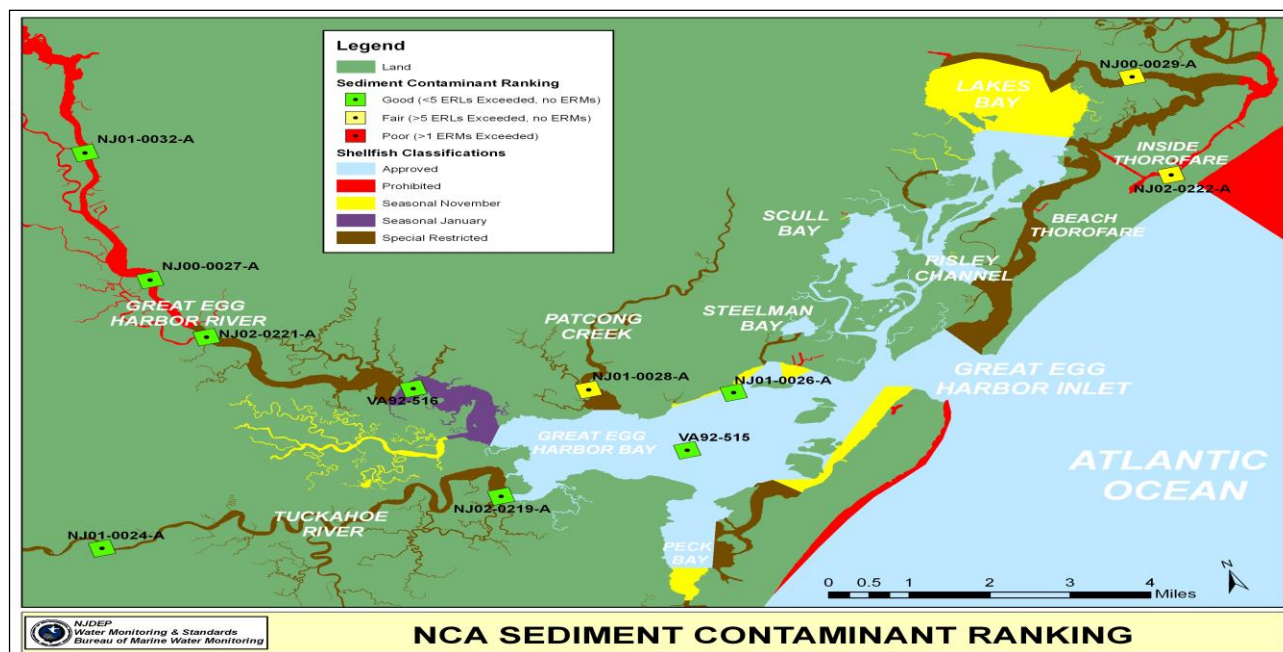
http://www.nj.gov/dep/beaches/monitoring_results.htm

National Coastal Assessment

Since 1990, USEPA National Coastal Assessment (NCA) and its partners began sampling in the coastal and estuarine water of the United States. 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)	
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.

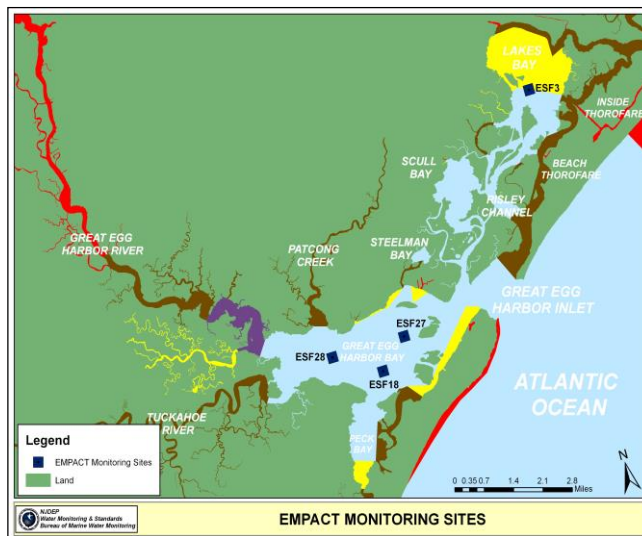
The most recent NCA data for this area were collected in 2004. Based on these data, no parameters were found to exceed the ERM value. The sediment qualities for this area were ranked as “Good” or “Fair” depending on the location. For additional NCA data or program information, visit <http://www.epa.gov/emap/nca/index.html>



Environmental Monitoring for Public Access & Community Tracking (EMPACT)

EMPACT is a project designed to provide the public with access to current information on the condition of their coastal waters. It is intended to enhance the connection between the public and their bays and coastal waters, to ultimately provide a better understanding of this valuable resource. One of the three components in this project includes the determination of toxic pollutant levels in shellfish tissue. Tissue samples were collected throughout this area. However, shellfish resources were only found at Station ESF 3, ESF 18, ESF 27, and ESF 28. See toxic monitoring sites map for the location. The chemical data collected from these sites were compared with available FDA criteria. None of the parameters tested exceeded applicable FDA criteria. For additional information regarding this project, visit

<http://www.state.nj.us/dep/wms/bmw/EMPACT.htm>



CONCLUSIONS

Majority of the sampling stations within this area do meet the NSSP criteria, with the exception of one APC station located in Shelter Island Bay area, which had failed to meet the ten percent cutoff criteria. Even though this station exceeded the approved criteria, no downgrade of waters is recommended. The coliform levels have always been considerably low in this area. Occasionally, there will be one or two spiked samples with results above standard level. Due to the fact that this is an APC station, it only takes two samples above standard to exceed the ten percent cutoff criteria. Inspection of the area indicated there was no point source of pollution. The higher than normal bacteria level was likely due to wildlife activity and runoffs.

Seasonal and rainfall assessment shows many stations impacted by seasonal component and rainfall. Stations with seasonal components show higher total coliform geometric mean during the summer season, which implies that bacteria count were influenced by summer related and wildlife activities. Stormwater runoffs still poses problems for some areas including Lakes Bay, Beach Thorofare, Risley Channel, and Scull Bay. These areas responded immediate to rainfall, possibly due to its close proximity to city center and the numerous stormwater outfalls that line the shore.

Chemical contaminants recovered from tissue samples were compared with applicable FDA criteria; and none of the parameters were found to exceed their respective criteria. Sediment samples were assessed using the sediment contaminant ranking method. Depending on the sediment location, they were ranked as either “Good” or “Fair”. Sediment quality was found to be better in areas where shellfish waters were classified as *Approved* or *Seasonally Approved*.

RECOMMENDATIONS

Continue sampling under the same sampling protocol. No downgrades or upgrades of shellfish waters recommended at this time.

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- Office of the New Jersey State Climatologist at Rutgers University. <http://climate.rutgers.edu/stateclim/>

Supporting Documentation

Data Sheets - Reappraisal Report for Shellfish Growing Area SE3 (Lakes Bay-Peck Bay), 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 SE3 (Lakes Bay-Peck Bay), see the Shellfish Growing Area Reports section at www.state.nj.us/dep/wms/bmw.