NJ Department of Environmental Protection
Water Monitoring and Standards

Sanitary Survey Report for Shellfish Growing Area A0NorthCent (Bayhead to Monmouth Beach)

March 2015

State of New Jersey
Chris Christie, Governor
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NJ Department of Environmental Protection
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Sanitary Survey Report for Shellfish Growing Area A0NorthCent (Bayhead to Monmouth Beach)

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Cover Photo – Winters' Beach – Deal, NJ

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This Sanitary Survey report describes shellfish growing water quality in relation to classifying 18 miles of Atlantic Ocean from Bayhead to Monmouth Beach (A0NorthCent). There are 46,664 acres comprising A0NorthCent. That acreage is composed of 31,985 acres of *Approved* and 14,679 acres of *Prohibited* waters. Those classifications can be seen in the map to the right. The New Jersey Shellfish Growing Water Classification Charts, which can be found within the Water Monitoring and Standards' (WM&S'), Bureau of Marine Water Monitoring's (BMWM's) website, provide an excellent tool for viewing the location and classifications for A0NorthCent (see *www.state.nj.us/dep/wms/bmw*).
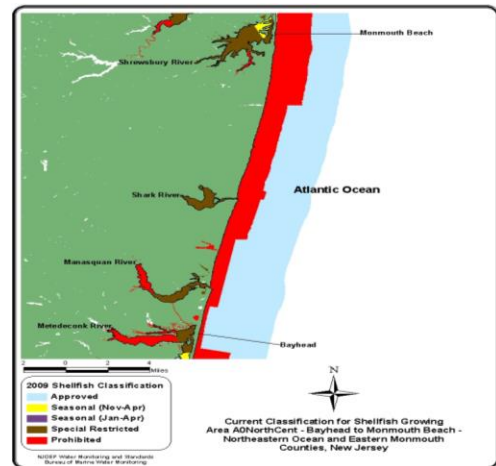
The statistics utilized for analysis and classification in this Sanitary Survey were derived from samples collected between May 2005 and April 2010. Statistical interpretation indicates the *Approved* waters in this shellfish growing area generally met criteria for classification as *Approved*. *Approved* surface station A16A2 did experience two spikes on individual dates, which produced a 90th percentile score for bacteriology that exceeded the *Approved* criteria during the summer. This occurred on one date in 2005 and one date in 2006. The raw data will be discussed in greater detail within this report but continued observation of this station has shown no additional spikes in the data since 2006. All bacteriological counts since that date have been very low and within the *Approved* criteria. WM&S/BMWM will continue to utilize a frequent review process for potentially higher counts in the raw data for this station going forward, and this will also be noted in the Recommendations section.

The discharge pipes and outfalls of six wastewater treatment facilities are located within A0NorthCent. The presence of direct discharge requires the use of the sampling strategy known as Adverse Pollution Condition (APC). From south to north, these facilities are the South Monmouth Regional Sewerage Authority, Township of Neptune Sewerage Authority, Asbury Park Water Pollution Control Facility, Township of Ocean Sewerage Authority, Long Branch Sewerage Authority and the Two Rivers Water Reclamation Authority. The treatment plants and their outfalls warrant description due to their location and potential to contribute influence as direct source inputs. Wastewater treatment plant outfalls require the designation of safety zones or *Prohibited* areas that act as buffers for dilution. These buffers are a necessary precaution in terms of public health concern and potential impact due to incidental or accidental discharge of untreated sewerage.

No impacts to the waters of A0NorthCent from treatment plant error, operation, or discharges were indicated for these treatment facilities by DMR Data, interview, or bacteriological analysis. Wastewater treatment plants in the state of New Jersey have generally kept pace with technology during the past two decades. This has provided for continuous facility upgrades that in turn help maintain their efficiency and reliability. As such, most wastewater facilities within the state have

accumulated an ongoing record of providing acceptable water quality treatment. This holds true for the facilities located within A0NorthCent.

Non-point source inputs such as those that might emanate from stormwater outfalls are located within some ocean waters of A0NorthCent, and certain brooks and rivers that feed into these waters also receive such inputs. *Prohibited* waters blanket the entire coastline of this shellfish growing area and as such surround the stormwater outfalls and mouths of the brooks and rivers that provide non-point inputs. No ongoing, debilitating impact from these indirect sources has been noted for A0NorthCent. Stormwater inputs from the outfalls, brooks, and rivers noted above have generally been diluted before they meet and mix with ocean waters, and further dilution takes place as they mix with the Atlantic. As such, inputs from indirect sources and effluents from treatment facilities (direct sources) appear to have little effect on this growing area and its *Approved* waters. With this and the presence of generally acceptable data from the monitoring and analysis presented in this report, the classifications designated for A0NorthCent will continue to be supported in this Sanitary Survey.

GROWING AREA PROFILE

LOCATION AND DESCRIPTION

This Sanitary Survey covers the ocean shellfish growing waters from Bayhead in the south to Monmouth Beach in the north (see figure to the right), and offshore to the State's three (3) mile jurisdictional limit (Please Note: all references to "miles" in this report are in nautical measure, whereby, one Nautical Mile equates to 6,086 feet).

Location of Shellfish Growing Area A0NorthCent - Bayhead to Monmouth Beach - Northeastern Ocean and Eastern Monmouth Counties, New Jersey

The numerous coastal towns adjoining the shellfish growing waters of A0NorthCent are urban, comprised in large part by residential homes although there are clusters of commercial properties. These towns generally act as seashore towns with populations expanding during spring and summer and substantially reducing in the winter.
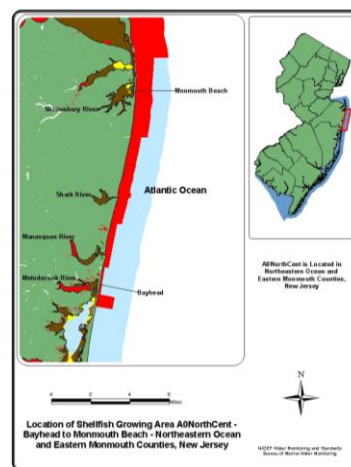
A0NorthCent shellfish growing waters receive input from the Manasquan and Shark Rivers along with Poplar Brook and Whale Pond Brook (indirectly – feeds into Lake Takanassee, which has an ocean outfall). There are a number of stormwater outfalls within those water sources and stormwater outfalls exist within various inshore lakes and ponds that empty into the waters of this growing area, and along the A0NorthCent shoreline. In addition, there are six wastewater treatment facilities servicing the coastal towns of A0NorthCent with direct outfalls within A0NorthCent shellfish growing waters.

As previously mentioned, the wastewater treatment facilities in A0NorthCent belong to the South Monmouth Regional Sewerage Authority (SMRSA), Township of Neptune Sewerage Authority (TNSA), Asbury Park Water Pollution Control Facility (APWPCF), Township of Ocean Sewerage Authority (TOSA), Long Branch Sewerage Authority (LBSA), and the Two

Rivers Water Reclamation Authority (TRWRA). Former reports for this growing area have found these wastewater treatment plant outfalls were the only direct point sources of pollution identified that had the potential to impact this locations water quality.

Yearly data listings have shown the effluent from these ocean discharge locations have not had a significant or ongoing impact to the water quality or classifications of this shellfish growing area. None the less, closed safety zones or *Prohibited* waters surrounding these direct outfalls must continue to be maintained in order to provide buffers for public health and safety.

Rainfall runoff also appears to have limited impact on this area's current shellfish classifications. Generally, impacted waters from stormwater runoff receive substantial dilution and mixing before entering the ocean. Dilution occurs to such inputs before they make their way to those areas where classifications prevail for *Approved* shellfishing, as mixing occurs in the rivers, brooks, lakes, and ponds. Additionally, there is a *Prohibited* buffer along the entire shoreline of A0NorthCent providing dilution to impacted waters.

Growing Area Classification Summary

The last Sanitary Survey for the waters of A0NorthCent was written in 1999. In a Reappraisal that followed, covering the time frame from 1999 – 2003, 66.40 acres were downgraded from *Approved* to *Prohibited* waters. This was an administrative downgrade as opposed to a decision based on poor water quality from a bacteriological standpoint. Primarily, it was the result of this Bureau's decision to increase the dilution water's (*Prohibited* acreage) around TNSA's diffuser locations. That downgrade brought about a change in growing water acreage to 31, 985 *Approved* acres and 14,679 acres of *Prohibited* waters (46,664 acres in total). Subsequently, there was a reappraisal that summarized the 2002 – 2006 time frame, and classifications and acreage did not change with that report.
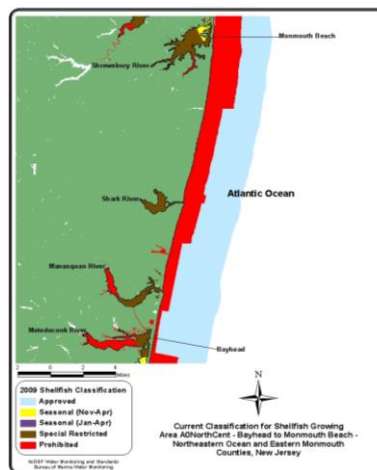
The representative data presented for this reporting period (05/01/05 – 04/13/10) suggests that bacteriological water quality for fecal coliform in A0NorthCent was generally acceptable with regard to current classifications associated with these waters. This report then, will serve to support all current classifications with no changes recommended at this time. Again as noted in the Executive Summary, continued observation for *Approved* surface station A16A2 is required due to an occasion in 2005 and again in 2006, where two higher raw data scores were observed for that station during the summer. All subsequent data for this station has been within the criteria for *Approved* classification, though. Current classifications along with growing water acreage and percentages are shown in the figures to the right.
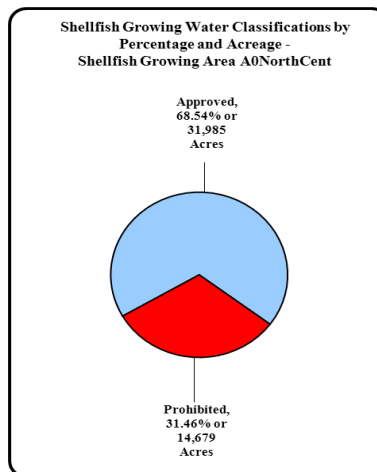
EVALUATION OF BIOLOGICAL RESOURCES

Historically, *Approved* ocean waters have been used for harvesting surf clams (<u>Spisula</u> <u>solidissima</u>) and blue mussels (<u>Mytilus</u> <u>edulis</u>) by dredge boats licensed by the Division of Fish and Wildlife. Surf clams (for bait purposes only - non-human consumption) can also be harvested from *Prohibited* areas under a special program administered by WM&S/BMWM and enforced by the Division of Fish and Wildlife.

Surf clam harvests take place from October 1 – May 31st. In addition to being the State's largest molluscan fishery (i.e., regarding lbs. landed), New Jersey's surf clam fishery historically leads all other surf clamming states in total annual landings, and continues to do so according to the most recently released statistics from NOAA's National Marine Fisheries Service. The table below denotes commercial landings in pounds of meat and ex-vessel value for New Jersey surf clams from 1993 through 2010.

Commercial Data for Surf Clams Showing Pounds of Meat and Ex-vessel Value for New Jersey Landings. **Source:** NOAA - National Marine Fisheries Service – February 27, 2013		
Year	**Lbs. of Surf Clams Landed**	**Ex-vessel Value**
1993	47,978,097	$ 21,802,735
1994	48,572,236	$ 26,840,477
1995	46,329,437	$ 27,443,281
1996	48,740,881	$ 28,983,170
1997	45,603,401	$ 27,168,453
1998	44,751,327	$ 23,060,750
1999	49,299,900	$ 25,371,922
2000	58,047,629	$ 31,371,354
2001	52,872,341	$ 29,326,676
2002	53,590,740	$ 29,172,373
2003	51,336,955	$ 27,431,645
2004	43,521,704	$ 22,284,335
2005	38,967,993	$ 20,028,662
2006	43,643,726	$ 25,106,785
2007	44,791,212	$ 26,546,602
2008	39,346,425	$ 24,349,551
2009	32,893,521	$ 20,568,576
2010	25,089,484	$ 16,010,934

Since New Jersey's surf clam industry is at the national forefront in total landings, monitoring, management, and conservation of this resource is very important to the State. In this regard, the New Jersey Surf Clam Advisory Committee, comprised of industry and government

representatives, in conjunction with the Commissioner for the New Jersey Department of Environmental Protection, sets the quotas for harvest. A brief history of those quotas and the ocean bi-valves with the largest landings for the State are shown in the tables that follow.

New Jersey Surf Clam Quotas in Industry Bushels by Year (1996 – 2010). Source: New Jersey Department of Environmental Protection, Bureau of Shellfisheries	
Surf Clam Harvest Year	**Surf Clam Quotas in Industry Bushels**
1996 - 1997	600,000
1997 - 1998	600,000
1998 - 1999	700,000
1999 - 2000	700,000
2000 - 2001	700,000
2001 - 2002	600,000
2002 - 2003	600,000
2003 - 2004	275,000
2004 - 2005	350,000
2005 - 2006	237,000
2006 - 2007	240,000
2007 - 2008	198,000
2008 - 2009	58,368
2009 - 2010	55,296

Ocean Bi-Valves w/ Largest Landings Reported for New Jersey (0 - 3 Miles Distance from Shore highlighted in yellow)									
	DISTANCE FROM N. J. SHORE								
	0 - 3 MILES		3 - 200 MILES		HIGH SEAS		COMBINED TOTALS		
COMMON BI-VALVE NAME	Pounds of Meat (000)	Dollars (000)	Pounds of Meat (000)	Dollars (000)	Pounds of Meat (000)	Dollars (000)	Total Pounds of Meat (000)	Total Dollars (000)	Price/ Pound of Meat
Surf Clam	7,959	4,641	17,130	11,370	-	-	25,089	16,011	$.64
Sea Scallops	56	497	14,098	108,492	-	-	14,155	108,990	$7.70
Ocean Quahog	2,141	1,104	11,307	6,775	-	-	13,448	7,878	$.59
-- TOTALS --	10,156	6,242	42,535	126,637	-	-	52,692	132,879	
Adapted from: Landings by Distance from U.S. Shores, 2010, State of New Jersey, National Marine Fisheries Service - Fisheries Statistics and Economics Division - Report printed on: 02/27/13 * No Data Available									

SHORELINE SURVEY: EVALUATION OF POTENTIAL POLLUTION SOURCES

Shoreline surveys or site specific tours of areas nearby or abutting shellfish growing waters can provide insight as to the location and nature of land use, surface water discharges, marinas, unpermitted discharges, and stormwater inputs. A shoreline survey of A0NorthCent was

conducted on January 20, 2011, and the following sections detail information derived collectively from that survey, and those that preceded it.

LAND USE

Areas for new development are generally limited within the municipalities or boroughs abutting A0NorthCent as much of the land that could be used for such projects has already been developed. Under normal circumstances there would be some new construction projects taking place in areas where homes had been torn down. And, there might be some new home projects taking place on previously vacant land. In addition, many of the homes and businesses within coastal A0NorthCent do undergo reconstruction and refurbishment from time to time.

Impact from construction is lessoned or unlikely though due to the nature of the land and water abutting and surrounding this shellfish growing area. Construction projects bordering on eco-sensitive areas such as those in A0NorthCent are required by local, state, and federal regulations to utilize specific set backs and buffers as a means of protecting flora and fauna specific to wetland, riparian, or estuarine locations. The use of these buffers can never be understated as their utilization suggests construction is unlikely to severely impact surrounding natural ecosystems.

Aside from contributing to productivity, wetland and estuarine zones provide valuable habitat for many marine species during some point of their life cycle. In addition, some plant species within these zones take up contaminants from the ecosystem.

A limited area of wetlands is present in close proximity to urban development in A0NorthCent. Locations for these wetlands can be seen in the figures for land use to the right side of this page. The most notable wetland location is situated in the western portion of the Manasquan River. There are additional wetlands scattered between the Shark and Shrewsbury Rivers.

The land adjacent to A0NorthCent is typical of New Jersey's coastal geophysiology. The Atlantic Ocean is located to the east. The predominant land use is urban. Interactions of ocean tides and wind help shape the shore and dune line along the easterly confines of A0NorthCent. There is
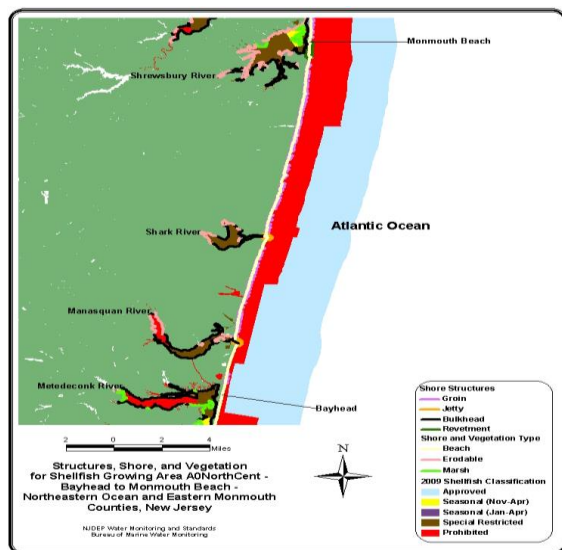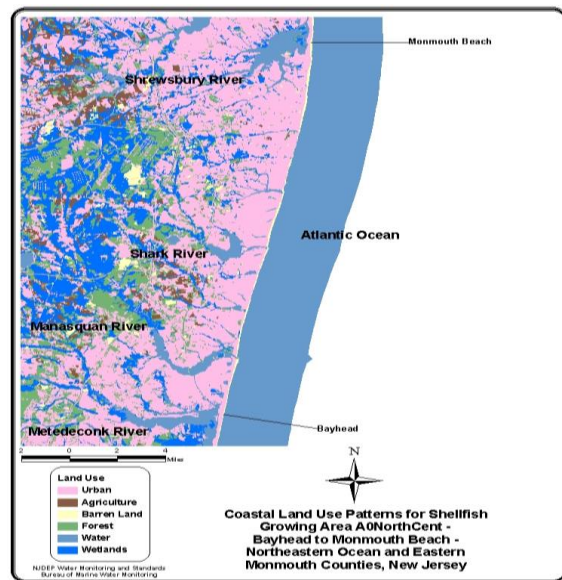
influence from the rivers and brooks that directly empty into this growing area and from those that indirectly flow (i.e., Whale Pond Brook). The largest of these water sources, and those that exhibit the greatest influence on A0NorthCent waters are the Manasquan River that feeds into the southern portion of A0NorthCent and Shark River, which empties into this growing area in the south central section.

There are numerous mainland communities situated west of A0NorthCent (see municipality figure at the bottom of this page). These communities can provide a source of nutrient and bacterial loading when considering the numerous stormwater inputs and outfalls that flow into or toward the ocean waters of A0NorthCent. However, the distance from input sources to the *Approved* waters of this growing area provides substantial time and area for dilution. In addition, WM&S/BMWM water quality testing shows that they have minimal impact on the current classification of shellfish growing waters for A0NorthCent.

Sewage from municipalities within close proximity to A0NorthCent is carried to wastewater treatment facilities by sanitary sewers. It is treated by one of the following six facilities: the South Monmouth Regional Sewerage Authority, Township of Neptune Sewerage Authority, Asbury Park Water Pollution Control Facility, Township of Ocean Sewerage Authority, Long Branch Sewerage Authority, or the Two Rivers Water Reclamation Authority.

There are pockets of homes well to the west of Shellfish Growing Area A0NorthCent that utilize septic systems. Septic is primarily used in areas of lower population density. Generally, the availability for access to city sewage infrastructure is less likely in these areas.

There are always concerns regarding nutrient loading and elevated coliform levels in watersheds near communities utilizing septic. However, the distance from these communities to this growing area provides a safety zone for dilution.

Further, as populations grow and communities expand, this generally leads to the extension and availability of city sewer lines to homes.

Sewerage treatment plants are generally designed or have been upgraded to facilitate population growth or seasonal fluctuation. Seasonal fluctuation with regard to capacity loading (for treatment

Coastal Municipalities for Shellfish Growing Area
A0NorthCent - Bayhead to Monmouth Beach -
Northeastern Ocean and Eastern
Monmouth Counties, New Jersey

NJDEP Water Monitoring and Standards
Bureau of Marine Water Monitoring
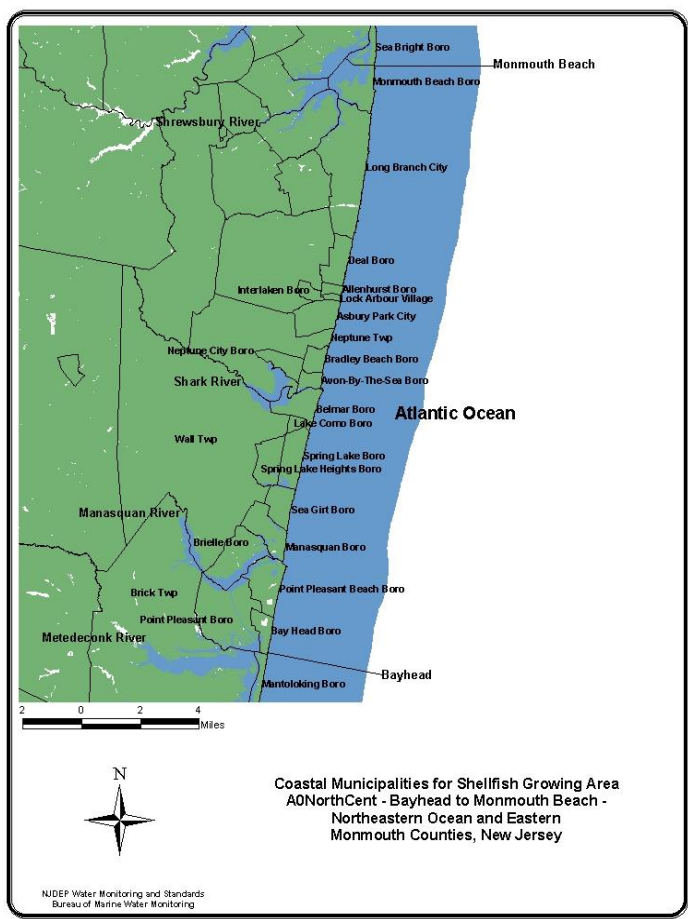
plants) is especially important within New Jersey's coastal communities as per increased use during the summer.

SURFACE WATER DISCHARGES – TREATMENT FACILITY WASTEWATER EFFLUENTS

Evaluation and compliance of shellfish growing areas is ascertained using NSSP criteria as contained in the *Guide for the Control of Molluscan Shellfish*, 2013. Interaction between the State and treatment plants is important in determining plant efficiency, which integrally relates to the eventual effluent quality discharged into ocean waters off the coast of New Jersey. State effluent standards for direct discharge are presented in the table below. And, the wastewater treatment facilities, discussed in this section do maintain the standards shown in that table.

As discussed previously, there are six wastewater treatment facility discharge pipes and outfalls located within A0NorthCent, which represent potential point sources of contamination. From south to north, they are the South Monmouth Regional Sewerage Authority (SMRSA), Township of Neptune Sewerage Authority (TNSA), Asbury Park Water Pollution Control Facility (APWPCF), Township of Ocean Sewerage Authority (TOSA), Long Branch Sewerage Authority (LBSA), and the Two Rivers Water Reclamation Authority (TRWRA).

Effluent Standards for Direct Discharge to Surface Water from Publicly/Privately Owned Wastewater Treatment Facilities – NJPDES Permit Regulations (7:14A – 12.2 – 12.5)	
Avg. BOD5 Level/Wk.	≤ 45 mg/L
Avg. BOD5 Level/Mo.	≤ 30 mg/L
Avg. BOD5 % Removal/ Mo.	≥ 85%
or Avg. CBOD5 Level/Wk.	≤ 40 mg/L
or Avg. CBOD5 Level/Mo.	≤ 25 mg/L
or Avg. CBOD5 % Removal/ Mo.	≥ 85%
Avg. TSS Level/Wk.	≤ 45 mg/L
Avg. TSS Level/Mo.	≤ 30 mg/L
Avg. TSS % Removal/ Mo.	≥ 85%
Geo. Mean FC/Wk.	≤ 400 MPN/100 mL
Geo. Mean FC/Mo.	≤ 200 MPN/100 mL

All of the wastewater treatment plant outfalls mentioned in the following sections are located in the Atlantic Ocean, east of Monmouth County. With the exception of the Township of Neptune Sewerage Authority, which uses tertiary treatment, wastewater facilities discussed within this report utilize secondary forms of sewage treatment. All facilities eventually release treated effluents through their ocean outfalls.

To allow for additional mixing and dilution, these ocean outfalls are located at some distance offshore. In nautical miles, the approximate distances are as follows: SMRSA (.73 n mi.), TNSA (.95 n mi.), APWPCF (.14 n mi.), TOSA (.33 n mi.), LBSA (.20 n mi.), and TRWRA (.27 n mi.).

The South Monmouth Regional Sewerage Authority Discharge Pipe and discharge location are situated southeast of Lake Como, Spring Lake Boro. Township of Neptune Sewerage Authority has its discharge pipe and discharge location running east of the intersection of Ocean and Garfield Avenues in Avon-by-the-Sea Boro. The discharge location and line for Asbury Park's' Water Pollution Control Facility run to the southeast of 8th Avenue, Asbury Park City. The Township of Ocean Sewerage Authority discharge line and outfall location are due east of Poplar Avenue, Deal Boro. The LBSA discharge pipe and outfall are located to the northeast of the intersection of Joline and Ocean Blvd. North, Long Branch. The TRWRA discharge pipe and outfall are situated in the Atlantic, southeast of Sailors Way and Monmouth Beach Borough.
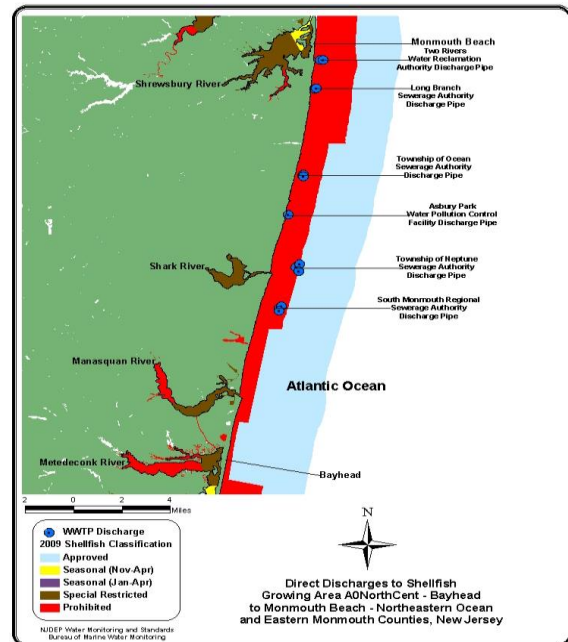
The figure to top right shows the outfall locations and the table below presents a brief description of the waste type, design flow, and discharge characteristics of each plant. Summaries of the SMRSA, TNSA, APWPCF, TOSA, LBSA, and TRWRA facilities follow that table.

Map Key(s) - Direct Discharge(s) to Waters of Shellfish Growing Area A0NorthCent			
Facility Name	Waste Type	Waste Quantity (Design Flow - MGD)	Discharge
South Monmouth Regional Sewerage Authority	Residential Wastewater Influent	9.1	Secondary Treated Effluent
Township of Neptune Sewerage Authority	Residential Wastewater Influent w/ Light Industrial Input	8.5	Tertiary Treated Effluent
Asbury Park Water Pollution Control Facility	Residential Wastewater Influent w/ Light Industrial Input	4.4	Secondary Treated Effluent
Township of Ocean Sewerage Authority	Residential Wastewater Influent w/ Light Industrial Input	7.5	Secondary Treated Effluent
Long Branch Sewerage Authority	Residential Wastewater Influent w/ Light Industrial Input	5.4	Secondary Treated Effluent
Two Rivers Water Reclamation Authority	Residential Wastewater Influent w/ Light Industrial Input	13.83	Secondary Treated Effluent

South Monmouth Regional Sewerage Authority

The South Monmouth Regional Sewerage Authority is located at 1235 18th Avenue in Belmar, New Jersey. The plant went online around 1977. It utilizes trickling filters in order to provide secondary treatment to sewage from Brielle, Wall Township, Manasquan, Sea Girt, Spring Lake Heights, Spring Lake, Lake Como, and Belmar.

The South Monmouth facility was designed to handle 9.1 million gallons of sewage per day. The sewage inflow to this plant is sanitary or residential. There would be extremely limited industrial discharge to the influent that flows in to the South Monmouth Regional Sewerage Authority, if any, according to spokespersons.

The facility has two trickling filters. These filters are made with "Modular Basket Media", a plastic media that improves $CBOD_5$, removes additional suspended solids, and reduces ammonia and nitrogen content. They utilize what is referred to as serial routing. Serial routing suggests sewage flows through a primary settling tank to the first trickling filter. After the first trickling filter, the sewage flows through an intermediate settling tank and into a second trickling filter. After the second trickling filter, the sewage flows to the final settling tank and then it is chlorinated. Once the effluent is chlorinated, it is held in an aeration pond, and then an equalization pond, before being released to the Atlantic Ocean.

The flow of sewage through the treatment system may be rerouted to allow for maintenance and repair of the facility. When this occurs, the treatment system becomes a single trickling filter with primary and secondary settling tanks.

There are eleven pumping stations connected to this facility. One pumping station is located in each of the following locations: Brielle, Wall, Sea Girt, Wreck Pond, Spring Lake Heights, Lake Como, and Belmar. In addition, two pump stations are present in each of the following municipalities: Manasquan and Spring Lake.

Automatic alarms are online for all pumping stations and the treatment facility as well. Emergencies relating to high water, power failure, and breakdown activate alarms by means of a Supervisory Control and Data Acquisition System (SCADA). Plant processes are also physically inspected every hour, 24 hours a day, as plant personnel are continuously on hand.

Each individual municipality is responsible for the sewer line, which feeds into their respective pumping stations. Until the late 1900's, infiltration and inflow were not important issues for South Monmouth Regional Sewerage Authority. Incoming sewage had consistently been less than the design capacity of the treatment system. As municipal populations increased, extraneous flows have created more demand for the treatment facility.

In order to take on issues with infiltration and inflow, an infiltration and inflow project (i.e., "I and I project") was integrally designed for six of their eight member towns. This project was created to prevent stormwater flows into their inflow lines, allowing the facility to maintain compliance with their NJPDES permit requirements.

Disinfection is achieved through continuous chlorination with Sodium Hypochlorite. Three, 3000 - gallon tanks feed sodium hypochlorite, with daily feed rates that range between 90 and 650 gallons of sodium hypochlorite, depending on the time of year. A chlorine alarm system is on line for leakage. No alarms are on line for failure of the chlorination system but the recorder and status of the tank are checked once per hour.

Chlorine residual is monitored with three grab samples per day. Effluent bacterial testing is performed three times per week.

Township of Neptune Sewerage Authority

This facility is located at 634 Old Corlies Avenue in Neptune, New Jersey. The plant utilizes trickling filter and Biofor processes to provide tertiary treatment to sewage from Neptune Township, Neptune City, Bradley Beach, Avon-By-The-Sea, Ocean Grove, portions of Wall Township, and Tinton Falls.

The facility is designed to handle 8.5 million gallons of sewage per day. Plant engineers suggest peak operating capacity is closer to 11.0 MGD. Sewage inflow is primarily residential. There is some light industrial input from a laundry business and plating factory.

Automatic alarms are online for the single pumping station, located on Laird Avenue in Neptune Township, and for the treatment facility. These alarms are intended to provide notification in instances of high water, power failure, and breakdown. All alarms go to the operators' panel including those sounding at the Laird Avenue pump station. The panel and plant are physically inspected every hour, 24 hours a day.

The plant has three treatment trains in constant operation. Each treatment train has primary and secondary settling tanks and trickling filters. This allows influent to be rerouted between treatment trains during maintenance of the facility. There are also duplicate chlorine tanks and sludge digesters, which translates to smoother maintenance and repair processes.

Disinfection is achieved through continuous chlorination with sodium hypochlorite. Two 3000-gallon tanks and one, 1000-gallon tank feed sodium hypochlorite, with an average daily rate of 210 gallons.

There is no chlorine alarm system for failure of the chlorination system. There is a leakage alarm, though. Each sodium hypochlorite tank has a calibrated visual indicator to allow metering of the amount of chlorinating agent present in the tanks.

In addition to typical secondary treatment, effluent also goes through an 18 million gallon aerated stabilization pond for three to five days allowing for additional settling. After aeration, effluent is additionally treated through a Biofor (Biological Filtration Oxygenation Reactor) process. The Biofor process, which is very similar to an activated sludge processor, improves BOD and reduces counts for ammonia and total suspended solids with the help of shale particulate.

After treatment in the Biofor, effluent is additionally chlorinated prior to being discharged to the outfall pipe. TNSA has an additional 500-gallon tank available for finalizing effluent chlorination at this operative point of the facility, before discharging to the plants outfall.

Chlorine residual in effluent is monitored with nine grab samples per day. Effluent bacterial testing is performed year round with one sample taken per day at a tap located at the final leg of plant processes, preceding discharge to the ocean.

Asbury Park Water Pollution Control Facility

This facility is located at 1701 Ocean Ave., Asbury Park, New Jersey. The plant went online in July 1988.

The wastewater entering this facility comes exclusively from Asbury Park. Secondary treatment is provided to treat what should primarily be considered a composition of residential sanitary waste although there is some light industrial input (approximately 1 %) from a local laundry company.

Plant design allows it to treat up to 4.4 million gallons per day and it is located within a single building, providing a plant that is for the most part, housed indoors. Newer ventilation systems and wet and dry carbon scrubbers aid in odor control. It utilizes 20 rotating biological contactors (four trains of five rotating contactors) with its secondary treatment system, preceded by screening and primary settling.

There are no pump stations connected to this treatment facility as all wastewater flows by gravity from Asbury Park. It has been estimated that an additional 25 per cent increase over normal flow from sewer lines can occur due to inflow and infiltration from older infrastructure.

Older, damaged lines are a factor in many shore areas. As such, many sewage treatment facilities along the New Jersey shore receive increased influent due to stormwater infiltration and seepage.

Despite the large amount of inflow and infiltration, the average flows for the Asbury Park plant are generally less than design flow and treatment efficiency is considered quite acceptable. There have been no plans addressed that would correct inflow and infiltration problems to date. Funding for such improvement projects has been limited.

The treatment facility has automatic alarm systems for all parameters of operation including its chlorinating system. Alarms will go to the operators' panel and to an alarm service. This facility is not staffed 24 hours per day and when an alarm occurs after hours, an alarm service receives the alarm and contacts the operator of the treatment facility.

Disinfection for this plant is achieved through a continuous manual feed of sodium hypochlorite. Six – 500 gallon tanks are available to provide sodium hypochlorite (only one is used at a given time), with an average daily feed rate of 70 gallons per day during both the summer and winter months.

Chlorine residual is monitored with two grab samples per day. Effluent bacterial testing is performed year round with one sample per week.

Township of Ocean Sewerage Authority

The Township of Ocean Sewerage Authority is located at 224 Roosevelt Avenue in the Oakhurst section of Ocean Township, New Jersey. It was built in 1968. Today, TOSA receives influent from 145 miles of sanitary sewer pipes.

The wastewater feeding into this facility comes from the communities of Ocean Township, Interlaken, Loch Arbor, Allenhurst, Deal and Tinton Falls.

The plant utilizes a pure oxygen-activated sludge system to provide secondary treatment. TOSA influent wastewater is primarily composed of sanitary waste, and the plant is currently designed to treat 7.5 million gallons per day (MGD).

There are eleven pump stations connected to this facility. Pump stations for TOSA have automatic alarms for high water and power failure. Of the eleven stations, eight are located in Ocean Township. The Ocean Twp. stations are located on Norwood Avenue, Wrickapecko Drive, Larchwood Avenue, Asbury Avenue, Lakeview Street and three stations are situated on Green Grove Road. Another pump station can be found on Main Street in Interlaken Boro. The remaining two pump stations are located in the housing developments of Rolling Meadows and Cedar Village, which both border on Tinton Falls.

The facility runs on six permanent generators. They also have one portable generator in the event an off site power failure requires immediate start up assistance.

In the case of an alarm situation, the operators' panel in the treatment facility is notified but the Township of Ocean Police Station is also put on alert, as the treatment facility is not staffed 24 hours per day.

After normal working hours, alarms are received by the police, which contact the licensed operator. The treatment facility also has automatic alarms, which are routed in the same fashion and pick up malfunctions at any and all pump stations.

TOSA utilizes a product called Bioxide at six of its pump stations. The use of Bioxide (a Calcium Nitrate derivative) is intended to reduce corrosion and aid in odor control. Corrosion can contribute to frequent replacement part turnover, resulting in higher costs for treatment facilities.

This authority utilizes a Unox system for aeration of the activated sludge tank. Unox systems filter atmospheric air to concentrate the air utilized in aeration to around 90 to 95 percent oxygen. Atmospheric air contains approximately 20 percent oxygen, with the remaining constituents of air consisting primarily of nitrogen and various trace gases. While concentrating oxygen for aeration of the activated sludge tank, the Unox system releases the non-utilized nitrogen and trace gases back to the atmosphere.

Aside from the Unox system utilized for aeration, the plant has a grit system with a heated grit building, four primary settling tanks, activated sludge and secondary settling tank, along with a chlorine contact tank. The activated sludge tank is fully enclosed to take advantage of the enriched oxygen atmosphere provided by the Unox system.

There are duplicate treatment processes so that treatment will not be disrupted when maintenance or repairs are required. The plant also has two sludge holding tanks, and one sludge thickener.

Although the sludge thickener does not have a duplicate, sludge can be fed directly into the sludge holding tanks, bypassing the sludge thickener.

Disinfection is achieved through a continuous manual feed of sodium hypochlorite. The plant has two – 1750 gallon tanks containing sodium hypochlorite. Average daily feed rates equate to 140 gallons per day during the summer and 90 gallons per day in the winter.

There are alarms for low chlorine residual, malfunction of the chlorinator, recorder, and chlorine container depletion at this facility. Chlorine residual is monitored with three grab samples per day. Effluent bacterial testing is performed year round with two samples per week.

Long Branch Sewerage Authority

The Long Branch Sewerage Authority (LBSA) is located at 150 Joline Avenue in Long Branch, New Jersey. The plant went online in 1968. It is an activated sludge treatment facility.

Secondary treatment is provided for wastewater, which is primarily composed of sanitary wastewater with some light industrial input (approximately 1 %) from two laundry companies and a hospital. Wastewater entering this facility comes from approximately 500,000 feet of sewer line connected to 31,000 customers in Long Branch and parts of West Long Branch (i.e. Monmouth University).

The plant is designed to treat 5.4 million gallons per day (MGD). Treatment is typical of an activated sludge, secondary treatment system, preceded by screening and primary settling.

There are seven pump stations connected to LBSA. They are all located in Long Branch, New Jersey. These stations can be found on the following streets: Joline Avenue, Lincoln Gardens, Exchange Place, McClellen Place, Monmouth Place, Hoey Ave., and Willow Ave..

Online, automatic alarms are utilized for the pump stations to register problems with high water, power failure, and breakdown of equipment. The treatment facility interacts with a similar online system for problem notification. In such cases, an alarm goes to the operator's panel in the treatment facility and to an alarm service, which will call the plant operator if an incident occurs after routine daily operational hours.

Disinfection is achieved through a continuous manual feed of sodium hypochlorite. Two, 1550-gallon tanks provide sodium hypochlorite with an average daily rate of 70 gallons per day (summer), and 25 gallons per day in the winter.

The chlorine container is checked daily for depletion. Chlorine residual is monitored with three grab samples per day. Effluent bacterial testing is performed year round with two samples per week.

Two Rivers Water Reclamation Authority

The Two Rivers Water Reclamation Authority (TRWRA) is located at One Highland Ave., Monmouth Beach, NJ. Treatment plant collection and operations began in 1971.

With approximately 200 miles of sewer mains, this facility serves approximately 90,000 customers from 39,000 households in Fair Haven, Little Silver, Oceanport, Shrewsbury Boro, West Long Branch, Monmouth Beach, Tinton Falls, Red Bank, Eatontown, Rumson, Sea Bright, Shrewsbury Township, and Fort Monmouth.

TRWRA is a Secondary, Activated Sludge Plant producing secondary treated effluent. The TRWRA facility was designed to handle average flows of 13.83 MGD. According to plant personnel, maximum peak capacity for this plant at any given time is 17.29 MGD.

A gravity and belt filter press thickens sludge. Thickened sludge is trucked offsite for either incineration (available at several sites) or composting which is available at one site.

The facility is staffed 24 hours a day and is equipped with 18 pump stations. Alarm systems are in place should a malfunction or breakdown occur. Automatic alarms are on line for high water, power failure, and breakdown. In the event of an automatic alarm, plant staff are notified via SCADA or Supervisory Control and Data Acquisition.

Essential equipment has backup equipment in the event of breakdown or needs arise for scheduled maintenance. For instance, pumping stations utilize dual pumps and standby generators are also available for emergency use along with two portable generators. Plant personnel are trained to rectify possible malfunctions and equipment failures that might occur within the system. This training is updated on a routine basis and is kept technologically current.

In its operations, the plant uses Sodium Hypochlorite for chlorination and chlorination is continuous and has never been interrupted. The plant currently uses three, 2,400 gallon tanks for chlorination.

Chlorine residual is recorded six times per day. Bacterial Testing is performed eight times per month.

SPILLS, UNPERMITTED DISCHARGES, AND CLOSURES

The map on the next page shows the location of spills or unpermitted discharges that occurred in areas that have relative proximity to the A0NorthCent coastal boundary. These discharges occurred or were reported to have occurred within the time frame for which this report was written (2005 – 2010). None of these indirect discharges resulted in closure of the waters of A0NorthCent. And, there were no large indirect discharges or spills that were immediately related to the ocean waters of A0NorthCent during the period covered by this report.

The contents discharged at the locations shown to the right, whether validated or proposed, were reported as a number of different substances such as sewage, oil, diesel, tar, paint, antifreeze, and pool water. Total discharge in all cases was suggested to be minimal and the result of a variety of circumstances such as back up, spill, or storm water input into back bay areas.

The spill locations shown in the map are unlikely to have had significant impact on the chemical or bacteriological water quality in A0NorthCent. In all cases, the spills and discharges were too small, and their distance to these shellfish growing waters was such that impact would have been reduced from dilution, percolation, and absorption. Bureau monitoring locations and subsequently related data show no specific impact, as well.
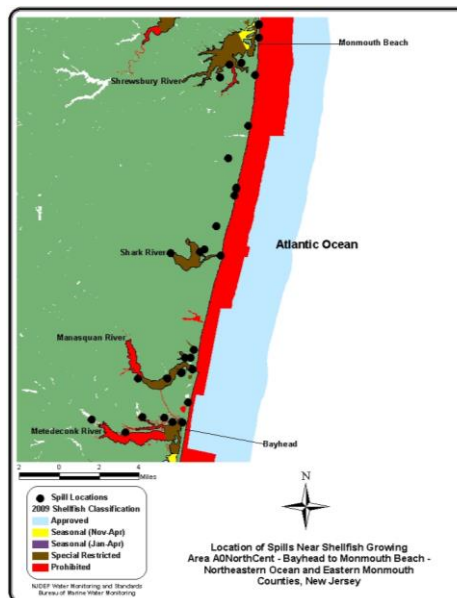
STORMWATER DISCHARGES

Environmental pressures on shellfish beds in New Jersey can originate in materials that enter growing waters via stormwater. These materials include bacteria, as well as other waste that enters the stormwater collection system. Management of stormwater runoff along this section of coastline (adjacent to A0NorthCent) consists of directing flow into rivers, brooks, lakes, ponds, and in some cases, the front ocean waters through beachfront outfalls. The stormwater outfalls that eventually have their input dispersed into the waters of this shellfish growing area can be seen in the map to the right.

As suggested in the SHORELINE SURVEY: EVALUATION OF POTENTIAL POLLUTION SOURCES section, a review of the stormwater discharge locations for A0NorthCent was conducted in the shoreline survey that took place on 01/20/11. Past and present

shoreline surveys of the abutting coastline and nearby communities for this shellfish growing area have provided evidence of a variety of ways that storm runoff enters the ocean waters of A0NorthCent.
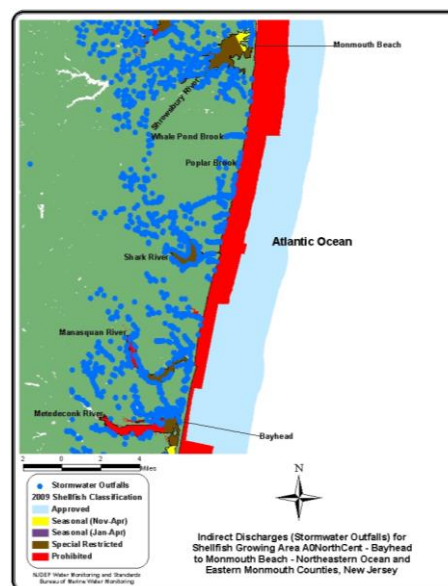
Stormwater runoff delivered to these shellfish growing waters is derived from what can be summarized as three different types of interactions. One of these interactions involves the numerous stormwater inputs received by Manasquan River, Shark River, Poplar Brook, and Whale Pond Brook, which flow into A0NorthCent. Secondly, there is the ocean drainage infrastructure of 12 lakes/ponds. Stormwaters enter these lakes/ponds from runoff or through

various site specific outfalls, and eventually these waters flow into the ocean through nine specifically designed drainage systems. The locations of the rivers, brooks, lakes and ponds that deliver stormwater runoff into A0NorthCent can be seen in the map that follows.
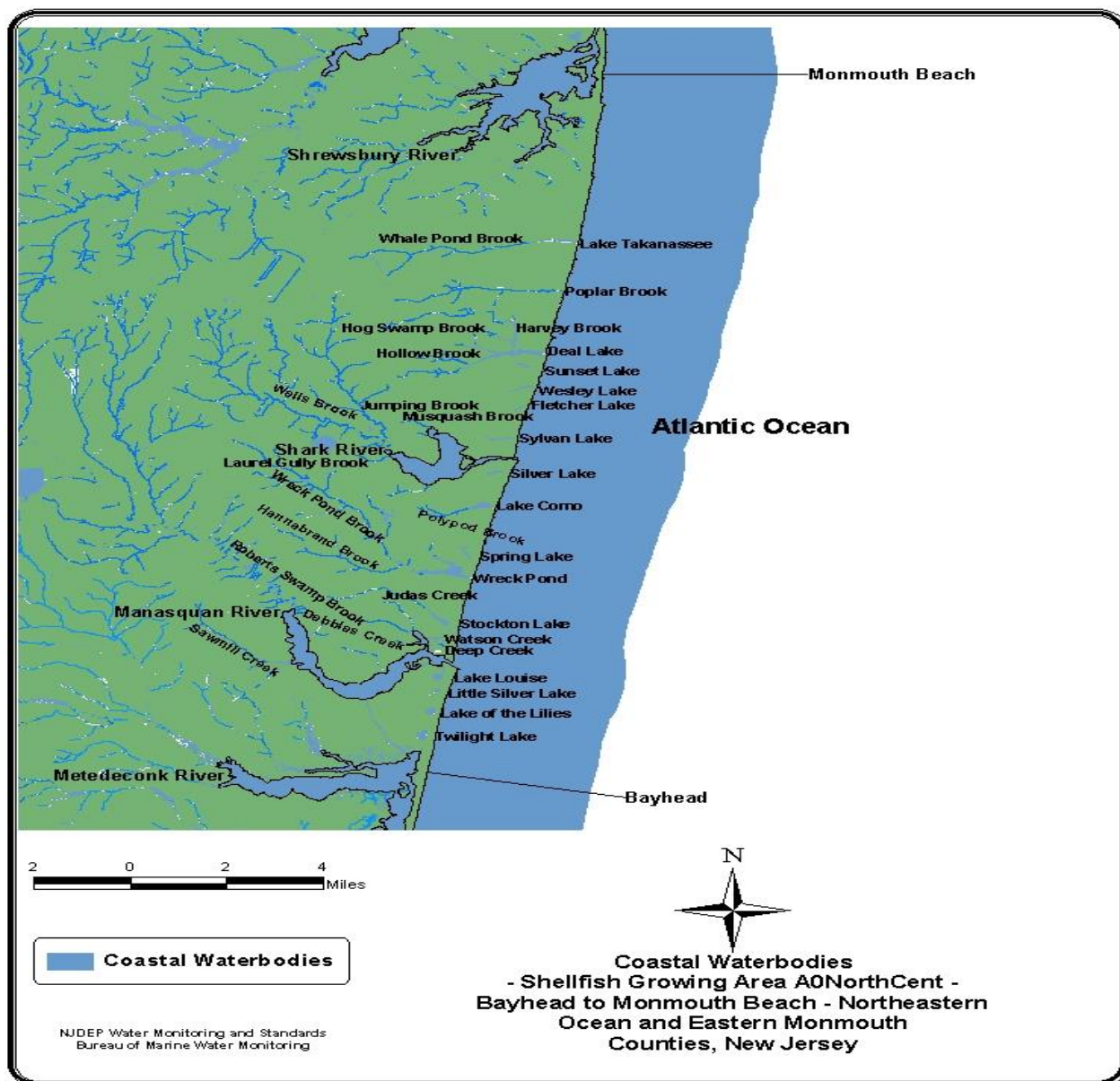
The third source for stormwater inputs into this shellfish growing area involves 20 beachfront outfalls that receive unknown or indirect runoff and then drain into the waters of A0NorthCent.

The ponds/lakes and any of their associated beachfront outfalls along with other non-associated stormwater or indirect beachfront outfalls can be seen in the map on the next page, and their specific locations can be reviewed in the tables that follow that map. Beachfront outfalls that are derived from lakes/ponds (nine outfalls) are highlighted in blue, and the additional outfalls (1 - 20) are highlighted in yellow in those tables.

Monmouth Beach

Beachfront Outfall (#20), Long Branch City
Beachfront Outfall (#19), Long Branch City
Beachfront Outfall (#18), Long Branch City
Beachfront Outfall (#17), Long Branch City
Beachfront Outfall (#16), Long Branch City

Atlantic Ocean

Lake Takanassee Outfall, Long Branch City
Beachfront Outfall (#15), Long Branch City
Beachfront Outfall (#14), Long Branch City
Beachfront Outfall (#13), Deal Boro
Beachfront Outfall (#12), Deal Boro
Beachfront Outfall (#11), Deal Boro
Beachfront Outfall (#10), Allenhurst Boro
Deal Lake Outfall, Lock Arbour Village

Wesley Lake Outfall, Borders Asbury Park
City and Neptune Twp.
Fletcher Lake Outfall, Borders Neptune Twp.
and Bradley Beach Boro
Beachfront Outfall (#9), Bradley Beach Boro
Sylvan Lake Outfall, Bradley Beach Boro
Silver Lake Outfall, Belmar Boro
Lake Como Outfall, Borders Spring Lake Boro
and Belmar Boro
Beachfront Outfall (#8), Spring Lake Boro
Beachfront Outfall (#7), Spring Lake Boro
Beachfront Outfall (#6), Spring Lake Boro
Beachfront Outfall (#5), Spring Lake Boro
Beachfront Outfall (#4), Spring Lake Boro
Beachfront Outfall (#3), Spring Lake Boro
Wreck Pond Outfall, Borders Spring Lake Boro
and Sea Girt Boro
Beachfront Outfall (#2), Sea Girt Boro
Beachfront Outfall (#1), Sea Girt Boro

Sea Ave. Stormwater Pumping Station - Drainage
from Louise Lake, Silver Lake, and Lake of the
Lilies, Point Pleasant Beach Boro

Bayhead

Shrewsbury River
Lake Takanassee
Whale Pond Brook
Poplar Brook
Deal Lake
Sunset Lake
Wesley Lake
Fletcher Lake
Sylvan Lake
Shark River
Silver Lake
Lake Como
Spring Lake
Wreck Pond
Manasquan River
Stockton Lake
Lake Louise
Little Silver Lake
Lake of the Lilies
Twilight Lake
Metedeconk River

2 0 2 4
Miles

● Beachfront Outfalls
2009 Shellfish Classification
Approved
Seasonal (Nov-Apr)
Seasonal (Jan-Apr)
Special Restricted
Prohibited

NJDEP Water Monitoring and Standards
Bureau of Marine Water Monitoring

N

**Beachfront Outfalls for Shellfish
Growing Area A0NorthCent -
Bayhead to Monmouth Beach - Northeastern
Ocean and Eastern Monmouth
Counties, New Jersey**

Beachfront Outfalls	Location of Outfall	Latitude of Outfall	Longitude of Outfall
MAP KEY FOR PREVIOUS PAGE SHOWING LOCATION, LATITUDE, AND LONGITUDE FOR BEACHFRONT OUTFALLS IN SHELLFISH GROWING AREA A0NorthCent			
Sea Ave. Stormwater Pumping Station for Lake of the Lilies, Little Silver Lake, and Lake Louise	Within 200' of intersection of Beacon and Maryland Avenues, Point Pleasant Beach Boro, Ocean County, NJ	Lat. = N 40° 04' 39.30"	Long. = W - 74° 02' 25.80"
Outfall # 1	East of intersection of Ocean Ave. and Neptune Ave., Sea Girt Boro, Monmouth County, NJ	Lat. = N 40° 07' 29.76"	Long. = W - 74° 01' 46.80"
Outfall # 2	East of intersection of Ocean Ave. and Baltimore Blvd., Sea Girt Boro, Monmouth County, NJ	Lat. = N 40° 07' 55.68"	Long. = W - 74° 01' 38.40"
Wreck Pond - Spring Lake Outfall	Within 200' of intersection of Ocean and Brown Avenues, Bordering Sea Girt Boro and Spring Lake Boro, Monmouth County, NJ	Lat. = N 40° 08' 17.50"	Long. = W - 74° 01' 31.30"
Outfall # 3	Due east of bathing house located between Salem and Atlantic Avenue(s) Intersection w/ Ocean Ave., Spring Lake Boro, Monmouth County, NJ	Lat. = N 40° 08' 35.94"	Long. = W - 74° 01' 25.98"
Outfall # 4	East of Essex Ave. and Ocean Ave. intersection, Spring Lake Boro, Monmouth County, NJ	Lat. = N 40° 08' 45.78"	Long. = W - 74° 01' 23.40"
Outfall # 5	East of Jersey Ave. and Ocean Ave. intersection, Spring Lake Boro, Monmouth County, NJ	Lat. = N 40° 09' 7.32"	Long. = W - 74° 01' 16.56"
Outfall # 6	East of Jersey and Washington Avenue(s) intersection w/ Ocean Ave., Spring Lake Boro, Monmouth County, NJ	Lat. = N 40° 09' 9.30"	Long. = W - 74° 01' 15.60"
Outfall # 7	Due east of bathing house located at Ocean and Ludlow Avenues, Spring Lake Boro, Monmouth County, NJ	Lat. = N 40° 09' 33.90"	Long. = W - 74° 01' 06.90"
Outfall # 8	Due east of Worthington and Ocean Avenues, Spring Lake Boro, Monmouth County, NJ	Lat. = N 40° 09' 37.20"	Long. = W - 74° 01' 05.90"
Lake Como Outfall	Due east of N. Blvd. and Ocean Avenue, Spring Lake and Belmar Boroughs, Monmouth County, NJ	Lat. = N 40° 10' 0.12"	Long. = W - 74° 00' 59.04"
Silver Lake Outfall	Due east of 6th Ave. and Ocean Avenue, Belmar Boro, Monmouth County, NJ	Lat. = N 40° 11' 43.02"	Long. = W - 74° 00' 39.54"
Sylvan Lake Outfall	East of Evergreen Ave. in Bradley Beach Boro, Monmouth County, NJ	Lat. = N 40° 11' 43.02"	Long. = W - 74° 00' 26.76"
Outfall # 9	East of Ocean Park Ave. and Ocean Ave. intersection, Bradley Beach Boro, Monmouth County, NJ	Lat. = N 40° 12' 13.50"	Long. = W - 74° 00' 18.18"
Fletcher Lake Outfall	Due east of intersection of Ocean Avenue and Broadway, bordering Neptune Twp. and Bradley Beach Boro, Monmouth County, NJ	Lat. = N 40° 12' 29.70"	Long. = W - 74° 00' 11.20"
Wesley Lake Outfall	Near Ocean and Spray Avenues and northeast of the Ocean Pavilion Family Restaurant, bordering Asbury Park City and Neptune Twp., Monmouth County, NJ	Lat. = N 40° 13' 00.10"	Long. = W - 73° 59' 59.30"
Deal Lake Outfall	Due east of Deal Lake and just off Ocean Place and Edgemont Dr., Lock Arbour Village, Monmouth County, NJ	Lat. = N 40° 13' 49.30"	Long. = W - 73° 59' 46.00"

MAP KEY CONT.: LOCATION, LATITUDE, AND LONGITUDE FOR BEACHFRONT OUTFALLS IN SHELLFISH GROWING AREA A0NORTHCENT			
Beachfront Outfalls	**Location of Outfall**	**Latitude of Outfall**	**Longitude of Outfall**
Outfall # 10	Due east of intersection of Ocean Place and Corlies Avenue and east of the Allenhurst Beach Club, Allenhurst Boro, Monmouth County, NJ	Lat. = N 40° 14' 06.60"	Long. = W - 73° 59' 43.90"
Outfall # 11	East of Deal Esplanade and Ocean Ave. intersection, Deal Boro, Monmouth County, NJ	Lat. = N 40° 14' 37.38"	Long. = W - 73° 59' 36.24"
Outfall # 12	East of Darlington Rd. and Ocean Ave. intersection, Deal Boro, Monmouth County, NJ	Lat. = N 40° 14' 41.10"	Long. = W - 73° 59' 34.80"
Outfall # 13	Due east of bathing house located between Parker and Brighton Avenue(s) intersection w/ Ocean Ave., Deal Boro, Monmouth County, NJ	Lat. = N 40° 15' 0.30"	Long. = W - 73° 59' 27.84"
Outfall # 14	Northeast of Beringer Rd. and Ocean Ave. intersection, Long Branch City, Monmouth County, NJ	Lat. = N 40° 15' 38.28"	Long. = W - 73° 59' 17.58"
Outfall # 15	Due east of bathing house located between Beringer Rd. and Lawrence Avenue(s) intersection w/ Ocean Ave., Long Branch City, Monmouth County, NJ	Lat. = N 40° 15' 38.28"	Long. = W - 73° 59' 16.92"
Whale Pond Brook - Lake Takanassee Outfall	Near the intersection of North Lake Dr. and Ocean Avenue and due east of Takanassee Beach Club and Lake Takanassee in the town of Elberon, Long Branch City, Monmouth County, NJ	Lat. = N 40° 16' 33.80"	Long. = W - 73° 59' 00.70"
Outfall # 16	Due east of Sea Verge Apts. and southeast of N. Bath Ave. and Ocean Blvd., Long Branch City, Monmouth County, NJ	Lat. = N 40° 17' 29.00"	Long. = W - 73° 58' 49.30"
Outfall # 17	East of Pavilion Ave. and Ocean Ave. intersection, Long Branch City, Monmouth County, NJ	Lat. = N 40° 17' 48.84"	Long. = W - 73° 58' 41.88"
Outfall # 18	East of Laird St. and Ocean Ave. intersection, Long Branch City, Monmouth County, NJ	Lat. = N 40° 18' 13.20"	Long. = W - 73° 58' 39.06"
Outfall # 19	Due east of Sutton Place Condominium's on Ocean Ave. North, Long Branch City, Monmouth County, NJ	Lat. = N 40° 19' 06.80"	Long. = W - 73° 58' 32.70"
Outfall #20	Due east of Sea Dunes Apts./Condo's on Ocean Ave., Long Branch City, Monmouth County, NJ	Lat. = N 40° 19' 19.60"	Long. = W - 73° 58' 31.30"

From south to north, Manasquan River, Shark River, Poplar Brook, and Whale Pond Brook empty into A0NorthCent directly or indirectly (i.e., Whale Pond Brook indirectly empties into the Atlantic because it feeds into Lake Takanassee, which has an outfall that flows into the ocean). The eastward flow of these waterways has potential to adversely influence the water quality in this shellfish growing area. These water systems are capable of receiving substantial quantities of stormwater runoff, and this is highlighted by the number of stormwater outfalls located along their shorelines.

The data contained within this report suggests these waterways did not exhibit significant influence on the shellfish growing water classifications of A0NorthCent during this reporting period, though. It would appear that dilution and mixing of stormwater inputs is occurring within

the Manasquan and Shark Rivers along with Poplar Brook and Whale Pond Brook prior to their reaching the waters of this growing area. In addition, the *Prohibited* area utilized along the shoreline of this growing area provides a substantial buffer. It too acts as an area of additional dilution for indirect inputs before they reach the *Approved* waters of this shellfish growing area.

There are 15 fresh water lakes/ponds located in and along the shore towns of this growing area. From south to north, these lakes/ponds are known as Twilight Lake, Lake of the Lilies, Little Silver Lake, Lake Louise, Stockton Lake, Wreck Pond, Spring Lake, Lake Como, Silver Lake, Sylvan Lake, Fletcher Lake, Wesley Lake, Sunset Lake, Deal Lake, and Lake Takanassee. In addition, there are some smaller unnamed waterbodies, which are further back from the shoreline.

The lakes or ponds mentioned in the previous paragraph are generally less than one mile from the shoreline. With the exception of the nine ocean outfalls that drain the following twelve lakes/ponds: the accumulated waters from Lake of the Lilies, Little Silver Lake, and Lake Louise, which are discharged by the Sea Avenue Stormwater Pumping Station, Wreck Pond, Spring Lake (discharge through Wreck Pond ocean outfall), Lake Como, Silver Lake, Sylvan Lake, Fletcher Lake, Wesley Lake, Deal Lake, and Lake Takanassee, three of the fifteen lakes/ponds were not designed to have direct drainage to the ocean.

The waters contained in the lakes/ponds mentioned in this report tend to receive input from a variety of sources. For example, sections of Wall Township, Spring Lake, Spring Lake Heights, and Sea Girt use Wreck Pond and its tributaries as receiving waters for stormwater runoff. In general, source inputs for these lakes/ponds can include tributaries, stormwater outfalls, waterfowl populations, nutrient loading from manicured lawns, and there is potential for septic runoff from some of the more rural areas of Wall Twp.. Therefore, any interaction with the ocean provided by the 12 lakes/ponds mentioned previously provides potential to impact the waters of A0NorthCent.

At the time this report was written, there were occasions when some A0NorthCent bathing beaches closed as a precautionary practice following rainfall. The Wreck Pond ocean outfall location was an example of this type of practice. Bathing beaches near this outfall underwent this type of precaution to protect bathers from indirect inputs due to stormwater sources after certain rain events where precaution was taken (beaches were closed for 24 hrs. at the end of rain events with > 0.10" of rain or the rain caused an increased flow in storm drains and or closed for 48 hrs. with > 2.8" of rainfall in 24 hrs.) to protect bathers from indirect inputs due to stormwater sources after certain rain events.

Four bathing beaches were involved in these precautionary closures. Those beaches were Brown and York Avenues, just north of the Wreck Pond Outfall, and Terrace and Beacon Blvd. Beaches, which are just south of the Wreck Pond ocean discharge area.

Over the years, WM&S/BMWM carried out extensive monitoring programs, oriented at further understanding bacteriological dilution processes at work along bathing beach areas near the outfall, surrounding precipitation events. In addition, a 300' extension of the Wreck Pond ocean outfall was completed in 2006 along with other infrastructural inspections and work, which

investigated/improved sanitary and stormwater processes, along with rerouting stormwater runoff, improving dispersion. As a result, precautionary closures were removed at the start of the 2014 bathing season.

When combining the nine outfalls that receive inputs from the 12 lakes/ponds along the shore of this growing area with the 20 additional Atlantic Ocean beachfront outfalls that have been identified in shoreline surveys performed for this shellfish growing area, there are a total of 29 beachfront outfalls that have been identified for this shellfish growing area.

With the possible exception of those outfalls numbered 3, 7, 10, 13 and 15 in the preceding table and map, which seem related to bathhouses or swim clubs, the majority of these outfalls appear to be stormwater related.

From the data, it appears that a good deal of mixing and dilution does take place with the stormwater received by the water systems or infrastructure that feeds this shellfish growing area. The *Prohibited* buffer along the coastline of A0NorthCent certainly aides in providing additional dilution as previously discussed.

The data contained in previous reports along with the statistics presented in this Sanitary Survey does not indicate routine impact to the ocean waters of this shellfish growing area due to stormwater. When considering stormwater related inputs, the shellfish classifications currently designated appear appropriate with regard to the guidelines promulgated by the National Shellfish Sanitation Program.

WATER QUALITIES STUDIES

SAMPLING STRATEGY

Shellfish growing area A0NorthCent was sampled using the Adverse Pollution Condition (APC) sampling strategy. The APC sampling strategy requires a minimum 15 sample composite of data, collectively supported by a minimum requirement of five samples per year.

Each shellfish producing state is directed to adopt either the total coliform or fecal coliform criterion to classify its waters. The criteria were developed to ensure that shellfish harvested from designated waters would be free of pathogenic (disease-producing) bacteria. Combinations of these criterion may also be used. While New Jersey had been using fecal coliform analysis (direct 3 tube, A-1) and criteria for its ocean waters and total coliform analysis (3 tube, three dilution) and criteria for its back bay areas, WM&S/BMWM switched all State shellfish growing areas over to the criteria for fecal coliform in February, 2012, and the method for analysis changed as well.

WM&S/BMWM now use mTEC agar plating to facilitate the fecal coliform bacteriological analysis for samples taken within New Jersey shellfish growing areas, and had been acquiring adjunct mTEC data for its growing areas for some time in order to statistically facilitate the transition to mTEC. Statistical facilitation, in the case of Shellfish growing area A0NorthCent refers to the combination of past, 3 tube, A-1 data with current mTEC data in order to obtain statistically valid measurements during the transition.

Each classification criterion is composed of a measure of the statistical "central tendency" (geometric mean) and the relative variability of the data set. For the Adverse Pollution Condition sampling strategy, variability is expressed utilizing the 90th percentile. Although the State has only *Approved* and *Prohibited* classifications in its ocean waters, an area to be *Approved* under the *Seasonal* classification using APC would have to be sampled and meet the criterion during the time of year that it is *Approved* for the harvest of shellfish. The table below shows the statistical criteria for the APC strategy. The area on the chart highlighted in yellow represents the criteria used when analyzing with direct 3 tube, A-1, which was utilized in the preparation of this report.

Statistical Criteria for Adverse Pollution Condition Sampling Strategy					
	Total Coliform Criteria		Fecal Coliform Criteria		
	Geometric mean (MPN/100 mL)	No more than 10% of samples can exceed (MPN/100 mL)	Geometric mean (MPN/100 mL)	No more than 10% of samples can exceed (MPN/100 mL)	
Approved Water Classification	70	330	14	49 w/ direct 3-tube, A1	31 w/ mTEC Agar
Special Restricted Water Classification	700	3300	88	300 w/direct 3-tube, A1	163 w/ mTEC Agar

Data management and analysis was accomplished using database applications developed for the Bureau. Mapping of pollution data was performed with the Geographic Information System (GIS: ARCMAP).

Water sampling was performed in accordance with the Field Procedures Manual (NJDEP, 2005). Water quality sampling, analysis, and shoreline/watershed surveys were conducted in accordance with the NSSP *Guide for the Control of Molluscan Shellfish,* 2013.

The results were compiled from the 41 surface and 19 bottom stations that comprise Assignments 521, and 541. A review of the records suggests that 1,140 water samples were collected for fecal coliform bacterial analysis between 2005 and 2010 and analyzed using direct 3 tube, A-1 analysis. Additional information on lab methodology and sampling strategy can be found in the Shellfish Growing Area Report Guidance Document.
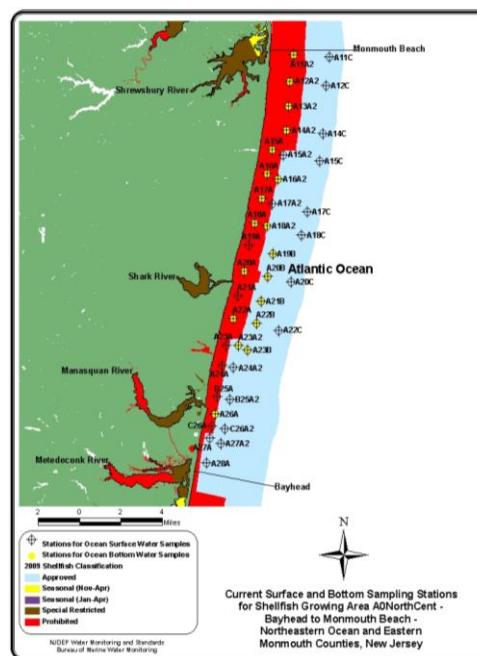
The Shellfish Growing Water Monitoring Stations for Bayhead to Monmouth Beach (A0NorthCent) are presented in the above map. They were analyzed by WM&S/BMWM at Leeds Point. Classification of these shellfish growing waters has been based on these data.

BACTERIOLOGICAL QUALITY

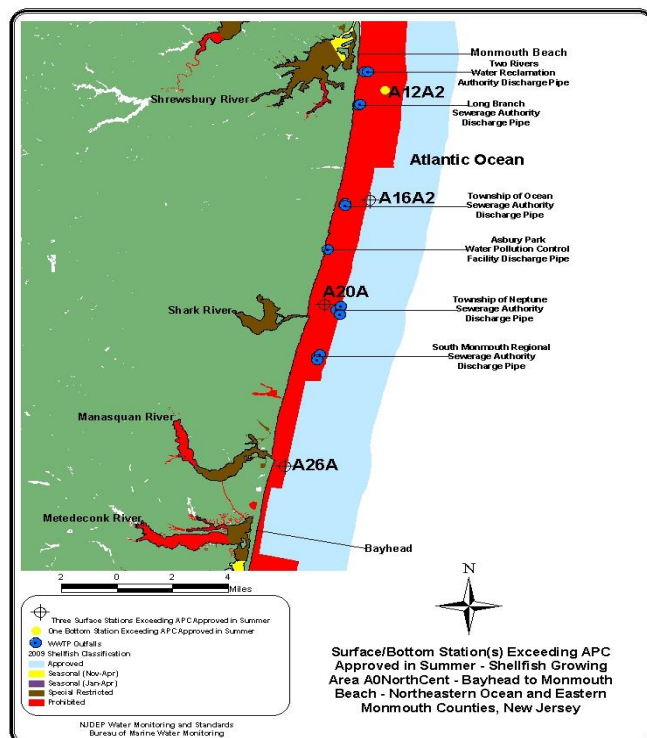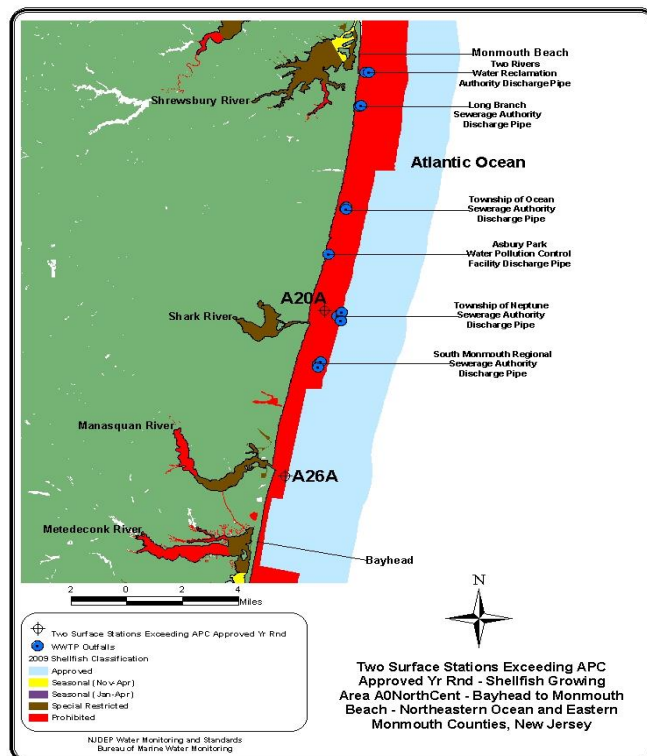## Compliance with NSSP APC Approved Year Round Criteria

When analyzing a minimum of the most recent fifteen samples collected per station, there were two stations that exceeded NSSP *Approved* year round criteria. These same two stations and two other stations also exceeded NSSP criteria for *Approved* waters during the summer.

The appropriate data analysis for this shellfish growing area in relation to NSSP criteria and the lab methodology used (fecal coliform direct 3 tube A-1 analysis), suggests the geometric mean shall not exceed 14 MPN/100 mL and no more than 10% of the samples can exceed 49 MPN/100 mL.

The data presented in this report was compiled from May 1, 2005 through April 13th, 2010. During that time frame, *Prohibited* surface stations A20A and A26A exceeded APC *Approved* yr. rnd. criteria with 18 samples when reviewing the Statistical Summary and the Shellfish Growing Water Data Listings.

Prohibited surface stations A20A and A26A had respective year round geo-means of 5.7 and 5.5 MPN/100 mL, which was acceptable for yr. rnd. *Approved*. However, *Prohibited* surface stations A20A and A26A exceeded *Approved* 90th percentiles with 11.1% > 49 MPN/100 mL. As both of these stations are located in *Prohibited* waters, the classification of waters in which they are located is acceptable for these statistics. Locations for *Prohibited* surface stations A20A and A26A can be seen in the figure to the top right of this page.

Bottom - *Prohibited* (B - P) station A12A2 along with stations A16A2 (Surface –

Two Surface Stations Exceeding APC Approved Yr Rnd - Shellfish Growing Area A0NorthCent - Bayhead to Monmouth Beach - Northeastern Ocean and Eastern Monmouth Counties, New Jersey

Surface/Bottom Station(s) Exceeding APC Approved in Summer - Shellfish Growing Area A0NorthCent - Bayhead to Monmouth Beach - Northeastern Ocean and Eastern Monmouth Counties, New Jersey

Approved or S - A), A20A (Surface – *Prohibited* or S - P) and A26A (Surface – *Prohibited* or S - P) exceeded APC *Approved* criteria for the summer with 16 to 17 samples when reviewing the Statistical Summary and the Shellfish Growing Water Data Listings. Utilizing fecal coliform direct 3 tube A-1 analysis, these stations had summer geo-means that were no higher than 6.0 MPN/100 mL, which was acceptable for *Approved* criteria. Stations A12A2 (B - P) and A16A2 (S - A) exceeded *Approved* criteria with 90th percentiles of 12.5 % > 49 MPN/100 mL during the summer, and stations A20A (S - P) and A26A (S - P) also exceeded *Approved* criteria during the summer with 90th percentiles of 11.8 % > 49 MPN/100 mL (see figure on the bottom of the previous page).

Surface station A16A2 is located in *Approved* waters while all others that exceeded *Approved* criteria for the summer were in *Prohibited* waters. Higher 90th percentiles for stations in waters classified as *Prohibited* did not create an issue with regard to NSSP criteria for *Approved* waters. The higher 90th percentile presented by surface station A16A2 (S - A) brought about concern and a frequent review of incoming data for that station in relation to public health and safety.

The raw data has improved for station A16A2 (S - A). In the years since 2006, the raw data for A16A2 (S - A) has not exceeded 3.6 MPN/100 mL on any date of sampling.

With the exception of the 90th percentile reported for station A16A2 (S - A) during the summer, the bacterial data for all stations in *Approved* shellfish growing waters for A0NorthCent continues to be acceptable in relation to current *Approved* water classifications. As suggested, WM&S/BMWM will continue to pragmatically monitor incoming data for *Approved* surface station A16A2.

Rainfall Effects

Based on Wet/Dry statistics, there were 28 surface sampling stations and 14 bottom stations that showed a rainfall component in relation to water quality for this shellfish growing area. Twenty-three of the above sampling stations are located within *Approved* waters and 19 are located in *Prohibited* waters. These sampling stations were located throughout this growing area as shown in the map to the right.

Rainfall components must register a t-statistical probability less than 0.05. The components for these stations were registered between t-statistical probabilities of 0.000 and 0.049.

Surface and Bottom Stations w/ Wet/Dry Components for Shellfish Growing Area A0NorthCent - Bayhead to Monmouth Beach - Northeastern Ocean and Eastern Monmouth Counties, New Jersey

The Wet/Dry Statistics were calculated based on an impact time of 48 hours prior to the day of sampling and a wet/dry cutoff of 0.25 inches of rain, as these criteria produced the most results for impact. All of these stations showed a higher geometric mean during wet conditions as opposed to dry.
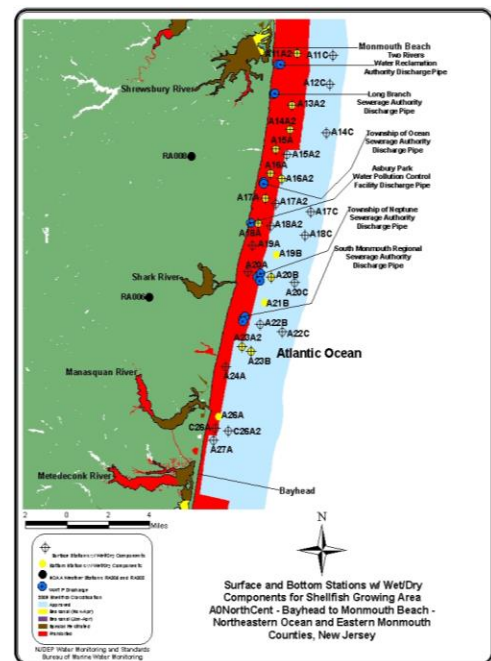
The highest geo-means for wet conditions in the wet/dry data sheets were 14.7, 18.3, 20.9, 19.2, 20.1, 58.4, 43.0, 27.5, 14.4 and 17.3 MPN/100 mL for stations A15A (B – P), A16A2 (B - A), A17A (B - P), A18A (B - P), A19B (B - A), A20A (S - P), A20B (B - A), A20B (S - A), A24A (S - P) and C26A2 (S - A), respectively. No station had more than five wet counts. Of the ten stations listed above, five were in *Approved* waters and 5 were in *Prohibited* waters, where in parenthesis, A and P stand for *Approved* and *Prohibited* and S and B stand for surface and bottom.

For the five Approved stations with rain components, noted in the preceding paragraph, geo-means occurred from 18.3 to 43.0 MPN/100 mL in the wet/dry data sheets. Again, these geo-means were noted with no more than five wet counts.

In the Statistical Summary, the highest year round geometric mean recorded for any one of the 42 stations with rain components was 6.5 MPN/100mL. Rain component station(s) A16A2 (S – A) and A20A (S - P) showed 9.5 and 11.1% > 49 MPN/100 mL, respectively, with regard to their year round 90th percentiles and no less than 18 samples. A16A2 (S - A) and A20A (S - P) also showed 12.5 and 11.8% > 49 MPN/100 mL, respectively, when reviewing their 90th percentiles for summer and no less than 16 samples.

As station A20A (S - P) is located in *Prohibited* waters, the higher estimated 90th percentiles for that station present no classification concern. A16A2 (S - A) results provide a level of concern as it had a high 90th percentile (or exceeded 10% w/ 15 or more samples) during the summer and is located in *Approved* waters. It should be noted that A16A2 had an 11.3 MPN/100 mL geo-mean in the Wet/Dry data sheets with five wet counts. That geo-mean was not of concern.

In recent years, the raw data has greatly improved for station A16A2 (S - A), and WM&S/BMWM have been following this progression. Higher 90th percentiles were shown for this station due to two sampling dates that produced a spike in the raw data of 75 MPN/100 mL on (10/24/05) and again on 06/05/06. It was those dates where two higher counts occurred in the raw data that caused the 90th percentile for *Approved* surface station A16A2 to show 12.5% > 49 with 16 sample dates during the summer.

Rainfall accumulation provided by the closest weather station (RA008) for monitoring station A16A2 (S - A) on 10/24/05 was 0.00", 0.61" and 0.80" during the prior 24, 48, and 72 hour periods preceding sampling. Station A16A2 (S - A) precipitation amounts were 0.27", 0.53", and 0.85" during the prior 24, 48, and 72 hours preceding sampling on 06/05/06 when reviewing accumulation amounts for weather station RA008. Interestingly, precipitation amounts were much higher during the 24, 48, and 72 hour time frames preceding sampling on 09/30/08 and 09/28/09. On these two dates, no spikes were shown in the raw data for *Approved* surface station A16A2.

Continued monitoring of the raw data following sampling runs has proved important in the consideration of station A16A2 (S - A). Specifically, it allowed WM&S/BMWM the opportunity to utilize future sampling and subsequent data, as a means to vigilantly review the data for these shellfish growing waters while keeping watch for public health and safety.

In the years since 2006, the raw data for A16A2 (S - A) has not exceeded 3.6 MPN/100 mL on any date of sampling. None the less, during the 2009 WM&S/BMWM annual meeting, Assignments 521 and 541, which comprise this shellfish growing area, were recommended for 48/72 hour rainfall priority sampling. Setting priorities for sampling will help build a larger catalog of data with relevance in relation to periods of precipitation preceding sampling, and their potential for producing spikes in the data during those time frames. Aside from this change in sampling strategy, there are no classification changes planned for A0NorthCent waters at this time.

The water quality in this shellfish growing area report suggests there is impact following precipitation events due to the number of stations showing statistical variability in the wet/dry data. The geo-means in the wet/dry data suggest the bacteriological water quality analysis in relation to precipitation for this shellfish growing area produces generally low geo-mean results for the stations showing variability or a rainfall effect in this growing area. Relatively low geo-means for stations with rainfall effects may be the result of substantial dilution that occurs to rain water inputs after precipitation events occur. This has appeared to be the case during many years of assessment when weighing the large number of potential storm water contributors such as indirect outfalls, rivers, and brooks that flow into A0NorthCent waters.
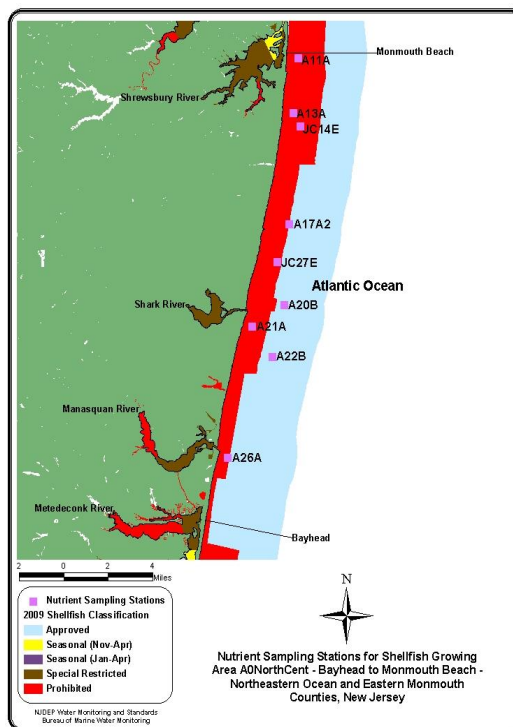
RELATED STUDIES

Nutrients

WM&S/BMWM perform additional water quality studies related to the bacteriological monitoring program. Nutrient monitoring and the collection of nutrient data is an example of one of those studies, and is part of WM&S'/BMWM's Ambient Marine Water Monitoring Program.

Stations for the Ambient Marine Water Monitoring Program are derived from an area weighted probabilistic sampling design. This provides a broader assessment, based on acreage of estuarine waters. Ocean waters are also sampled although in lessor frequency than State back bay waters.

Currently, there are 40 + nutrient sampling stations within the estuarine waters of New Jersey. At the time this shellfish growing area report was written, ocean nutrient sampling for this growing area involved stations A11A, A13A, JC14E, A17A2, JC27E, A20B, A21A, A22B, and A26A, as shown in the map to the right.

Nutrient Sampling Stations for Shellfish Growing Area A0NorthCent - Bayhead to Monmouth Beach - Northeastern Ocean and Eastern Monmouth Counties, New Jersey

Chlorophyll data are also contained within the nutrient data. As such, WM&S'/BMWM is able to maintain an ongoing picture of algal activity within State waters. This chlorophyll data also proves to be useful as adjunct information for the Bureau's phytoplankton monitoring program.

Increased chlorophyll levels are also identified by WM&S/BMWM with the aid of a remote chlorophyll flight sensor. WM&S'/BMWM's remote aircraft sensing began in 2007, and involves partnerships with New Jersey's Forest Fire Service (plane services), Rutgers (data storage); USEPA Region 2 (funding). With this program, flights take place six days a week, weather permitting, during spring and summer. These flights provide estimates of State coastal chlorophyll levels and a perspective on bloom conditions/trends.

If chlorophyll sensing suggests an area of the State is experiencing a bloom, WM&S/BMWM target sample from shore or by boat. Subsequently, such samples are analyzed at the Leeds Point Lab so species type and concentration levels are known.

Further information on nutrients within State waters is available at *www.state.nj.us/dep/wms/bmw* in report sections such as those referring to Estuarine and Coastal Water Quality. Ambient results and nutrient data additionally serve other reports such as the States' Integrated Assessment Report.

Phytoplankton Monitoring

The WM&S/BMWM phytoplankton monitoring program involves the collection of water column samples in order to evaluate and determine the presence of marine biotoxins associated with certain algal species, as NSSP requires shellfish harvesting states to have a Biotoxin Contingency Plan. Were there to be a toxic algal bloom for some duration, shellfish tissue samples would also be analyzed, and if found to contain toxins, the State would be required to close impacted shellfish growing waters.

WM&S/BMWM Stations for Phytoplankton Monitoring Program

Although New Jersey's marine waters are generally not associated with toxic algal species or blooms of this type, the Biotoxin Contingency Plan is required for public health and safety, as ingestion of shellfish that have fed on toxic algal species, can cause an array of human health issues.

Currently, the WM&S/BMWM Phytoplankton Monitoring Program consists of 48 marine water stations (see figure to the right), located in both estuarine and front ocean waters. The data and information gathered in this sampling is used as adjunct information, if necessary (bloom and species dependent), in State Annual, Reappraisal, and Sanitary Survey reports for shellfish growing

areas. Additionally, reports denoted as Summary of Phytoplankton Blooms have been compiled and are available electronically at *www.state.nj.us/dep/wms/bmw*.

At present, stations A21A and AX16A1 have been allocated as phytoplankton stations within the A0NorthCent shellfish growing area. Limited results exist for these stations thus far but a review of WM&S'/BMWM's Annual Summary of Phytoplankton Blooms and Related Conditions in New Jersey Coastal Waters suggests populations of phytoplankton are generally found in low concentrations within this shellfish growing area, when reviewing monitoring data for phytoplankton monitoring stations A11A and A24A, which were utilized previously in A0NorthCent. And toxic species, of any size and duration, have not been associated with the A0NorthCent Shellfish Growing Area (again see *www.state.nj.us/dep/wms/bmw*).

There are occasional occurrences of algal blooms in all ocean waters in New Jersey, and these can occur throughout the year. The warmer months of spring and summer provide a very common period for algal growth, though.

It is more frequently the discoloration of the water from algal blooms that causes issues along New Jersey's coastal waters rather than the toxicity of the phytoplankton. For example, brown tides resulting from one of New Jersey's more frequent algal blooms can be spotted in back bay waters, inlets, and occasionally the ocean, near inlet passageways. This generally occurs during May and June. However, aside from the bloom causing discoloration of the water, there are no known threats to human health from brown tides. For this reason, they are not considered in classifying waters for shellfish harvest.

Cooperative Coastal Monitoring

WM&S/BMWM also oversee the Cooperative Coastal Monitoring Program (CCMP). CCMP involves coastal water quality assessments and pollutant source investigation. There are two components to this program. These are recreational water quality monitoring at New Jersey bathing beaches and aerial surveillance of State coastal waters.

Water quality monitoring for the bathing beach component is administered by NJDEP, the Department of Health, and local environmental health agencies interacting within their regions of coastal New Jersey. These agencies collect water samples each week at 180 ocean and 35 bay monitoring stations from mid-May through mid-September. Samples are taken on Monday and continued sampling through the week is performed as required. Samples are analyzed for enterococci bacteria concentrations at these monitored stations.

Enterococci are used as a fecal coliform indicator in marine recreational waters (US EPA, 1986). The acceptable rate for the "steady state geometric mean indicator density" for enterococci in the waters of marine bathing beaches is 35 MPN/100 mL or less, and 104 enterococci/100 mL is also considered acceptable as a one time exposure (Cabelli, 1983).

At the time this report was written, A0NorthCent had thirty-nine bathing beach stations as shown in the map to the right. Data for Cooperative Coastal Monitoring or bathing beach stations is available at http://www.njbeaches.org.

The other component of the CCMP program, aerial surveillance, is conducted six days a week, weather permitting. Having this component provides an evaluative tool to aerially observe coastal water quality and potential pollution reports.

Flight paths are coordinated to observe the eastern coastal and inter-coastal waters of the State during the week. The aerial component of the CCMP program works in conjunction with the United States Army Corps of Engineers. It is part of the NY/NJ Harbor Estuary Program Floatables Action Plan. If floating solid waste and debris are spotted by aerial surveillance, the Army Corps attempts to respond with water-skimming vessels.
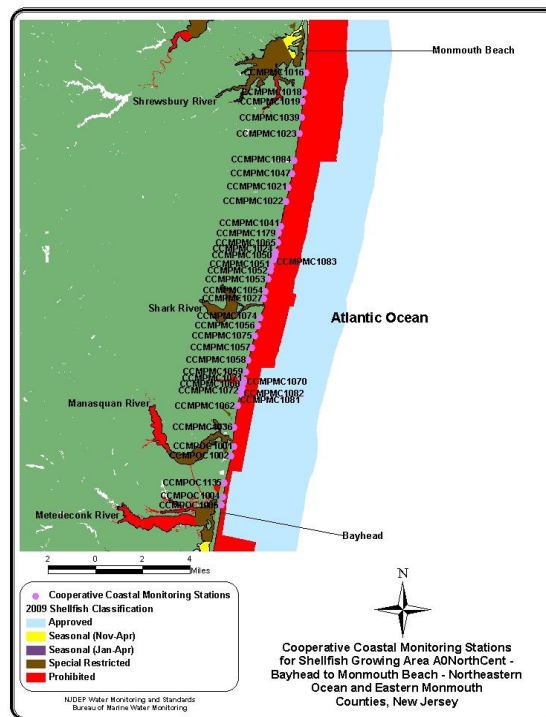
CONCLUSIONS

The following was concluded based on the water quality data from May 01, 2005 through April 13, 2010. The shellfish growing waters within this 18 -mile stretch, known as A0NorthCent, generally continue to meet NSSP criteria for all classifications.

Surface station A16A2, located in *Approved* waters presented an exception to NSSP criteria for two spikes in the raw data (once in 2005 and once in 2006), which produced a 90th percentile (12.5 > 49 MPN/100 mL) that exceeded *Approved* criteria for the summer. These higher raw data counts both came in at 75.0 MPN/100 mL. As pointed out in previous sections, WM&S/BMWM have been routinely monitoring incoming data for this station in relation to public health and safety, and have found no counts higher that 3.6 MPN/100 mL from June 6, 2006 through the most current raw data entry of September 15, 2010. Scrutiny of routine monitoring data will continue for that station, though.

There were rainfall components noted for a number of stations. Generally there was limited impact as shown by relatively low Fecal Coliform levels in relation to those components. Surface station A16A2, located in *Approved* waters was again the most notable station discussed in the Rain Effects section. A broad statistical comparison with discussions on Wet/Dry data, the Statistical Summary, and Raw Data within the Rain Effects section showed that A16A2 (S – A) was more notable for the higher 90th percentile discussed above for summer results (12.5 > 49 MPN/100 mL), than the 11.3 MPN/100 mL geo-mean it produced in the Wet/Dry data sheets. Although the data has been good for this station since the unusual spikes seen in the raw data in 2005 and 2006, routine review of sample results for this station will continue going forward, as already mentioned.

The effluents from outfalls of the South Monmouth Regional Sewerage Authority, Township of Neptune Sewerage Authority, Asbury Park Water Pollution Control Facility, Township of Ocean Sewerage Authority, Long Branch Sewerage Authority, and the Two Rivers Water Reclamation Authority are not impacting the shellfish growing waters of this area with significant coliform levels.

There were no indications that indirect discharges such as spills caused significant impact to the waters of this growing area. In addition, the presence of indirect discharges along the coastal shoreline of A0NorthCent, and within the rivers and brooks that feed the growing area appear to be limited in impact with regard to mixing and dilution.

Prohibited waters in this growing area remain a primary necessity though in order to fulfill requirements for buffers, dilution; public health and safety in relation to the direct and indirect outfalls present in these shellfish growing waters.

Coliform levels were generally too low in the data that supports this report to suggest there is substantial impact from any of the potential sources mentioned in this section and throughout most of this Sanitary Survey. The data derived from WM&S/BMWM monitoring projects, supports a predominately good characterization for water quality in A0NorthCent.

RECOMMENDATIONS

Shellfish growing area A0NorthCent is comprised of Assignments 521 and 541. It is sampled under the Adverse Pollution Condition strategy. With regard to the information presented in this report, there are no changes to the stations or classifications recommended for this shellfish growing area.

The following is suggested though:

Continue monitoring the raw data on a routine basis in relation to bacteriological counts for *Approved* surface station A16A2.

Continue current sampling schedule as referenced in BMWM's 2010' – 2011' Marine Water Sampling Assignments guide but the following changes are requested:

Assignments 521 and 541 are to be sampled with rainfall priority utilizing 48/72 hours following a precipitation event as the preferred sampling time frame.

Generally acceptable water quality prevails in A0NorthCent suggesting current classifications can remain in effect with the continued monitoring of raw data for *Approved* surface station A16A2 proposed in this report.

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SUPPORTING DOCUMENTATION

Data sheets - Reappraisal Report for Shellfish Growing Area A0NorthCent (Bayhead to Monmouth Beach), March 2015 (see the Shellfish Growing Area Reports section at *www.state.nj.us/dep/wms/bmw*).

Shoreline survey field notes and pictures - Reappraisal Report for Shellfish Growing Area A0NorthCent (Bayhead to Monmouth Beach), March 2015 (see the Shellfish Growing Area Reports section at *www.state.nj.us/dep/wms/bmw*).