South Carolina Department of Health and Environmental Control

ENVIRONMENTAL AFFAIRS

SHELLFISH MANAGEMENT AREA 07

2023 ANNUAL UPDATE

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

September 2023

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SHELLFISH MANAGEMENT AREA 07
2023 ANNUAL UPDATE

[Data Through December 2022]

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Shellfish Management Area 07

Data Inclusive Dates:
01/01/20 thru 12/31/22

Classification Change:
___ Yes __X__ No

Shoreline Survey Completed: Yes

(I)ncreased/(D)ecreased/(N)one:
__N__ Approved
__N__ Conditionally Approved
__N__ Restricted
__N__ Prohibited

Prior Report & Date: 2022 Annual Update

SUMMARY

There are no classification changes for the 2023 Annual Update within Shellfish Management Area 07 (SFMA 07). Station 07-14 (Doehall Creek – third bend at dock) water quality data exibit that it's classification be upgraded to Approved, however, this station will remain Restricted due to lying within Restricted waters.

Potential impacts to water quality within the area appear to be by freshwater from the Santee Rivers and creeks from the Francis Marion National Forest. The creeks from the Francis Marion National Forest includes Awendaw Creek which has extensive wildlife and an expanding rookery population within the management area.

Nearly all of SFMA 07 lies within the confines of the Cape Romain National Wildlife Refuge, and the vast wildlife and waterfowl populations supported by this area likely contribute to the shellfish growing area's minimal fecal coliform concentrations. Tidal flushing, however, likely mitigates pollution impacts by shorebird populations. Waterfowl impoundments are typically located closer to the uplands, and their distance from ocean inlets and diminished tidal flushing likely makes waterfowl impoundments a more significant source of observed pollution in Area 07. Individual sewage treatment and disposal systems are used exclusively in the outlying portions of the management area.

A significant contributor to adverse water quality within SFMA 07 is due to freshwater inflow from the Santee Rivers within the Santee River Basin. The Atlantic Intracoastal Waterway (AIWW) is the conduit for inflow entering SFMA 07 via SFMA 06B. Additionally, Awendaw Creek has shown to have potential impacts to water quality within the AIWW.

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 United States Food and Drug Administration (USFDA) uses The National Shellfish Sanitation Program's (NSSP) *Guide for the Control of Molluscan Shellfish* 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. Requirement 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 the 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 through the use of 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 the 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 the 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

This sanitary survey evaluates the current harvesting classification of shellfish growing waters designated as Shellfish Management Area 07 (SFMA 07). SFMA 07 consists of approximately 40,375 acres of shellfish growing area habitat located in Charleston County, South Carolina. SFMA 07 extends from just north of the Town of McClellanville eleven miles southwestward to the southern end of Bulls Bay. It consists of the waters of Bulls Bay, the Atlantic Intracoastal Waterway (AIWW), Muddy Bay, Romain River, Awendaw, Five Fathom, Graham, Horsehead, Jeremy, Tibwin and Venning Creeks. The northern boundary of the area extends from the AIWW Marker #32 southeastward to Cape Island and the southern edge of Cape Romain Harbor. US Highway 17 defines the western border of the management area. The area is bounded to the south by an imaginary line extending between AIWW Marker #68 and the northeastern tip of Bull Island. The eastern boundary line is the National Wildlife Refuge boundary line.

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 ribbed mussel (*Geukensia demissa*) is also harvested in South Carolina, primarily gathered on a small scale by the general public for recreational harvest. Areas in South Carolina designated for commercial harvest by the South Carolina Department of Natural Resources (SCDNR) include State shellfish grounds, Culture permits, Mariculture permits and Kings Grant areas.

There are nine (9) State Shellfish Grounds (SSGs), S-272, S-275, S-276, S-279, S-280, S-286, S-294, S-295, and S-328; Sixteen (16) Culture Lease Permits (C); Nine (9) Mariculture Permits (M); Two (2) King's Grants (G) and One (1) Recreational Shellfish Ground (R) located in SFMA 07.

The shellfish harvesting season in South Carolina typically extends from October 1 through May 31. 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.

The harvesting classification of SFMA 07 **prior** to this sanitary survey was as follows:

PROHIBITED

1. Jeremy Creek, extending from its headwaters to 315 feet into the AIWW, and extending 714 feet in each direction along the AIWW, from Jeremy Creek's northeast point.

RESTRICTED

1. Station 07-20 (Graham Creek at AIWW, Marker #64) extending through Station 07-20 into Bulls Bay 1000' in all directions, including Station 07-02A (Graham Creek at Bulls Bay);
2. All of Awendaw, Sandy Point, and Tibwin Creeks and their adjacent marshlands.
3. Doe Hall Creek and adjacent marshlands upstream from station 07-14.
4. AIWW and adjacent marshlands between stations 07-18 and 06B-10.
5. AIWW and adjacent marshlands southeast to Station 07-17 (Five Fathom Creek at second small creek north of Marker #18) to Station 07-08 (Clubhouse Creek-1/4 mile north of Five Fathom Creek.)

CONDITIONALLY APPROVED

None

APPROVED

All other waters in SFMA 07.

Station Additions/Deactivations/Modifications: None

POLLUTION SOURCE SURVEY

SURVEY PROCEDURES

The South Carolina Department of Health and Environmental Control, Environmental Affairs, Lowcountry – Charleston, Shellfish Sanitation Staff, routinely conducts shoreline survey activities in SFMA 07**,** by watercraft, vehicle, and on foot, during the survey period and are ongoing. Previous shoreline survey efforts conducted by the Office of Coastal Resource Management (OCRM) will continue to be documented.

OCRM developed GIS shapefiles documenting rural, non-MS4 (Municipal separate storm sewer system) areas in Charleston County on septic tanks. A one-mile buffer was drawn around all impaired shellfish water bodies in the county. County parcel data was cross referenced with Department septic tank permit data in those areas to develop shapefiles of all parcels on septic tanks, to include the number of tanks on the property and the property owner's names(s) and address(s). A physical shoreline survey of these same areas was conducted, taking GPS coordinates of any observed animal farms, to include the parcel information of the farm, the type and number of animals observed, and their distance from shellfish harvesting waters. Together, the septic data and animal farm data should provide focus for future shoreline survey efforts in locating and evaluating potential non-point source impacts near impaired shellfish harvesting waters.

POINT SOURCE POLLUTION

A. Municipal and Community Waste Treatment Facilities

The sole domestic wastewater treatment facility within close proximity to SFMA 07 shellfish waters is the Lincoln High School facility in McClellanville. In January 2004, a no-discharge permit ND0073016 was issued to Lincoln High School allowing land disposal of their treated wastewater on two parcels of land a few miles from the actual school. The McClellanville Middle School also utilizes Lincoln High School's permit for wastewater disposal. For the 2020-2022 reporting years and this Annual Update, SFMA 07 WWTP's had no sanitary sewer overflows during this review period.

National Pollutant Discharge Elimination System (NPDES) Permitted Facilities				
Permit #	**Facility**	**Outfalls**	**Permitted Flow (Gallons Per Day)**	**Fecal Coliform Limits**
ND0073016	Lincoln High School WWTP	001 – Land App. 2.4 Acres and 0.9 Acres	16,000 GPD Design Capacity	Daily Max. – 400 FC/100ml Monthly Avg. – 200 FC/100ml
SCG645033	St. James-Santee Elementary – Reverse Osmosis	02A- Iron Based Coagulant	N/A	N/A

The only other NPDES permit issued within SFMA 07 is to St. James-Santee Elementary in McClellanville, which has been issued permit SCG645033 for drinking water treatment using Reverse Osmosis.

B. Industrial Waste (Discharges)

National Pollutant Discharge Elimination System (NPDES) Permitted Facilities		
Permit #	**Facility Name**	**Facility Type – Outfall Type**
SCG731034	Marcinak Con/Landry Farms Mine	Mineral Mine - Discharge

There are no direct industrial wastewater discharges located within the boundary of SFMA 07. A NPDES permit SCG731034 had been issued to Marcinak Con/Landry Farms Mine for mineral mine dewatering. The discharge is located outside the current boundary of SFMA 07, but still within the watershed boundary that drains into SFMA 07. Since there is no fecal component to this discharge, its impact is deemed negligible.

Santee Cooper's spillway at Wilson Dam and the St. Stephens hydroelectric generating station near St. Stephens produce power and regulate freshwater flow into the Santee River system. In order to prevent flooding during periods of high flow into Lake Marion, freshwater is discharged from the Lake Marion spillway to the Santee River. Freshwater from Lake Moultrie enters the Santee River by way of the Rediversion Canal. The vast amount of fresh water released into the Santee River likely negatively impacts water quality within the northern portions of SFMA 07, specifically the AIWW, Five Fathom and Clubhouse Creeks.

C. **Marinas** - In 2007, prompted by a SCDHEC Office of Coastal Resource Management (OCRM) marina definition change, SCDHEC Shellfish adopted 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.

Prior to the 2007 definition change, the only commercial boat docking facilities in SFMA 07 were located exclusively in Jeremy Creek, which is Administratively Prohibited in its entirety. Leland Oil Company operates a recreational marina, with 11 slips and 120 feet of dockage for transients. They currently offer fuel services, but no pump-out service. There are no liveaboards at this marina. They reconstructed their dock in 2012 and applied for a permit to incorporate a sewage pump-out service. Also, two commercial fisheries docks are located in Jeremy Creek. The largest, Carolina Seafood, has approximately 700 feet of dockage, with 15 local shrimp trawlers docked there. During shrimp season, they will accommodate an additional 4 to 10 shrimp trawlers from North Carolina. Carolina Seafood offers diesel fuel, but not gasoline, and does not have a pump-out service. Additionally, Livingston's Bulls Bay Seafood operates a commercial fisheries dock in Jeremy Creek. They have approximately 150 feet of dockage, with usually only 1 or 2 shrimp trawlers, but can accommodate up to 15 North Carolina shrimp trawlers during shrimp season. Livingston's has neither fuel nor pump-out services. A Prohibited closure zone, based upon theoretical dilution analysis, extends into the AIWW 714 feet upstream and downstream from Jeremy Creek's northeast point. Table #8 provides additional detail on boat docking facilities in SFMA 07.

D. **Radionuclides** - Sources of radionuclides have not been identified within SFMA 07 and no other sources of poisonous or deleterious substances have been identified within the

area.

NONPOINT SOURCE POLLUTION

A. **Urban and Suburban Stormwater Runoff** – Stormwater runoff impacts water quality by transporting fecal coliform bacteria from land to the shellfish growing area. Previous shoreline surveys conducted in SFMA 07 reveal the highest populated areas to be along the shores of Awendaw and Jeremy Creeks. The headwaters of Awendaw, Jeremy and Tibwin Creeks originate in the freshwater swamps of the Francis Marion National Forest, approximately four miles from their confluences with the AIWW. These creeks serve as conduits for low salinity water and stormwater runoff entering the Area. Additionally, Jeremy Creek is impacted by runoff from a series of large storm drainage ditches that serve the town of McClellanville.

Past field observations have revealed several horse farms along Awendaw Creek on both sides of US Highway 17 North. There are also multiple homes near the water's edge of Awendaw Creek. Sandy Point Creek also has some homes at its headwaters, as well as two large ponds that provide habitat for substantial populations of waterfowl. There are three ponds that drain to the Doe Hall creek. Large bird populations can be seen at all three ponds. A drainage canal also extends from US Highway 17 North to Doe Hall Creek. Tibwin Creek has three ponds that may influence its water quality. The first two ponds are at the headwaters of the third tributary on the west side of Tibwin creek, upstream from the AIWW. The third pond is on the west side of Tibwin Creek at its headwaters near US Highway 17. A small drainage canal has been dug from the extreme headwaters of Tibwin Creek. It extends under US Highway 17 and through a small community that is along Tibwin Rd. and Simmons Rd. This community has approximately 18 residences and a large part of the community is associated with farming. Five of the residences were noted to have small numbers of farm animals, including cows, goats and horses. There is an extensive ditch system along these tracts of land that drains to Tibwin Creek.

The uplands surrounding the shellfish growing waters of SFMA 07 consist of various soil textures defined by the United States Department of Agriculture (USDA), Soil Conservation Service (1971) utilizing general classifications and descriptions. Although lands within Area 07 consist of numerous soil types, the area is generally comprised of Seewee-Rutlege soils, nearly level and gently sloping woodland and cropland loamy fine sand. The USDA (1971) further describes these soils as "somewhat poorly drained to moderately well drained, nearly level, sandy soils on ridges and poorly drained to very poorly drained, sandy soils in depressions."

B. **Agricultural Runoff** - There are no permitted agricultural facilities located in SFMA 07, although there are multiple farms, primarily horse, located throughout the area.

C. **Individual Sewage Treatment and Disposal Systems** - New homes continue to be built along the AIWW from Garris Landing to Jeremy Creek. All homes within this area utilize individual sewage treatment disposal (ISTD) systems. Each system requires

inspection by the South Carolina Department of Health and Environmental Control's, Environmental Affairs, Bureau of Environmental Health Services Lowcountry – Charleston, On-site Wastewater Section and approval before final installation.

D. **Wildlife and Domestic Animals** - SFMA 07 supports substantial populations of both wildlife and domestic animals. The lands throughout the area help comprise the Cape Romain National Wildlife Refuge. The refuge contains such wildlife as beavers, rabbit, white-tailed deer, raccoon, opossum, alligators, various rodents, and a substantial bird population typical of coastal South Carolina. The tidal uplands in the refuge have small creeks and drainage ditches throughout the area. These creek systems become a conduit for animal fecal coliform bacteria to be transported to the adjacent shellfish growing waters.

E. **Boat Traffic** - Recreational boat traffic is relatively sparse throughout the area during the winter months. Shrimp baiting season, which typically begins in September and ends in November, contributes to moderate levels of recreational boat traffic throughout the area. Commercial traffic in the AIWW consists primarily of tugs and barges. Commercial fisheries boats, ranging in size from 16 to over 50 feet, operate as long as product demand exists.

F. **Hydrographic and Habitat Modification** - Hydrographic and habitat modification in estuarine areas requires both State and Federal approval. Portions of the AIWW require periodic maintenance dredging. The U.S. Army Corps of Engineers utilizes designated tracts of land adjacent to the AIWW as dredge spoil sites.

The Army Corps of Engineers conducted a dredging project on Jeremy Creek in January 2016 to restore the creek to navigable depths.

NATURALLY OCCURRING PATHOGENS

A. **Marine Biotoxins** - Bivalve shellfish contamination from marine biotoxins has not been shown to be a human health concern within SFMA 07. 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 SFMA 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 in a State Task Group on Toxic Algae and operates a toxic algae emergency response team. The Department also has a Marine Biotoxin Contingency Plan in place that must be evaluated and updated annually.

B. ***Vibrio Management Plan*** – Because State water temperatures exceed 81 degrees Fahrenheit (F) during June through September; *Vibrio* 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 is currently closed from June 1 through September 30th. The Department is currently not

opposed to the issuance of special harvest permits to Certified Shippers during the closed season, provided permit conditions include current NSSP requirements for temperature control to be included in the Certified Shipper's HACCP plan.

HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS

PHYSIOGRAPHY

Shellfish Management Area 07 is comprised of salt and brackish marsh. It includes shallow bays and meandering creeks protected by a series of undeveloped offshore barrier islands. The entire system is approximately four miles wide (northwest to southeast) and eleven miles long (southwest to northeast). The creeks within the area range from 15 to 700 feet in width and average 3 to 18 feet in depth. Additionally, the AIWW traverses the area's entire length in a northeast-southwest direction. The AIWW is maintained at a depth of 12 feet by the US Army Corps of Engineers. The AIWW is a major conduit for low salinity water entering SFMA 07 from the Santee Rivers. The major upland creeks including Awendaw Creek also provide an influx of fresh water via drainage from the Francis Marion National Forest. Bulls Bay and Five Fathom Creek are the major conduits of high salinity ocean water into the area.

Tides in SFMA 07 are semidiurnal, consisting of two low and two high tides occurring each lunar day. Mean tidal ranges in the AIWW at Buck Hall are 5.0 feet during normal tides and 6.6 feet during spring tides. Wind direction and intensity, as well as atmospheric pressure, typically cause variations in predicted tides.

Precipitation in SFMA 07 is typically heaviest during late summer and early autumn. Tropical storms and hurricanes occasionally produce extremely large amounts of rainfall. During winter months heavy rainfall events are uncommon, yet occasional intense thunderstorms, associated with rapidly moving low-pressure systems, generate heavy rains. Precipitation occasionally occurs in the form of snow or ice. Spring and summer weather patterns are often dynamic with associated thunderstorms and severe weather conditions.

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 2022 annual rainfall total recorded was 41.94 inches, which was below the 10-year mean average of 52.85 inches.

The prevailing winds along the central portion of the South Carolina coast are from the south and west 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.

WATER QUALITY STUDIES

DESCRIPTION OF THE PROGRAM

The Department currently utilizes a systematic random sampling (SRS) strategy within SFMA 07 in lieu of sampling under adverse pollution conditions. In order to comply with NSSP guidelines, a minimum of thirty 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 quarterly period thereby insuring random selection with respect to tidal stage and weather. Day of 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 shellfish water quality data scheduling and collection 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 sample bottles, lab error, breakdowns, etc. This also allows each annual report's water quality data to meet the requirements for the NSSP Triennial Review sampling criteria.

Seven hundred and fifty-five (755) SRS surface water quality samples (<1.0 ft. deep) were collected for bacteriological analyses and classification purposes from twenty-one (21) active water quality sampling stations in SFMA 07 during the period 01/01/20 through 12/31/22. Multiple samples were collected for non-classification purposes, associated with reopening following precautionary closures. 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's Lowcountry – Charleston Environmental Quality Control laboratory at North Charleston, South Carolina. An additional 120 ml water sample was included with each shipment as a temperature control. At the laboratory, sample sets exceeding a 30-hour holding time or containing a temperature control in excess of 10 degrees C. were discarded (APHA, 1970).

Surface water temperatures are measured utilizing hand-held, laboratory-quality calibrated centigrade thermometers. Salinity measurements are measured in the laboratory using an automatic temperature compensated refractometer. Additional field data include ambient air temperature, wind direction, tidal stage, and date and time of sampling.

MONITORING RESULTS

Stations 07-03, 07-15, 07-21 and 07-22 exceeded a fecal coliform geometric mean MPN/100 ml. value of 14.

Stations 07-02, 07-02A, 07-03, 07-05, 07-06, 07-15, 07-19, 07-20, 07-21 and 07-22 exceeded an

estimated 90th percentile fecal coliform MPN/100 ml. value of 43.

No station exceeded a geometric mean MPN value of 88 and no station exceeded a fecal coliform MPN estimated 90th percentile value of 260.

CONCLUSIONS

Based on the review of fecal coliform bacteriological data and the pollution source survey, SFMA 07 appears to be impacted primarily by nonpoint source pollution.

NONPOINT SOURCE RUNOFF

Stormwater runoff appears to be a major source of fecal coliform bacteria contamination in the area. The majority of SFMA 07 lies within the boundary of the Cape Romain National Wildlife Refuge. The uplands, small tidal islands and the vast network of creeks are teaming with wildlife. The dredge spoil areas used by the Army Corps of Engineers and the multiple ponds along Doe Hall, Sandy Point and Tibwin Creeks provide prime habitat for regional wildlife and migratory waterfowl.

FRESHWATER INFLOW

SFMA 07 receives freshwater inflow from the South Santee River via the AIWW and from creeks that extend into the Francis Marion National Forest. The flow of water from the South Santee River into the area is primarily due to the added water released by Santee Cooper as part of the Rediversion project. The Santee River can force substantial amounts of fresh water into the growing area. During high flow periods, low salinity water enters SFMA 06B via the Atlantic Intracoastal Waterway (AIWW) and continues into the northern portion of SFMA 07, affecting the AIWW, Five Fathom and Clubhouse Creeks. Analytical results have suggested a direct relationship between lower salinities and elevated fecal coliform bacteria concentrations in the AIWW in both SFMA 07 and 06B. TABLE # 7 of this Annual Review uses data from USGS Santee River Station 02171700, to compare fecal coliform Data to River Gauge Height and Rainfall.

RECOMMENDATIONS

Although Station 07-14 (Doehall Creek – third bend at dock) has an Approved water quality classification, it will remain in the Restricted status because this station lies within Restricted classification boundaries of SFMA 07.

There are no new classification changes recommended for SFMA 07 for the upcoming 2023-2024 shellfish harvesting season.

PROHIBITED

1. Jeremy Creek, extending from its headwaters to 315 feet into the AIWW, and extending 714 feet in each direction along the AIWW, from Jeremy Creek's northeast point.

RESTRICTED

1. Station 07-20 (Graham Creek at AIWW, Marker #64) extending through Station 07-20 into Bulls Bay 1000' in all directions, including Station 07-02A (Graham Creek at Bulls Bay);
2. All of Awendaw, Sandy Point, and Tibwin Creeks and their adjacent marshlands.
3. Doe Hall Creek and adjacent marshlands upstream from station 07-14.
4. AIWW and adjacent marshlands between stations 07-18 and 06B-10.
5. AIWW and adjacent marshlands southeast to Station 07-17 (Five Fathom Creek at second small creek north of Marker #18) to Station 07-08 (Clubhouse Creek-1/4 mile north of Five Fathom Creek.)

CONDITIONALLY APPROVED

None

APPROVED

All other waters of SFMA 07.

Station Additions/Deactivations/Modifications: None

Analysis of sampling data for SFMA 07 demonstrates the probability of a significant impact from rainfall exceeding 4.00" in a 24-hour period. Therefore, a precautionary closure of SFMA 07 will be implemented following rainfall events of greater than 4.00" in a 24-hour period, as measured by the National Weather Service's Southeastern River Forecast Center. This methodology is associated with the concept of the Probable Maximum Precipitation (PMP). The National Weather Service publishes PMP estimates for the coastal United States in a series of hydro-meteorological reports (HMRs) (*National Weather Service*). PMP estimates for South Carolina's growing areas are derived from HMRs 51, 52, and 53 (*National Research Council, 1985*).

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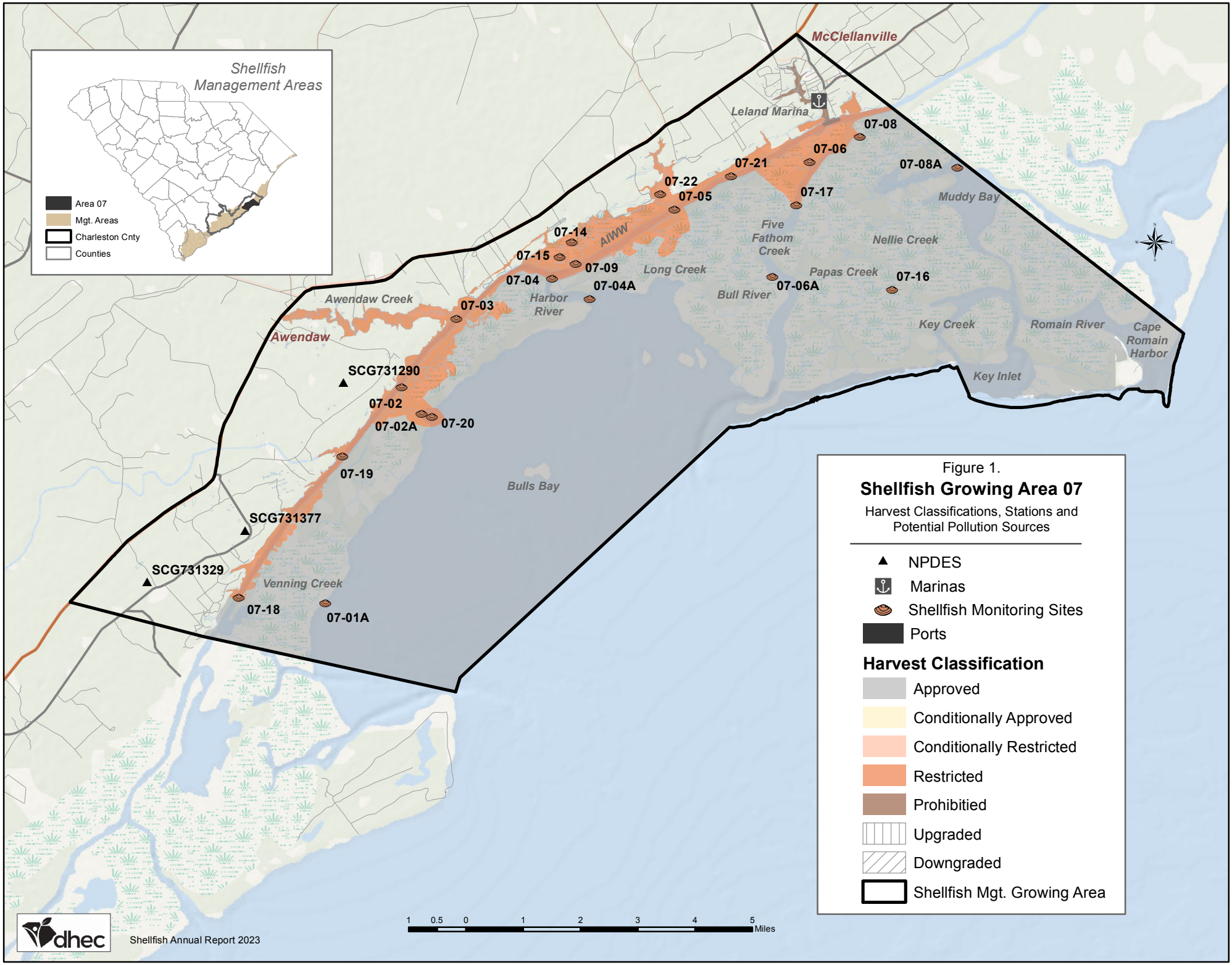
Shellfish Management Areas
Area 07
Mgt. Areas
Charleston Cnty
Counties
McClellanville
Leland Marina
07-08
07-06
07-21
07-08A
07-22
07-05
07-17
Muddy Bay
AIWW
07-14
07-15
07-09
07-04
07-04A
Long Creek
Five Fathom Creek
Nellie Creek
Papas Creek
07-16
07-06A
Bull River
Harbor River
Awendaw Creek
07-03
Awendaw
Key Creek
Romain River
Cape Romain Harbor
Key Inlet
SCG731290
07-02
07-02A
07-20
07-19
Bulls Bay
SCG731377
SCG731329
Venning Creek
07-18
07-01A
1 0.5 0 1 2 3 4 5 Miles
Figure 1.
Shellfish Growing Area 07
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
dhec
Shellfish Annual Report 2023

TABLE #1
Shellfish Management Area 07
Water Quality Sampling Stations Description

Station	**Description**
07-01A	Venning Creek at Bulls Bay
07-02	Graham Creek at AIWW, Marker #64
07-02A	Graham Creek at Bulls Bay
07-03	Awendaw Creek at AIWW, Marker #57
07-04	Harbor River at AIWW, Marker #48
07-04A	Harbor River at Bulls Bay
07-05	Tibwin Creek at AIWW, Marker #42
07-06	Five Fathom Creek at Marker #20
07-06A	Five Fathom Creek at Bull River
07-08	Clubhouse Creek-1/4 mile north of Five Fathom Creek
07-08A	Oyster Bay at Muddy Bay
07-09	Doehall Creek at AIWW
07-14	Doehall Creek – third bend at dock
07-15	Sandy Point Creek – fourth bend
07-16	Romain River at Santee Path Creek
07-17	Five Fathom Creek at second small creek north of Marker #18
07-18	AIWW at Marker #65
07-19	AIWW at unnamed creek on west bank 1.5 miles south of Graham Creek
07-20	Bulls Bay, 1,000 feet from Graham Creek
07-21	AIWW, midway between Tibwin Creek and Matthews Creek
07-22	Tibwin Creek past the first bend, at first small creek on right

(**Total Active – 21**)

TABLE #2

Shellfish Management Area 07
FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY
From Shellfish Water Quality Sampling Stations Between

January 1, 2020 to December 31, 2022

Station #	1A	2	2A	3	4	4A	5	6	6A	8
SAMPLES	36	36	36	36	36	36	35	36	36	36
GEOMEAN	1.9	10.2	8.3	16.2	6.2	3.7	11.1	10.8	3.1	6.3
90TH %ILE	3	59	55	131	32	13	53	57	9	30
WATER QLTY	A	R	R	R	A	A	R	R	A	A
CLASSIFICATION	A	R	R	R	R	A	R	R	A	R

Station #	8A	9	14	15	16	17	18	19	20	21
SAMPLES	36	36	36	36	36	36	36	36	36	36
GEOMEAN	4.1	6.8	9.2	20	2.1	5.7	3.9	10.9	9.6	15.4
90TH %ILE	16	34	38	218	5	29	16	72	55	82
WATER QLTY	A	A	A	R	A	A	A	R	R	R
CLASSIFICATION	A	R	R	R	A	R	R	R	R	R

Station #	22
SAMPLES	36
GEOMEAN	26.7
90TH %ILE	185
WATER QLTY	R
CLASSIFICATION	R

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

Table #3
Fecal Coliform Historical Trend Sheet

Area 07 Stations 90th%ile Values for Annual Updates related to River Flow and Rainfall

Station #	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
07-01A	3	4	4	8	10	10	5	3	3	3	4
07-02	59	73	73	50	42	39	26	28	22	19	22
07-02A	55	56	52	31	27	24	16	11	10	8	10
07-03	131	131	105	94	96	95	40	43	37	40	39
07-04	32	32	29	35	38	40	15	13	12	14	18
07-04A	13	17	13	20	23	30	13	9	5	4	7
07-05	53	51	59	48	60	66	49	38	29	25	26
07-06	57	57	42	13	14	18	21	20	14	13	11
07-06A	9	9	7	8	11	14	9	6	3	3	4
07-08	30	36	34	19	20	19	21	16	13	7	8
07-08A	16	21	15	11	10	9	5	4	4	6	6
07-09	34	32	31	29	29	33	16	14	9	8	11
07-14	38	47	44	49	48	47	27	25	24	22	24
07-15	218	200	172	107	114	101	104	74	60	68	201
07-16	5	6	6	5	6	6	4	3	3	3	4
07-17	29	30	27	12	10	12	11	14	10	9	9
07-18	16	40	38	33	18	16	10	7	9	8	9
07-19	72	119	113	86	64	58	24	23	22	38	38
07-20	55	49	36	25	25	24	15	11	10	8	11
07-21	82	98	115	63	58	47	45	43	31	35	24
07-22	185	168	186	100	116	110	99	94	72	52	84
Annual Rainfall (In inches)	**41.94**	**39.70**	**61.16**	**43.02**	**66.29**	**53.79**	**58.63**	**72.29**	**55.52**	**49.34**	**28.79**
Annual Average Daily River Flow (In CFS)	**6,392**	**10,188**	**7,646**	**8,280**	**4,881**	**8,250**	**12,494**	**7,921**	**13,135**	**1,567**	**8,406**

ND = No Data Red = Impaired Water Quality

TABLE #4

WATER QUALITY
SAMPLING STATIONS DATA

Shellfish Management Area 07

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 07

SOURCE:

2020 – 2022 Data
National Weather Service - Southeastern River Forecast Center
Location: Charleston County, South Carolina

2020 Annual Rainfall Summary
Source: NOAA National Weather Service – Southeastern River Forecast Center
Charleston County, South Carolina

2020	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1		0.37		0.30	0.26		0.30					0.22
2							0.18	0.04	0.02		0.01	
3			0.45				0.08	0.01	0.01			
4	0.07		0.04					3.15		0.05		
5	0.08		0.77			0.09		0.01				0.09
6			1.41				0.08	0.47	0.07			
7		0.70			0.02	0.06	1.64	0.95	0.02	0.03	0.01	
8							0.46	0.25			0.02	
9						0.08	0.18	0.17	1.37		0.03	
10						0.04	0.09	0.18	0.23			
11						1.06	0.03	0.05		0.59	1.59	
12	0.03		0.03			0.87	0.05		0.44		0.60	
13	0.29			0.06		0.59	0.04	0.01	0.23		2.10	
14		0.14		1.81			1.07	1.28				
15	0.02	0.03		0.42		1.27		0.40	0.05		0.01	
16			0.02	0.74				0.19		0.19		0.08
17	0.07	0.11							0.76			0.17
18			0.03					0.01	0.27			0.01
19		0.63						1.24				
20		0.18		1.41	0.06	0.45		0.81	0.02			0.01
21		0.61		0.01	1.79	0.22		0.20		0.02		0.38
22	0.02				0.11			0.34		0.02		
23			0.15	0.11	0.08	0.15	0.02	0.04				
24			0.23	2.59		0.14		0.85				0.08
25	0.14	0.66	0.12			1.90	0.01	1.95		0.22		1.21
26		0.11	0.02		0.02		0.17	0.53	0.58	0.03	0.03	
27	0.12	0.23			1.11	0.03	0.01	0.03			0.13	
28	0.02				0.65	0.11			0.20			
29					0.21	0.21	0.42	0.10	0.82		0.06	
30	0.28			0.77	0.35		0.01		0.25	0.09	0.44	
31					0.74			0.13				
Total	**1.14**	**3.77**	**3.27**	**8.22**	**5.40**	**7.27**	**4.84**	**13.39**	**5.34**	**1.24**	**5.03**	**2.25**

***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**	**61.16**

2021 Annual Rainfall Summary
Source: NOAA National Weather Service – Southeastern River Forecast Center
Charleston County, South Carolina

2021	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1	0.31	0.78		0.42				0.63	0.01			
2		0.01	0.08				0.12	0.09	0.26			
3			1.06			0.02	0.10	0.77		0.04		
4	0.14		0.23		0.32	0.74		0.40				
5					0.11	1.25		0.07				
6		0.09				0.48		0.22	0.03	0.10	0.22	
7		0.15	0.01			0.08	0.07	0.37		0.49	0.93	
8	0.75						1.64	0.41			0.02	0.06
9	0.02					0.03	0.02	0.23	0.58	0.33		0.80
10				0.01		0.25	0.19		0.54			
11				0.01	0.01	0.01						
12	0.08				0.55	0.10		0.01			0.04	0.18
13		0.13			0.22	1.04	0.01	0.01				
14	0.01	0.36				0.08	0.02					
15		1.38						0.22				
16	0.14	0.17	0.04			0.58		0.05				
17			0.01			0.04		0.32				
18							0.01	0.51	0.06			
19		0.39	1.19				0.24	0.42	0.02			
20		0.58				0.22	0.31	0.02				0.15
21			0.04			1.08	0.30	0.19	0.66			0.09
22	0.07		0.12			0.05		1.29	0.54			0.72
23	0.02	0.02				0.33	0.25	0.63	0.09		0.01	
24												
25				0.90						0.55		
26							0.02			0.08	0.02	
27	0.34					0.29	0.26				0.02	
28	0.29						0.07					
29			0.01			0.13	0.99			0.21		
30					1.26	0.03						
31			0.01							0.01		0.69
Total	**2.17**	**4.06**	**2.80**	**1.34**	**2.47**	**6.83**	**4.62**	**6.86**	**2.79**	**1.81**	**1.26**	**2.69**

***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** | **39.70**

2022 Annual Rainfall Summary
Source: NOAA National Weather Service – Southeastern River Forecast Center
Charleston County, South Carolina

2022	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1				0.26		0.02	0.66		0.11	1.74	0.01	0.12
2						0.57	0.81	0.02	0.01			
3	0.01								0.16			
4						0.44	0.04		0.10			
5		0.28			0.04	0.15	0.20					
6	0.01			0.32			0.01	0.04	0.02		0.01	0.09
7		0.10		1.52				0.26				
8		0.05		0.01		0.02	0.01	0.02				
9			0.44			0.10	0.03	0.15	0.24			
10	0.11		0.45				0.22	0.02	1.36			0.14
11			0.01				0.92		0.60		1.52	
12			0.17			0.03		0.12			0.07	0.13
13		0.04	0.02			0.02	1.21	0.66	0.04	0.89		
14		0.03			0.15		0.06			0.05		
15					0.01	0.28	0.89					0.33
16	0.36		0.01				0.88	0.05			0.30	0.06
17	1.18	0.02	0.49	0.24	0.52	0.13	0.01	0.51				
18		0.04		0.54		0.09	0.05	0.12		0.21		
19		0.05	0.04	0.07			0.25	0.71	0.12			
20							0.33	0.54	0.01		0.06	
21	0.16				0.02		0.11					0.44
22	0.28				0.03			0.88				0.12
23					0.79		0.11	0.60				0.12
24			0.48				1.34	0.20				
25			0.75				0.01	0.10			0.11	
26								0.63				
27				0.22							0.02	
28		0.03			0.94						0.02	
29	0.01					1.40		0.15				
30						0.87		0.98	1.68			
31							0.23	0.07		0.30		
Total	**2.12**	**0.64**	**2.86**	**3.18**	**2.50**	**4.12**	**8.38**	**6.83**	**4.45**	**3.19**	**2.12**	**1.55**

***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** | **41.94**

TABLE #6

Shellfish Management Area 07
Precautionary & Pollution Event Closures
2020 – 2022

Event	Date(s)	Sample Date(s)	Opening Date	Comments
Hurricane Ian	9/30/2022	N/A	10/2/2022	SFMA 07 was closed as a precautionary closure due to the Hurricane Warning. SFMA 07 was not affected by rainfall from the hurricane.

TABLE #7

Shellfish Management Area 07
Fecal Coliform Data Compared to River Gauge Height and Rainfall
2018-2022

Sample Date	07-06	07-08	07-17	Gage Height (Feet)	Rainfall (Inches)
12/6/2022	13	17	23	7.54	0.09
11/28/2022	4.5	1.7	1.7	3.61	0.02
10/17/2022	2	4.5	1.7	2.34	0
9/19/2022	2	4	4.5	2.45	0.12
8/17/2022	2	1.7	1.7	2.83	0.51
7/13/2022	33	2	33	2.89	1.21
6/13/2022	11	4	4	2.55	0.02
5/25/2022	1.7	1.7	2	2.20	0
4/5/2022	1.7	1.7	1.7	7.28	0
3/30/2022	31	4.5	13	10.32	0
2/7/2022	1.7	1.7	1.7	2.60	0.10
1/24/2022	2	1.7	1.7	8.10	0
12/6/2021	17	11	1.7	1.71	0
11/17/2021	1.7	2	2	3.89	0
10/18/2021	17	7.8	7.8	3.92	0
9/20/2021	17	6.8	1.7	2.87	0
8/18/2021	49	33	13	6.96	0.22
7/14/2021	7.8	2	1.7	2.07	0
6/15/2021	49	4.5	2	7.18	0.10
5/25/2021	33	11	17	5.04	0
4/6/2021	33	11	7.8	14.14	0
3/9/2021	22	49	17	13.69	0
2/3/2021	1.7	2	1.7	8.60	0
1/20/2021	4.5	9.3	2	11.64	0
12/2/2020	33	13	11	13.25	0
11/18/2020	21	33	13	14.91	0
10/20/2020	17	9.3	13	11.15	0
9/15/2020	33	2	13	5.94	0.05
8/25/2020	79	79	17	9.53	1.95
7/13/2020	7.8	11	2	6.43	0.04
6/9/2020	22	4.5	4.5	15.69	0.08
5/27/2020	13	17	4.5	16.17	1.11
4/14/2020	79	240	350	7.17	1.81
3/10/2020	79	2	2	15.09	0

2/5/2020	13	4.5	23	12.12	0
1/22/2020	31	4.5	43	14.62	0.02
12/4/2019	1.7	1.7	1.7	7.12	0
10/28/2019	1.7	23	2	3.16	0
9/17/2019	7.8	4.5	17	2.80	0
8/26/2019	1.8	4.5	2	2.82	0
7/10/2019	1.7	4	2	3.97	0.13
6/12/2019	17	13	11	11.15	0.98
5/29/2019	2	4	1.7	3.46	0
4/9/2019	11	21	1.8	8.78	0.17
3/12/2019	32	13	17	16.28	0.15
2/6/2019	11	4.5	23	13.67	0
1/23/2019	2	7.8	2	14.80	0
12/18/2018	11	70	13	11.08	0
11/14/2018	17	8.2	7.8	10.64	0.01
10/3/2018	2	1.7	1.7	8.61	0
9/26/2018	1.7	7.8	4.5	10.93	0.09
8/21/2018	4.5	14	2	7.11	0
7/11/2018	11	1.7	1.8	7.75	0
6/19/2018	1.7	1.7	1.7	8.61	0
4/4/2018	1.7	4.5	1.7	10.41	0
3/14/2018	1.7	1.7	2	8.22	0
2/7/2018	2	2	1.7	9.58	0
1/23/2018	1.7	1.7	1.7	10.00	0.15
Gage Height is for Jamestown and is the maximum recorded height for 5 days prior to sampling.					
Rainfall is the maximum 24hr rainfall event total for 3 days prior to sampling.					
Red = Impaired Water Quality Green = >10.0ft. Gage Height					

TABLE #8
Shellfish Management Area 07
MARINA INVENTORY

Marina	Total Slips	Pump-out Facility	Fuel Dock
Leland Oil Company	15	No	Diesel-Gas
Carolina Seafood	37	No	Diesel-Gas
Livingston's Bulls Bay Seafood	24	No	No