South Carolina Department of Health and Environmental Control

ENVIRONMENTAL AFFAIRS

SHELLFISH MANAGEMENT AREA 01

2021 ANNUAL UPDATE

Shellfish Sanitation Section
Environmental Affairs
2600 Bull Street
Columbia, SC 29201

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SHELLFISH MANAGEMENT AREA 01
2021 ANNUAL UPDATE

[Data Through December 2020]

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SCDHEC Environmental Affairs

Data Inclusive Dates:
01/01/18 thru 12 /31/20

Classification Change:
___ Yes _X_ No

Shoreline Survey Completed: Yes

Prior Report & Date: 2020 Annual Update

(I)ncreased/(D)ecreased/(N)one:
_N_ Approved
_N_ Cond. Approved
_N_ Restricted
_N_ Prohibited

SUMMARY

No classification changes are recommended for the 2021-2022 harvesting season in Shellfish Management Area 01 (SFMA 01). Six of the nine stations in the management area showed improvements in water quality from the previous annual survey. Overall water quality in this area has improved over the past few years, however, water quality data continue to indicate that fecal coliform levels are still above allowable shellfish harvesting limits throughout the entire area.

The area continues to be under constant residential and commercial development. Stormwater run-off and other nonpoint source issues (i.e. boats, animals) will continue to influence water quality within the area. Along the Atlantic Intracoastal Waterway (AIWW) there are 10 marinas in close proximity to sampling stations which may also potentially contribute to water quality issues.

Due to the constant flow pattern changes and shoaling issues that seems to affect the headwaters of Eden Saltworks Creek and at the Waites Island Bridge Station 01-06 was deactivated a few years ago. In 2018, Station 01-20 (Tilghman Estate Boat Landing) was added to replace Station 01-06 (Bridge to Waites Island) due to the lack of water flow to the station. A full data set of sampling results for Station 01-20 is still forthcoming but thus far sampling data have not indicated any significant improvements in water quality bacteriological data within this particular area.

INTRODUCTION

PURPOSE AND SCOPE

The authority to regulate the harvest, sanitation, processing, and handling of shellfish is granted to the South Carolina Department of Health and Environmental Control by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47, which provides the rules used to implement this authority and outlines the requirements applied in regulating shellfish sanitation in the State. This regulation specifically addresses classification of shellfish harvesting areas and requires that all areas be examined by sanitary and bacteriological surveys and classified into an appropriate shellfish harvesting classification.

The National Shellfish Sanitation Program (NSSP) Guide for the Control of Molluscan Shellfish is used by the United States Food and Drug Administration (USFDA) to evaluate state shellfish sanitation programs. The NSSP Model Ordinance requires that a sanitary survey be in place for each growing area prior to its use as a source of shellfish for human consumption and prior to the area's classification as Approved, Conditionally Approved, Restricted, or Conditionally Restricted. Each sanitary survey shall be updated on an annual basis and accurately reflect changes which have occurred within the area. Requirements of the annual reevaluation include, at a minimum, field observations of pollution sources, an analysis of water quality data consisting of the past year's data in combination with appropriate previously collected data, review of reports and effluent samples from pollution sources, and review of performance standards for discharges impacting the growing area. A brief report documenting the findings shall also be provided.

The following criteria consistent with the NSSP Model Ordinance and S.C. Regulation 61-47 are used in establishing shellfish harvesting classifications:

Approved Area - Growing areas shall be classified approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations that would render shellfish unsafe for human consumption. Approved classifications shall be determined upon a sanitary survey that includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, nor shall more than ten percent of the samples exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform MPN shall not exceed fourteen per one hundred milliliters, nor shall the estimated ninetieth percentile exceed an MPN of forty-three per one hundred milliliters (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be determined using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

Conditionally Approved Area - Growing areas may be classified conditionally approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in non-point source pollution from rainfall runoff or discharge of a major river, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department prior to classifying an area as conditionally approved. Where appropriate, the management plan for each conditionally approved area shall include performance standards for sources of controllable pollution (e.g., wastewater treatment and collection systems), evaluation of each source of pollution, and means of rapidly closing and subsequently reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish shall not be directly marketed from a conditionally approved area until conditions for an approved classification have been met for a period of time likely to ensure the shellfish are safe for consumption. Shellstock from conditionally approved areas that have been subjected to temporary conditions of actual or potential pollution may be relayed to approved areas for purification or depurated through controlled purification operations only by special permit issued by the Department.

Restricted Area - Growing areas shall be classified restricted when sanitary survey data show a moderate degree of pollution or the presence of deleterious or poisonous substances to a degree that may cause the water quality to fluctuate unpredictably or at such a frequency that a conditionally approved classification is not feasible. Shellfish may be harvested from areas classified as restricted only for the purposes of relaying or depuration and only by special permit issued by the Department and under Department supervision. The suitability of restricted areas for harvesting of shellstock for relay or depuration purposes may be determined using comparison studies of background tissue samples with post-process tissue samples, as well as other process verification techniques deemed appropriate by the Department. For restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters nor shall more than ten percent of the samples exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters nor shall the estimated ninetieth percentile exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

Conditionally Restricted Area - Growing areas may be classified conditionally restricted when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as conditionally restricted. Where appropriate, the management plan for each conditionally restricted area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems and an evaluation of each source of pollution, and description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish may be harvested from areas classified as conditionally restricted only for the purposes of relaying or depuration and only by permit issued by the Department and under Department supervision. For conditionally restricted areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of conditionally restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters nor shall more than ten percent of the samples exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters nor shall the estimated ninetieth percentile exceed an MPN of two hundred and sixty per one hundred milliliters (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

Prohibited Area - Growing areas shall be classified prohibited if there is no current sanitary survey report or if the sanitary survey report or monitoring data show unsafe levels of fecal

material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or otherwise indicate that such substances could potentially reach quantities that could render shellfish unfit or unsafe for human consumption.

BACKGROUND INFORMATION

Shellfish Management Area 01 consists of approximately 3,289 acres of shellfish growing area habitat located in Horry County, South Carolina. It is comprised of estuarine portions of Little River, Little River Inlet, Dunn Sound, Hog Inlet, Milliken Cove, and the Atlantic Intracoastal Waterway (AIWW). The area is bounded to the east by the North Carolina-South Carolina state line, on the west by Sea Mountain Highway and portions of the AIWW southwest of the U. S. Highway 17 Bridge traversing the AIWW, and on the south by Cherry Grove Beach, Waites Island, and the Atlantic Ocean. Approximately seven (7) nautical miles of AIWW shoreline define the northern boundary.

The harvesting classifications of Area 01 **prior** to this sanitary survey were as follows:

Prohibited: (1,146 Acres)

1. All waters of the Atlantic Intracoastal Waterway (AIWW);
2. All waters of the Little River;
3. All waters of Calabash Creek;
4. All waters of Milliken Cove;
5. All waters of Little River Inlet north of the southeastern point of Little River Neck (Tilghman's Point).

Restricted: (2,143 Acres)

1. Little River Estuary seaward of Tilghman's Point, including all portions of Dunn Sound & Hog Inlet.

Conditionally Approved: None

Approved: None

Station Addition/Reactivation/Deactivation/Modification: None

The shellfish industry in South Carolina is based primarily on the harvest of the eastern oyster (*Crassostrea virginica*) and hard clams, which include both the northern clam (*Mercenaria mercenaria*) and several small populations of the southern clam (*Mercenaria campechiensis*). The South Carolina Department of Health and Environmental Control does not currently allow harvesting of oysters and clams within Area 01 for direct marketing purposes; however, Cherry Grove, Dunn Sound, and Little River Inlet are suitable only as a source of shellfish for indirect marketing through the use of depuration (controlled purification) and/or relaying (transplanting) activities. No commercial shellfish relay projects were permitted during the review period.

The shellfish harvesting season in South Carolina normally extends from October 1 through May 15. The South Carolina Department of Natural Resources (SCDNR) has the authority to alter the

shellfish harvesting season for resource management purposes and grant permits for year-round mariculture operations. Additionally, the South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that shellfish harvested in South Carolina waters are safe for human consumption.

POLLUTION SOURCE SURVEY

SURVEY PROCEDURES

Shoreline surveys of SFMA 01 were conducted by the South Carolina Department of Health & Environmental Control (SCDHEC) Environmental Affairs, Pee Dee – Myrtle Beach, Shellfish Sanitation Staff, by watercraft, vehicle and on foot, during the survey period and are ongoing. Extensive visual examination of lands adjacent to the waters of SFMA 01 was conducted to determine potential sources of pollution entering shellfish growing waters.

POINT SOURCE POLLUTION

A. **Municipal and Community Waste Treatment Facilities** - The City of North Myrtle Beach operates two wastewater facilities with permitted discharges to the AIWW at separate locations adjacent to the southern reaches of SFMA 01. These facilities are typically operated efficiently and within National Pollution Discharge Elimination System (NPDES) permit limitations. Additionally, Grand Strand Water and Sewer Authority's Vereen Wastewater Treatment Plant discharges into the AIWW. The biological solids that are generated during the treatment process from the Vereen Plant are treated to Class A standards through composting to provide the most beneficial reusable product. The composted material is utilized as crop fertilizer at several SCDHEC approved farms. Although these discharges contribute to pollution loading within the freshwater portions of the AIWW, the discharges to the AIWW are seven miles from the closest viable shellfish (subtidal clams) populations and therefore have no adverse impact upon restricted shellfish beds.

B. **Industrial Waste** - There are no permitted industrial discharges within Shellfish Management Area 01.

C. **Marinas** - In 2007, prompted by the Department's Office of Coastal Resource Management (OCRM) marina definition change, the Shellfish Sanitation Section incorporated the following marina definition. S.C. Regulation 61-47, Shellfish defines Marina as any of the following: (1) locked harbor facility; (2) any facility which provides fueling, pump-out, maintenance or repair services (regardless of length); (3) any facility which has effective docking space of greater than 250 linear feet or provides moorage for more than 10 boats; (4) any water area with a structure which is used for docking or otherwise mooring vessels and constructed to provide temporary or permanent docking space for more than ten boats, such as a mooring field; or (5) a dry stack facility.

Numerous marinas and multiple docking facilities provide anchorage for commercial and recreational watercraft along the AIWW portion of SFMA 01. This portion of SFMA 01 is administratively Prohibited in its entirety. No individual marina closure zone calculations have been conducted. Table 6 summarizes services provided by these facilities.

D. Radionuclides - Sources of radionuclides have not been identified within Area 01, and radionuclide monitoring has not been conducted. No poisonous or deleterious substances have been documented. No poisonous or deleterious substances have been identified within the area.

NONPOINT SOURCE POLLUTION

A. Urban and Suburban Stormwater Runoff - Stormwater runoff from construction activities can have a significant impact on water quality. As stormwater flows over a construction site, it can pick up pollutants like sediment, debris, and chemicals and transport these to a nearby storm sewer system or directly to a river, lake, coastal waterways, or shellfish growing area. Stormwater runoff is a substantial problem in most of Area 01 waters due to dense development of the surrounding area. Horry County has seen a substantial amount of population growth within the last few years and this trend appears to not be slowing down. Recently, there has been much political pressure for slowing down development because of major flooding that has taken place in the past few years. Two Bureaus within SCDHEC, the Bureau of Water in coordination with the Office of Ocean and Coastal Resource Management ensure that land disturbance activities are permitted accordingly and utilize stormwater best management practices to ensure potential pollutants are not introduced into the environment and nearby water bodies.

Development is not confined to lands immediately adjacent to shellfish growing areas but also includes lands adjacent to the AIWW southwest of SFMA 01, as well portions of North Carolina adjacent to Calabash Creek and surrounding areas. An existing network of dead-end finger canals in the Cherry Grove section of SFMA 01 is the recipient of most of the drainage from streets and paved surface areas. Finger canals typically exhibit poor flushing action. This has contributed to sediment accretion within the canals. Additionally, tidal flooding in portions of Cherry Grove is a common occurrence due to spring tides and storm systems.

The lands surrounding shellfish growing waters in SFMA 01 consist of various soil types and conditions. These have been defined by the United States Department of Agriculture, Soil Conservation Service (1986) utilizing general classifications and descriptions. Although lands within SFMA 01 consist of numerous soil types, the area is generally comprised of Lakeland-Leon-Newhan soils, nearly level and gently sloping soils that have a sand or loamy subsoil. The United States Department of Agriculture (1986) further describes these soils as "excessively drained and poorly drained soils that are sandy throughout: in drainage ways, on broad ridges and slopes, and on dunes."

There are no approved solid waste landfills located within close proximity to SFMA 01 shellfish growing waters, however several unpermitted solid waste dumps and other local environmental issues have been found in the Little River Neck area adjacent to the AIWW and marsh areas within the management area. These issues are typically handled through SCDHEC's Regional Solid Waste and Air Quality Programs and/or through the Horry County Police Department's - Environmental Services Section.

B. **Agricultural Runoff** - There are no major commercial farming activities occurring adjacent to SFMA 01 waters. Fertilizer, pesticide, and herbicide usage is limited primarily to residential lawn maintenance and golf courses. Several golf courses are located throughout the area and contribute to nonpoint source pollution loading.

C. **Individual Sewage Treatment and Disposal (ISTD) Systems** - SCDHEC Bureau of Environmental Health Services (BEHS) personnel indicate that portions of the Little River Neck and residences bordering the AIWW are serviced by ISTD systems. Soils are suitable for installation and efficient operation of ISTD systems; however, they are being phased out in lieu of municipal wastewater collection and treatment facilities. Central treatment systems have less potential for discharge of untreated wastewater although lift station malfunctions occasionally result in spills of untreated wastewater to the environment. Few system malfunctions have been noted within the past several years. North Myrtle Beach provides central collection service within East Cherry Grove.

Several municipal sewage collection system construction projects are currently underway in portions of Cherry Grove located to the northwest of the Hog Inlet estuary, northeast of Sea Mountain Highway. Additionally, the City of North Myrtle Beach is seeking grant approval to connect the last remaining areas along the Little River Neck that utilize septic systems on the western side of Cherry Grove / Dunn Sound marshes to a municipal sewage collection system.

D. **Wildlife and Domestic Animals** - SFMA 01 supports substantial populations of both wildlife and domestic animals. The Tilghman Estate, consisting of approximately 1,800 acres of wooded highlands at the northeastern section of Little River Neck and 500 acres of barrier island environment located on Waites Island, contains wildlife populations typical of the South Carolina coastal plain. The estate supports populations of rabbit, whitetail deer, raccoon, opossum, rodents, songbirds, and migratory waterfowl. Similar populations are located along the banks of the AIWW. The Estate also houses a horse stable operation that currently has a twenty-stall barn. Domestic animals are also found throughout the area.

E. **Boat Traffic** - Little River Inlet provides ocean access for many recreational and commercial vessels. Additionally, the AIWW comprises a substantial portion of the waters of SFMA 01. Traffic is heavy except during winter months and is comprised of commercial barges and tugs, shrimpers, charter and head boats, and recreational sail and powerboats of various sizes. Due to shallow depths, boat traffic within the Hog Inlet estuary is generally limited to small, shallow draft fishing craft of less than 5 meters in length. Extensive

shoaling at the mouth of Hog Inlet greatly hinders navigation in this portion of the growing area.

F. **Hydrographic and Habitat Modification** - Hydrologic and habitat modification in estuarine areas require both State and federal approval. Marina construction and maintenance dredging have been allowed at several locations within Area 01. Sand from the Hog Inlet shoals has been used for beach renourishment along Cherry Grove Beach. Little River Inlet and portions of the AIWW require maintenance dredging. The United States Army Corps of Engineers has designated tracts of land adjacent to the AIWW as dredge spoil sites. Additionally, large portions of Cherry Grove Beach and Hog Inlet have been altered during the past five decades. Cherry Grove Inlet, originally located south of Hog Inlet, was filled during the 1950's. Numerous dead-end canals were constructed in order to maximize land development. Estuarine wetlands were filled to create residential lots. These activities have altered flow patterns throughout Hog Inlet. Both the Cherry Grove and Hog Inlet sections underwent a maintenance dredging project to improve access to the area. All maintenance dredging was completed within these two sections during the late spring of 2018.

NATURALLY OCCURRING PATHOGENS

A. **Marine Biotoxins** - During the winter and spring of 1988, South Carolina experienced an occurrence of "Red Tide", specifically Ptychodiscus brevis (K. brevis), which affected water quality in Area 01. There have been no documented reoccurrences of this organism at levels requiring emergency response in South Carolina waters subsequent to the 1988 event. Due to the vast media coverage of events related to Pfiesteria pisicida, the Department participates on a State Task Group on Toxic Algae and operates a toxic algae emergency response team.

B. ***Vibrio parahaemolyticus*** – Because State water temperatures exceed 81 degrees Fahrenheit (F) during June through September; *Vibrio parahaemolyticus* (Vp) management controls must be implemented during these months. Management controls for permitted Aquaculture facilities are specifically addressed in R.61-47. The season for wild-stock harvest of oysters is currently closed from May 16 through September 16. Because R.61-47 does not specifically address control of wild-stock harvest from waters exceeding 81 degrees F, the Department will recommend to and request of SCDNR that the wild stock harvesting season not be opened until October 1. The Department is currently opposed to issuance of special wild-stock harvest permits to Certified Shippers during the closed season. Special permit conditions for maricultured triploid oysters during the vibrio control months must include current R.61-47 and NSSP temperature control requirements to be included in the Certified Shipper’s HACCP plan.

HYDROGRAPHICAL AND METEOROLOGICAL CHARACTERISTICS

Shellfish Management Area 01 is a meso-tidal, bar-built estuary typical of South Carolina's northern coast. The entire system is approximately five nautical miles in length (northeast to southwest) and approximately two nautical miles in width (northwest to southeast). Characteristic of this type of system are ebb and flood tidal deltas and protective point bars, which may not be readily apparent at Little River Inlet due to construction of a rubble jetty system. Main channel depths in Little River Inlet are maintained at 10 feet below mean low water (MLW). Main channel depths in the AIWW are maintained at 12 feet below MLW. Depths in the creeks of Dunn Sound and Hog Inlet are not controlled. Sand and mud bars, as well as oyster reefs, are evident during low tides throughout the Little River Inlet, Dunn Sound and Hog Inlet portions of Area 01. Extensive shoaling is evident at the entrance to Hog Inlet.

Tides in SFMA 01 are semidiurnal, consisting of two low and two high tides occurring each lunar day. Mean tidal ranges during normal tides in Little River estuary vary from 4.0 feet at Nixon's Crossroads to 4.85 feet at the west end of Dunn Sound. Spring tides range from 4.56 feet to 5.58 feet. Mean tidal range in the Hog Inlet estuary is 4.71 feet. Spring tide is 5.46 feet. (Nautical Software Inc.) Wind direction and intensity, as well as atmospheric pressure, typically cause variations in predicted tidal ranges.

In 2017, the collection of rainfall data has been improved for a more consistent, accurate, and reliable data set that can be accessed directly from a shellfish staff member's computer or phone. With assistance from the National Weather Service's, Southeastern River Forecast Center, the development of the South Carolina Shellfish Rainfall Program was introduced and utilized. This new technology provides shellfish program staff with real-time daily updates for rainfall accumulation in each of the South Carolina shellfish growing management areas, as well as providing critical triggers that alert staff to when rainfall thresholds for closures are exceeded.

The annual rainfall total in 2020 was 48.74 inches. The 10-year average rainfall total for this area is 48.90 inches. Severe weather events like hurricanes and major rain events have affected South Carolina in recent years. During September of 2019, Hurricane Dorian made landfall on the South Carolina coast and produced 9.21 inches of rain during a two-day period. In September of 2018, Hurricane Florence made landfall just north of the South Carolina/North Carolina state line and produced 8.99 inches of rain during a four-day period. Hurricane Florence was a very slow-moving storm that produced extreme rainfall amounts in North Carolina which weeks later flowed south and flooded many areas within Horry County and Area 01. In October 2016, Hurricane Matthew made landfall north of Charleston, South Carolina and produced 9.38 inches of rain during a two-day period. Lastly, in October 2015, a historical rain and flood event hit the entire state of South Carolina and produced 21.18 inches of rain during a four-day period. Since SFMA 01 was already classified Restricted in its entirety during all these events there were no closures or special sampling performed after the completion of these severe weather events.

Prevailing winds along the northern portion of the South Carolina coast are south during spring and summer and from the north during autumn and winter. Wind speeds are generally less than 15 miles per hour (mph); however, strong weather systems may generate winds in excess of 25 mph. Tropical storms and hurricanes occur occasionally.

Portions of SFMA 01 receive appreciable freshwater inflow from the Waccamaw River via the AIWW (Johnson, 1977). While net flow within the Waccamaw River, AIWW and Little River system is generally northward, tidal forces flow within the Waccamaw and Pee Dee Rivers, and other hydrographic influences cause variations in flow and salinity within the entire system (Turner, 1989). Additional freshwater input occurs via localized precipitation and resulting runoff. Little River originates in and receives drainage from Little River Swamp located on the west side of the AIWW. Calabash Creek receives drainage from portions of Brunswick County, North Carolina.

WATER QUALITY STUDIES

DESCRIPTION OF THE PROGRAM

The Department currently utilizes a systematic random sampling (SRS) strategy within SFMA 01 in lieu of sampling under adverse pollution conditions. In order to comply with NSSP guidelines, a minimum of thirty (30) samples are required to be collected and analyzed from each station during the review period. Sampling dates are computer generated prior to the beginning of each calendar year thereby insuring random selection with respect to tidal stage and weather. The day of the week selection criteria is limited to Mondays, Tuesdays, and Wednesdays due to shipping requirements and laboratory manpower constraints. Sample schedules are rarely altered.

During July 1998, an updated data analysis procedure was formalized. Samples utilized for classification purposes are limited to those samples collected in accordance with the SRS for a 36-month period beginning January 1 and ending December 31. This allows for a maximum of 36 samples per station yet provides a six-sample "cushion" (above the NSSP required 30 minimum) for broken samples, lab error, breakdowns, etc. This also allows each annual report to meet the NSSP Triennial Review sampling criteria.

Three hundred six (306) surface water quality samples (<1.0 ft. deep) were collected for bacteriological analyses and classification purposes from nine active water quality sampling stations in Area 01 during the period of 01/01/18 through 12/31/20. The samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported to the South Carolina Department of Health and Environmental Control, Environmental Affairs, Lowcountry - Charleston laboratory in North Charleston, South Carolina. An additional 120 ml water sample was included with each shipment as a temperature control. Upon receipt at the laboratory, sample sets that exceeded a 30-hour holding time or contained a temperature control >10 degrees Celsius were discarded. Samples collected after September 1, 1986 have been analyzed using the five tube/three dilution modified A-1 method described by Nuefeld (1985).

Surface water temperatures were measured utilizing hand-held, laboratory-quality calibrated centigrade thermometers. Salinity measurements were measured in the laboratory using automatic temperature compensated refractometers. Additional field data include ambient air temperature, wind direction, tidal stage and date and time of sampling. Tidal stages were determined using Nautical Software's Tides and Currents, Version 2.2.

MONITORING RESULTS

The monitoring results from the bacteriological data period show that no stations in SFMA 01 meet the geometric mean and the estimated 90th percentile standard for an Approved classification.

Stations 01-01, 01-02, 01-05, 01-07, 01-17, 01-17A, 01-19, and 01-20 exceed a geometric mean (MPN) value of 14.

All stations exceeded the estimated 90th percentile MPN value of 43.

No station exceeds a geometric mean MPN value of 88.

Stations 01-02, 01-05, and 01-20 exceeded a fecal coliform MPN estimated 90th percentile value of 260. Shellfish located around these stations will not be available for relay or depuration.

Fecal coliform data collected are summarized in Table #2. Also, included in this report is a long-range trend summary of each station with the estimated 90th percentile values in correlation to annual rainfall totals (Table #3).

CONCLUSIONS

Water quality in Shellfish Management SFMA 01 improved slightly at six of the nine sampling stations during this annual survey review period. Although there was a slight improvement the entire growing area should continue to retain a Restricted classification for the 2021-2022 shellfish harvesting season. All stations within the area have exceeded the allowable fecal coliform bacteriological standards to meet an Approved classification.

Stormwater runoff related issues and other potential pollution sources that can occur during large rain events continue to be a major contributor to water quality in this area. During September of 2019, Hurricane Dorian made landfall on the South Carolina coast and produced 9.21 inches of rain during a two-day period in SFMA 01. In September of 2018, Hurricane Florence made landfall just north of the South Carolina/North Carolina state line and produced 8.99 inches of rain during a four-day period.

In 2018 maintenance dredging was completed in the Cherry Grove and Hog Inlet portions of the area and may have improved tidal flushing and water salinity throughout this section of the area. Hog Inlet has changed over past few decades and the effects of tidal flushing have been limited. Due to the shoaling of sandbars in Hog Inlet and changes in creek water flows over time, Station 01-06 (Bridge to Waites Island) was deactivated in 2018 and replaced by Station 01-20 (Tilghman Estate Boat Landing). This was done to better represent water quality within the growing area waters from Hog Inlet to Dunn Sound which sustains a large portion of harvestable shellfish.

During the third year of water quality analysis for Station 01-20 there have not been any significant improvements in water quality data for this section of the growing area. Based on review of fecal

coliform bacteriological data and the pollution source survey, SFMA 01 is continually impacted by five sources of actual or potential pollution and are described below.

1. **Freshwater Inflow** – The Northeastern portions of SFMA 01 receives freshwater inflow from the Waccamaw River via the AIWW. Additionally, freshwater input occurs via localized precipitation and resulting runoff which are especially extreme during major storm events like hurricanes and flooding. Little River originates in, and receives drainage from, Little River Swamp located on the west side of the AIWW. Calabash Creek receives drainage from portions of Brunswick County, North Carolina.

2. **Nonpoint Source Runoff** - Stormwater runoff is a substantial problem in SFMA 01 mostly due to dense development. This has become a very big political issue within Horry County especially due to major flooding that has been occurring throughout the county. This development is not confined to lands immediately adjacent to shellfish growing areas but also includes lands adjacent to the AIWW north and south of SFMA 01. Horry county has and is predicted to continue rapid growth in population size until 2040 according to Horry County Planning and Zoning. South Carolina was the 7th fastest growing state in the United States in 2018 and 31% of those individuals relocated to Horry County which Area 01 is located.

3. **Wastewater Treatment Plant Discharges** - There are no municipal or community wastewater treatment facilities which discharge directly to the waters of SFMA 01 seaward of the SCDNR saltwater-freshwater dividing line; however, the City of North Myrtle Beach operates two wastewater facilities with permitted discharges to the AIWW at separate locations in the southern reach of Area 01. Additionally, Grand Strand Water and Sewer Authority's Vereen Wastewater Treatment Facility also discharges directly to the AIWW in the vicinity of the southern-most North Myrtle Beach discharge location. These discharges are approximately seven miles from the closest viable shellfish (hard clam) populations. The biological solids that are generated during the treatment process from the Vereen Plant are treated to Class A standards through composting to provide the most beneficial reusable product. The composted material is utilized as crop fertilizer at several SCDHEC approved farms.

4. **Individual Sewage Treatment and Disposal Systems** - Individual sewage treatment and disposal systems are being replaced by municipal wastewater collection and treatment facilities. Several projects are currently underway near Sea Mountain Highway. Particularly, the City of North Myrtle Beach has obtained a grant to replace the ISTD systems in the Little River Neck area with a municipal wastewater collection system. SCDHEC Bureau of Environmental Health Services - Pee Dee Region Staff indicate that portions of the Little River Neck are serviced by ISTD systems; however, soils are suitable for installation and systems should operate properly if they are properly maintained. Additionally, several residences bordering the AIWW are also serviced by these systems. Northern portions of SFMA 01, which are not adjacent to shellfish waters, contain numerous structures, which are serviced by ISTD's. These areas ultimately drain to SFMA 01.

5. **Marinas** - Marinas and multiple docking facilities are located along the AIWW portion of SFMA 01. These facilities provide over 1,100 slips for commercial and recreational watercraft. Several of these marinas provide sewer pump out facilities and fuel for recreational and commercial vessels (Table # 6).

RECOMMENDATIONS

The shoreline survey and bacteriological data review of SFMA 01 indicate that the current classification descriptions are appropriate and the area should retain the following harvesting classifications:

Prohibited: (1,146 Acres)

1. All waters of the Atlantic Intracoastal Waterway (AIWW);
2. All waters of the Little River;
3. All waters of Calabash Creek;
4. All waters of Milliken Cove;
5. All waters of Little River Inlet north of the southeastern point of Little River Neck (Tilghman's Point).

Restricted: (2,143 Acres)

1. Little River Estuary seaward of Tilghman's Point, including all portions of Dunn Sound & Hog Inlet.

Conditionally Approved: None

Approved: None

Station Addition/Reactivation/Deactivation/Modification: None

REFERENCES

Johnson, F. A. 1977. A reconnaissance of the hydrology of the Intracoastal Waterway from Bucksport to Little River Inlet, South Carolina. South Carolina Water Resources Commission Report No. 7, Columbia, S.C. 33 p.

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Turner, L. E. 1989. Trend analysis of fecal coliform bacteria levels Little River/Atlantic Intracoastal Waterway 1972-1987. South Carolina Department of Health and Environmental Control. Columbia, S.C. 27 p.

United States Department of Agriculture, Soil Conservation Service. 1986. Soil survey of Horry County, South Carolina. In cooperation with South Carolina Agricultural Experiment Station and South Carolina Land Resources Conservation Commission, National Cooperative Soil Survey, Washington, D.C. 137 p.

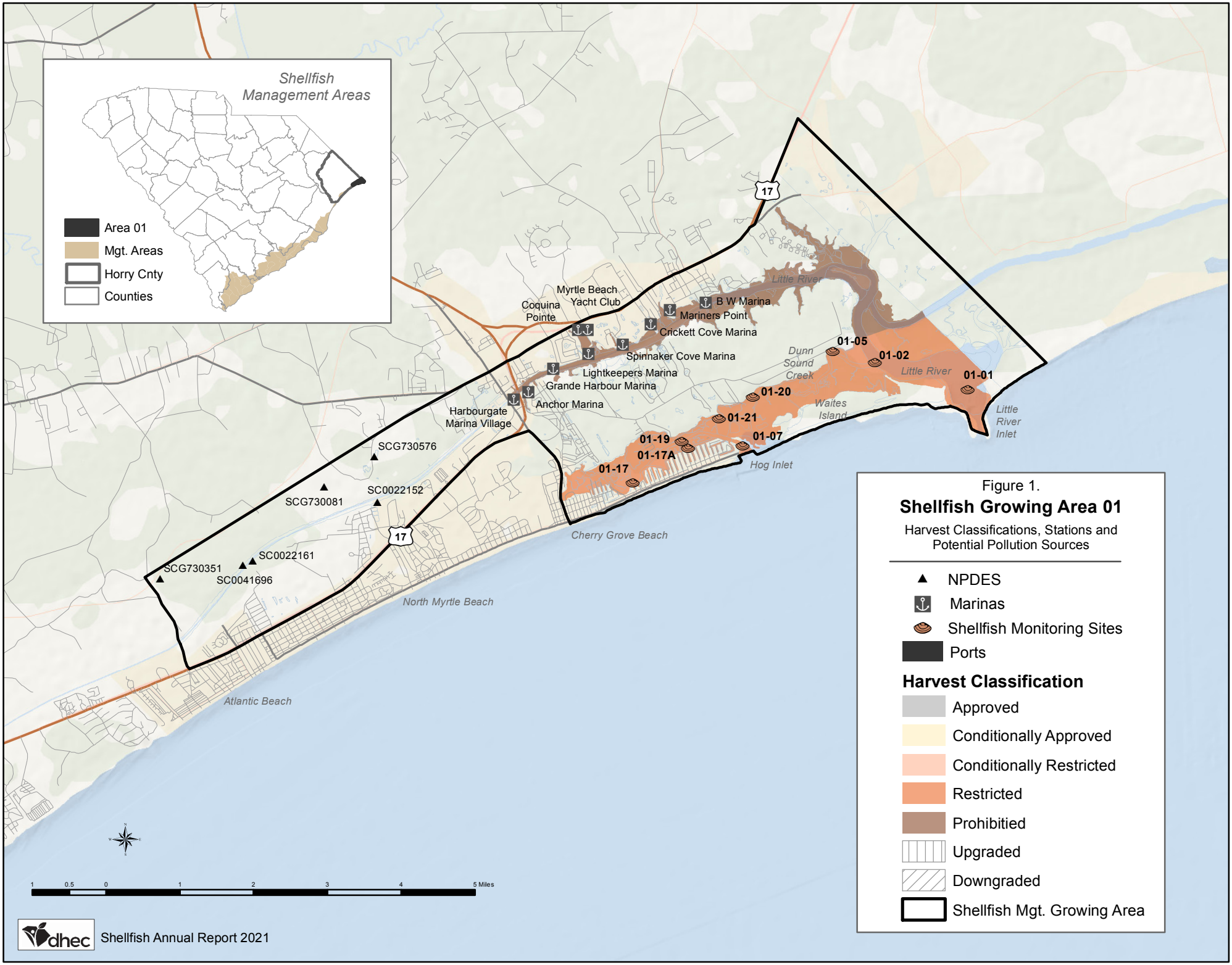
Shellfish Management Areas
Area 01
Mgt. Areas
Horry Cnty
Counties
Myrtle Beach Yacht Club
Coquina Pointe
B W Marina
Mariners Point
Crickett Cove Marina
Spinnaker Cove Marina
Lightkeepers Marina
Grande Harbour Marina
Anchor Marina
Harbourgate Marina Village
Little River
Dunn Sound Creek
Waites Island
Little River Inlet
Hog Inlet
Cherry Grove Beach
North Myrtle Beach
Atlantic Beach
01-05
01-02
01-01
01-20
01-21
01-07
01-19
01-17A
01-17
SCG730576
SCG730081
SC0022152
SCG730351
SC0041696
SC0022161
17
1 0.5 0 1 2 3 4 5 Miles
Figure 1.
Shellfish Growing Area 01
Harvest Classifications, Stations and Potential Pollution Sources
NPDES
Marinas
Shellfish Monitoring Sites
Ports
Harvest Classification
Approved
Conditionally Approved
Conditionally Restricted
Restricted
Prohibitied
Upgraded
Downgraded
Shellfish Mgt. Growing Area

TABLE #1

Shellfish Management Area 01
Water Quality Sampling Stations Description

Station	Description
01-01	Little River Jetty
01-02	Mouth of Dunn Sound Creek
01-05	Big bend up Dunn Sound Creek
01-07	Hog Inlet
01-17	42nd Avenue - Cherry Grove
01-17A	53rd Avenue Bridge on Canal
01-18	Dunn Sound at Hog Inlet
01-19	53rd Avenue at Main Creek
01-20	Tilghman Estate Boat Landing

(Total 9)

TABLE #2

Shellfish Management Area 01
FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY
From Shellfish Water Quality Sampling Stations between

January 01, 2018 and December 31, 2020

Station #	01	02	05	07	17	17A	18	19	20
SAMPLES	34	34	34	34	34	34	34	34	34
GEOMEAN	15.8	30.1	26.1	16.2	20	19.6	10.5	20	25
90TH %ILE	236	432	352	109	100	105	50	126	358
WATER QLTY	R	RND	RND	R	R	R	R	R	RND
CLASSIFICATION	R	RND	RND	R	R	R	R	R	RND

A - Approved **CA** - Conditionally Approved **R** - Restricted
RND - Restricted/No Depuration **P** - Prohibited

TABLE #3
Fecal Coliform Historical Trend Sheet

Area 01 Stations 90^{tho}%ile Values for Annual Updates Related to Rainfall

Station #	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
01-01	236	158	293	360	482	287	376	347	331	176	131
01-02	432	362	416	341	395	291	316	292	275	169	184
01-05	352	358	439	371	385	225	271	225	244	129	153
01-06	ND	ND	ND	467	513	358	252	238	165	82	38
01-07	109	123	107	128	114	77	73	62	57	35	27
01-17	100	115	118	128	156	191	215	186	138	106	67
01-17A	105	114	131	138	131	133	147	140	131	84	69
01-18	50	62	95	150	147	121	120	112	92	46	34
01-19	126	81	136	145	218	138	172	149	126	65	63
01-20	358	434	437	ND	ND	ND	ND	ND	ND	ND	ND
Annual Rainfall (inches)	**48.74**	**47.0**	**57.2**	**36.2**	**56.1**	**74.7**	**40.9**	**48.5**	**48.6**	**32.6**	**47.2**

ND = No Data Red = Impaired Water Quality

TABLE #4

WATER QUALITY
SAMPLING STATION DATA

Shellfish Management Area 01

Detailed data for each shellfish monitoring station listed in this report's "Fecal Coliform Bacteriological Data Summary Table" and in other shellfish reports can be obtained by writing South Carolina's Department of Health and Environmental Control – Freedom of Information Office at the address below.

Freedom of Information
SC Dept. of Health & Environmental Control
2600 Bull Street
Columbia, SC 29201

Any explanation or clarity needed on the report's content can be obtained by contacting the preparer(s), and/or reviewer(s) listed on the cover page.

TABLE #5

RAINFALL DATA

Shellfish Management Area 01

Source:

2018 - 2020 Data
NOAA National Weather Service - Southeastern River Forecast Center
Location: North Myrtle Beach, South Carolina

2018 Annual Rainfall Summary
Source: National Weather Service - Southeastern River Forecast Center
Location: North Myrtle Beach, South Carolina

2018	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1			0.26					0.25				
2		0.05	0.13				0.06	0.18			0.19	0.53
3						0.10	0.01	0.84	0.04		0.02	0.15
4	0.16	0.01		0.02				0.35				0.02
5		0.42		0.03			0.04	0.13			0.27	
6					0.27			0.03		0.05	0.11	
7			0.21						0.04	0.02	0.07	
8		0.04		0.78			3.14		0.05	0.15	0.51	0.04
9				0.04				0.24	0.05	0.09		1.00
10		0.40		0.17		0.03				0.32	0.06	0.85
11				0.08	0.01	0.01				0.02		
12	0.24	0.02	0.45			2.52			0.02			0.01
13	0.67	0.10	0.24			0.84	0.21	0.03	0.02		0.70	
14					0.01			0.10	**0.53**		0.02	0.04
15					0.01	0.52			***6.19**		0.02	2.36
16				0.48	0.30	0.10		0.02	**1.57**		0.22	0.18
17					0.30		0.18		**0.70**	0.54		
18	0.06				0.10		1.02		0.05			
19					0.55	0.05	0.40	0.01	0.06		0.17	
20			0.32		1.24		0.18					
21			0.26			0.24	1.16			0.02	0.01	0.51
22							0.01	0.01				
23	0.33			0.22			0.13					
24				1.82	0.06		0.69				0.07	
25			0.12	0.17	0.05	0.12	0.55		0.03		2.08	
26		0.01				0.60	0.09		0.59	0.02		
27		0.11		0.15		0.19	0.02			1.27	0.02	
28					1.19		0.13		0.04			0.04
29	1.65				0.96		0.32		0.03			0.63
30					0.06		0.98		0.39			
31			0.11		0.11		1.01					0.02
Total	**3.11**	**1.16**	**2.10**	**3.96**	**5.22**	**5.32**	**10.33**	**2.19**	**10.40**	**2.55**	**4.54**	**6.38**

***Days highlighted indicate 4 or more inches of rain in a 24-hour period. Blank fields indicate no rainfall.**

***Sample dates are indicated in blue.** | **ND = No Data** | **ANNUAL RAINFALL** | **57.26**

2019 Annual Rainfall Summary
Source: National Weather Service - Southeastern River Forecast Center
Location: North Myrtle Beach, South Carolina

2019	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1	0.04		0.01	0.11		0.42					0.08	
2	0.46		0.28	0.21					0.05			0.32
3		0.25	0.19	0.40		0.04		0.13	0.03			
4	0.09	0.08	1.06		0.03		0.96	0.08				
5	0.16		0.17	0.01	0.12		0.53	0.01	*4.80		0.03	
6			0.04	1.49		0.02	0.59	0.25	*4.41		0.58	
7						0.40						0.05
8						0.04					0.79	
9			0.15			1.41	0.03					0.15
10				0.04		0.06	0.22					
11						0.01	1.11	0.01				
12		0.16	0.03	0.01			0.10	0.73				
13	0.01	0.04		0.02	0.53	0.34					0.29	
14	0.04			0.15			1.24	0.21	0.10	0.56		0.58
15				0.09				0.20	0.01		0.34	
16		0.22				0.03		1.00		0.14	0.43	
17		0.13						3.52		0.04	0.47	
18	0.02							0.94				
19		0.01		0.10		0.08	0.03				0.01	
20	0.18	0.03		1.70						2.83		
21		0.04	0.04			0.35		0.06				
22		0.03	0.03			0.25		0.01				
23		0.05				0.76						0.70
24	0.38					0.01	0.28				0.10	2.19
25	0.06							0.15				
26			0.01				0.03					
27			0.03							0.01		
28										0.12		
29								0.09				
30	0.02									0.02		0.26
31					0.04		0.21					
Total	**1.46**	**1.04**	**2.04**	**4.33**	**0.72**	**4.22**	**5.33**	**7.39**	**9.40**	**3.72**	**3.12**	**4.25**

***Days highlighted indicate 4 or more inches of rain in a 24-hour period. Blank fields indicate no rainfall.**

***Sample dates are indicated in blue.** | **ND = No Data** | **ANNUAL RAINFALL** | **47.02**

2020 Annual Rainfall Summary
Source: National Weather Service - Southeastern River Forecast Center
Location: North Myrtle Beach, South Carolina

2020	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1		0.58		0.42	0.95		0.58				0.02	0.43
2		0.01						0.19	0.02		0.22	
3			0.55				0.19	0.14				
4	0.04		0.02					3.37		0.04		
5	0.11		0.31		0.17	0.22		0.06		0.01		0.26
6			0.81		0.07			0.31			0.06	
7		1.32		0.13	0.01		0.12	0.43			0.01	0.02
8							1.40	0.11				0.02
9				0.35	0.02	0.06	0.21		0.52			
10						0.01	0.09		0.11			
11		0.02					0.19		0.01	2.87		
12	0.02					0.01			0.04	0.03	1.78	
13	0.01			0.02		0.60	0.11		0.02		3.95	0.02
14	0.29	0.11		0.59		0.15	0.06	0.08				0.03
15						0.47	0.01	0.06	0.19			0.01
16	0.01			0.22		0.46	0.04	0.28		0.08	0.03	0.03
17	0.02	0.14						0.14	0.74	0.09		0.30
18			0.60		0.03				2.02			
19		0.53			0.45							
20		0.12		0.24	0.01	0.01		0.15				0.01
21		1.08		0.06	0.06	0.14		0.01				1.30
22					0.36			0.09				
23			0.03		0.11							
24			0.38	0.40		0.01		0.55				
25	0.19	0.46	0.34			0.04	0.81	0.45		0.07		0.29
26		0.76				0.37	0.26		0.38	0.27	0.02	
27	0.03	0.08			0.23	0.01					0.80	
28	0.04				1.46				0.16		0.02	
29						0.29			0.28		0.11	
30	0.06			0.30	0.23		0.11	0.31	0.20		1.05	
31	0.01				0.02		0.02					0.03
Total	**0.83**	**5.21**	**3.04**	**2.73**	**4.18**	**2.85**	**4.20**	**6.73**	**4.69**	**3.46**	**8.07**	**2.75**

***Days highlighted indicate 4 or more inches of rain in a 24-hour period. Blank fields indicate no rainfall.**

***Sample dates are indicated in blue.** | **ND = No Data** | **ANNUAL RAINFALL** | **48.74**

TABLE #6
Shellfish Management Area 01
MARINA INVENTORY

Name	Primary Use	Number of Slips	Fuel (gal)	Fuel Type	Pump-Out	Status
Anchor Marina	Recreational	100 w/Public Ramp	12,000	Gas/Diesel	Yes	Active
Calabash Docks (NC)	Recreational & Commercial	750 Lineal Feet	6,000	Diesel	No	Active
Calabash Marina (NC)	Recreational	87 Dry + 100 Lineal Ft	None	None	No	Closed
Coquina Harbor	Recreational	520	15,000	Gas/Diesel	Yes	Active
Crickett Cove	Recreational & Commercial	90 Wet / 350 Dry - Jet Ski & Pontoon Rentals	24,000	Gas/Diesel	Yes	Active
Dock Holidays	Recreational & Commercial	97 Jet Ski & Pontoon Rentals	20,000	Gas/Diesel	Yes	Active
East Port	Recreational	20 Slips + 200 Lineal Ft	None	None	Yes	Active
Harbourgate Marina	Recreational & Commercial	93 Jet Ski & Pontoon Rentals	24,000	Gas/Diesel	No	Active
Little River Docks	Recreational & Commercial	360 Lineal Ft + 11 Slips - Jet Ski, Pontoon Rentals, Casino Boats	11,500	Gas/Diesel	No	Active
Mariner's Pointe	Recreational	116	None	None	Yes	Active
Marsh HarbourYacht Club	Recreational	125	20,010	Gas/Diesel	Yes	Closed
North Myrtle Beach Public Boat Ramps						
Cherry Grove at 53rd Ave. N.	Recreational	25 parking spaces	None	None	No	Active
ICW under bridges	Recreational	32 Spaces	None		No	Active
ICW under bridges	Recreational	54 Spaces	None		No	Active
NMB at 2nd Ave. N	Recreational	0-15 Boats	None		No	Active
Designated Achorage in Calabash River	Recreational		None		No	Active
Silver Coast Marina	Recreational	10 Wet / 200 Dry	2,000	Gas	No	Active