NJ Department of Environmental Protection

Water Monitoring and Standards

Reappraisal Report of Shellfish Classification for Growing Area AO South The Atlantic Ocean from Cape May Point to Absecon Inlet

May 2014

State of New Jersey

Chris Christie, Governor

Kim Guadagno, Lt. Governor

NJ Department of Environmental Protection

Bob Martin, Commissioner

Reappraisal Report of Shellfish Classification for Growing Area AO South The Atlantic Ocean from Cape May Point to Absecon Inlet

New Jersey Department of Environmental Protection
Water Resources Management
Michele Siekerka, Assistant Commissioner

Water Monitoring and Standards
Jill Lipoti, Director

Bureau of Marine Water Monitoring
Bruce Friedman, Bureau Chief

May 2014

Report prepared by:

Paul Wesighan

Acknowledgements:
This report was written and published under the direction of Bruce Friedman, Bureau Chief. Mike Kusmiesz assisted in the collection and storage of statistical and GIS data used in analysis. Special acknowledgment is given to Captain Ken Hayek and Captain Marc Resciniti for perseverance in collecting shellfish water quality samples. This study would not have been completed without the aid of the analytical capabilities of our microbiology laboratory staff, including Elena Heller, Robert Seabrook, Lisa DiElmo, Carrie Lloyd and Abole Oyelade (advanced microbiology lab); and our chemistry laboratory staff, including Bill Heddendorf (interim supervisor – microbiology and chemistry labs), Eric Ernst, Dawn Thompson, and Amanda Burkert, with overall supervision by Bob Schuster, Interim Section Chief.

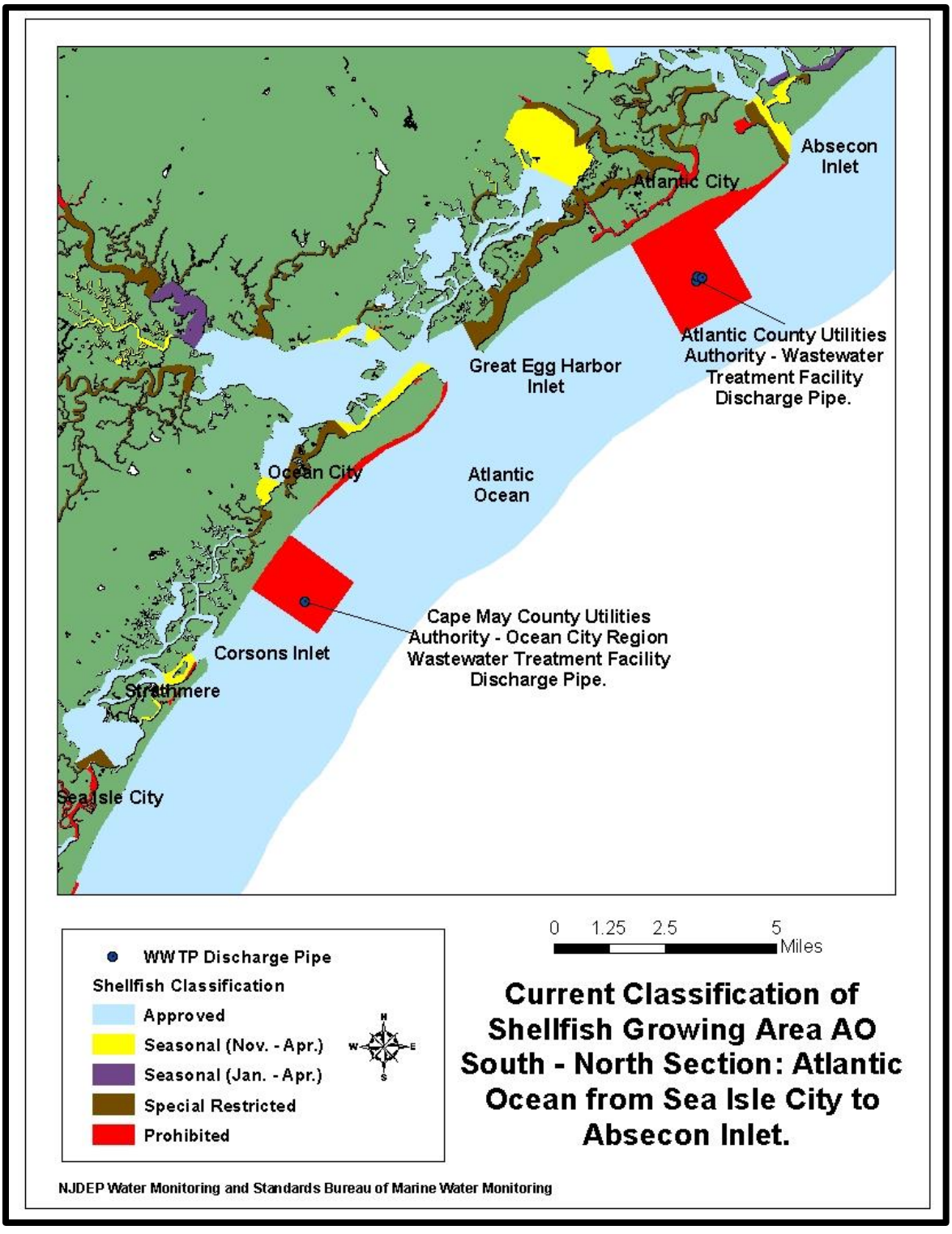
Cover Photo – Absecon Inlet, north of Atlantic City.

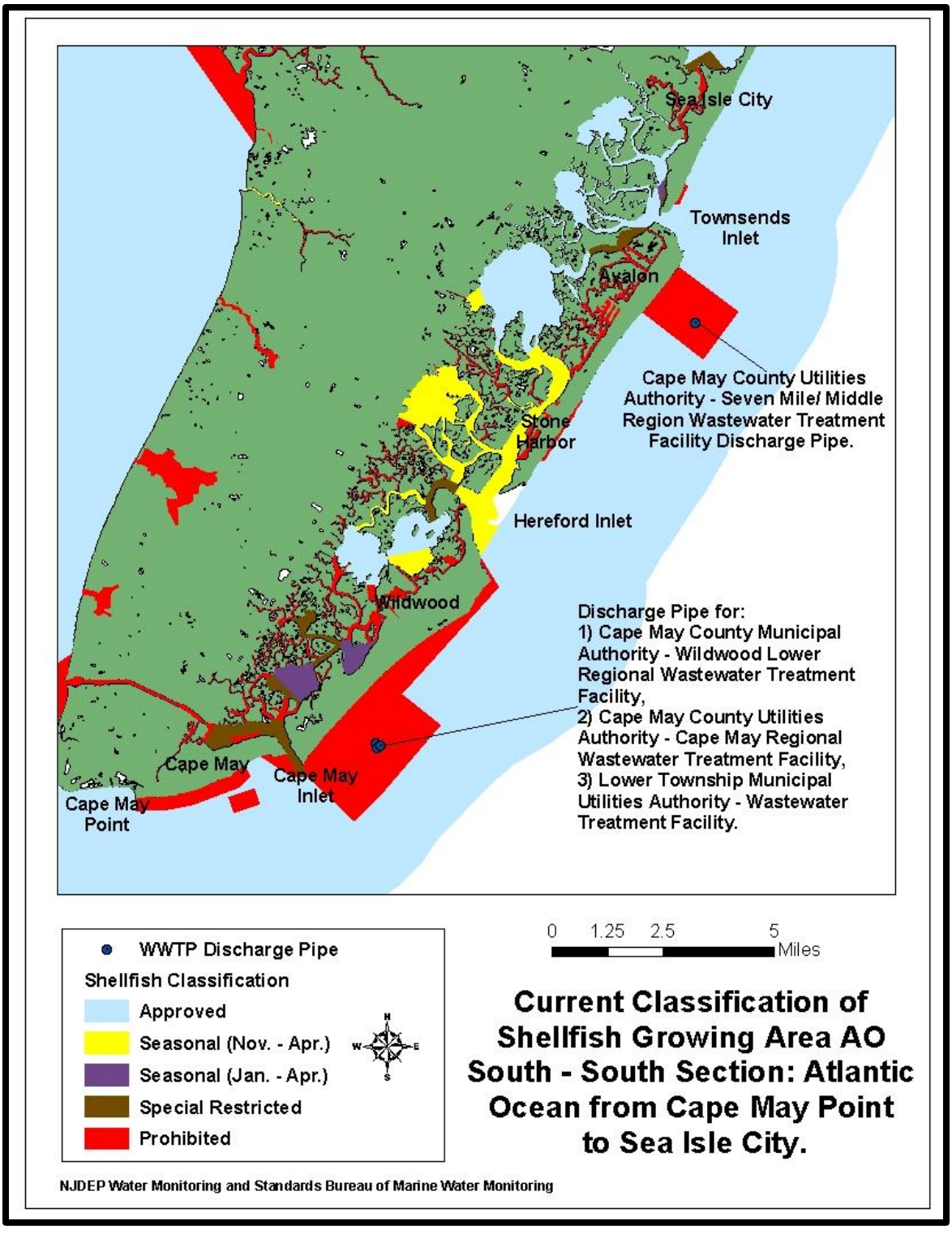
TABLE OF CONTENT

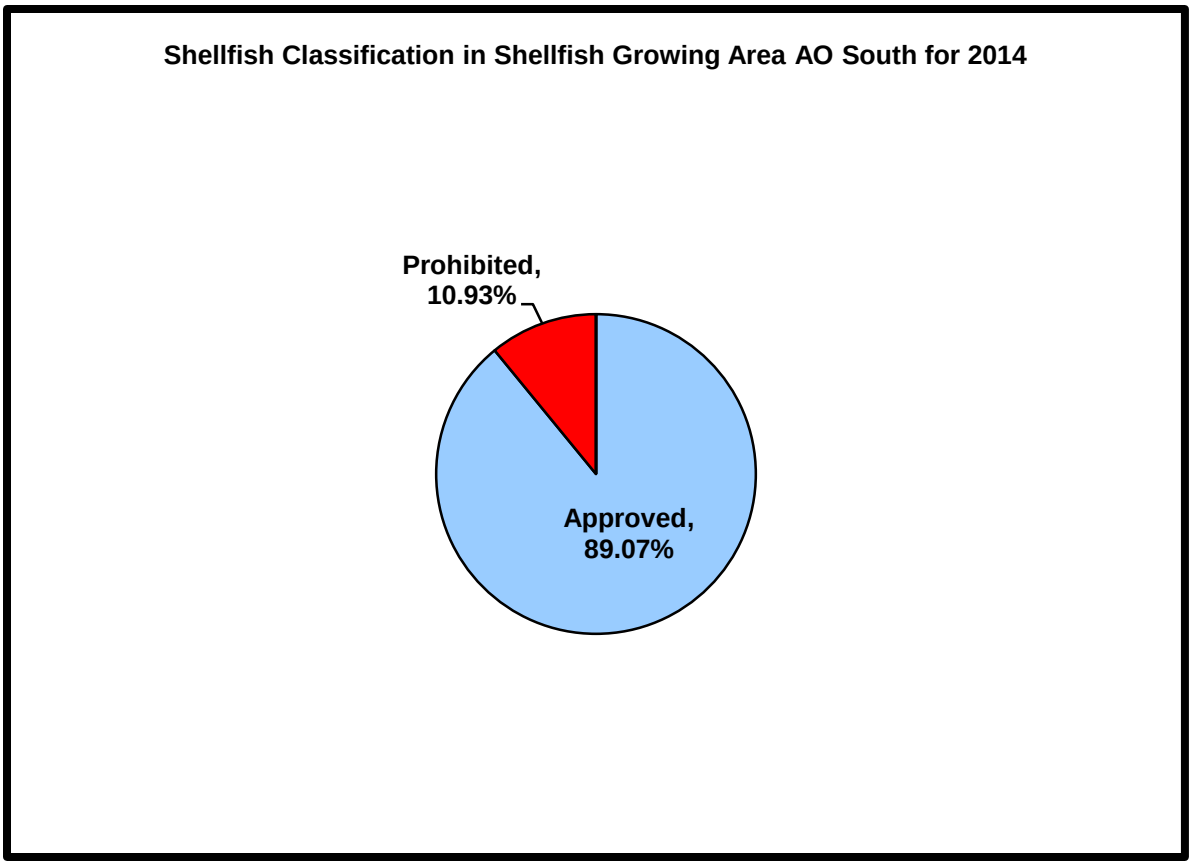
EXECUTIVE SUMMARY 1
DESCRIPTION OF GROWING AREA 4
Location & Description 4
Growing Area Classification 6
Evaluation of Biological Resources 8
SHORELINE SURVEY: EVALUATION OF POTENTIAL POLLUTION SOURCES 9
Shoreline Survey 9
Land Use 9
Identification and Evaluation of Potential Pollution Sources 11
Wastewater Treatment Facilities 12
Potential Indirect Discharges 15
Spills, Unpermitted Discharges, and Closures 22
Stormwater Discharges 24
WATER QUALITIES STUDIES 25
Sampling Strategy 25
Bacteriological Quality 29
Compliance with NSSP APC Criteria 29
Seasonal Effects 30
Rainfall Effects 31
RELATED STUDIES 34
Nutrients 34
Toxic Monitoring 36
Bathing Beach Data 36
CONCLUSIONS 37
RECOMMENDATIONS 38
LITERATURE CITED 38

EXECUTIVE SUMMARY

Shellfish Growing Area AO South is located in the southeastern part of New Jersey, in the Atlantic Ocean from Cape May Point in Cape May County, north to Absecon Inlet in Atlantic County, which includes approximately 46 miles of coastline and extends offshore to the three mile jurisdictional limit. The approximate size of this shellfish growing area is 103,948 acres and the primary shellfish classification of this shellfish growing area is *Approved* (89.07%) and *Prohibited* (10.93%). The water quality data presented in this Reappraisal of Shellfish Growing Area AO South, the Atlantic Ocean from Cape May Point to Absecon Inlet, was collected between January 2008 and May 2014 using the Adverse Pollution Condition (APC) strategy, because there are six wastewater treatment facilities connected to four discharge pipes that extend into the Atlantic Ocean in this shellfish growing area. The wastewater treatment facilities are: 1) the Atlantic County Utilities Authority – Wastewater Treatment Facility, 2) the Cape May County Utilities Authority – Ocean City Region Wastewater Treatment Facility, 3) the Cape May County Utilities Authority – Seven Mile/ Middle Region Wastewater Treatment Facility, and 4) the Cape May County Municipal Authority – Wildwood Lower Regional Wastewater Treatment Facility, which also shares the same discharge pipe with 5) the Cape May County Utilities Authority – Cape May Regional Wastewater Treatment Facility and 6) the Lower Township Municipal Utilities Authority – Wastewater Treatment Facility. The wastewater from these facilities is discharged into the ocean to four safety buffer zones that are classified as *Prohibited* to shellfish harvesting. There are also *Prohibited* shellfish harvesting areas along the shoreline of this shellfish growing area where stormwater outfall pipes extend into the ocean and the stormwater from these outfall pipes have the potential to impact the water quality of this shellfish growing area as sources of pollution. All of the sampling stations in this shellfish growing area are in compliance with the fecal coliform criteria for the *Approved* and *Prohibited* classifications of this shellfish growing area, as specified by the National Shellfish Sanitation Program (NSSP). No classification changes are recommended for this shellfish growing area. There were no observed changes to pollution sources of this area as documented in the shoreline survey included in this report.


Absecon Inlet
Atlantic City
Atlantic County Utilities Authority - Wastewater Treatment Facility Discharge Pipe.
Great Egg Harbor Inlet
Ocean City
Atlantic Ocean
Cape May County Utilities Authority - Ocean City Region Wastewater Treatment Facility Discharge Pipe.
Corsons Inlet
Strathmere
Sea Isle City
WWTP Discharge Pipe
Shellfish Classification
Approved
Seasonal (Nov. - Apr.)
Seasonal (Jan. - Apr.)
Special Restricted
Prohibited
0 1.25 2.5 5
Miles
Current Classification of Shellfish Growing Area AO South - North Section: Atlantic Ocean from Sea Isle City to Absecon Inlet.
NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring


Sea Isle City
Townsends Inlet
Avalon
Cape May County Utilities Authority - Seven Mile/ Middle Region Wastewater Treatment Facility Discharge Pipe.
Stone Harbor
Hereford Inlet
Wildwood
Discharge Pipe for:
1) Cape May County Municipal Authority - Wildwood Lower Regional Wastewater Treatment Facility,
2) Cape May County Utilities Authority - Cape May Regional Wastewater Treatment Facility,
3) Lower Township Municipal Utilities Authority - Wastewater Treatment Facility.
Cape May
Cape May Inlet
Cape May Point
WWTP Discharge Pipe
Shellfish Classification
Approved
Seasonal (Nov. - Apr.)
Seasonal (Jan. - Apr.)
Special Restricted
Prohibited
N
W
E
S
0 1.25 2.5 5
Miles
Current Classification of Shellfish Growing Area AO South - South Section: Atlantic Ocean from Cape May Point to Sea Isle City.
NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring

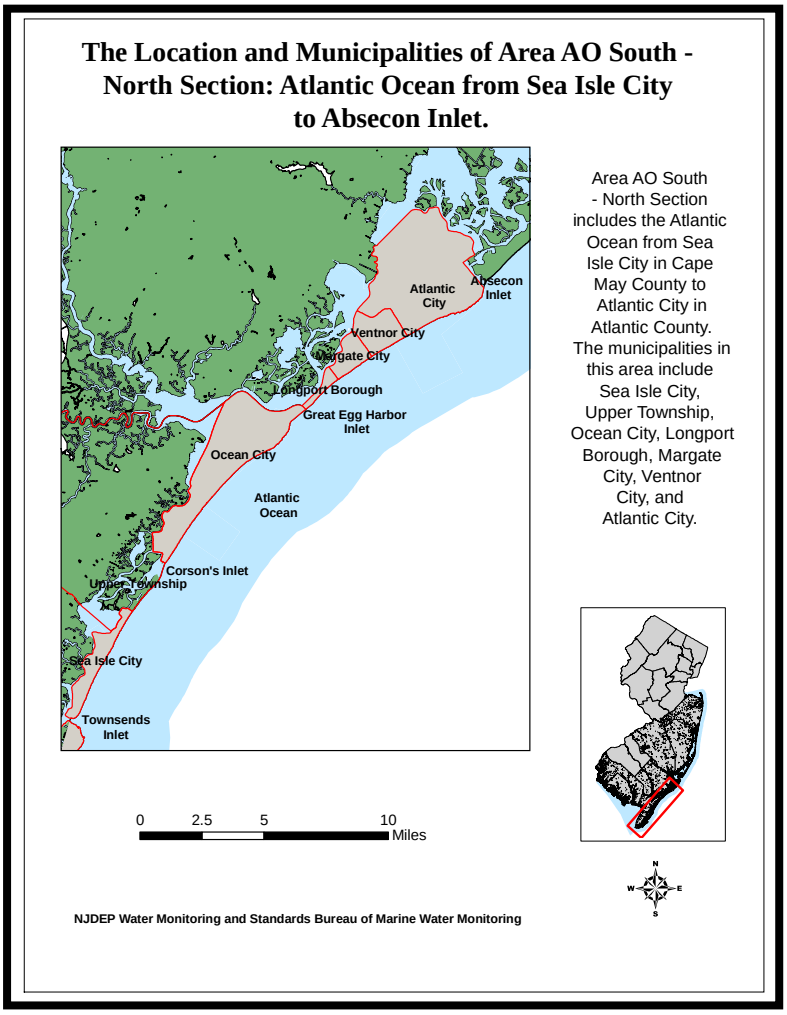


DESCRIPTION OF GROWING AREA

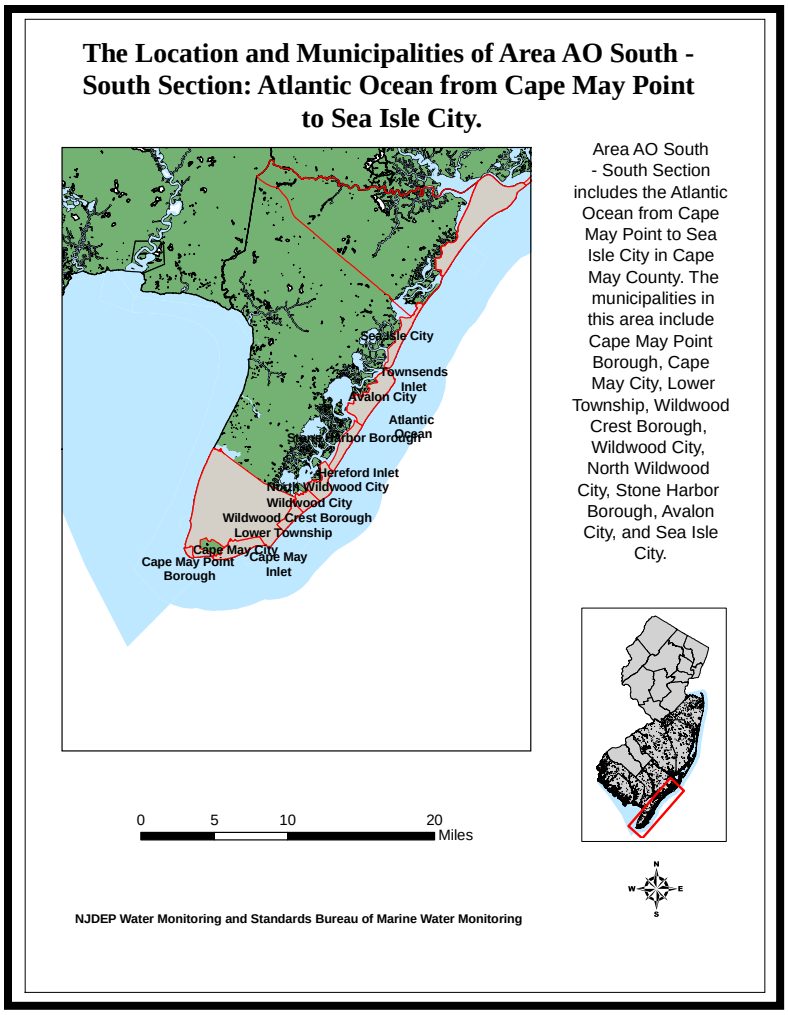
Location & Description

Shellfish Growing Area AO South is located in the southeastern part of New Jersey, from Cape May Point in Cape May County, north to Absecon Inlet in Atlantic County. This shellfish growing area includes approximately 46 miles of coastline from Cape May Point in the south to Absecon Inlet in the north, and offshore to the three mile jurisdictional limit (the word "miles" in this report refers to "nautical miles", and is equal to 6,076 feet). The primary classification of this shellfish growing area is *Approved* or *Prohibited,* and the approximate size of this shellfish growing area is 103,948 acres. This shellfish growing area has 92,590 acres of *Approved* shellfish waters, and 11,358 acres of *Prohibited* shellfish waters. The *Prohibited* classification applies to the shellfish growing waters located around the four wastewater discharge outfall pipes from the six wastewater treatment facilities in this area, and the shellfish growing waters located along the shoreline near the stormwater outfall pipes.

The *Approved* classification applies to the rest of the ocean waters located in this shellfish growing area. The ocean waters of this shellfish growing area are bordered on the west by Atlantic City, Ventnor, Margate, Longport, Ocean City, Strathmere (Upper Township), Sea Isle City, Avalon, Stone Harbor, North Wildwood, Wildwood, Wildwood Crest, Lower Township, Cape May City, and Cape May Point. The locations of the adjacent municipalities are shown in the figures on pages 5 and 6. Population statistics for the adjacent municipalities can be found in the previous reappraisal report of this shellfish growing area, which was written in 2010 and included the population statistics from the 2000 census of this area.



Absecon Inlet, Great Egg Harbor Inlet, Corsons Inlet, Townsends Inlet, Hereford Inlet, and Cape May Inlet drain into this shellfish growing area. This area can be found on Charts 12, 13, 14, 15, 16, and 17 of the "2014 State of New Jersey – Shellfish Growing Water Classification Charts" (NJDEP, 2014). The current classification of this shellfish growing area can be seen in the figures on pages 7 and 8 or on WM&S/BMWM's website at http://www.state.nj.us/dep/bmw/.



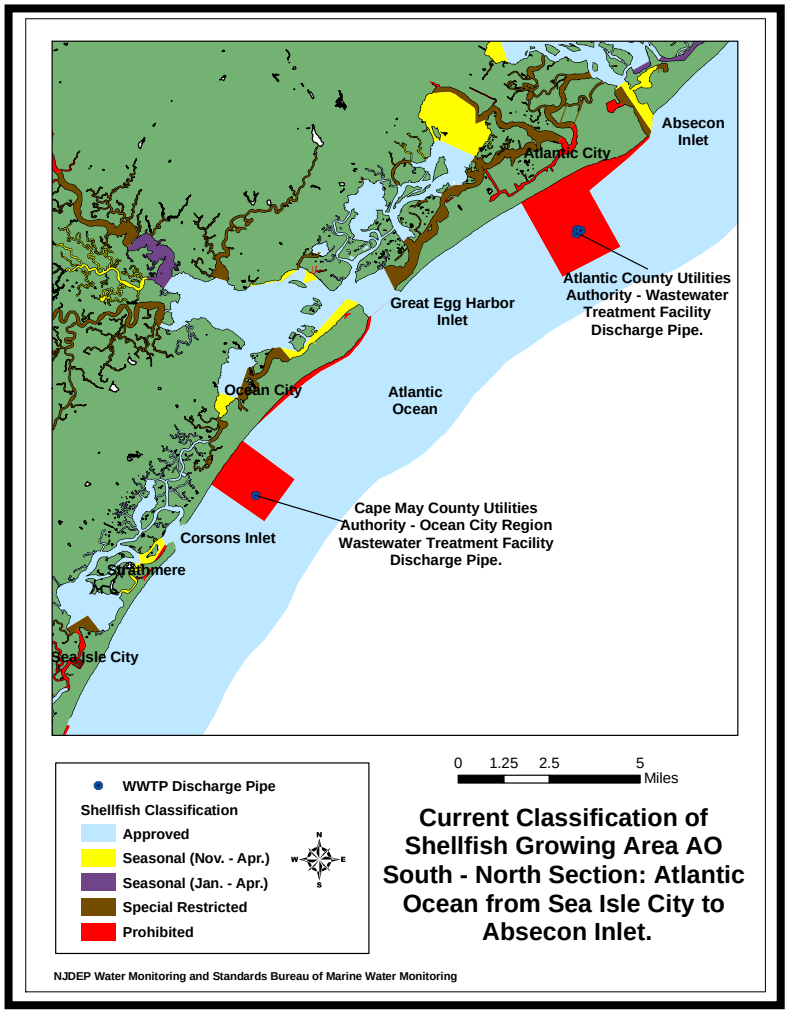
Growing Area Classification

The waters of this shellfish growing area are primarily classified as Approved and Prohibited (see pages 7 and 8 for description of shellfish classification of this area). The Prohibited shellfish classification also applies to the ocean waters immediately off the coast of Atlantic City, the north coast of Ocean City, the southern tip of Sea Isle City, the north coast of Stone Harbor, the entire coast of North Wildwood, Wildwood, and Wildwood Crest, and the City of Cape May. These areas are classified as Prohibited because they have many stormwater outfall pipes located on their coastal beaches. A small rectangle of Prohibited waters is also located off the coast of the City of Cape May in the 'Cold Spring Inlet Hopper and Bucket Dredge Disposal Area'. This area is used to dispose of the dredge spoils related to beach replenishment. Since these dredge spoils could contain shellfish that are not from Approved waters, this area is classified as a Prohibited buffer zone to prevent the harvesting of these shellfish.

A Reappraisal of the Atlantic Ocean from Cape May Point to Absecon Inlet was written in April 2002 and included water quality data from 1996 to 2001 (Wesighan, 2002). In this report, all of

the sampling stations in this shellfish growing area met the existing shellfish classification criteria as specified by the NSSP, and no classification change was recommended for this area.

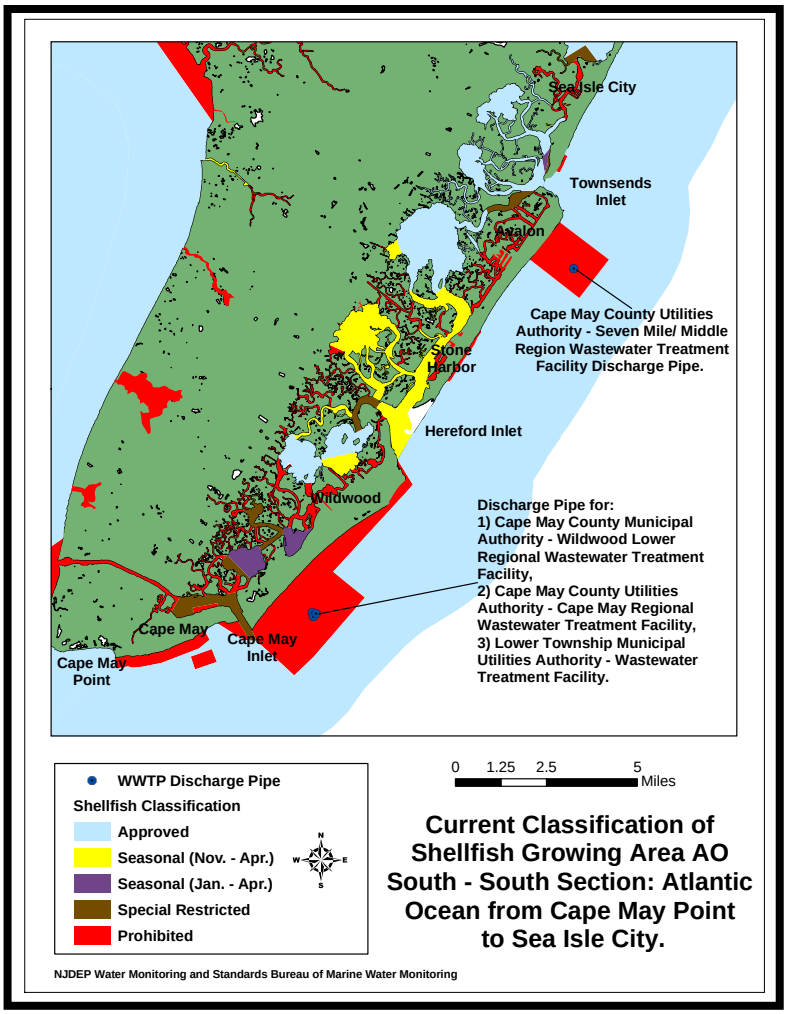
In the 2003 Annual Review of Shellfish Growing Area AO South, Sampling Station AX75A1 Surface exceeded the Approved fecal coliform criteria, year-round and in the summer. Since this sampling station was located off the northeast coast of Atlantic City in Approved shellfish waters and near Prohibited shellfish waters, the shellfish waters near this sampling station were proposed to be downgraded to the Prohibited shellfish classification (NJDEP, 2003). In the 2004 Partial Sanitary Survey of Shellfish Growing Area AO South, approximately 257 acres of these Approved shellfish waters in the Atlantic Ocean off the northeast coast of Atlantic City were downgraded to the Prohibited shellfish classification (Wesighan, 2006).



In the 2005 Annual Review of Shellfish Growing Area AO South, Sampling Station A74A Surface exceeded the Approved fecal coliform criteria, year-round and in the summer, using the 12-tube single dilution combination analysis. However, this station was sampled and analyzed using the 3 tube decimal dilution test and met the Approved shellfish water classification criteria for the 3 tube decimal dilution analysis Therefore, the shellfish waters northeast of Atlantic City near Absecon Inlet were not downgraded (NJDEP, 2005).

In the 2006 to 2013 Annual Reviews of Shellfish Growing Area AO South, all of the sampling stations in this shellfish growing area met the Approved fecal coliform shellfish classification criteria for water quality year-round, in the summer months, and in the winter months, using the fecal coliform (A-1 Medium) 3 tube analysis. There were no stations out of compliance with the existing shellfish growing water classification criteria for the Approved or Prohibited waters in the Atlantic Ocean from Cape May Point to Absecon Inlet (NJDEP, 2006, NJDEP, 2007, NJDEP, 2008).

The last full Sanitary Survey for Shellfish Growing Areas AO South: the Atlantic Ocean from Cape May Point to Absecon Inlet was written in 1997. However, a Partial Sanitary Survey of Shellfish Growing Area AO South was written in 2004 to downgrade approximately 257 acres of shellfish waters to the Prohibited shellfish classification.



Evaluation of Biological Resources

This growing area has a wide diversity of biological resources. Surf clams (Spisula solidissima), ocean quahogs (Arctica islandica), and hard clams (Mercenaria mercenaria) are the primary shellfish resource that is commercially harvested in this ocean shellfish growing area.

This shellfish growing area is also utilized for fishing and boating. Many species of finfish can be found in the ocean waters of this shellfish growing area. The important finfish species caught by marine recreational anglers are bluefin, yellowfin, and bigeye tuna; white and blue marlin; winter and summer flounder (fluke); striped bass; bluefish; sharks; little tunny; Atlantic bonito; black sea bass; tautog (blackfish); mackerel; gray sea trout (weakfish) and cod (Weinstein, 2001). In 1991, the striped bass was classified as a gamefish in New Jersey, and this status prevents the commercial harvest or sale of this first coastal saltwater species designated as such in New Jersey (Bochenek, 2000).

Wildlife populations of birds and animals could have an impact on the water quality of this shellfish growing area. However, they are not known to be actual contributors to the water quality in the Atlantic Ocean from Cape May Point to Absecon Inlet. Birds sometimes may accumulate around the groins, jetties, seawalls, and bulkheads on the coast of this ocean shellfish growing area, and fecal matter from these birds could affect the water quality.

SHORELINE SURVEY: EVALUATION OF POTENTIAL POLLUTION SOURCES

Shoreline Survey

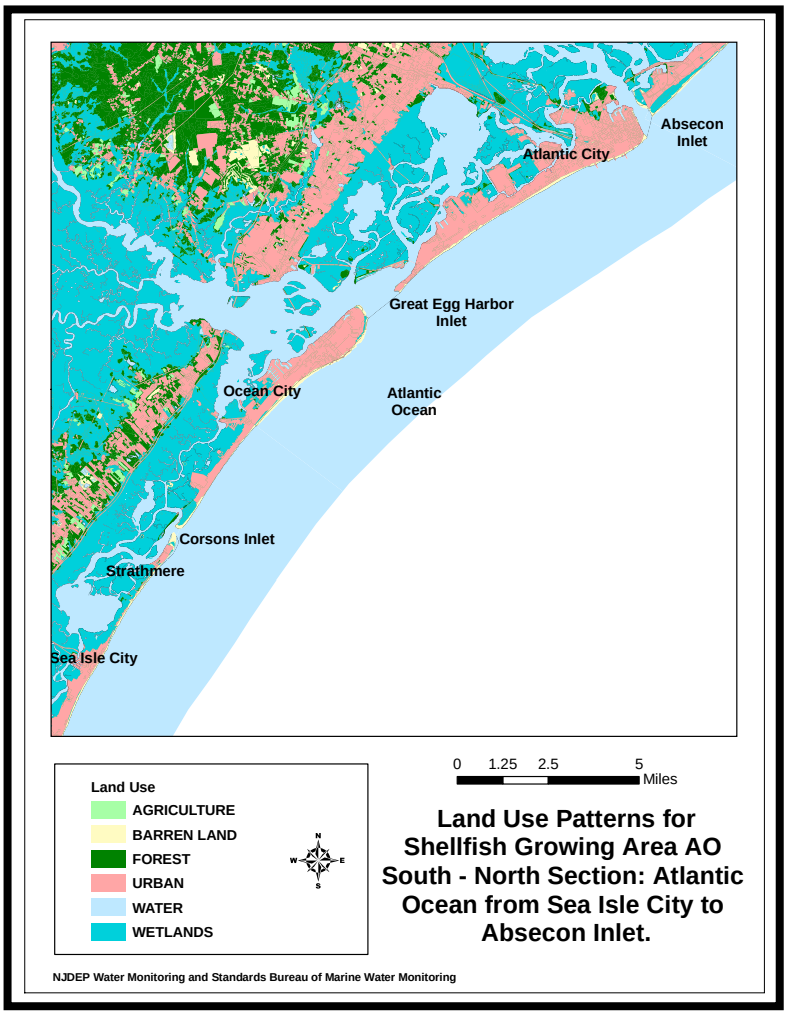
The shoreline survey for Shellfish Growing Area AO South: the Atlantic Ocean from Cape May Point to Absecon Inlet was done on May 25, 2014 during an aerial surveillance of the New Jersey coast. During the shoreline survey conducted in and around the Atlantic Ocean between Cape May Point and Absecon Inlet, no evidence could be seen that direct and indirect discharges from potential sources of pollution draining into this shellfish growing area are having an impact on the water quality.

There have been minor changes to this area since the 2004 partial sanitary survey of this shellfish growing area. The cover photo of the Absecon Inlet north of Atlantic City was taken during the shoreline survey of this shellfish growing area on May 25, 2014.

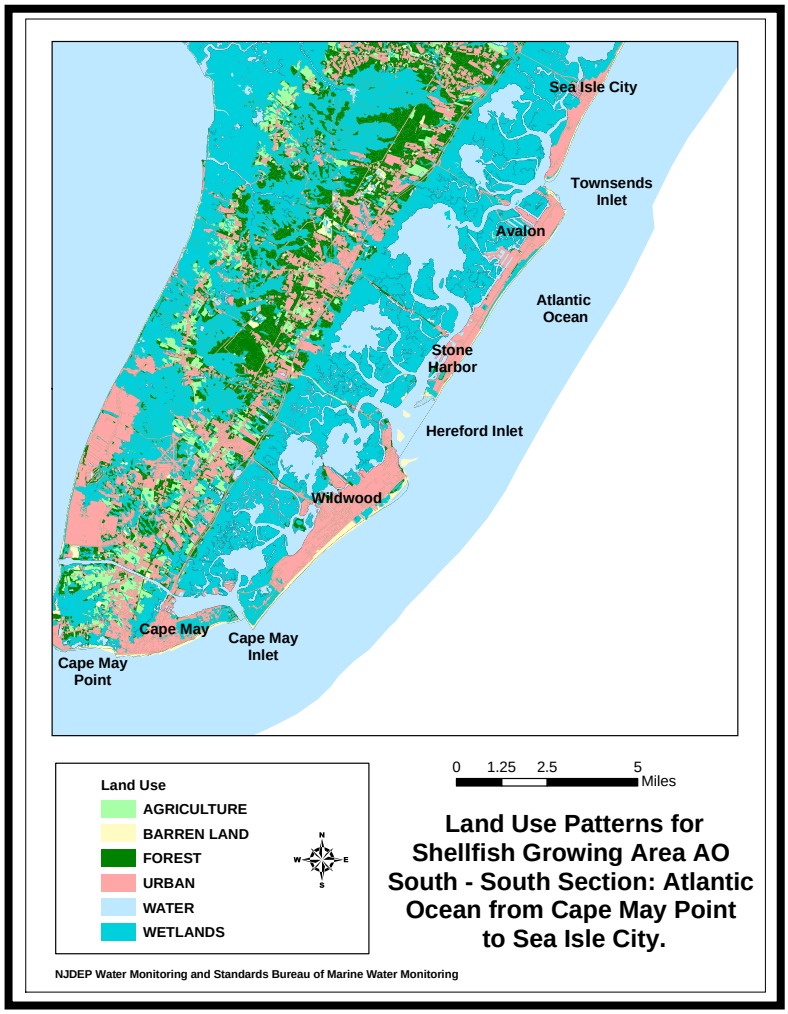
Land Use

The major land use patterns for the municipalities adjacent to this shellfish growing area are urban, with some wetland areas and a few forest areas (see figures on pages 10 and 11). The developed urban areas are located on the barrier islands along the coast, and include Atlantic City, Ventnor, Margate, Longport, Ocean City, Strathmere, Sea Isle City, Avalon, Stone Harbor, North Wildwood, Wildwood, and Wildwood Crest. Cape May and Cape May Point are also urban areas, and are located in an area that could be considered a barrier island (the Cape May Canal separates these municipalities from the mainland, and creates a barrier island that extends from the Atlantic Ocean into the Delaware Bay). These urban areas also have recreational bathing beaches bordering this shellfish growing area.

Atlantic City, in the north section of this shellfish growing area, is a major urban area with a large resident population. Almost all of Atlantic City has been heavily developed, with a very high population density. The urban area of Atlantic City also extends into Ventnor, Margate, and Longport. The presence of the multi-million dollar casino and entertainment industry has been directly responsible for the expanding urban development to the Atlantic City area, and this area is reaching saturation levels of urban land use.



The remaining communities along the New Jersey coast are known for their recreational bathing beaches, the summer tourism industry, and the seasonal boating and fishing activities. These areas are more urban-residential communities, with some commercial businesses. The populations in these areas fluctuate greatly, especially during the summer months. Population pressures during the summer months can have an impact on the water quality of the coastal waters in this shellfish growing area. However, since surf clams are only harvested during the winter months, these summer activities would not have a significant impact to the water quality of this shellfish growing area.



Identification and Evaluation of Potential Pollution Sources

There are four permitted municipal point source discharges in Area AO South (Cape May Point to Absecon Inlet) and they are: 1) the Atlantic County Utilities Authority – Wastewater Treatment Facility Discharge Pipe, 2) the Cape May County Utilities Authority – Ocean City Region Wastewater Treatment Facility Discharge Pipe, 3) the Cape May County Utilities Authority – Seven Mile/ Middle Region Wastewater Treatment Facility Discharge Pipe, and 4) the Cape May County Municipal Authority – Wildwood Lower Regional Wastewater Treatment Facility Discharge Pipe, which includes the discharges from the Cape May County Utilities Authority – Cape May Regional Wastewater Treatment Facility and the discharges from the Lower Township Municipal Utilities Authority – Wastewater Treatment Facility (see Table 5 and Figures 15 and 16).

There are several indirect ground and surface water discharges, many known contaminated sites, and eight solid waste landfills located in this shellfish growing area. However, there is no evidence that they currently impact the shellfish growing water

quality. Since there is a potential for pollutant inputs from these indirect sources to get into these shellfish growing waters, it is important to continue monitoring the water quality of these areas to determine the presence or absence of these indirect sources of pollution (APHA, 1995).

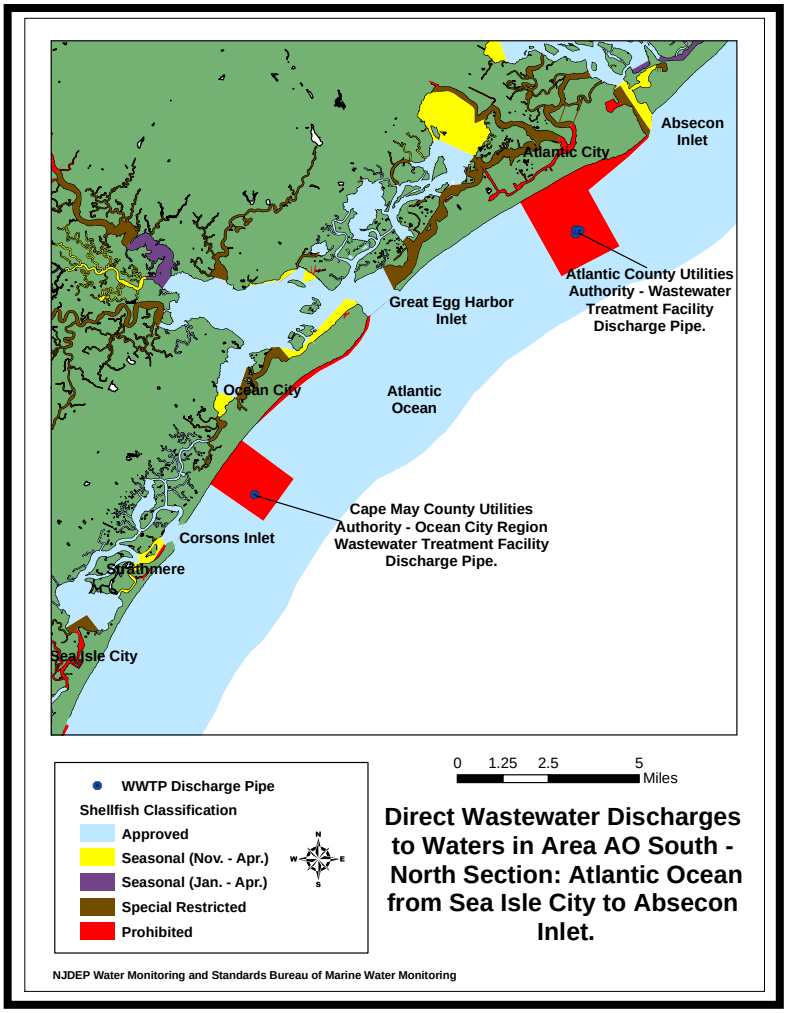
Wastewater Treatment Facilities

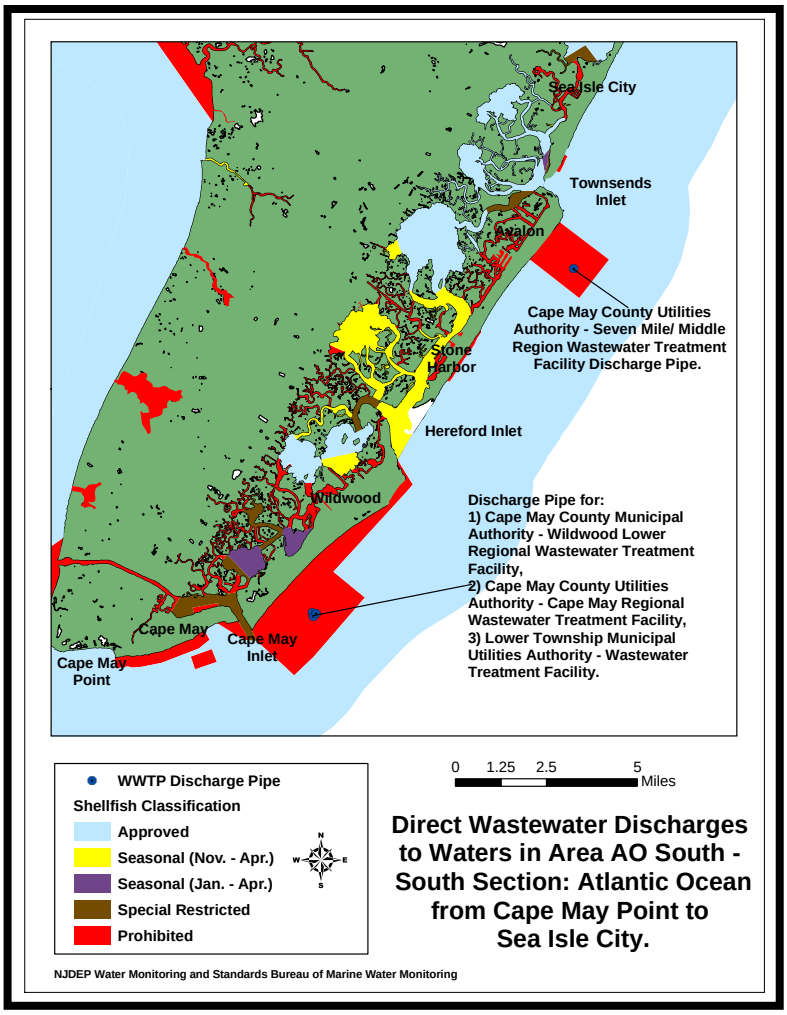
The Atlantic County Utilities Authority – Wastewater Treatment Facility uses an activated sludge system to provide secondary treatment to effluent, and the wastewater discharge pipe extends approximately 8,700 feet into the Atlantic Ocean near Raleigh Avenue in Atlantic City to a diffuser pipe. The Cape May County Utilities Authority – Ocean City Region Wastewater Treatment Facility uses rotating biological contactors to provide secondary treatment to effluent, and the discharge pipe extends approximately 6,081 feet into the Atlantic Ocean near 46th Street in Ocean City.

The Cape May County Utilities Authority - Seven Mile/ Middle Region Wastewater Treatment Facility also uses rotating biological contactors for secondary treatment of effluent, and the discharge pipe extends approximately one mile into the Atlantic Ocean near Avalon. The Cape May County Municipal Authority – Wildwood Lower Regional Wastewater Treatment Facility also uses rotating biological contactors to treat effluent. The Cape May County Utilities Authority – Cape May Regional Wastewater Treatment Facility uses rotating biological contactors to provide secondary treatment to effluent, and the Lower Township Municipal Utilities Authority - Wastewater Treatment Facility uses an activated sludge system to provide secondary treatment to effluent. All three of these wastewater treatment facilities share the same discharge pipe and the discharge pipe extends approximately 5,500 feet into the Atlantic Ocean near Jefferson Avenue in Wildwood Crest.

Map Key	Discharge	Waste Type	Waste Quantity (MGD)
1	Atlantic County Utilities Authority – Wastewater Treatment Facility	Residential Wastewater	40.0
2	Cape May County Utilities Authority – Ocean City Region Wastewater Treatment Facility	Residential Wastewater	8.2
3	Cape May County Utilities Authority – Seven Mile/ Middle Region Wastewater Treatment Facility	Residential Wastewater	7.67
4	Cape May County Municipal Authority – Wildwood Lower Regional Wastewater Treatment Facility, including the flows from: Cape May County Utilities Authority – Cape May Regional Wastewater Treatment Facility Lower Township Municipal Utilities Authority – Wastewater Treatment Facility	Residential Wastewater Residential Wastewater Residential Wastewater	14.18 3.0 4.0

.


Absecon Inlet
Atlantic City
Atlantic County Utilities Authority - Wastewater Treatment Facility Discharge Pipe.
Great Egg Harbor Inlet
Ocean City
Atlantic Ocean
Cape May County Utilities Authority - Ocean City Region Wastewater Treatment Facility Discharge Pipe.
Corsons Inlet
Strathmere
Sea Isle City
WWTP Discharge Pipe
Shellfish Classification
Approved
Seasonal (Nov. - Apr.)
Seasonal (Jan. - Apr.)
Special Restricted
Prohibited
N
W
E
S
0 1.25 2.5 5
Miles
Direct Wastewater Discharges to Waters in Area AO South - North Section: Atlantic Ocean from Sea Isle City to Absecon Inlet.
NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring



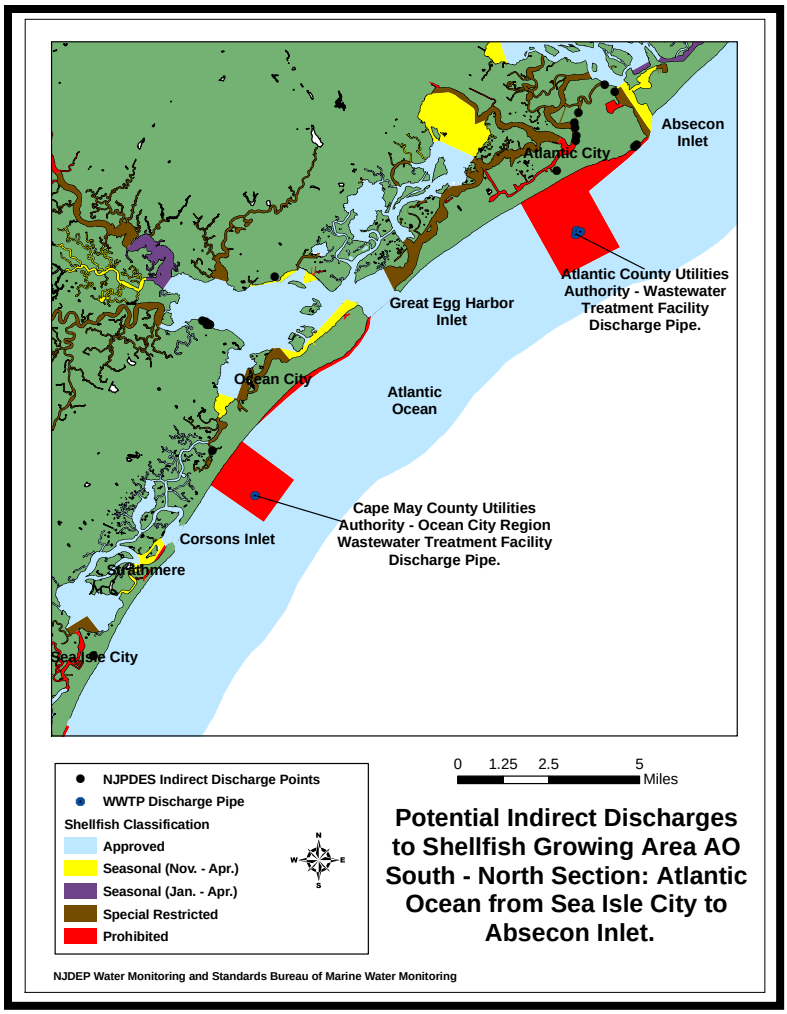
Potential Indirect Discharges

There are many potential indirect discharges located in this shellfish growing area. The major concentrations of these indirect ground and surface water discharges are located in Atlantic City in Atlantic County; and in Ocean City, North Wildwood, Wildwood, Lower Township, Cape May, and Cape May Point in Cape May County. These potential indirect discharges are from many sources, such as service stations, municipal utility authority facilities, the Borden Snow seafood processing plant in Lower Township, and the Cape May Desalination Project in Cape May.

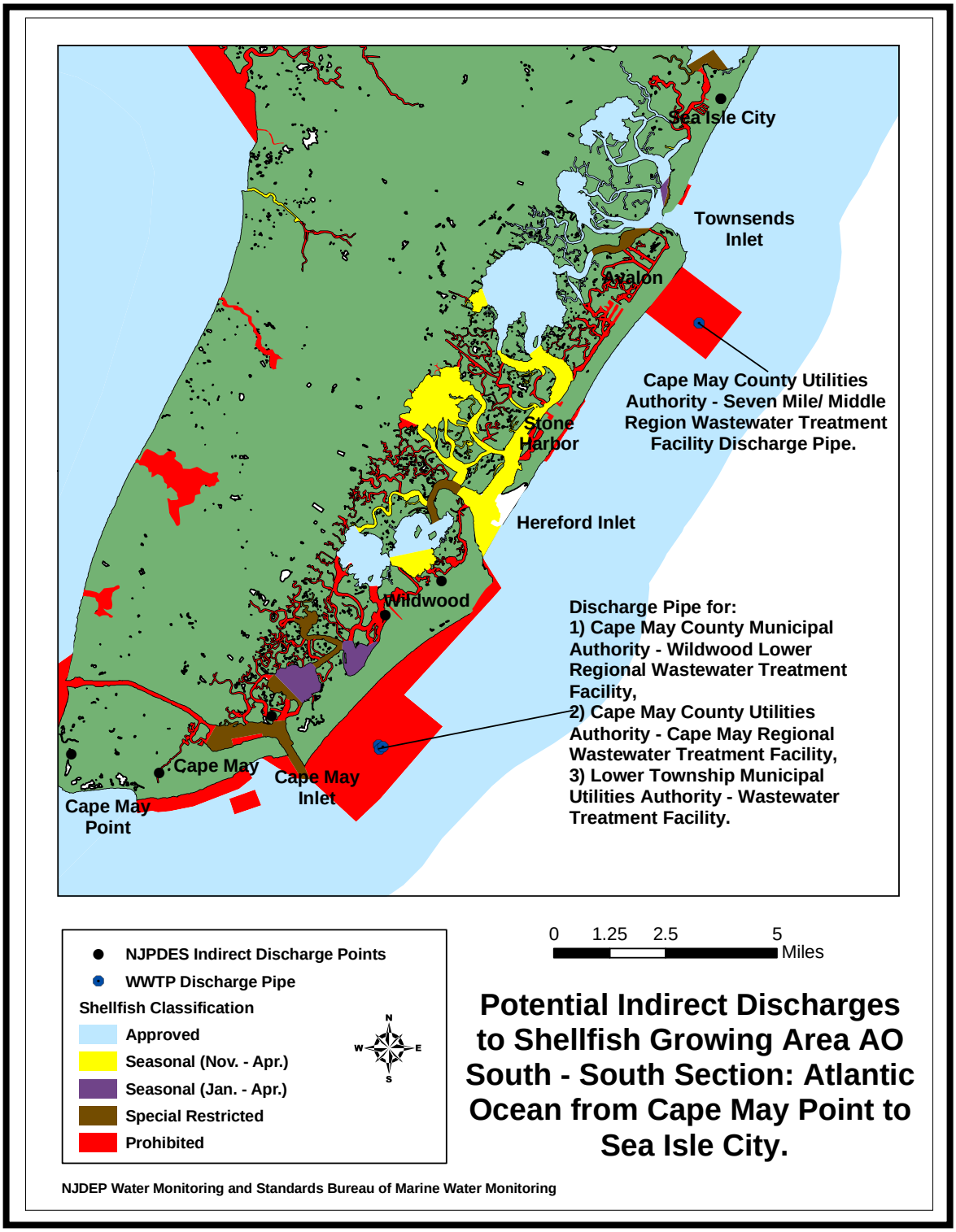
This shellfish growing area, which extends from Cape May Point in Cape May County to Absecon Inlet in Atlantic County, has several known contaminated sites located in the adjacent areas. The major concentrations of these known contaminated sites are located in Atlantic City, Ventnor, Margate, and Longport in Atlantic County, and in Ocean City, Upper Township, Sea Isle City, Avalon, North Wildwood, Wildwood, Wildwood Crest, Lower Township, Cape May, and Cape May Point in Cape May County. The primary

causes of these known contaminated sites are from leaking underground storage tanks or sewage spills. Most of these known contaminated sites are now closed.

There are eight solid waste landfills located adjacent to this shellfish growing area. These landfills are the Atlantic City Sanitary Landfill (located in northwest Atlantic City in Atlantic County), the Margate City Landfill (located in northwest Margate City in Atlantic County), The Ocean City Sanitary Landfill (located in southern Ocean City in Cape May County), the Sea Isle City Landfill (located in northern Sea Isle City in Cape May County), the Anglesea Beach Landfill (located in North Wildwood in Cape May County), the Wildwood City Sanitary Landfill (located in northwest Wildwood), Smith's Landfill – Lower Township (located in Lower Township northeast of Cape May Point in Cape May County), and the Harbison – Walker Landfill (located in Lower Township northwest of Cape May Point in Cape May County).

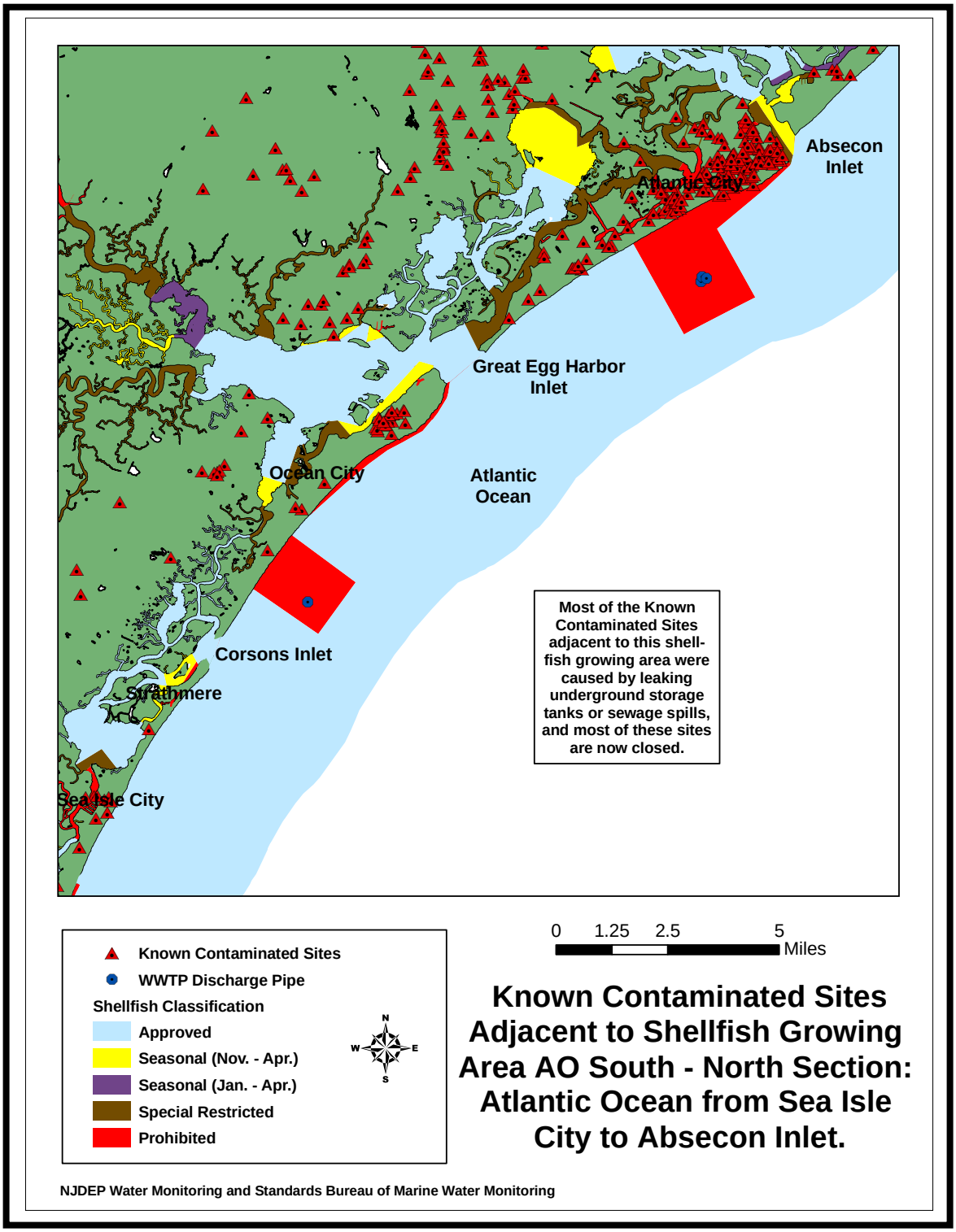


The potential indirect discharges, the currently active known contaminated sites, and the solid waste landfills have the potential to impact the water quality of this shellfish growing area. Therefore, the water quality in the Atlantic Ocean from Cape May Point to Absecon Inlet is constantly monitored to determine the presence or absence of these contaminants..



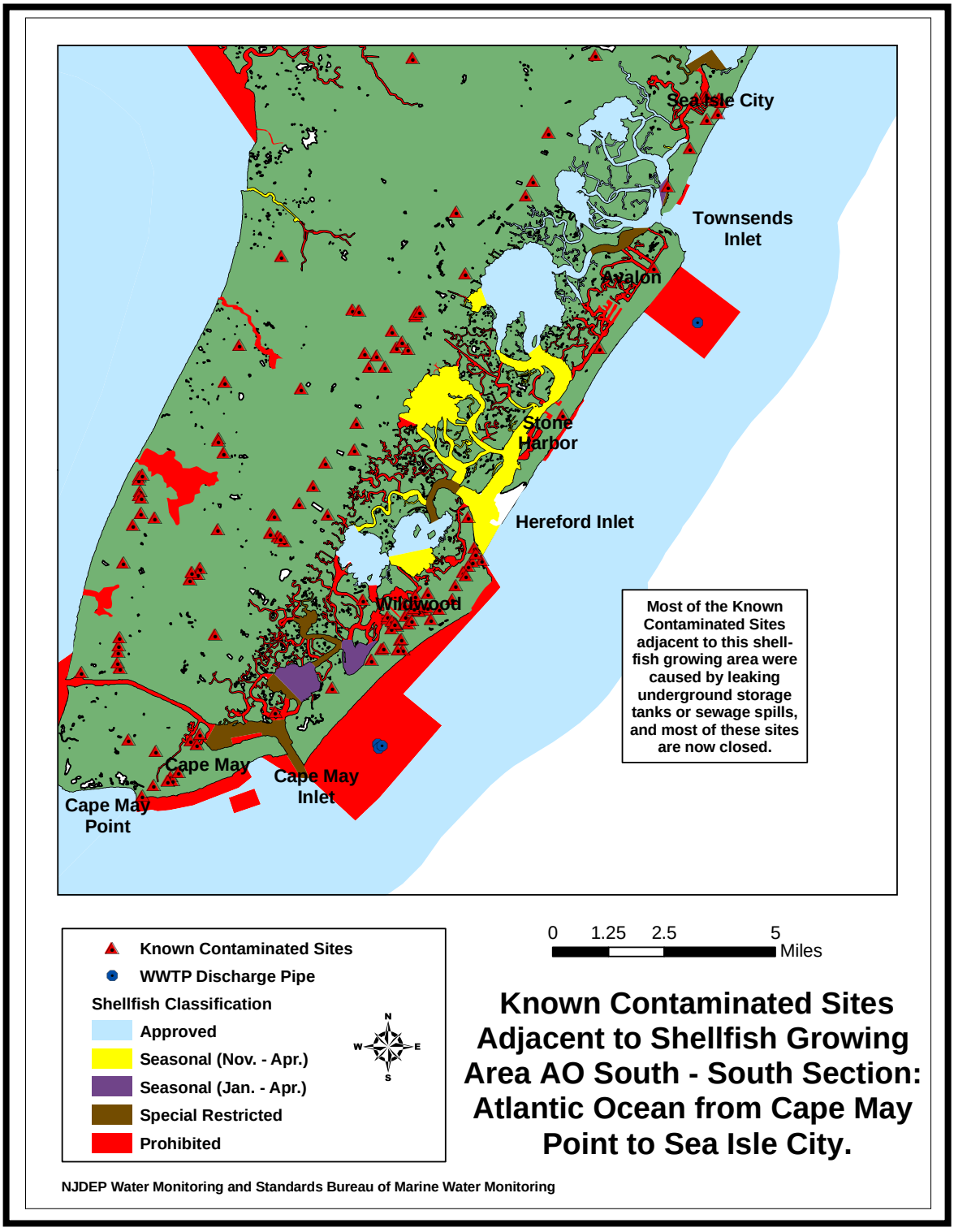
Potential Indirect Discharges to Shellfish Growing Area AO South - South Section: Atlantic Ocean from Cape May Point to Sea Isle City.

NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring



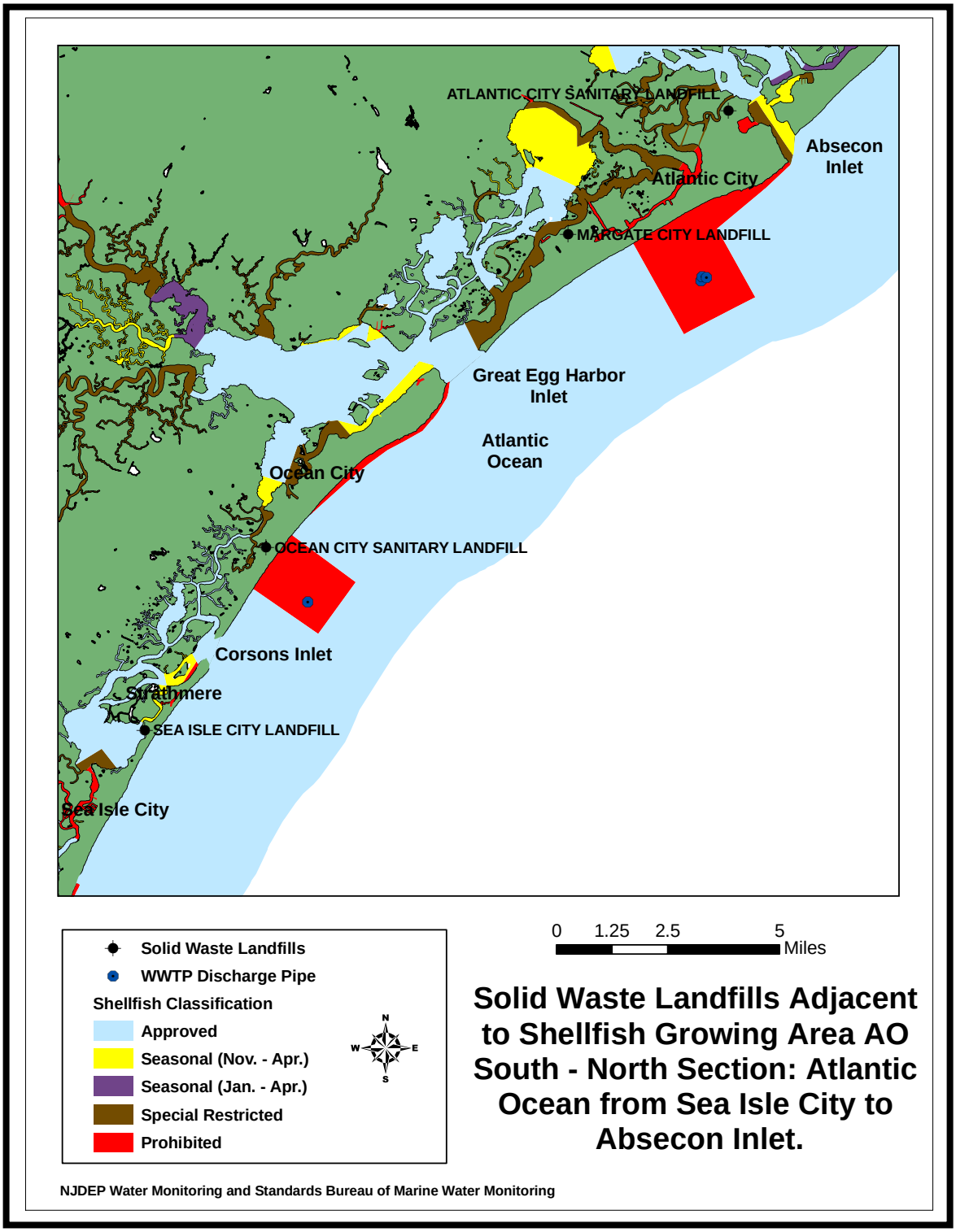
Known Contaminated Sites Adjacent to Shellfish Growing Area AO South - North Section: Atlantic Ocean from Sea Isle City to Absecon Inlet.

NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring



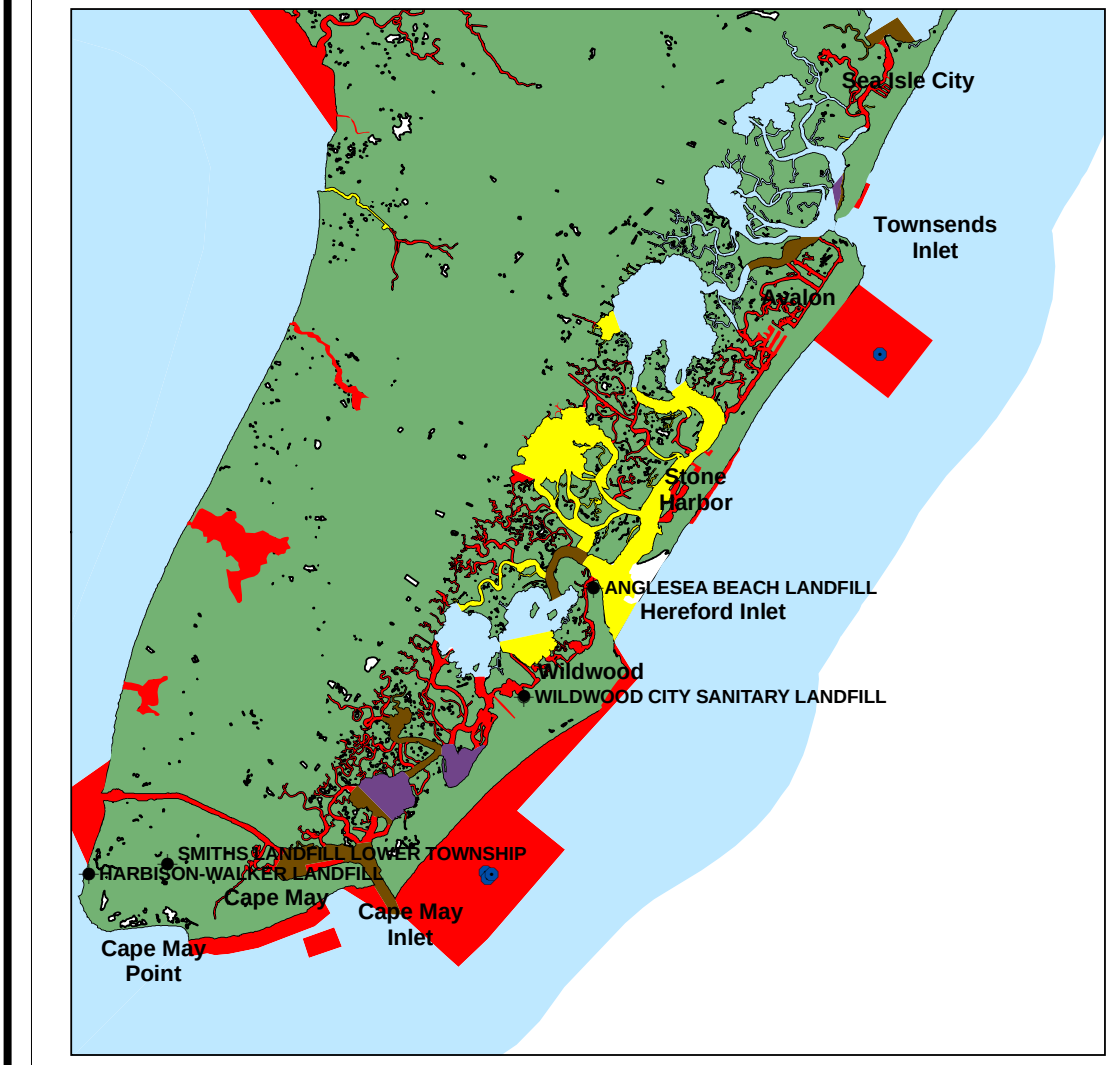
Known Contaminated Sites Adjacent to Shellfish Growing Area AO South - South Section: Atlantic Ocean from Cape May Point to Sea Isle City.

NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring



Solid Waste Landfills Adjacent to Shellfish Growing Area AO South - North Section: Atlantic Ocean from Sea Isle City to Absecon Inlet.

NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring

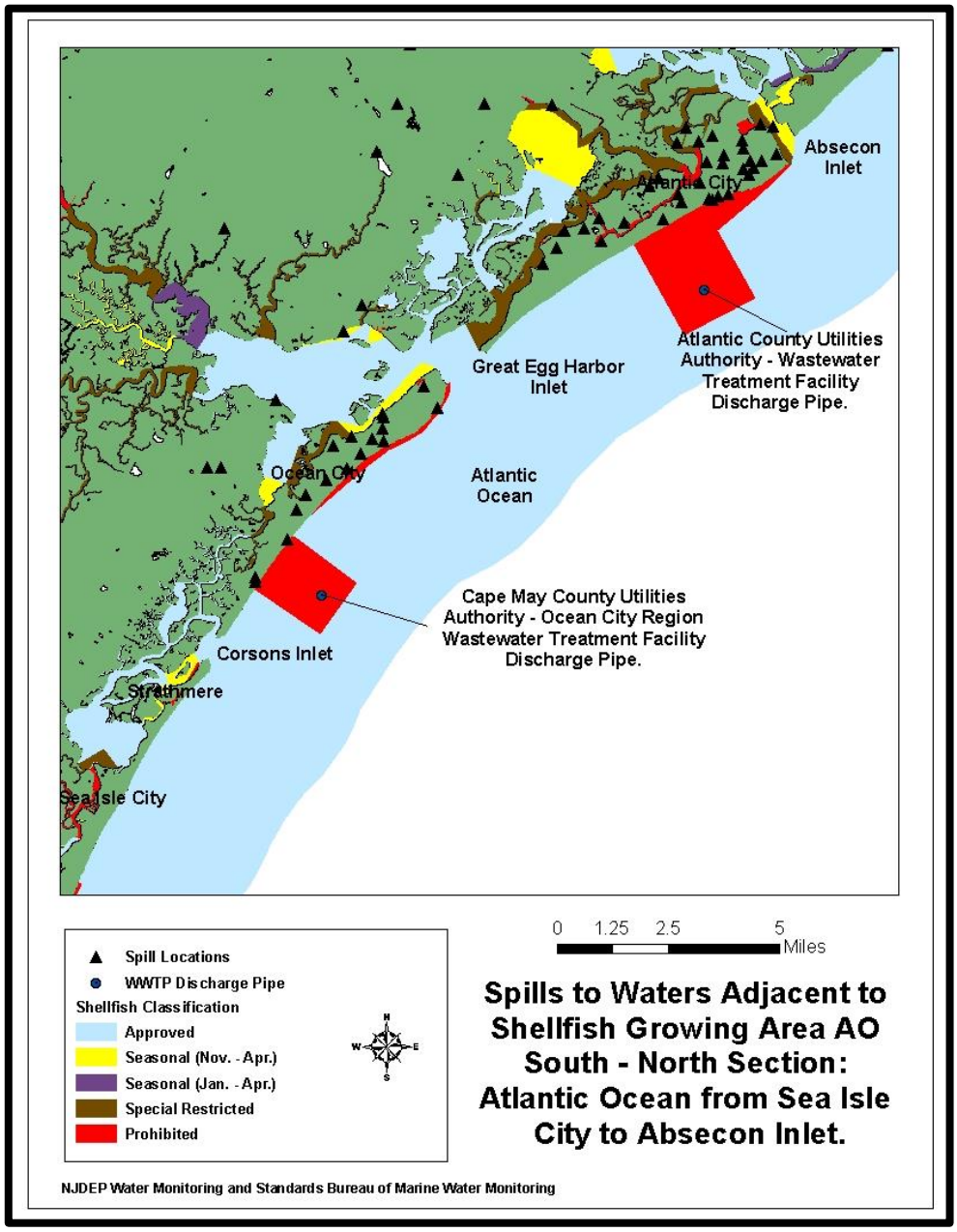


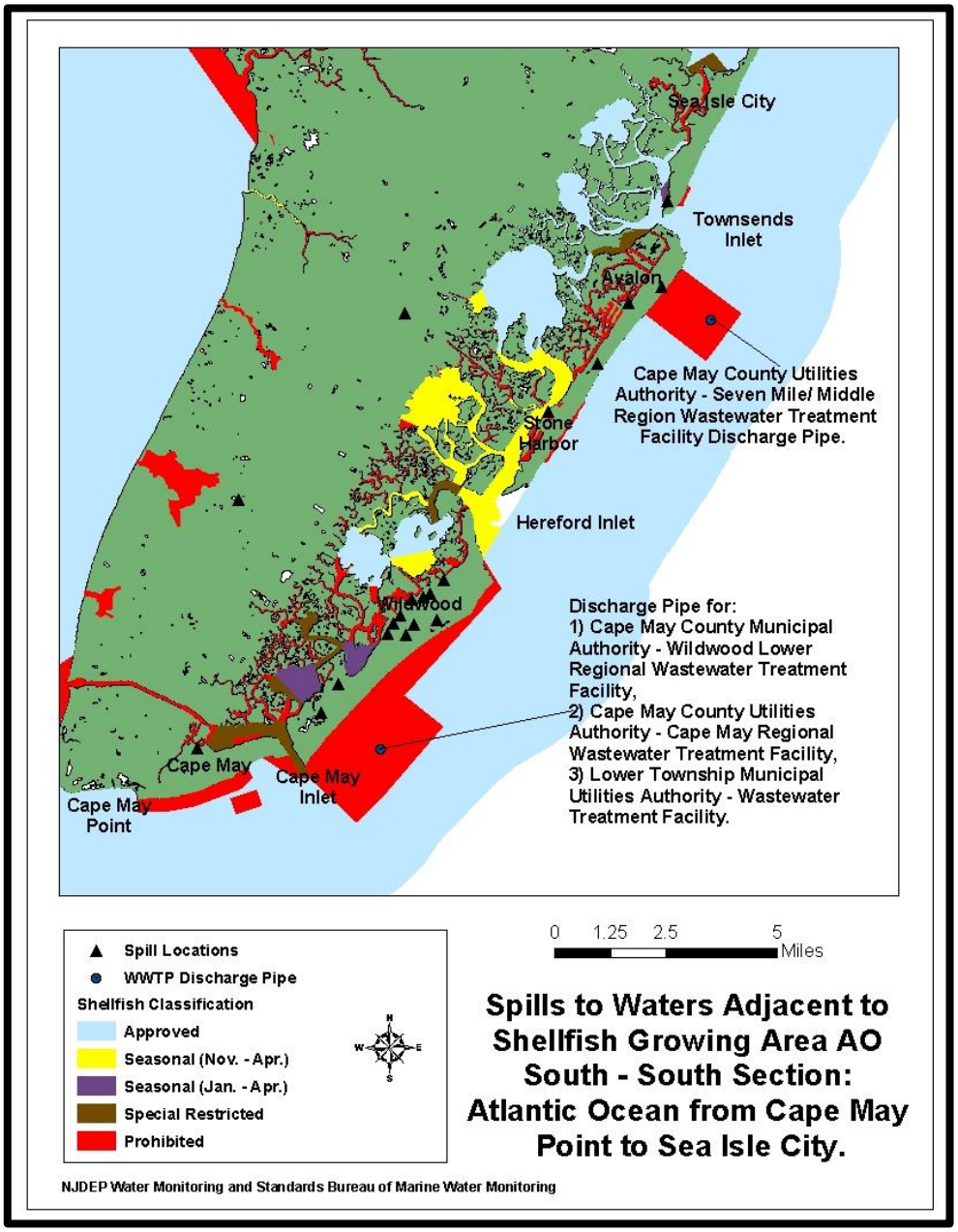
Solid Waste Landfills Adjacent to Shellfish Growing Area AO South - South Section: Atlantic Ocean from Cape May Point to Sea Isle City.

NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring

Spills, Unpermitted Discharges, and Closures

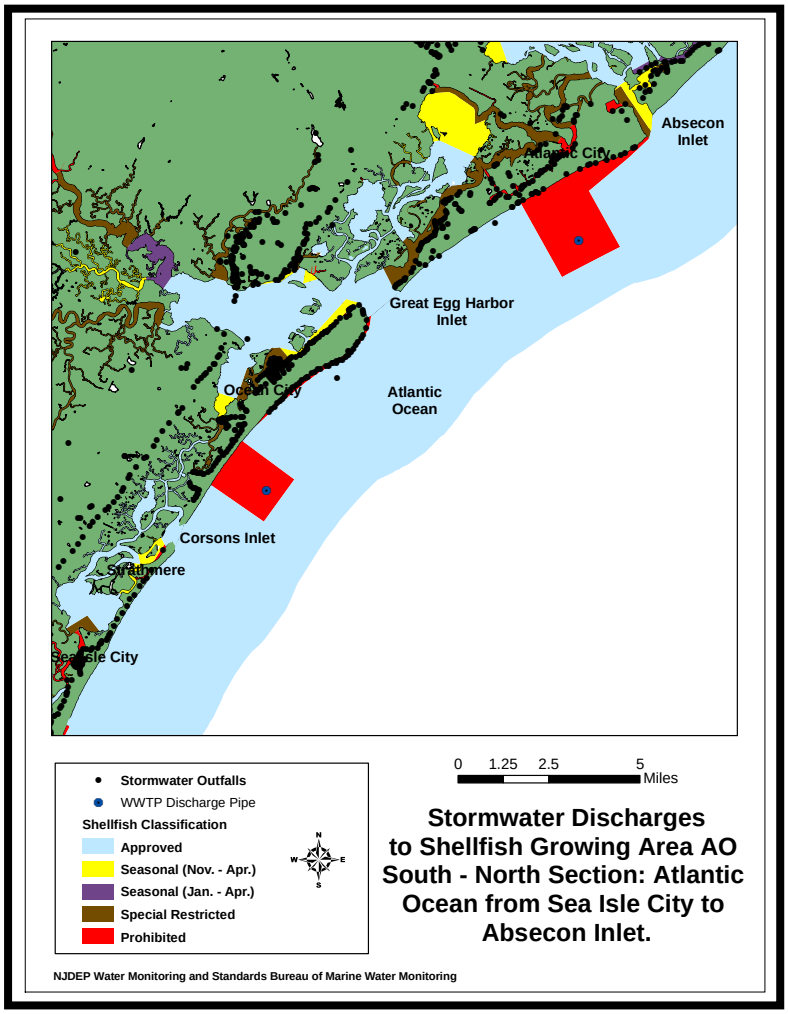
The locations of all reported spills to the waters in this shellfish growing area can be seen in the figures on pages 22 and 23. Of the major spills reported for this shellfish growing area during the time period of this report (2008 to 2014), none of these spills were known to have impacted the water quality of this ocean growing area and there were no shellfish closures of this shellfish growing area due to possible impacts by these spills.



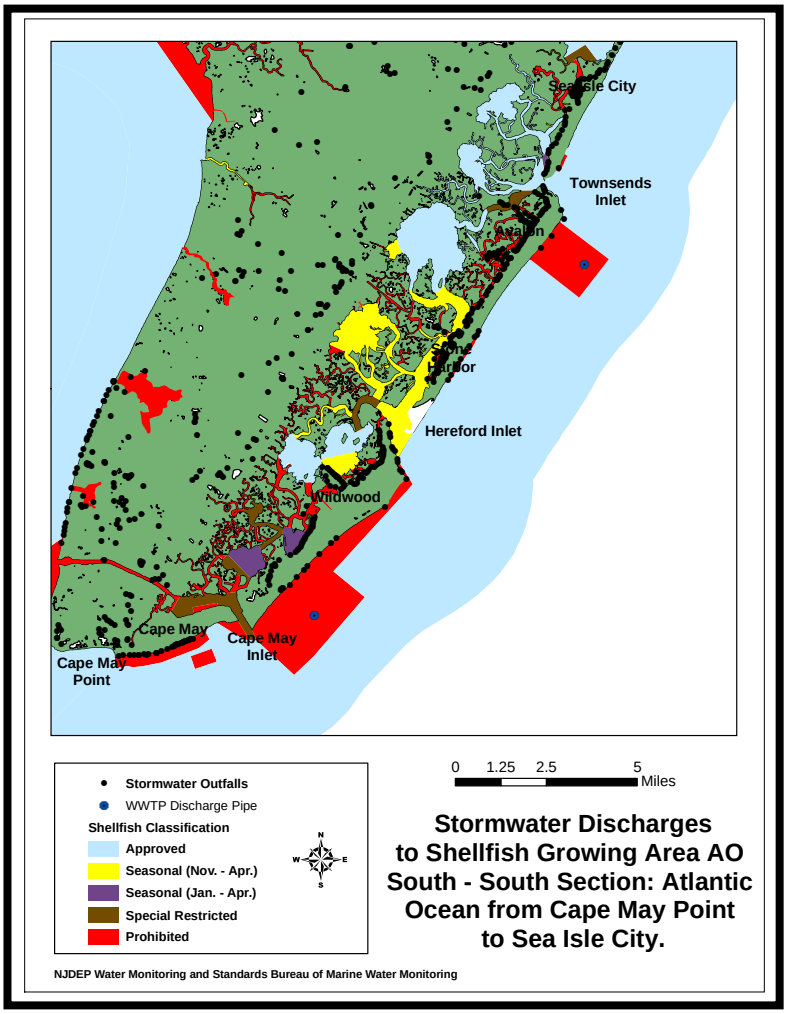

Sea Isle City
Townsends Inlet
Avalon
Cape May County Utilities Authority - Seven Mile/ Middle Region Wastewater Treatment Facility Discharge Pipe.
Stone Harbor
Hereford Inlet
Wildwood
Discharge Pipe for:
1) Cape May County Municipal Authority - Wildwood Lower Regional Wastewater Treatment Facility,
2) Cape May County Utilities Authority - Cape May Regional Wastewater Treatment Facility,
3) Lower Township Municipal Utilities Authority - Wastewater Treatment Facility.
Cape May
Cape May Inlet
Cape May Point
Spill Locations
WWTP Discharge Pipe
Shellfish Classification
Approved
Seasonal (Nov. - Apr.)
Seasonal (Jan. - Apr.)
Special Restricted
Prohibited
0 1.25 2.5 5
Miles
Spills to Waters Adjacent to Shellfish Growing Area AO South - South Section: Atlantic Ocean from Cape May Point to Sea Isle City.
NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring

Stormwater Discharges

The stormwater inputs to this shellfish growing area are the result of rainwater, which would normally be absorbed into vegetated soils and used to recharge aquifers, maintain stream base flow, and maintain waterway health, instead being collected on top of impervious surfaces, such as parking lots, rooftops, and roadways, and then temporarily collected in detention basins, and finally dumped into streams, creeks, wetlands, lakes, bays, and rivers. This runoff can carry a variety of waste materials, such as domestic and wild animal fecal materials, petroleum and other toxic materials spilled from automobiles, and fertilizer and pesticide materials used on neighboring lots.



There are many stormwater outfalls located along the coastline that borders this shellfish growing area. Most of these stormwater outfalls are located along the coastal beaches of Atlantic City, Ventnor, Margate, Longport, Ocean City, Strathmere, Sea Isle City, Avalon, Stone Harbor, North Wildwood, Wildwood, Wildwood Crest, Cape May, and Cape May Point. Prohibited shellfish zones are located along the coastal beaches of these municipalities to minimize the impacts of these stormwater outfalls to the water quality of this shellfish growing area. However, there is no current evidence from water quality and bathing beach data that these shellfish growing waters are directly impacted by the outflow from these stormwater outfalls.

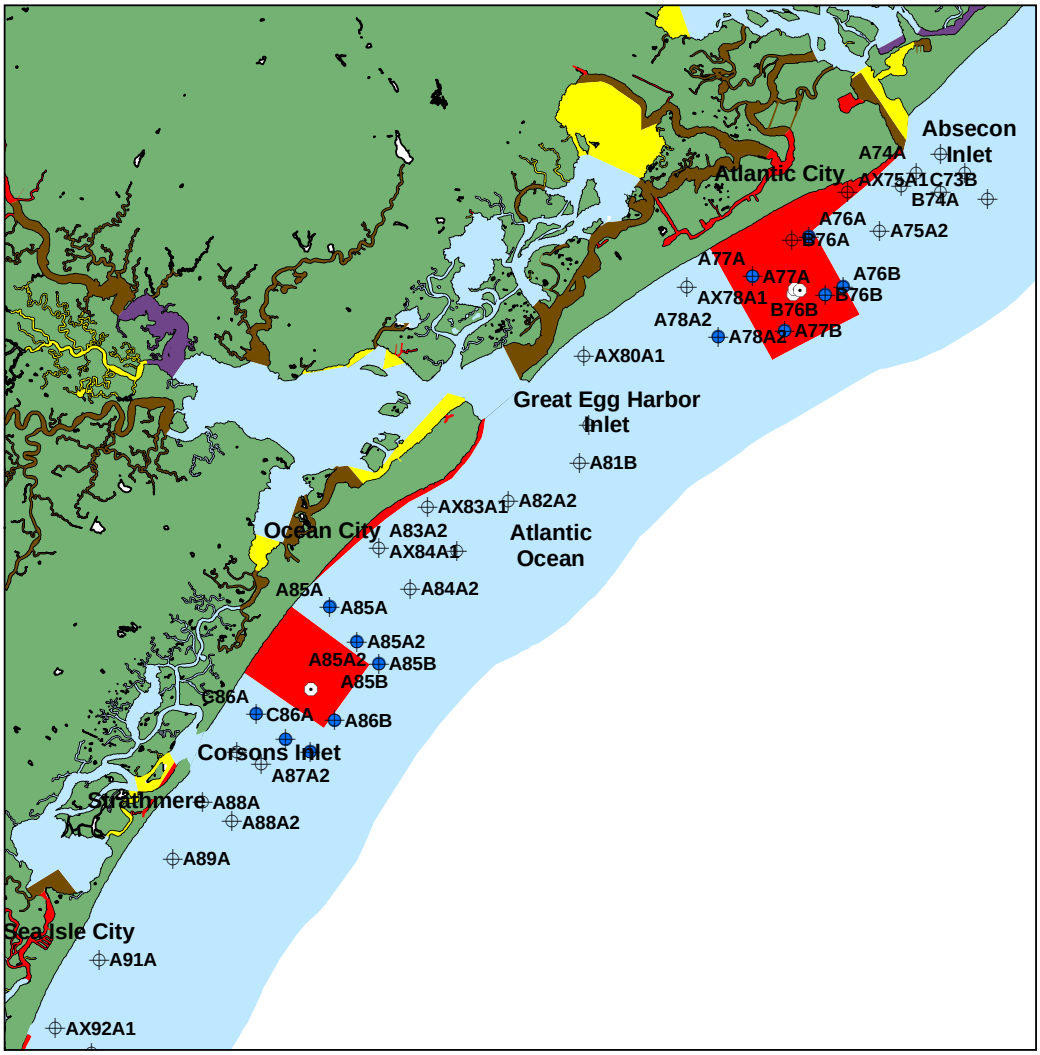


WATER QUALITIES STUDIES

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, 2007*. This shellfish growing area could possibly be impacted by the discharges from the sewage treatment facility in this area or combined sewer overflows; therefore, it was sampled under the Adverse Pollution Condition (APC) Strategy.

Water sampling was performed in accordance with the Field Procedures Manual (NJDEP, 2005). From 2008 through 2014, approximately 2,067 water samples were collected for fecal coliform bacteria from 91 monitoring stations. The locations of these stations are shown in the map below. These samples were analyzed by using the fecal coliform mTEC 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 2011. 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: ARC map).



Stations for Ocean Surface Water Sampling
Stations for Ocean Bottom Water Sampling
WWTP Discharge Pipe

Shellfish Classification

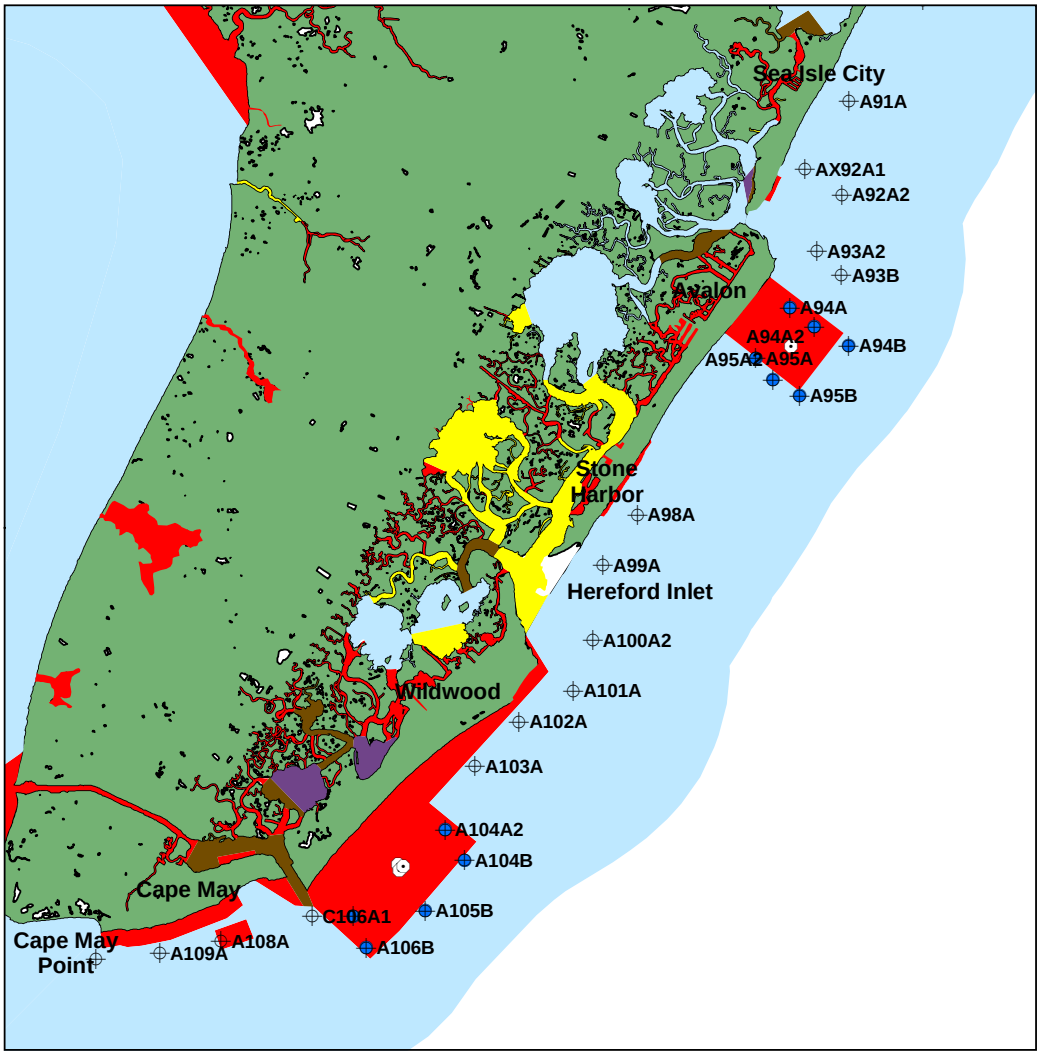
Approved
Seasonal (Nov. - Apr.)
Seasonal (Jan. - Apr.)
Special Restricted
Prohibited

N
W
E
S

0 1.25 2.5 5 Miles

Location of Sampling Stations in Shellfish Growing Area AO South - North Section: Atlantic Ocean from Sea Isle City to Absecon Inlet.

NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring



Location of Sampling Stations in Shellfish Growing Area AO South - South Section: Atlantic Ocean from Cape May Point to Sea Isle City.

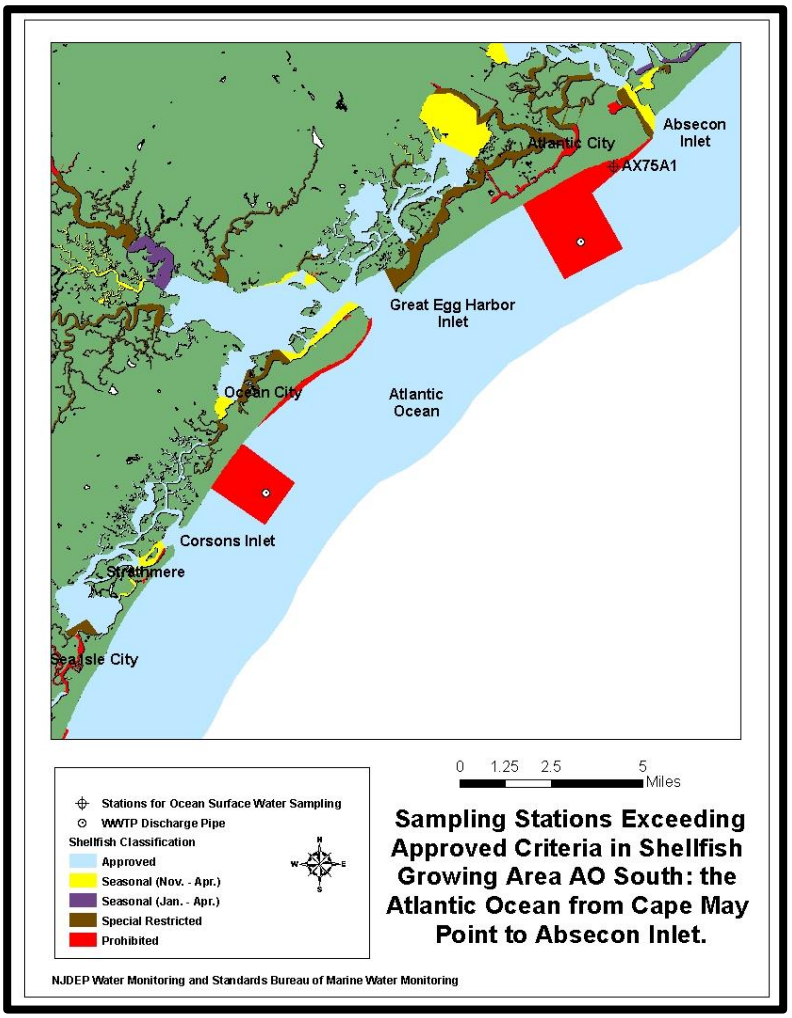
NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring

Bacteriological Quality

This report includes data analyzed from January 2008 to May 2014. This shellfish growing area is composed of four assignment areas, (Assignments 401, 421, 431, and 441) and is sampled using the Adverse Pollution Condition (APC) sampling strategy year-round. The preceding two figures show all of the sampling stations for this area. The raw data listings for each sampling station, in accordance with the National Shellfish Sanitation Program (NSSP), are at the end of this report in the Appendix.

Compliance with NSSP APC Criteria

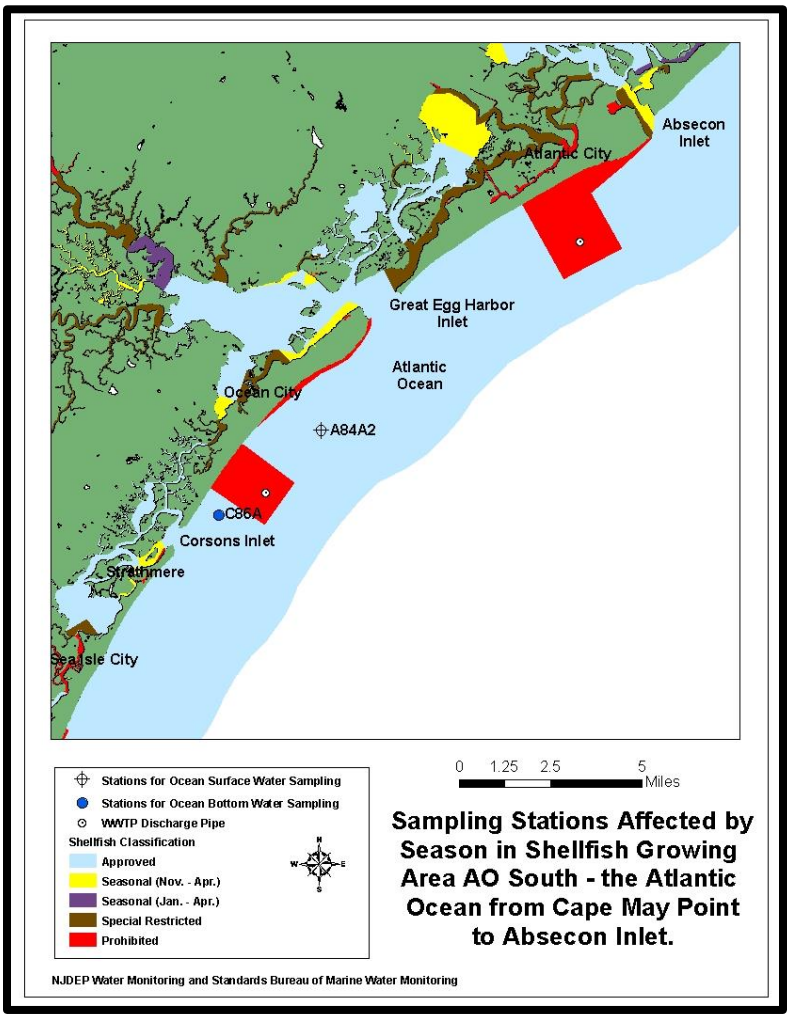
Most of the sampling stations in this shellfish growing area met the *Approved* shellfish classification criteria, year-round, in the summer, and in the winter. Therefore, most of the sampling stations in this area were in compliance with their existing shellfish classification criteria. There was one station (**AX75A1 Surface**) that exceeded the NSSP shellfish classification criteria for water quality in the *Approved* waters of this shellfish growing area. However, this station is located in *Prohibited* waters off the coast of Atlantic City and meets the *Prohibited* shellfish classification.



Seasonal Effects

As the earth experiences variations in the tilt of its axis and its revolution around the sun, it goes through seasonal phases of summer, spring, autumn, and winter. These seasonal phases cause much variation in the atmosphere of the earth, resulting in changes in weather patterns. Temperature, precipitation, wind, and the general circulation of the atmosphere have seasonal variations that also affect the marine environment (Ingmanson and Wallace, 1989). Seasonal variation may also be the result of a variety of conditions, including specific agricultural land-use practices, biological activity, stream flow and/or sediment.

To determine whether seasonal variation can influence bacteria counts, WM&S/BMWM uses a t-test to compare the fecal coliform MPN values from samples collected during the summer season versus samples collected during the winter months Based on the t-test results, two (2) monitoring stations had a t-statistical probability of less than 0.05. These monitoring stations showed a higher geometric mean during the winter than during the summer. This shellfish growing area was sampled with no seasonal preference.



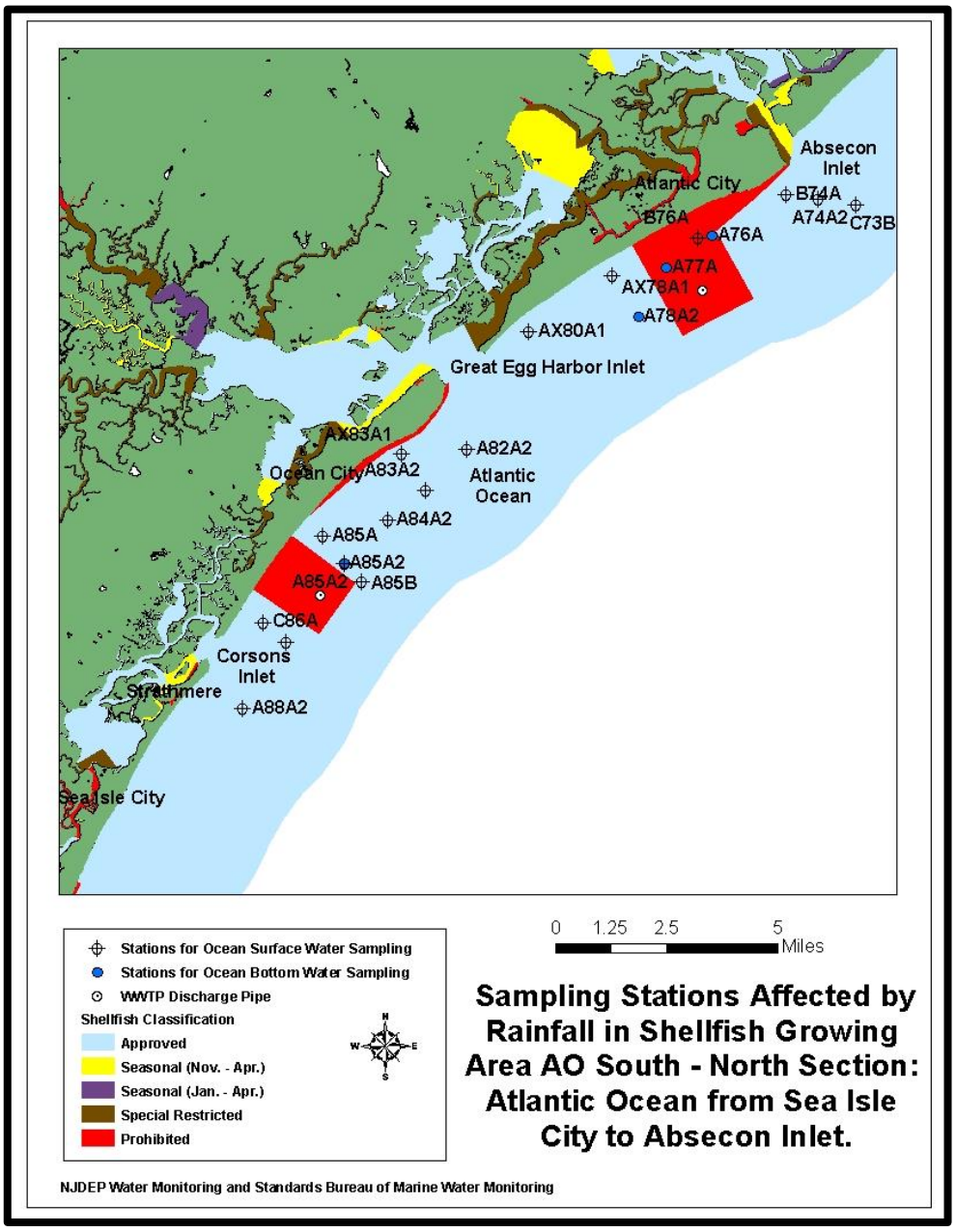
Rainfall Effects

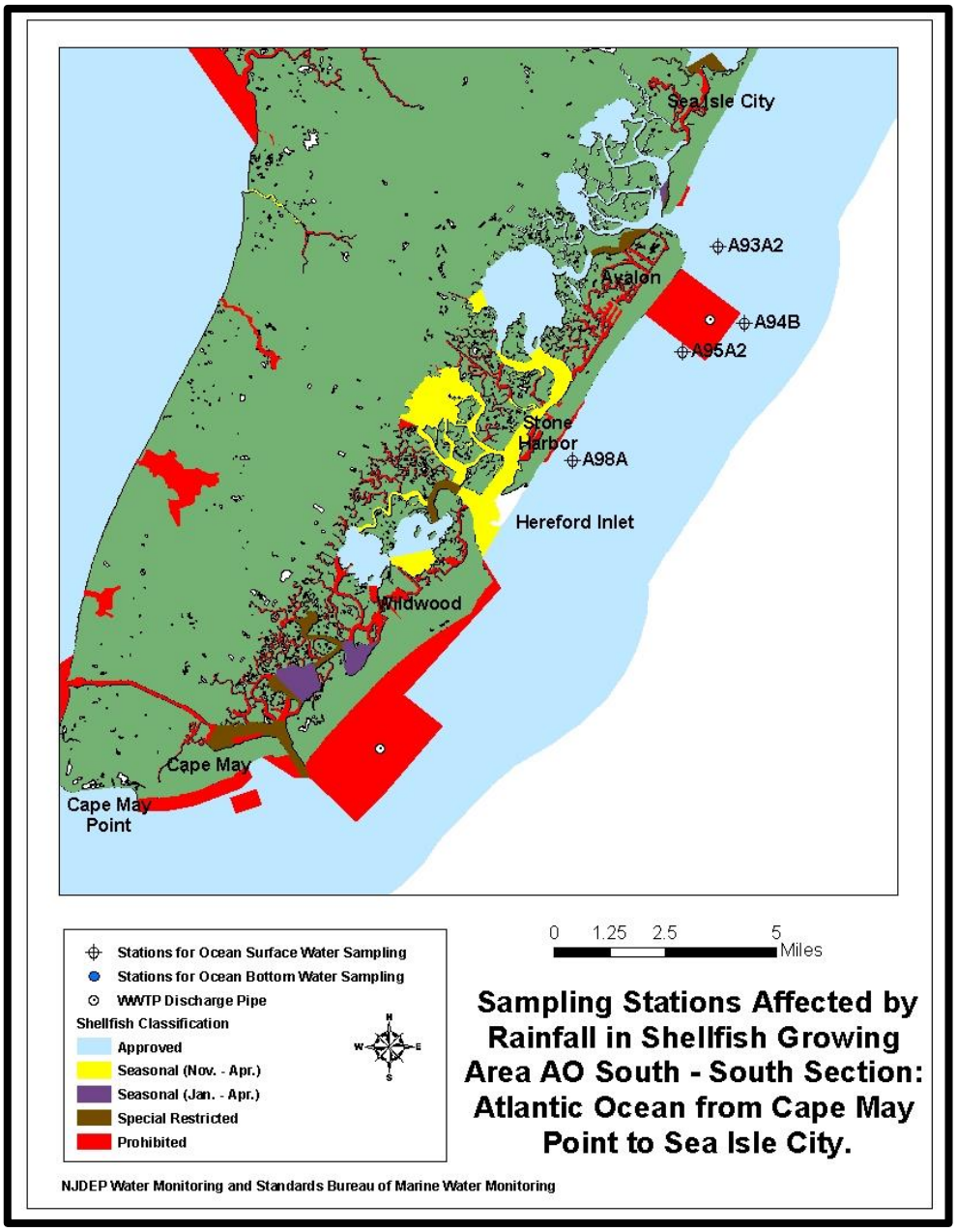
Non-point source pressures on shellfish beds in New Jersey originate in materials that enter the water via stormwater. These materials include bacteria, as well as other waste that enters the stormwater collection system.

Rainfall impacts were assessed by using a t-test to compare the fecal coliform MPN values from water samples collected during wet weather to water samples collected during dry weather from 1/1/2008 to 5/8/2014. The Wet/Dry Statistics were calculated based on a post impact time of 48 hours prior to the day of sampling and a wet/dry cutoff of 0.2 inches of rain. Any rainfall amounts above 0.2 inches are considered to be a wet condition. A sampling station is considered to be impacted by rainfall when the t-statistic probability is 0.05 or less, but not zero.

Based on a significant correlation between fecal coliform MPN values from wet/dry data for 1/1/2008 to 5/8/2014, an impact from rainfall was found to occur at the twenty four (24) sampling stations throughout this shellfish growing area. These APC sampling stations are located throughout this shellfish growing area. Most of these sampling stations showed a higher fecal coliform geometric mean during wet than dry conditions. However, the fecal coliform levels still meet the existing *Approved* and *Prohibited* shellfish classification criteria for these shellfish waters. Since the water quality in this shellfish growing area is slightly impacted by rainfall but not enough to affect the shellfish classification, this area will continue to be sampled using the Adverse Pollution Condition (APC) strategy.

The Bureau of Marine Water Monitoring has begun to identify particular stormwater outfalls that discharge excessive bacteriological loads during storm events. In some cases, specific discharge points can be identified. When specific outfalls are identified as significant sources, the Department works with the county and municipality to further refine the source(s) of the contamination and implement remediation activities.

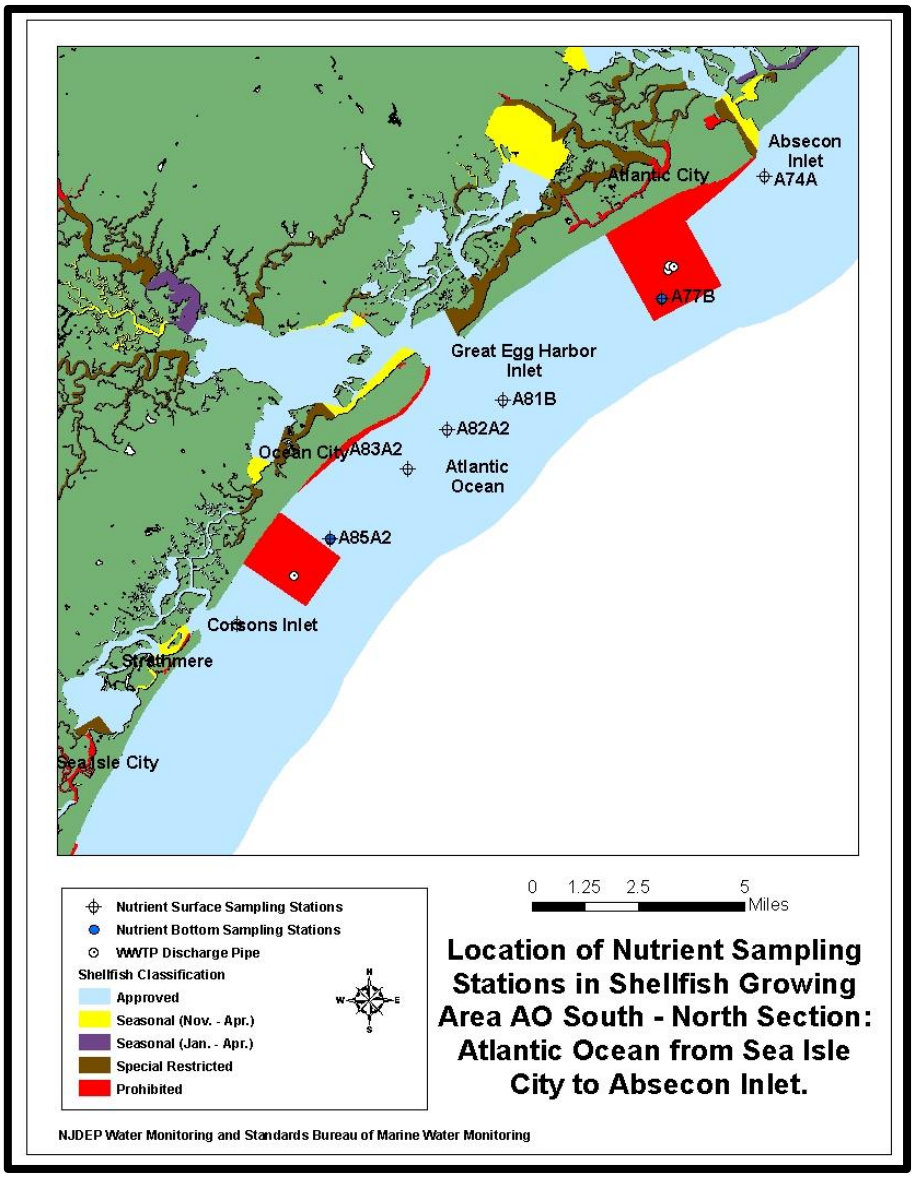

Absecon Inlet
Atlantic City
B74A
A74A2
C73B
B76A
A76A
A77A
AX78A1
A78A2
AX80A1
Great Egg Harbor Inlet
AX83A1
A82A2
Ocean City
A83A2
Atlantic Ocean
A84A2
A85A
A85A2
A85A2
A85B
C86A
Corsons Inlet
Strathmere
A88A2
Sea Isle City
Stations for Ocean Surface Water Sampling
Stations for Ocean Bottom Water Sampling
WWTP Discharge Pipe
Shellfish Classification
Approved
Seasonal (Nov. - Apr.)
Seasonal (Jan. - Apr.)
Special Restricted
Prohibited
0 1.25 2.5 5
Miles
Sampling Stations Affected by Rainfall in Shellfish Growing Area AO South - North Section: Atlantic Ocean from Sea Isle City to Absecon Inlet.
NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring

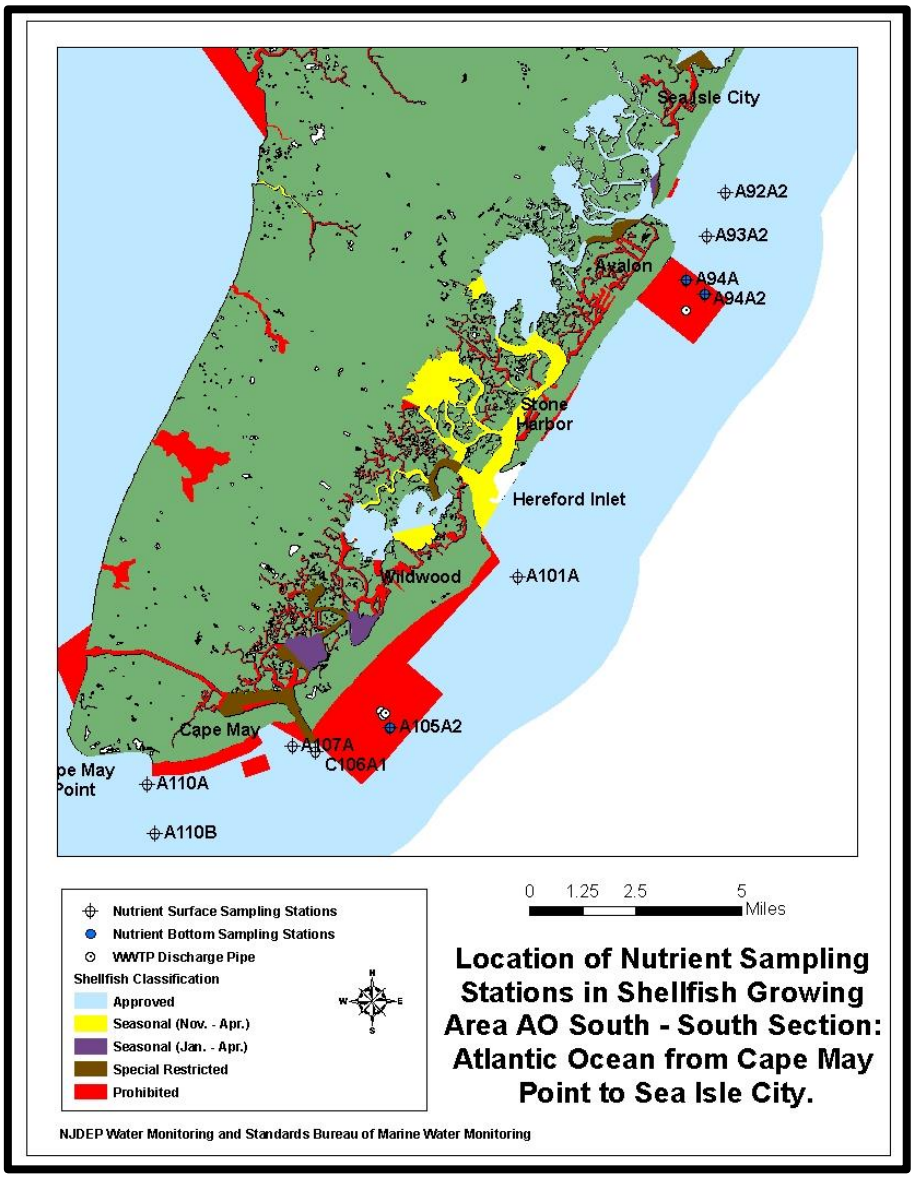

Sea Isle City
A93A2
Avalon
A94B
A95A2
Stone Harbor
A98A
Hereford Inlet
Wildwood
Cape May
Cape May Point
Stations for Ocean Surface Water Sampling
Stations for Ocean Bottom Water Sampling
WWTP Discharge Pipe
Shellfish Classification
Approved
Seasonal (Nov. - Apr.)
Seasonal (Jan. - Apr.)
Special Restricted
Prohibited
N
W
E
S
0 1.25 2.5 5
Miles
Sampling Stations Affected by Rainfall in Shellfish Growing Area AO South - South Section: Atlantic Ocean from Cape May Point to Sea Isle City.
NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring

RELATED STUDIES

Nutrients

In this growing area, twenty two (22) nutrient monitoring sites were sampled under the estuarine monitoring program. 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. For full nutrient assessment, see the Estuarine Monitoring Reports, available electronically at: http://www.state.nj.us/dep/bmw/



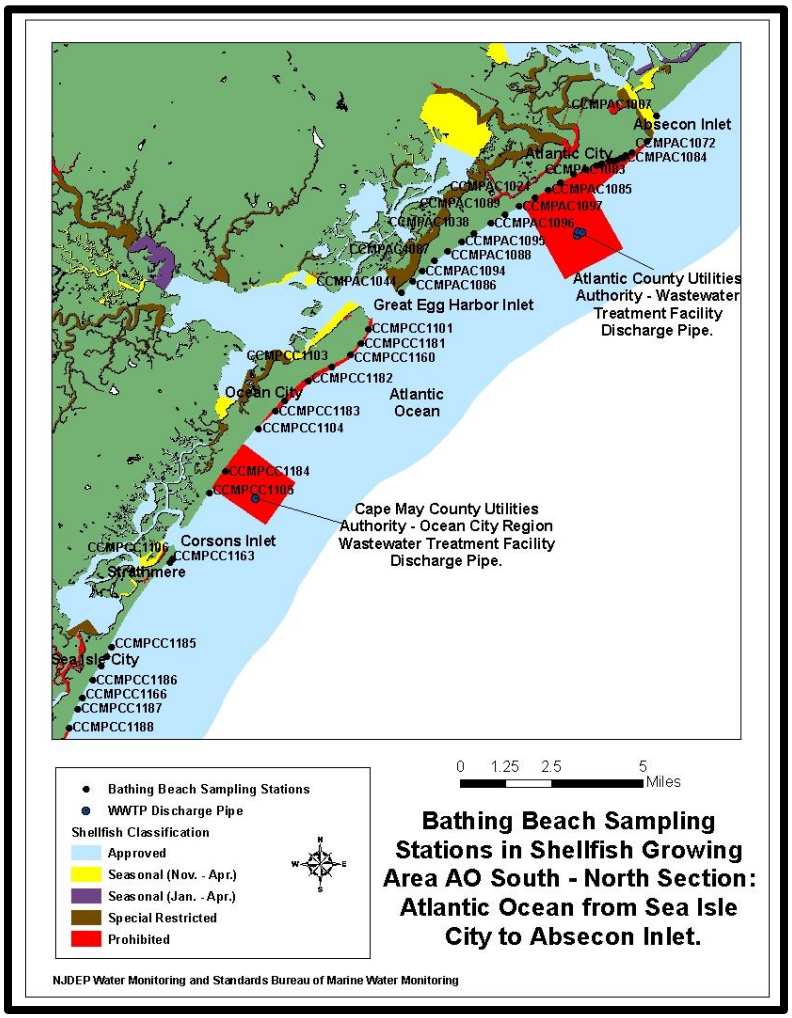

Seaisle City
A92A2
A93A2
Avalon
A94A
A94A2
Stone Harbor
Hereford Inlet
A101A
Wildwood
A105A2
Cape May
A107A
C106A1
pe May Point
A110A
A110B
Nutrient Surface Sampling Stations
Nutrient Bottom Sampling Stations
WWTP Discharge Pipe
Shellfish Classification
Approved
Seasonal (Nov. - Apr.)
Seasonal (Jan. - Apr.)
Special Restricted
Prohibited
0 1.25 2.5 5
Miles
Location of Nutrient Sampling Stations in Shellfish Growing Area AO South - South Section: Atlantic Ocean from Cape May Point to Sea Isle City.
NJDEP Water Monitoring and Standards Bureau of Marine Water Monitoring

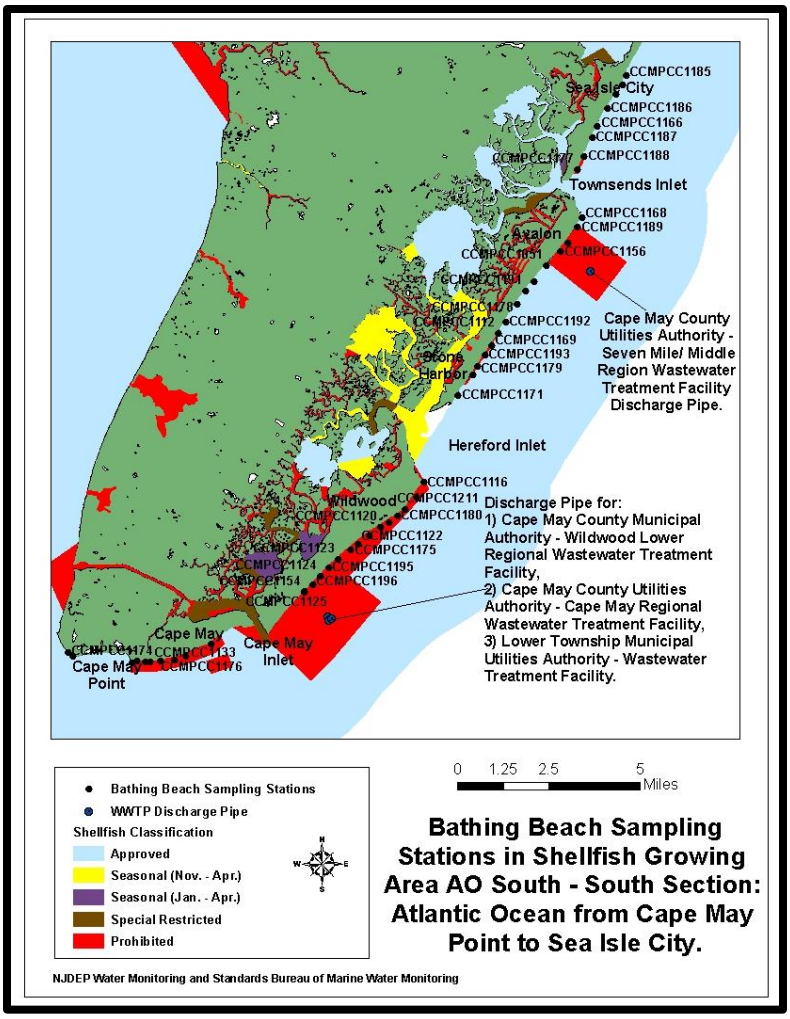
Toxic Monitoring

The Department collects samples at regular intervals throughout the summer to determine the occurrence of marine algae that produce biotoxins. However, there are no Phytoplankton sampling stations located in this shellfish growing area. Data from the coastal aerial surveillance and remote sensing flights to collect chlorophyll data did not show the presence of marine algae that produce biotoxins in this shellfish growing area for 2008 to 2014. The chlorophyll data from these remote sensing flights can be accessed at: www.state.nj.us/dep/wms/bmw.

Bathing Beach Data

There are 87 bathing beach sampling stations in this shellfish growing area and they are located on the shoreline adjacent to this shellfish growing area from Atlantic City to Cape May Point. A review of the bathing beach data for these sampling stations showed that the geometric mean levels for most of these stations generally meet the enterococcus criteria. The water quality sample results for these bathing beach sampling stations have been posted on the beach web site at www.njbeaches.org under Ocean Beach Information.





CONCLUSIONS

Water quality in Shellfish Growing Area AO South - the Atlantic Ocean from Cape May Point to Absecon Inlet, continues to be good, with all of the sampling stations in compliance with the requirements of the *Approved* and *Prohibited* shellfish classification for the waters in this area, based on NSSP total coliform criteria. This area was sampled using the Adverse Pollution Condition (APC) strategy, because this shellfish growing area has many direct and indirect impacts from point sources of pollution, such as discharges from the wastewater treatment facilities at their ocean outfall pipes, and discharges from the stormwater outfall pipes that extend into the waters of this ocean shellfish growing area.

Shellfish Growing Area AO South - the Atlantic Ocean from Cape May Point to Absecon Inlet, is correctly classified as *Approved* and *Prohibited* as currently described in *N.J.A.C. 7:12*. No classification changes are recommended.

RECOMMENDATIONS

Continue sampling using the existing Adverse Pollution Condition (APC) strategy for Assignments 401, 421, 431, and 441.

LITERATURE CITED

APHA. 1970. Recommended Procedures for the Examination of Seawater and Shellfish, 4th ed., American Public Health Association, Washington, DC

APHA. 1995. Standard Methods for the Examination of Water and Wastewater, 19th ed., American Public Health Association, Washington, DC

Bochenek, Dr. Eleanor. 2000. New Jersey's Marine Recreational Fisheries. The Jersey Shoreline: Special Edition 1999-2000. New Jersey Sea Grant College Program and New Jersey Sea Grant Extension Program in cooperation with the New Jersey Marine Sciences Consortium, Fort Hancock, NJ.

Connell, Robert C. 1991. Evaluation of Adverse Pollution Conditions in New Jersey's Coastal Waters. New Jersey Department of Environmental Protection, Marine Water Classification and Analysis, Leeds Point, NJ.

Flimlin, Gef, and Stewart Tweed. 2000. "Commercial Fisheries" The Jersey Shoreline: Special Edition 1999-2000. New Jersey Sea Grant College Program and New Jersey Sea Grant Extension Program in cooperation with the New Jersey Marine Sciences Consortium, Fort Hancock, NJ.

Gosner, Kenneth L. 1978. The Peterson Field Guide Series: A Field Guide to the Atlantic Seashore. Houghton Mifflin Company, Boston, Mass.

Ingmanson, Dale E., and William J. Wallace. 1989. Oceanography: An Introduction. Wadsworth Publishing Company, Belmont, California.

Morris, Percy A. 1975. The Peterson Field Guide Series: A Field Guide to Shells of the Atlantic. Houghton Mifflin Company, Boston, Mass.

NJDEP. 2005. Field Sampling Procedures Manual. New Jersey Department of Environmental Protection, Trenton, NJ.

NJDEP. 2003. 2003 Annual Review of Shellfish Growing Areas for Data Year 2003, Growing Area # AO South: Cape May Point to Absecon Inlet. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

NJDEP. 2005. 2005 Annual Review of Shellfish Growing Areas for Data Year 2005, Growing Area # AO South: Cape May Point to Absecon Inlet. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

NJDEP. 2006. 2006 Annual Review of Shellfish Growing Areas for Data Year 2006, Growing Area # AO South: Cape May Point to Absecon Inlet. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

NJDEP. 2007. 2007 Annual Review of Shellfish Growing Areas for Data Year 2007, Growing Area # AO South: Cape May Point to Absecon Inlet. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

NJDEP. 2008. 2008 Annual Review of Shellfish Growing Areas for Data Year 2008, Growing Area # AO South: Cape May Point to Absecon Inlet. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

NJDEP. 2010. State of New Jersey Shellfish Landings 2005 – 2009. New Jersey Department of Environmental Protection, Bureau of Shellfisheries, Nacote Creek, NJ.

NJDEP. 2010. State of New Jersey Shellfish Growing Water Classification Charts. New Jersey Department of Environmental Protection, Marine Water Monitoring, Leeds Point, NJ.

NMFS. 2010. Marine Fisheries Annual Landings Results for New Jersey 2005 – 2009. National Marine Fisheries Service, Fisheries Statistics and Economics Division, Silver Spring, Md.

National Oceanic and Atmospheric Administration. 1998. Chemical Contaminants in Oysters and Mussels by Tom O'Connor. NOAA's State of the Coast Report. Silver Spring, MD: NOAA.

Peters, Steven. 2000. Sanitary Survey – Atlantic Ocean – Peck Beach to Brigantine 1995 – 1999. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

Suoninen, William. 1997. Sanitary Survey Shellfish Growing Area 42 Stone Harbor to Sea Isle City 1989 – 1996. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

Suoninen, William. 1997. Sanitary Survey Shellfish Growing Area 43 Sea Isle City to Peck Beach 1989 – 1995. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

U.S. Food and Drug Administration. 1997. Manual Interpretation. 12-Tube Single Dilution Test. National Shellfish Sanitation Program, Shellfish Program Implementation Branch, Division of Cooperative Program, Office of Field Programs, Washington, DC.

USPHS. 2003 Revision. National Shellfish Sanitation Program *Guide for the Control of Molluscan Shellfish*. US Public Health Service, Food and Drug Administration, Washington, DC.

Van Rossum, Maya K. 2001. "Stormwater Runoff: Lost Resource or Community Asset?" Estuarine News. Partnership for the Delaware Estuary, Inc., Wilmington, DE.

Weinstein, M.P. 2001. 'New Jersey: The "Coastal State".' The Jersey Shoreline. Volume 20, No. 1. New Jersey Sea Grant College Program and New Jersey Sea Grant Extension Program in cooperation with the New Jersey Marine Sciences Consortium, Fort Hancock, NJ.

Wesighan, Paul. 2010. Reappraisal of Shellfish Growing Area AO South The Atlantic Ocean from Cape May Point to Absecon Inlet. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

Wesighan, Paul. 2006. Partial Sanitary Survey of Shellfish Growing Area AO South The Atlantic Ocean from Cape May Point to Absecon Inlet. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

Zimmer, Bonnie J., Ph.D. 2000. New Jersey Ambient Monitoring Program Report on Marine and Coastal Water Quality 1997 – 1999. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

Zimmer, Bonnie J., Ph.D. 2001. New Jersey Ambient Monitoring Program Annual Data Report on Marine and Coastal Water Quality 2000. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.