



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

**Reappraisal Report of Shellfish Classification  
for Growing Area SE5  
(Ludlam Bay to Townsends Inlet)**



**July 2017**

*State of New Jersey*  
Philip D. Murphy, Governor  
Sheila Y. Oliver, Lt. Governor

*NJ Department of Environmental Protection*  
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Debbie Mans, Deputy Commissioner

# **Reappraisal Report of Shellfish Classification for Growing Area SE5 (Ludlam Bay to Townsends Inlet)**

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January 2013 to July 2017

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**Cover Photo** – Townsend Channel northwest of Townsends Inlet behind south Sea Isle City from the dock at Pier 88 Marina looking north, including Sunset Pier Marina, The Yacht Club of Townsends Inlet, and condominium docks and boats in this picture.

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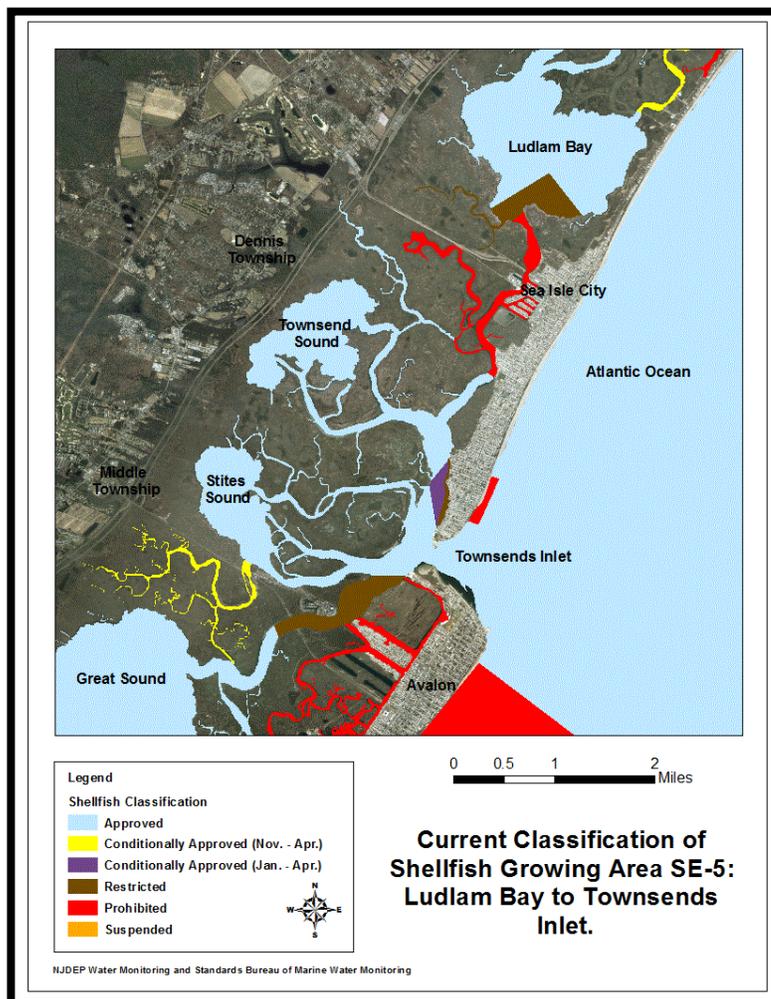
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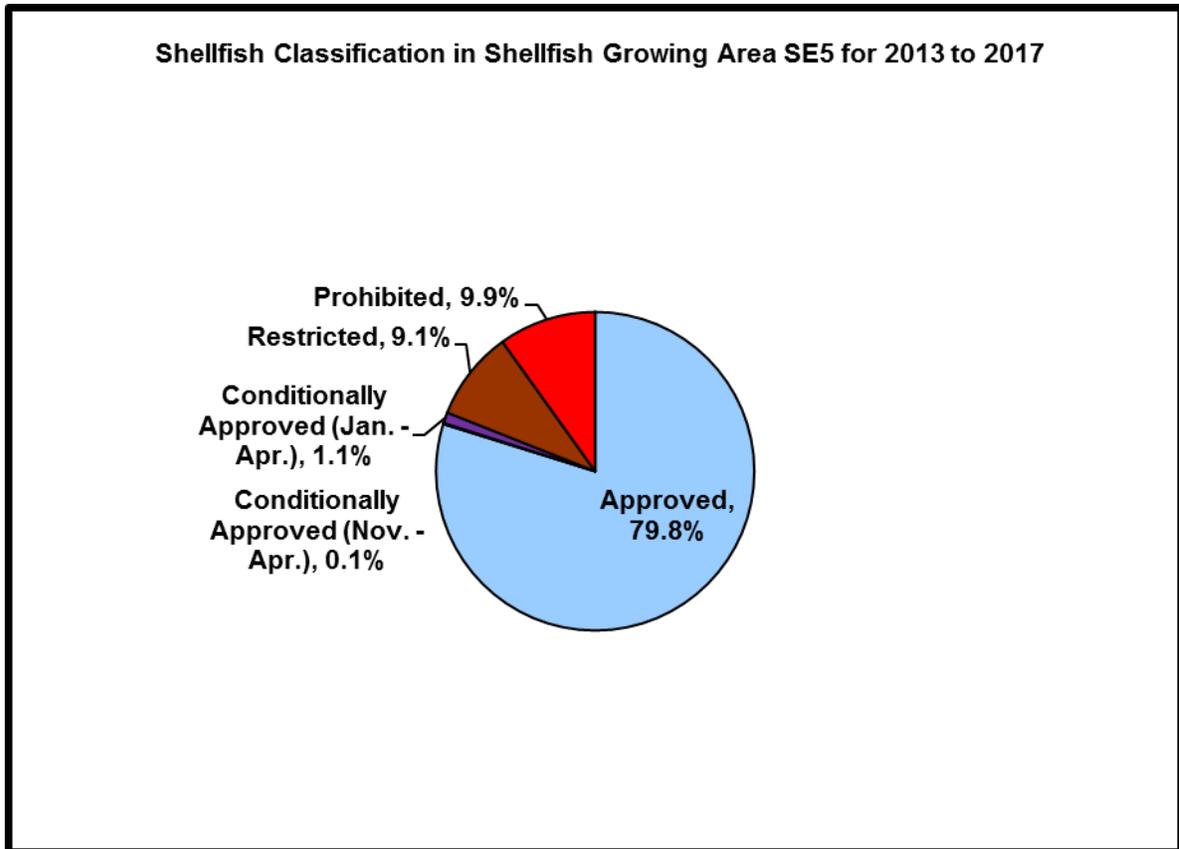
## EXECUTIVE SUMMARY

Shellfish Growing Area SE-5; Ludlam Bay to Townsends Inlet, is located in the southern part of New Jersey, northwest of the city of Avalon and southwest of Strathmere, in Cape May County.

The water quality data presented in this Reappraisal of Shellfish Growing Area SE-5 were collected between January 2012 and July 2017. This shellfish growing area is sampled using the Systematic Random Sampling (SRS) strategy. According to NSSP sampling criteria, only 8 water samples are needed for each sampling station (75 stations sampled, 43 stations in Assignment 247 and 32 stations in Assignment 287) per year. The approximate size of this shellfish growing area is 3,574 acres, and the shellfish classification for this growing area is *Approved* (79.8%), *Conditionally Approved (November-April)* (0.1%), *Conditionally Approved (January to April)* (1.1%), *Restricted* (9.1%), and *Prohibited* (9.9%) for shellfish harvesting (as seen in the figure to the right). All but 3 (three) of the sampling stations (Sampling Stations **3127B**, **3219A**, and **3219C**) were in compliance with the fecal coliform criteria for the existing classifications of this shellfish growing area, as specified by the National Shellfish Sanitation Program (NSSP). Sampling station **3127B** is located in Ludlam Bay northwest of Sea Isle City in *Approved* shellfish waters and exceeded the *Approved* classification year-round. Sampling Station **3219A** is located in Kitts Thorofare east of Stites Sound and exceeded the *Approved* shellfish classification year-round and in the summer. Sampling Station **3219C** is located in Middle Thorofare west of Sea Isle City in *Approved* shellfish waters and exceeded the *Approved* classification year-round, in the summer, and in the winter. Sampling Stations **3219A** and **3219C** exceeded the *Approved* classification in the 2015 and 2016 Annual Reviews of this growing area. On October 10, 2016, water samples at Sampling Stations **3219A** and **3219C** were collected and analyzed for ARA, and Sampling Station **3219A** (Assignment 287, bottle 18) showed up as being impacted by domestic sources, while Sampling Station **3219C** (Assignment 287, bottle 5) showed up as being impacted by human sources. A downgrade is being considered for Kitts Thorofare east of Stites Sound from the *Approved* to the *Conditionally Approved (November – April)* shellfish classification, and from the *Approved* to the *Restricted* shellfish classification for Middle Thorofare west of Sea Isle City. In



July 2017, four new sampling stations were added to Kitts Thorofare and Middle Thorofare to determine where the line should be drawn for this downgrade. This is the first time Sampling Station **3127B** exceeded its existing shellfish classification, and other sampling stations next to this station in Ludlam Bay meet their existing *Approved* shellfish classification. Therefore, no classification changes are recommended for the Ludlam Bay area and Sampling Station **3127B** will be closely monitored during shoreline surveys of this area. Water samples will also be collected at Sampling Station **3127B** and analyzed for coliphage and MAR. There were no observed changes to pollution sources of this area as documented in the shoreline survey included in this report.



## **DESCRIPTION OF GROWING AREA**

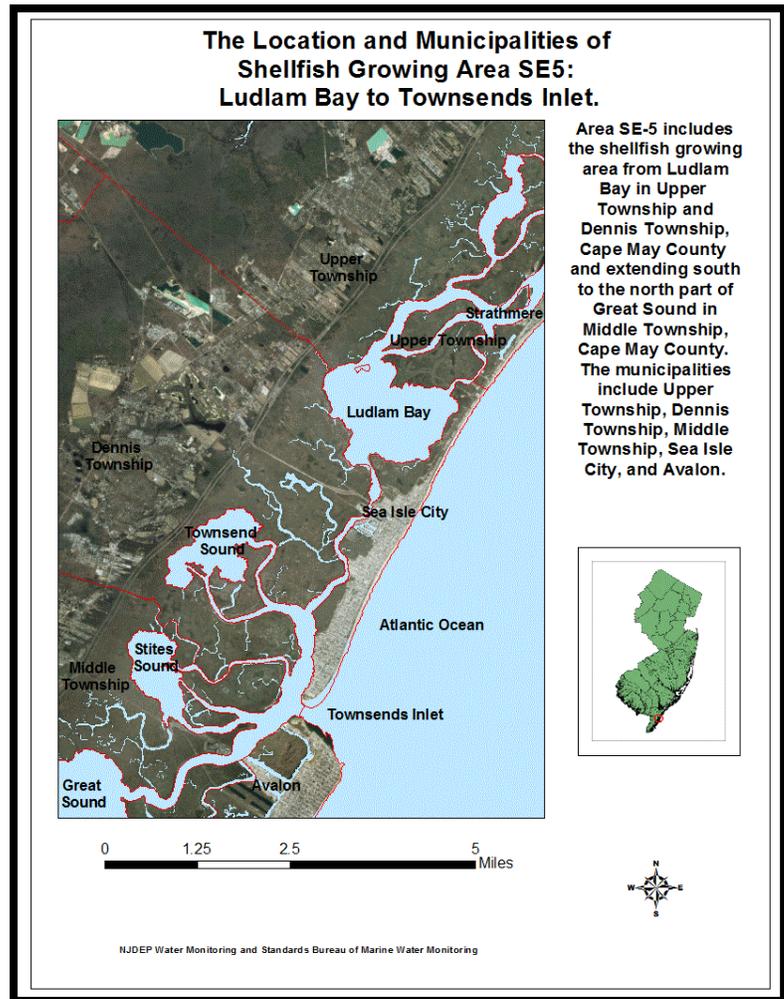
### ***Location & Description***

Shellfish Growing Area SE-5; Ludlam Bay to Townsends Inlet, is located north and northeast of the city of Avalon, west of Sea Isle City, and southwest of Strathmere in the southeastern part of New Jersey, Cape May County (see figure on next page). Dennis Township is located to the northwest and Middle Township is located to the west and southwest of this shellfish growing area.

The shellfish classification of the waters in this growing area are *Approved*, *Conditionally Approved (November–April)*, *Conditionally Approved (January–April)*, *Restricted*, and *Prohibited* and the approximate size of this shellfish growing area is 3,574 acres. There are approximately 2,851 acres of *Approved* waters, 3.0 acres of *Conditionally Approved (November to April)* waters, 39.0 acres of *Conditionally Approved (January to April)* waters, 327.0 acres of *Restricted* waters, and 355.0 acres of *Prohibited* waters in this shellfish growing area.

The municipalities adjacent to this shellfish growing area include Dennis Township and Middle Township to the northwest and west, and Strathmere, Sea Isle City, and Avalon to the northeast, east, and southeast in Cape May County. The locations of these municipalities are shown in the figure on this page.

In Cape May County, this shellfish growing area drains through Townsends Inlet. This area can be found on Chart 15 of the “2016 State of New Jersey – Shellfish Growing Water Classification Charts” (NJDEP, 2017). The figure on the next page shows the current classification of this shellfish growing area.



### **Growing Area Classification**

The waters of this shellfish growing area are primarily classified as *Approved*, *Conditionally Approved (November–April)*, *Conditionally Approved (January–April)*, *Restricted*, and *Prohibited* (NJDEP, 2017). The *Approved* waters are located in Ludlam Bay (excluding the Special Restricted part in the south of Ludlam Bay), Main Channel, Townsend Sound, Mill Creek, Ware Thorofare, Mill Thorofare, Clam Thorofare, Townsend Channel, the south part of Ludlam Thorofare, Stites Sound, Kitts Thorofare, Middle Thorofare, North Channel, South Channel, Townsends Inlet, and the south part of Paddy Thorofare. The *Conditionally Approved (November–April)* waters are located in an unnamed creek on Gull Island, which is west of Ludlam Thorofare, in Deep Creek, in

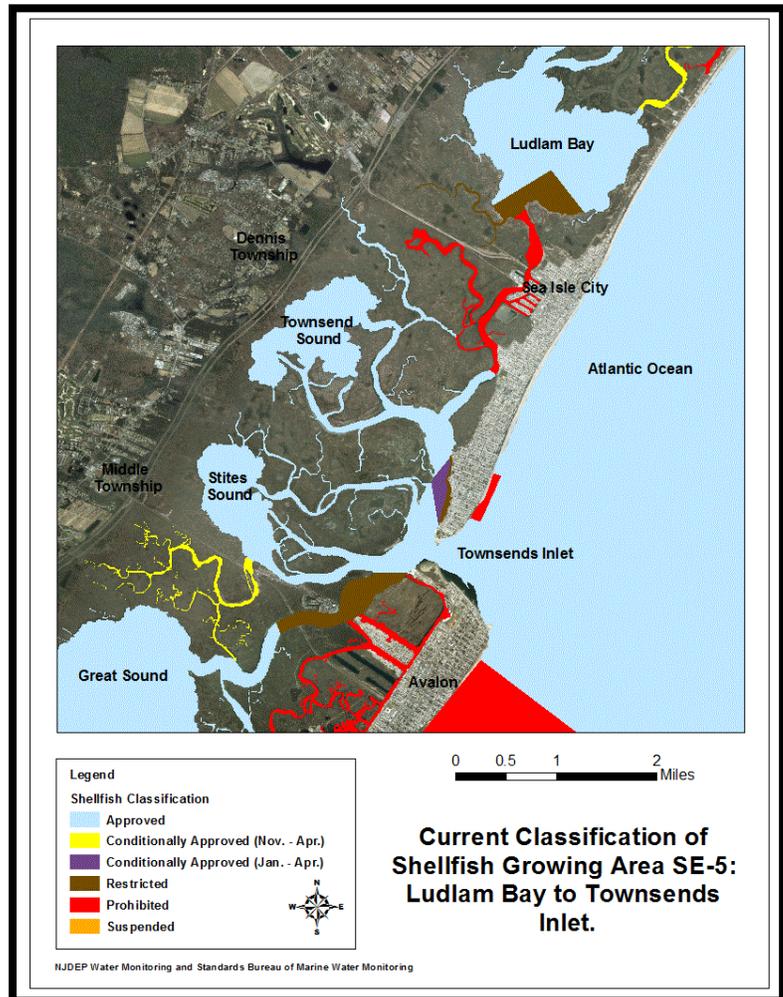
Deep Thorofare, in Leonard Thorofare, and in Scraggy Creek which is east of the central part of Ludlam Thorofare and west of Sea Isle City. The *Conditionally Approved (January-April)* waters are located in the south part of Townsend Channel north of Townsends Inlet. The *Restricted* waters are located in the south part of Ludlam Bay, in Big Elder Creek, the east side of Townsend Channel north of Townsends Inlet, and the north and central parts of Ingram Thorofare. The *Prohibited* waters include the rest of the waters in this shellfish growing area.

A reappraisal report for Shellfish Growing Area SE-5, using water quality data from 2009 to 2014, was written in March 2014. In this report, three of the sampling stations (Sampling Stations 3216, 3300B, and 3300D) exceeded the *Approved* shellfish classification criteria, year-round, in the summer, and in the winter. However, no classification change was proposed for this shellfish growing area because the sampling strategy for the area of these three stations (Assignment 287) was changed from the Adverse Pollution Condition (APC) strategy to the Systematic Random Sampling (SRS) strategy to obtain more samples for analysis. In this report, 14 sampling stations were affected by a seasonal component, and nine sampling stations were affected by a rainfall component.

In the 2013 Annual Review of Shellfish Growing Area SE5 for the Ludlam Bay to Townsends Inlet area, two sampling stations (Sampling Stations 3300B and 3300D) exceeded their existing *Approved* shellfish classification, and approximately 93.8 acres of the shellfish waters of Leonard Thorofare, Deep Creek, Deep

Thorofare, and Cat Run were downgraded to the Seasonally Approved (November to April) shellfish classification. In this report, 14 sampling stations were affected by a seasonal component, and 8 (eight) sampling stations were affected by a rainfall component.

In the 2015 Annual Review of Shellfish Growing Area SE5 for the Ludlam Bay to Townsends Inlet area, two sampling stations (Sampling Stations 3219A and 3219C) exceeded their existing *Approved* shellfish classification. These two stations were closely monitored during shoreline surveys of this area and water samples were collected and analyzed for coliphage and MAR. In the 2016 Annual Review of this shellfish growing area, these same two sampling stations showed up



again as exceeding their existing *Approved* shellfish classification and the results of the coliphage and MAR analysis showed the need for a downgrade to this area. Four new sampling stations were proposed to be added to Assignment 287 to determine where the line would need to be drawn to do a downgrade to the waters of this area. The shellfish waters of Sampling Station 3219A would be downgraded from the *Approved* to the *Conditionally Approved (November to April)* shellfish classification and the shellfish waters of Sampling Station 3219C would be downgraded from the *Approved* to the *Restricted* shellfish classification. Even though this information was presented in the Annual Review of this growing area in October 2016, these new sampling stations were not added to Assignment 287 for growing area SE5 until July 2017.

The last Sanitary Survey for Shellfish Growing Area SE-5 (Ludlam Bay to Townsends Inlet) was written in 2010.

### ***Evaluation of Biological Resources***

This growing area has a wide diversity of biological resources. Hard clams (*Mercenaria mercenaria*) exist in high densities and are privately and commercially harvested. Blue crabs (*Callinectes sapidus*) are also harvested in this shellfish growing area. Ludlam Bay, Townsend Sound, Stites Sound, and Townsends Inlet are also utilized for fishing, clamming, crabbing, and boating. Striped bass, bluefish, eels, summer flounder (fluke), weakfish, and other species of fish are caught in this shellfish growing area. The first table on the next page shows the total New Jersey hard clam landings data from 2013 to 2015 (NMFS, 2017). Shellfish landings statistics had not been verified and posted for 2016 and 2017 at the time this reappraisal report was written.

The second table on the next page shows the total New Jersey shellfish landings data from 2013 to 2015 (NMFS, 2017). Shellfish landing statistics had not been verified and posted for 2016 and 2017 at the time this reappraisal report was written. These shellfish species include blue crabs (*Callinectes sapidus*), blue crabs – peelers, hard clams (*Mercenaria mercenaria*), blue mussels (*Mytilus edulis*), bay scallops (*Aequipecten irradians*), oysters (*Crassostrea virginica*), ocean quahogs (*Arctica islandica*), surf clams (*Spisula solidissima*), and sea scallops (*Placopecten magellanicus*) (Morris, 1975, Gosner, 1978). However, this report primarily focuses on bivalve mollusks, such as clams, quahogs, oysters, and mussels, and does not include crustaceans, such as blue crabs.

Many species of animals and vegetation can be found in the marshes of this shellfish growing area, including sea birds, waterfowl, salt-tolerant grasses, muskrats, field mice, turtles, etc. Wildlife populations of birds and animals are actual contributors to the water quality in the Townsend Sound area, and potential contributors to the water quality in the Stites Sound and Townsends Inlet areas.

**New Jersey Hard Clam Landings - 2013 to 2017 (NMFS, 2017).**

<b>NEW JERSEY HARD CLAM LANDINGS 2013 to 2017</b>		
<b>YEAR</b>	<b>POUNDS OF MEAT (millions)</b>	<b>\$ VALUE (exvessel)</b>
2013	17,231,460	\$12,044,144
2014	17,504,960	\$12,765,696
2015	16,237,760	\$13,288,656
2016	*	*
2017	*	*

**\*No Data**

**New Jersey Shellfish Landings - 2013 to 2017 (NMFS, 2017).**

<b>NEW JERSEY SHELLFISH LANDINGS 2013 to 2017</b>		
<b>YEAR</b>	<b>POUNDS OF MEAT (millions)</b>	<b>\$ VALUE (exvessel)</b>
2013	45,992,234	\$96,264,744
2014	55,569,046	\$120,369,860
2015	53,147,052	\$143,441,691
2016	*	*
2017	*	*

**\*No Data**

## SHORELINE SURVEY: EVALUATION OF POTENTIAL POLLUTION SOURCES

### *Shoreline Survey*

The shoreline survey that was performed for this area on September 12, 2017 determined that there have been minor changes made to the area since the last reappraisal of this area. During this shoreline survey, a new sewer pump station was observed on the corner of 26<sup>th</sup> Street and Landis Avenue, and this pump station was added to this report. It was also observed that 20<sup>th</sup> Street in Sea Isle City is the border between the homes in Sea Isle City south of this line that are connected to the CCMUA Seven Mile/Middle Regional WWTP and the homes north of this line that have septic systems. A marina inspection was recorded for the Minmar Marine Basin and Marina at 14 Old Sea Isle Boulevard, in Dennis Township and for Larsens Marina and Boat Rental at 7 Old Sea Isle Boulevard, in Sea Isle City. Some minor changes were made to the number of boat slips at these marinas and the marina table in this report was updated with this new information.

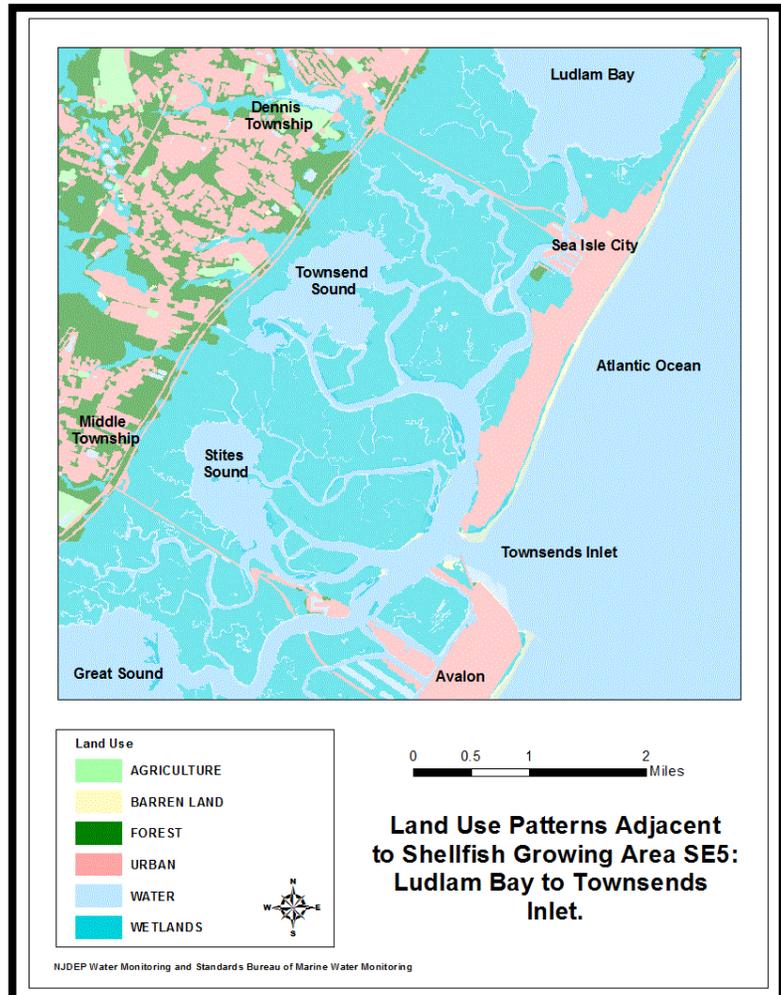
There were photographs taken during the shoreline survey of this shellfish growing area on September 12, 2017. The photograph on the front cover shows Townsend Channel northwest of Townsends Inlet behind south Sea Isle City from the dock at Pier 88 Marina looking north, including Sunset Pier Marina, The Yacht Club of Townsends Inlet, and condominium docks and boats in this picture. Additional photos taken during the shoreline survey of this area are attached at the end of this report in the Supporting Documentation section.

The mouth of Middle Thorofare was observed across Townsends Channel from Pier 88 Marina and photographs were taken of this area for this report. Sampling Station **3219C** is immediately northwest of the mouth of Middle Thorofare and, since this station exceeded its existing shellfish classification, this area is being considered for a shellfish classification downgrade in this report. Sampling Station **3127B** in Ludlam Bay could not be seen from along Landis Avenue in northern Sea Isle City because extremely high vegetation blocked the view of Ludlam Bay, and Sampling Station **3219A** in Kitts Thorofare west of Middle Thorofare could not be seen from the dock of Pier 88 Marina because it was too far away. An additional date for another shoreline survey was scheduled to see this area by boat.

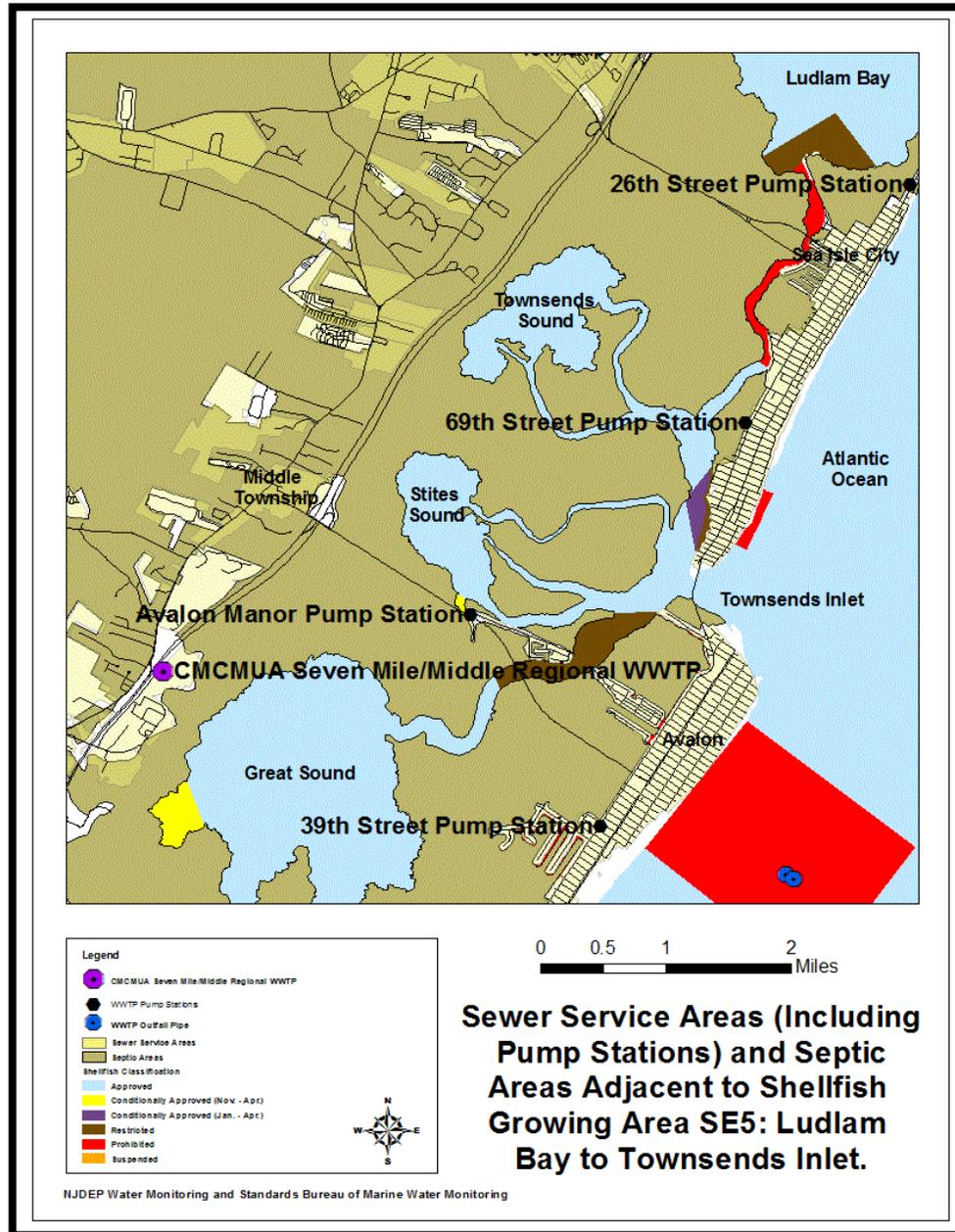
On September 25, 2017, a shoreline survey was performed by boat for Ludlam Bay to the northwest of Sea Isle City and Kitts Thorofare and Middle Thorofare to the west of southern Sea Isle City. This shoreline survey was accomplished to observe the areas around Sampling Stations **3219C**, **3219A**, and **3127B**, and to identify possible impacts to the water quality of these stations since these sampling stations exceeded their existing *Approved* shellfish classification. At the area around Sampling Station **3219C**, a small flock of cormorants and gulls were observed at a small beach near this station. However, Sampling Station **3219A** was surrounded by nothing but marshes and Sampling Station **3127B** was in Ludlam Bay far from the shoreline west of northern Sea Isle City and the homes along this shoreline which are connected to septic systems. Sampling Station **3126B** is located between Sampling Station **3127B** and the homes along this shoreline of Ludlam Bay and **3126B** meets its existing *Approved* shellfish classification.

## Land Use

An extensively urbanized area to the east and north and tidal wetlands to the south and west border much of this area. The urban areas to the east are resort areas (Sea Isle City, Avalon, and Strathmere) with significant boating and marine activities during the summer months. There are currently 20 marinas in this area. The wetlands to the west of the growing area act as a buffer for the communities on the western side of the bays. Devauls Creek, Mill Creek, and Deep Creek cross the Garden State Parkway into these communities, and are upstream of this shellfish growing area. Since some of these communities are still on septic systems, there is a potential for pollutant inputs into these shellfish growing waters, which is why continued monitoring of the water quality in these waters is very important. The figure on this page shows the land use and municipalities that surround this shellfish growing area. The figure on page 9 shows the sewer service areas (including the four pump stations) and the septic areas adjacent to this shellfish growing area.



The area immediately west of the Garden State Parkway is part of the Pinelands Comprehensive Management Plan, and is listed as a Regional Growth Area (northwest of Townsend Sound), and a Rural Development Area (west of Stites Sound). According to the New Jersey Pinelands Commission, a Regional Growth Area is “an area that can accommodate existing and future growth while protecting the essential character and environment of the pinelands”. The Pinelands Comprehensive Management Plan permits from 1.5 to 5.25 dwelling units per developable acre of land in a Regional Growth Area. The New Jersey Pinelands Commission describes a Rural Development Area as “an area that can attempt to protect characteristic Pinelands features, while allowing modest development to proceed, giving municipalities leeway to determine land uses”. The Pinelands Comprehensive Management Plan permits one dwelling unit per 3.2 acres of private, undeveloped upland for a Rural Development Area.

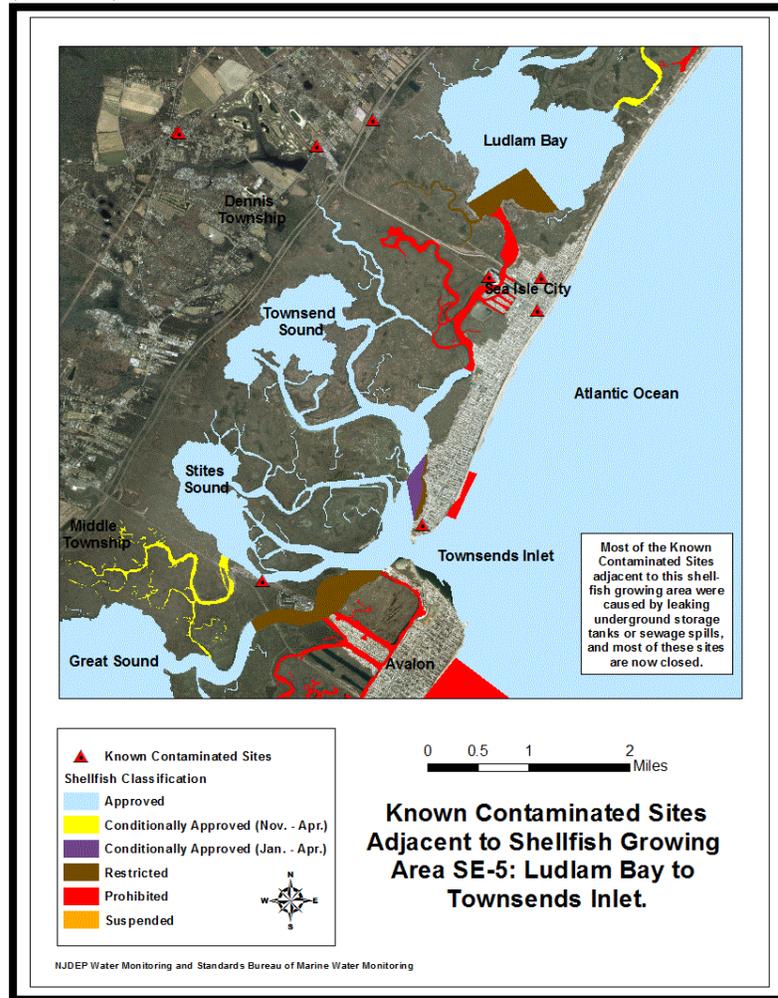


### Known Contaminated Sites

NJDEP, Site Remediation Program (SRP) has established a list of the Known Contaminated Sites (KCSNJ), Classification Exception Area (CEA) and Currently Known Extent (CKE) of groundwater pollution. KCSNJ are those non-residential sites and properties within the state where contamination of soil or groundwater has been confirmed at levels equal to or greater than applicable standards. This list of Known Contaminated Sites may include sites where remediation is either currently under way, required but not yet initiated or has been completed. CEA and CKE areas are geographically defined areas within which the local groundwater resources are known to

be compromised because the water quality exceeds drinking water and groundwater quality standards for specific contaminants (NJDEP).

This shellfish growing area, which extends from Ludlam Bay to Townsends Inlet, has several known contaminated sites located in the adjacent areas (see figure on this page). The major concentrations of these known contaminated sites are located to the east in Sea Isle City, to the northwest in Dennis Township, and to the west in Middle Township. There are also a few known contaminated sites located to the south in Avalon. The primary causes of these known contaminated sites are from leaking underground storage tanks. Most of these known contaminated sites are now closed.



## Surface Water Discharges

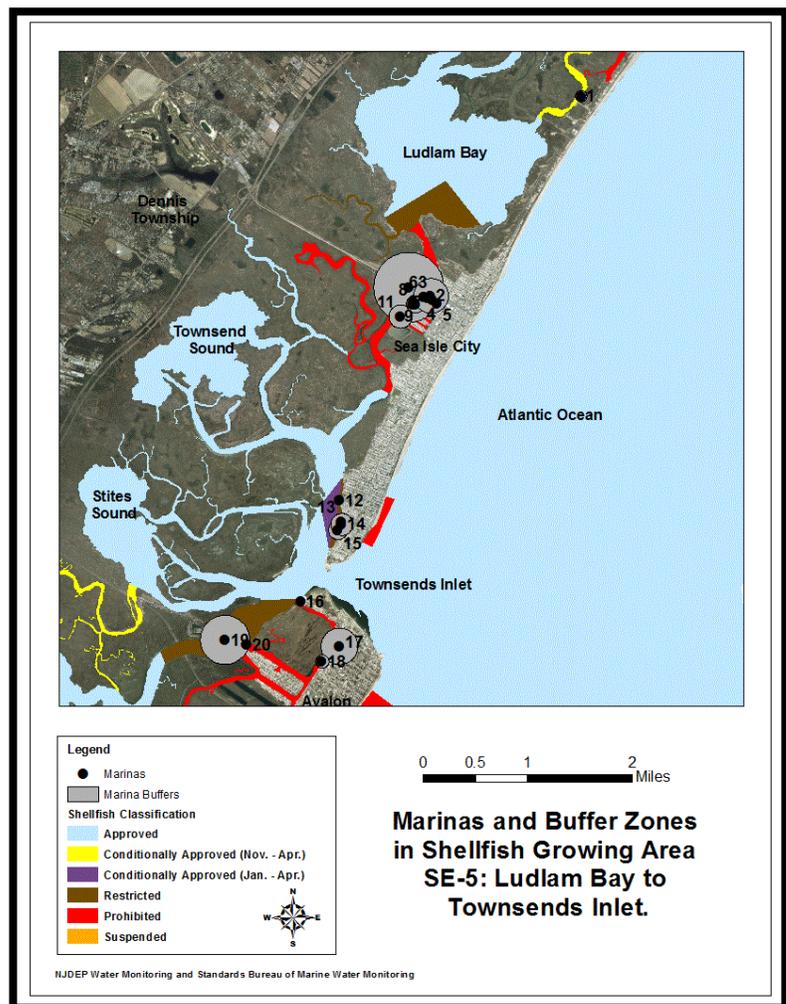
The discharge of pollutant from a point source is authorized under New Jersey Pollutant Elimination System (NJPDES), and the regulations are found at N.J.A.C. 7:14A. The main purpose of the NJPDES program is to ensure proper treatment and discharges of wastewater. By doing so, the permit limits the amount or concentration of pollutants that can be discharged into ground water, streams, rivers, and the ocean. Facilities regulated under this program include mines, schools, hospitals, large corporate office buildings, industrial manufacturing facilities, campgrounds, mobile home parks, food processor, potable water treatment plants, sewage treatment plants, or any dischargers that may have the potential to impact water quality. As of December 2010, there were 6,752 active permits. The number of active permits includes permits for all NJPDES permit classes, including Discharge to Surface Water (DSW), Discharge to

Groundwater (DGW), Significant Indirect User (SIU), Discharge of Stormwater (DST), and Residuals (RES), (NJDEP, Division of Water Quality).

A surface water discharge involves the release of treated effluent from various municipal and industrial facilities directly into a river, stream, or the ocean. According to the NJPDES program, there was no surface discharger found in this shellfish growing area.

## Marinas

Marina facilities have the potential to affect the suitability of shellfish growing areas for the harvest of shellfish. The biological and chemical contamination associated with marina facilities can be of public health significance. 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. In addition, sewage released in the vicinity of shellfish beds poses a public health problem. Because shellfish are filter feeders, they concentrate the pathogens in their tissue, thereby causing the shellfish to be unsafe for human consumption. The most notable diseases potentially transmitted by the ingestion of shellfish contaminated with the pathogens are gastroenteritis, dysentery, infectious hepatitis, and typhoid fever. Chemical compounds, such as oil and gasoline resulting from spills or leaks 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.



In this growing area, there are 20 known marinas. The table on the next page lists the facility name and the number of boat slips that are available at each facility. The location of these facilities can be found on the figure on this page. 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 the depth of the water, shellfish waters immediately adjacent to each marina may be classified as

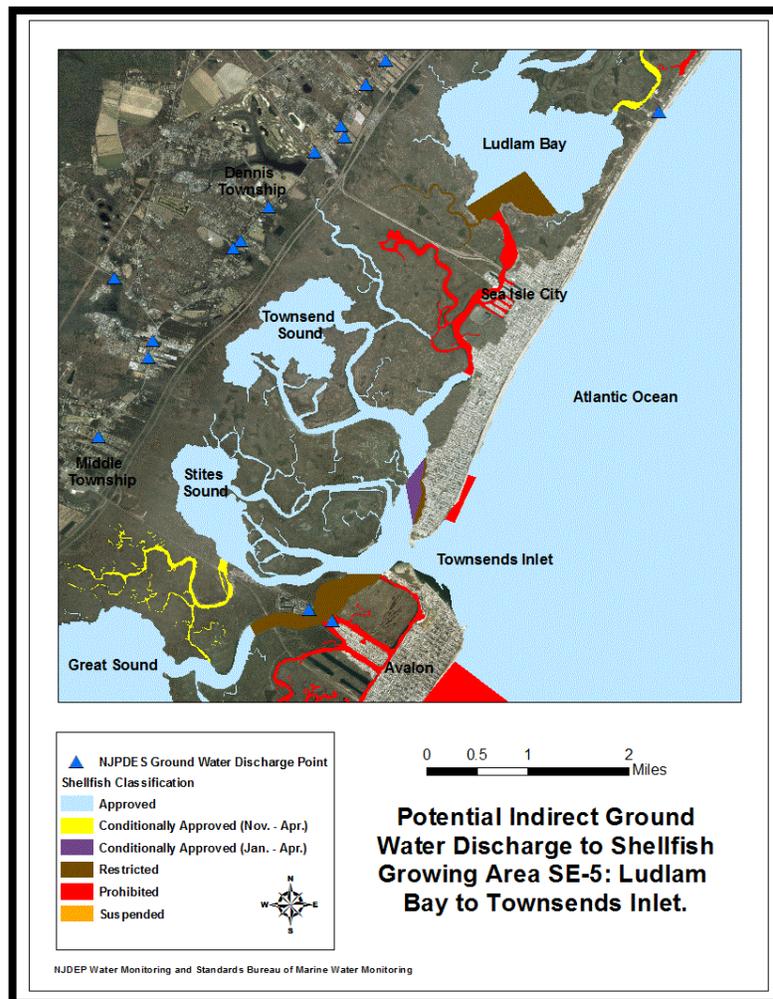
*Prohibited, Restricted, or Conditionally Approved* (no harvest during summer months when the marina is normally active).

NJDEP has implemented the New Jersey Clean Marina Program. This program aims to protect waters from being polluted by marina activities. This is a volunteer based program for marinas. The program provides assistance and guidance to marina owners as well as boaters on ways to reduce pollution, including sewage facility management, fueling operations, fish and solid waste management and boat cleaning. Currently, there are only a small percentage of marinas in the state that participate in this program. A list of marinas that are certified and/or have pledged under this program are listed on the New Jersey Clean Marina Program website ([www.njcleanmarina.org](http://www.njcleanmarina.org)).

Map Key	Marina Name	Location	# of Wet Slips Total/Boats > 24ft.	Size of Buffer Area (radius; feet)	Average Water Depth (ft.)	Pumpout Facility
1	Whale Creek Marina	Upper Township	20/0	289	6	No
2	Sea Isle City Marina	Sea Isle City	78/50	876	6	No
3	Red Dog Boat Rental	Sea Isle City	6/6	283	6	No
4	Carmen's Restaurant	Sea Isle City	5/5	259	6	No
5	Sea Isle Water Sport Center	Sea Isle City	8/8	327	6	No
6	Tradewinds Dock	Sea Isle City	12/12	401	6	No
7	Minmar Marine Basin	Sea Isle City	116/116	1,762	6	Yes
8	Capt. Robbins Deep Sea Fishing Marina	Sea Isle City	8/8	327	6	No
9	Larsens Boat Rental	Sea Isle City	16/16	448	6	No
10	Larsens Marina	Sea Isle City	60/0	441	6	No
11	Sea Isle City Yacht Club	Sea Isle City	26/26	590	6	No
12	U.S. Coast Guard Station	Sea Isle City	1/1	118	6	No
13	Sunset Pier Marina	Sea Isle City	22/22	290	6	No
14	Yacht Club of Townsends	Sea Isle City	80/80	553	4	No
15	Pier 88 Marina	Sea Isle City	60/60	479	6	No
16	Avalon Yacht Club	Avalon	34/34	70	6	No
17	Commodore Bay Club M.	Avalon	106/106	923	6	No
18	Avalon Sport Fishing/ Public Marina	Avalon	14/14	335	6	No
19	Avalon Anchorage	Avalon	0/0	0	6	No
20	Avalon Pointe Marina	Avalon	115/115	1241	6	Yes

## Groundwater Discharges

According to NJPDES, there are several facilities with active Discharge to Groundwater (DGW) permits in this area. Besides groundwater discharger, septic systems are widely used in remote area where public sewer lines are inaccessible. When septic systems fail to function properly, it could lead to groundwater contamination. The location of groundwater injection, surface water discharge (stormwater), areas are shown in the figure on the next page.



## Spills, Unpermitted Discharges, and Closures

### Spills

On October 2, 2015, the State of New Jersey Department of Environmental Protection put into effect a precautionary closure for all shellfish waters in New Jersey due to the approach of a

nor'easter predicted to impact the State from October 2 through 4, 2015 'to assure that the public health is not imperiled by the consumption of shellfish that may be subject to pollution or to any other conditions which may render shellfish dangerous.' All shellfish waters in this shellfish growing area were closed to shellfish harvesting. On October 5, 2015, 'the Department returned all waters of the State to their prior classification and opened them to all shellfish harvesting in accordance with their classification.'

There were no emergency closures of shellfish waters in area SE5 due to major spills or unpermitted discharges for the time period from January 2013 to July 2017.

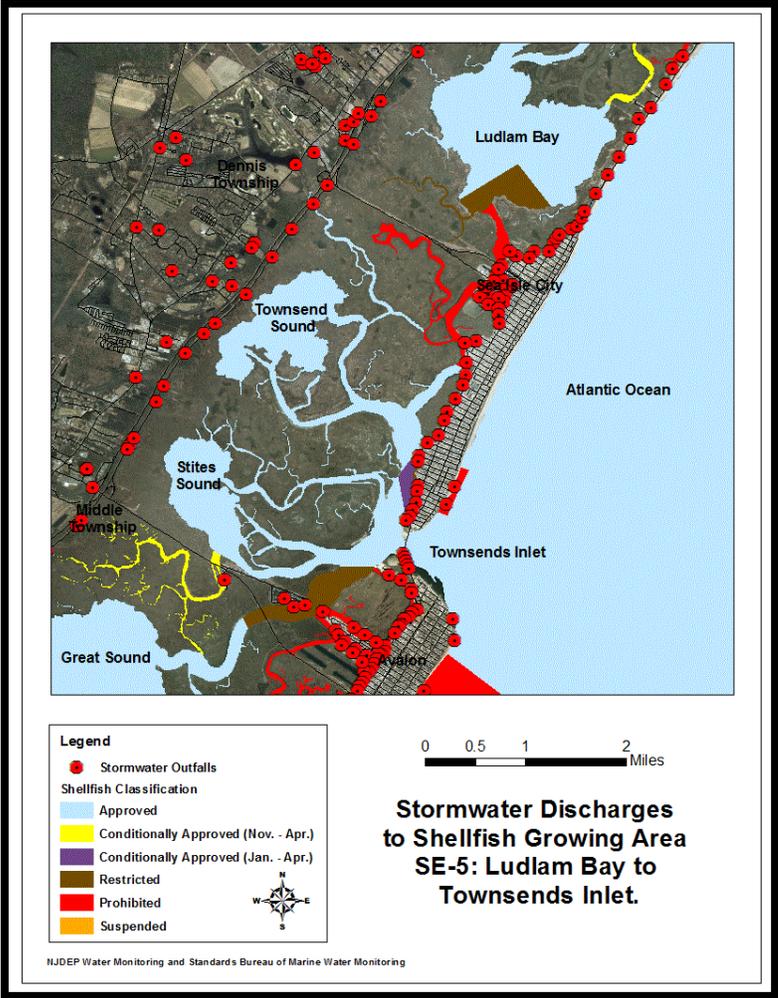
## **Dredging**

The process of dredging can impair water quality and contaminate shellfish beds that are living near dredging and disposal sites. WM&S/BMWM is given the opportunity to review such project through CAFRA submission and will deny a project if the proposed dredging or disposal site can potentially contaminate shellfish beds or impair water quality. The bureau's comments are taken into consideration by the NJDEP, Division of Land Use Regulations (DLUR) when approving or denying a permit. There were no dredging projects submitted to DLUR between 2013 and 2017 for this area.

## **Stormwater Discharges**

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) Most of the stormwater outfalls within this growing area are near residential and urbanized district. About 120 outfalls in this area have the potential to impact water quality. The bulk of these outfalls are in Middle Township, Dennis Township, Sea Isle City, and Avalon.

These outfalls usually discharge to nearby creeks and lagoon systems. For this reason, shellfish harvesting is condemned (*Prohibited* shellfish classification) in all lagoon system.

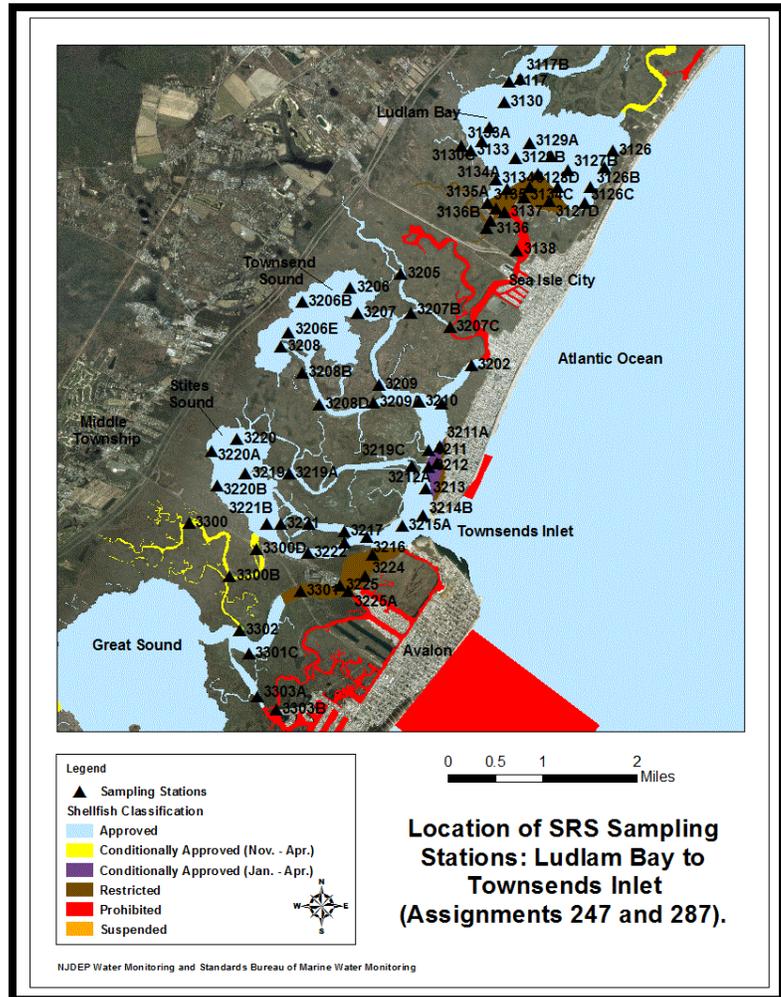


# WATER QUALITIES STUDIES

## 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 is not impacted by discharges from sewage treatment facilities or combined sewer overflows. Therefore, it was sampled using the Systematic Random Sampling (SRS).

Water sampling was performed in accordance with the Field Procedures Manual (NJDEP, 2005). From 2013 through 2017, approximately 2,625 water samples were collected for fecal coliform bacteria from 75 monitoring stations. The locations of these stations are shown in the map on the next page. 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 2013*. 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).



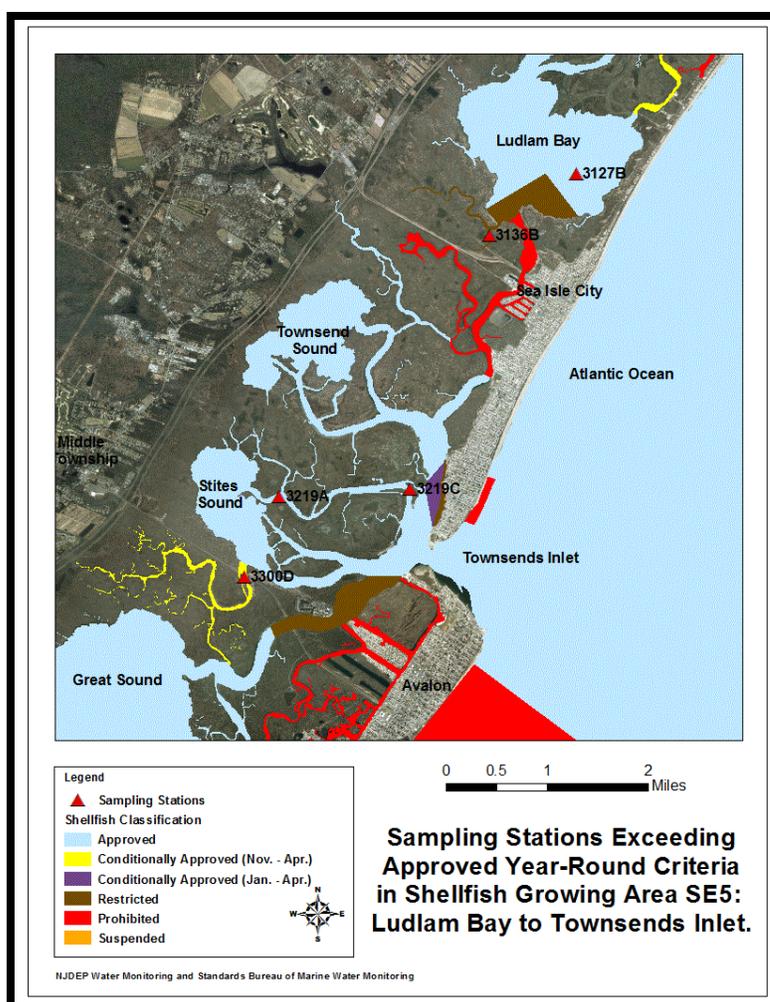
## Bacteriological Quality

This report includes data analyzed from January 2013 to March 2017. This shellfish growing area is composed of two assignment areas, Assignment 247 (Ludlam Bay and Townsends Sound) and Assignment 287 (Great Sound and Townsends Inlet), and are sampled using the SRS sampling strategy year-round. The figure on page 15 shows 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), attached to the end of this report.

### Compliance with NSSP SRS and APC Criteria

Three of the sampling stations (Sampling Stations **3127B**, **3219A**, and **3219C**) in this shellfish growing area were not in compliance with the fecal coliform criteria for their existing *Approved*

shellfish classifications, as specified by the National Shellfish Sanitation Program (NSSP). Sampling station **3127B** is located in Ludlam Bay northwest of Sea Isle City in *Approved* shellfish waters and exceeded the *Approved* classification year-round. Sampling Station **3219A** is located in Kitts Thorofare east of Stites Sound and exceeded the *Approved* shellfish classification year-round and in the summer. Sampling Station **3219C** is located in Middle Thorofare west of Sea Isle City in *Approved* shellfish waters and exceeded the *Approved* classification year-round, in the summer, and in the winter. Sampling Stations **3219A** and **3219C** also exceeded the *Approved* classification in the 2015 and 2016 Annual Reviews of this growing area, and a downgrade is being considered for Kitts Thorofare east of Stites Sound from the *Approved* to the *Conditionally Approved (November – April)* shellfish classification, and from the *Approved* to the *Restricted* shellfish classification for Middle Thorofare west of Sea Isle City. In July 2017, four new sampling stations were added to Kitts Thorofare and Middle Thorofare to determine where the line should be drawn for this downgrade. This is the first time Sampling Station **3127B** exceeded its existing shellfish classification, and other sampling stations next to this station in Ludlam Bay meet their existing *Approved* shellfish classification. Therefore, no

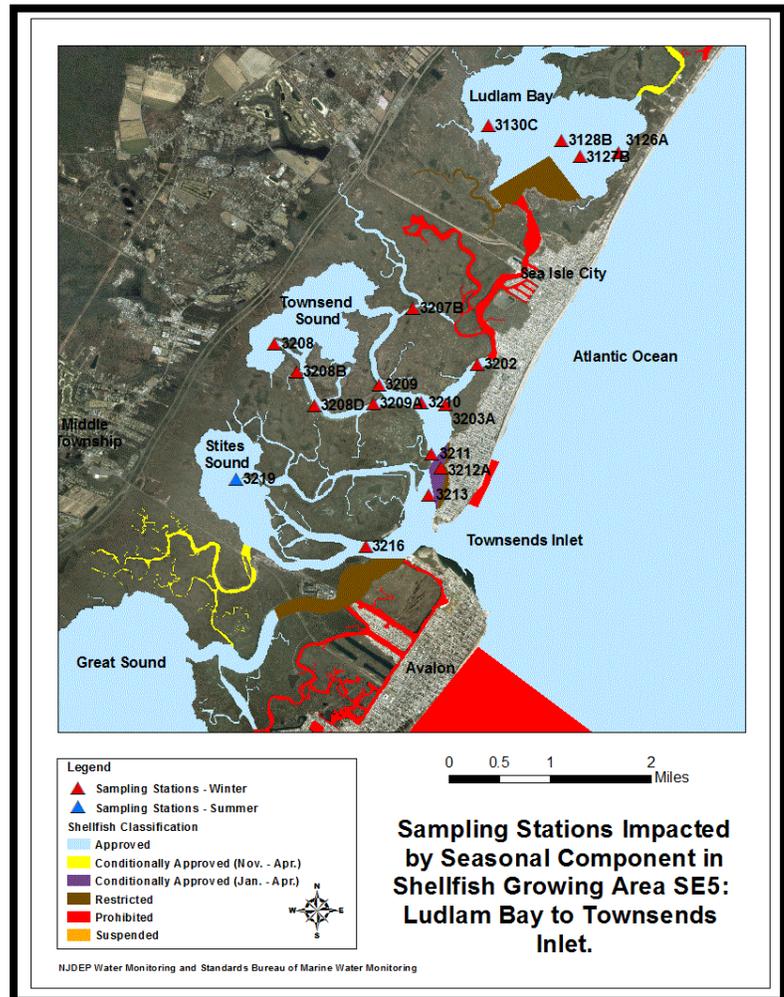


classification changes are recommended for the Ludlam Bay area and Sampling Station **3127B** will be closely monitored during shoreline surveys of this area. Water samples will also be collected at Sampling Station **3127B** and analyzed for coliphage and MAR.

## 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, 18 monitoring stations had a t-statistical probability of less than 0.05 while 17 of these monitoring stations showed a higher geometric mean during the winter, and only one monitoring station (sampling station 3219) showed a higher geometric mean during the summer. This shellfish growing area was sampled with no seasonal preference.

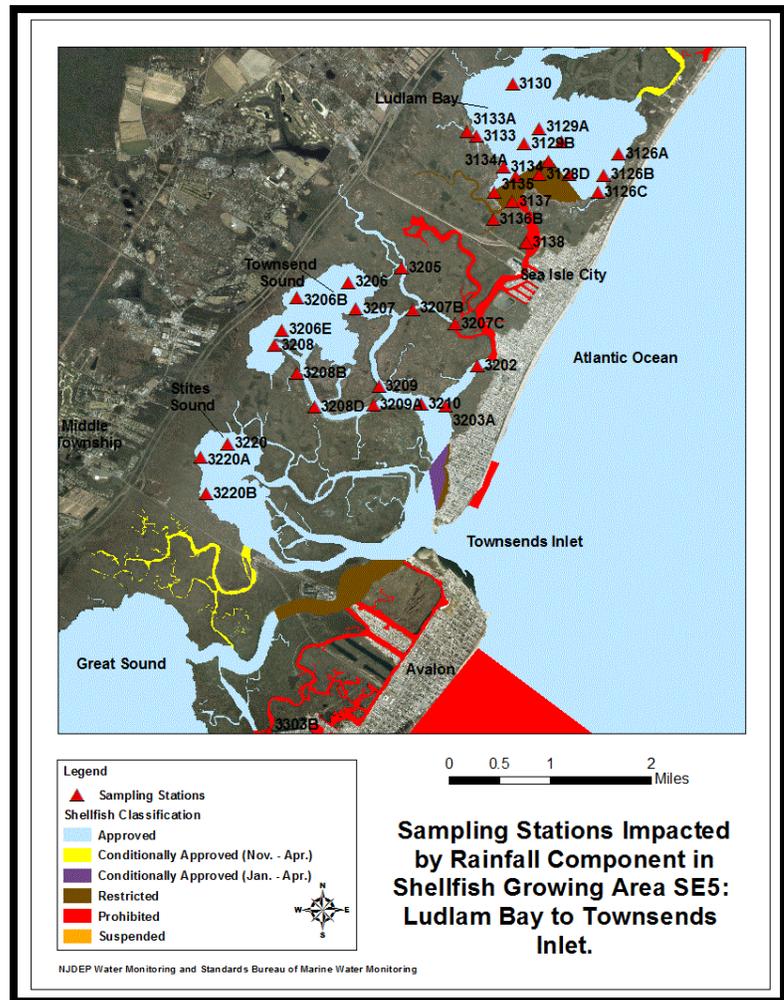


## Rainfall Effects

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 1/1/2013 to 7/26/2017. The Wet/Dry Statistics were calculated based on a post impact time of 72 hours prior to the day of sampling and a wet/dry cutoff of 0.6 inches of rain. Any rainfall amounts above 0.6 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. Using these parameters for the rainfall data, 37 sampling stations showed an impact from rainfall.

These 37 SRS sampling stations are located throughout this shellfish growing area, in *Approved*, *Restricted*, and *Prohibited* shellfish waters and showed a higher fecal coliform geometric mean during wet than dry conditions. However, the fecal coliform levels still meet the existing 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 Systematic Random Sampling (SRS) strategy.

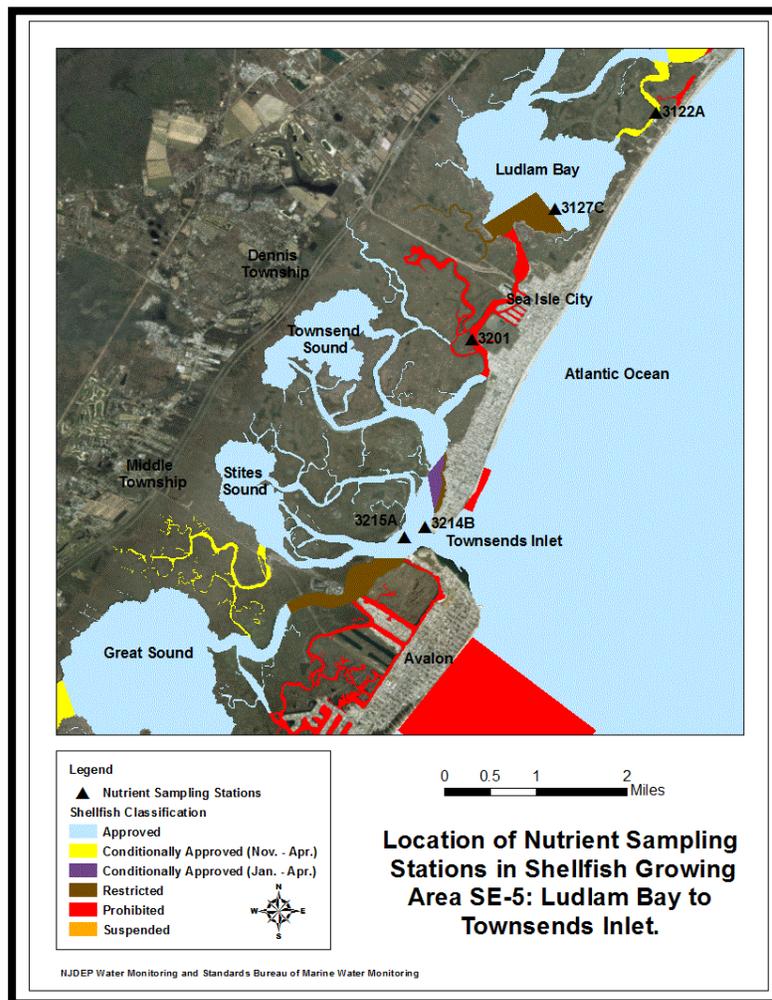


# RELATED STUDIES

## Nutrients

In this growing area, five 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. Between 2013 and 2017, water samples were analyzed for these nutrient parameters in this growing area. For full nutrient assessment, see the Estuarine Monitoring Reports, available electronically at:

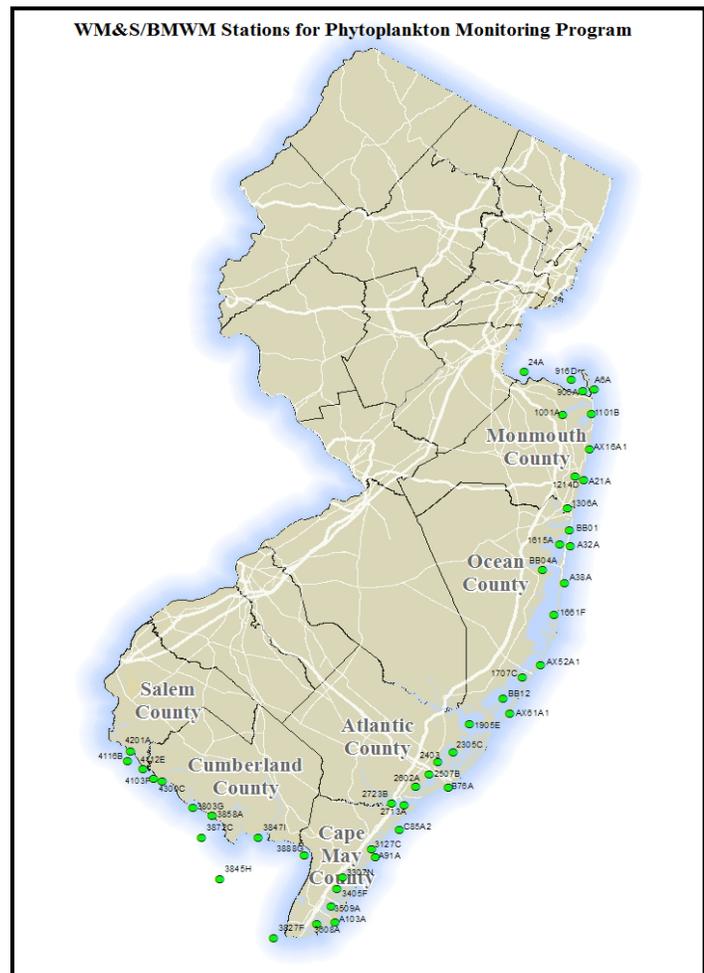
<http://www.state.nj.us/dep/bmw/reports.htm>



## Toxic Monitoring

The DWM&S/BMWM collects samples at regular intervals throughout the summer to determine the occurrence of marine algae that produce biotoxins (see figure to the right for the location of the 48 phytoplankton sampling stations in New Jersey). Certain planktonic species have the potential to adversely affect the suitability of shellfish for human consumption and can adversely affect the respiratory function of people. These planktonic species cause algal blooms that deplete the dissolved oxygen levels in the water.

Since 2007, algal blooms are also identified by the DWM&S/BMWM with the aid of a remote chlorophyll flight sensor. Coastal monitoring flights with remote aircraft sensing have taken place from Coyle Field in Burlington County, north to the Raritan Bay, south to the Little Egg Harbor Inlet, and back to Coyle Field (short flights), and from Coyle Field, north to the Raritan Bay, south to Cape May Point, west into the Delaware Bay, and north through the back bays of New Jersey back to Coyle Field (long flights). In a partnership between the DWM&S/BMWM, the



New Jersey Forest Fire Service (aviation operations and maintenance), Rutgers University (data management), and USEPA Region 2 (funding), these flights (4 short flights and 2 long flights a week) are scheduled for six days a week from May to September of each year. Flight observers are also on these flights to observe conditions that could adversely affect bathing beach and water quality, such as the presence of algal foam from algal blooms, floating trash or debris, broken sewer lines, and the presence or absence of marine life and fish kills. The sensor data from these remote aircraft sensing flights provide estimates of coastal chlorophyll 'a' levels and a perspective on bloom conditions/trends. If estimates of coastal chlorophyll 'a' levels come up high in specific areas during a coastal monitoring flight, this enables the Bureau to target boat sampling to locations where algal blooms might be occurring. The NJDEP and Rutgers University Chlorophyll Remote Sensing flights in the waters of New Jersey are available electronically at: <http://njdep.marine.rutgers.edu/aircraft/>.

Generally, no toxic species associated with large algal blooms over long periods have been recorded for the Ludlam Bay to Townsends Inlet Area. The phytoplankton monitoring of sampling stations in New Jersey waters is available electronically at: <http://www.nj.gov/dep/bmw/phytoplankton.htm>.

## CONCLUSIONS

Based on the bacteriological data assessed, all but three of the sampling stations within this growing area meet their current shellfish classifications. Sampling Stations **3127B**, **3219A**, and **3219C** were not in compliance with the fecal coliform criteria for their existing *Approved* shellfish classifications, as specified by the National Shellfish Sanitation Program (NSSP). Sampling station **3127B** exceeded the *Approved* classification year-round. Sampling Station **3219A** exceeded the *Approved* shellfish classification year-round and in the summer. Sampling Station **3219C** exceeded the *Approved* classification year-round, in the summer, and in the winter. Sampling Stations **3219A** and **3219C** also exceeded the *Approved* classification in the 2015 and 2016 Annual Reviews of this growing area. On October 10, 2016, water samples at Sampling Stations **3219A** and **3219C** were collected and analyzed for ARA, and Sampling Station **3219A** (Assignment 287, bottle 18) showed up as being impacted by domestic sources, while Sampling Station **3219C** (Assignment 287, bottle 5) showed up as being impacted by human sources. In July 2017, four new sampling stations were added to Kitts Thorofare and Middle Thorofare to determine where the line should be drawn for a downgrade to this area. This is the first time Sampling Station **3127B** exceeded its existing shellfish classification, and other sampling stations next to this station in Ludlam Bay meet their existing *Approved* shellfish classification. Except for these three sampling stations, the overall water quality for this growing area is generally good. No significant changes to landuse patterns, hydrography, or discharges that would change the shellfish waters classification were observed during shoreline surveys of this area.

## RECOMMENDATIONS

Continue sampling using the existing Systematic Random Sampling (SRS) Strategy for Assignment 247 and Assignment 287. A downgrade is being considered for Kitts Thorofare east of Stites Sound from the *Approved* to the *Conditionally Approved (November – April)* shellfish classification, and from the *Approved* to the *Restricted* shellfish classification for Middle Thorofare west of Sea Isle City. Four new sampling stations were added to Kitts Thorofare and Middle Thorofare to determine where the line should be drawn for this downgrade to this growing area. No classification changes are recommended for the Ludlam Bay area and Sampling Station **3127B** will be closely monitored during shoreline surveys of this area. Water samples will also be collected at Sampling Station **3127B** and analyzed for coliphage and MAR.

## 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

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- 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. 2015. 2015 Annual Review of Shellfish Growing Areas for Data Year 2015, Growing Area # SE-5, Ludlam Bay to Townsends Inlet. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ
- NJDEP. 2016. 2016 Annual Review of Shellfish Growing Areas for Data Year 2016, Growing Area # SE-5, Ludlam Bay to Townsends Inlet. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ
- NJDEP. 2017. Water Sampling Assignments. New Jersey Department of Environmental Protection, Trenton, NJ
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- NJDEP. 2012. *Shellfish Growing Area Report Guidance Document*, 2012 Revision. New Jersey Department of Environmental Protection, Marine Water Monitoring, Leeds Point, NJ
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- Wesighan, Paul. 2014. Reappraisal of Shellfish Growing Area SE-5: Ludlam Bay to Townsends Inlet. 2009 – 2014. New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring, Leeds Point, NJ.

## SUPPORTING DOCUMENTATION

A. Statistical Summaries

Year-round/ Summer/ Winter -

[rptStatSummary\\_Approved\\_SRS.pdf](#), [rptStatSummary\\_SpecialRestricted\\_SRS.pdf](#),  
[rptStatSummary\\_Approved\\_SRS - Extended to 2009 for Summer.pdf](#),  
[rptStatSummary\\_Approved\\_SRS - Extended to 2007 for Winter.pdf](#)

B. Seasonal Evaluation – [rptStatSummary\\_Seasonal.pdf](#)

C. Precipitation -

Cumulative Rainfall - [rptStatsSummary\\_Rainfall.pdf](#)

Wet/Dry Weather Statistical Summary – [rptWetDry\\_24HrStats.pdf](#),  
[rptWetDry\\_48HrStats.pdf](#), [rptWetDry\\_72HrStats.pdf](#)

D. Data Listing -2013 through 2017 - [rpt\\_DataListing.pdf](#), [rpt\\_DataListing -  
Extended to 2009 for Summer.pdf](#), [rpt\\_DataListing -  
Extended to 2007 for Winter.pdf](#)

E. Shoreline Survey photographs – [Shoreline Survey of Shellfish Growing Area SE5 on  
September 12, 2017.docx](#), [Shoreline Survey of Shellfish Growing Area SE5 on September  
25, 2017.docx](#)

F. Shoreline Survey Sheet - [Shoreline Survey of SE5 on September 12, 2017\Shoreline Survey  
of SE5 on 09-12-2017.pdf](#), [Shoreline Survey of SE5 on September 25, 2017\Shoreline  
Survey of SE5 on 09-25-2017.pdf](#)