## 3.8 ENVIRONMENTAL COMPLIANCE SUMMARY

SRS was not involved in any environmental lawsuits during 2017. SRS received five NOVs in 2017; one was for a December 2016 water noncompliance. Table 3-6 summarizes the NOVs SRS received from 2013–2017.

**Table 3-6 NOV Summaries, 2013–2017**

| Program Area | Notice of Violation (NOV) | | | | |
|---|---|---|---|---|---|
| | 2013 | 2014 | 2015 | 2016 | 2017 |
| **Clean Air Act (CAA)** | 0 | 0 | 1 | 0 | 3 |
| **Clean Water Act (CWA)** | 2 | 0 | 0 | 1 | 2 |
| **Resource Conservation and Recovery Act (RCRA)** | 0 | 0 | 0 | 0 | 0 |
| **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** | 0 | 0 | 0 | 0 | 0 |
| **Others** | 0 | 0 | 0 | 0 | 0 |
| **Total** | **2** | **0** | **1** | **1** | **5** |

# Chapter 4 Nonradiological Environmental Monitoring Program

**The Savannah River Site (SRS) nonradiological environmental monitoring program is twofold in that it confirms that the Site is complying with state and federal regulations and permits, and it monitors any effects SRS has on the environment, both onsite and offsite. SRS monitors permitted point-source discharges from onsite facilities for nonradiological parameters to ensure compliance with regulations and permit requirements. SRS collects and analyzes environmental media such as air, water, sediment, and fish for nonradiological parameters to evaluate the effect of Site operations on the environment.**

## 2017 Highlights

### Effluent Releases

- Nonradiological effluent releases for all categories except industrial wastewater were below permit limits and applicable standards.
- Only 2 of approximately 3,210 analyses at SRS industrial wastewater outfalls exceeded National Pollutant Discharge Elimination System (NPDES) permit limits, a 99.9% compliance rate.
- All SRS industrial stormwater outfalls under the NPDES permit were compliant.

### Onsite Drinking Water

All SRS drinking water systems complied with South Carolina Department of Health and Environmental Control (SCDHEC) and U.S. Environmental Protection Agency (EPA) water quality standards.

### Surveillance Program

- SRS industrial wastewater and industrial stormwater discharges are not significantly affecting the water quality of onsite streams and the Savannah River.
- Sediment results from SRS streams, stormwater basins, and the Savannah River were consistent with the background control locations and were comparable with historical levels.
- Fish flesh sample results indicated most measured metals were not detectable. Zinc, found in 139 (99%) of the samples, was at levels consistent with the background control location. Mercury, detected and quantified in 79 (56%) of the samples, was consistent with 5-year trends for catfish, bream, mullet, sea trout, and red drum. Mercury levels in bass are in the range expected based on comparison with results for 2013 through 2016.

## 4.1 INTRODUCTION

Environmental monitoring programs at SRS examine both radiological and nonradiological constituents that SRS activities could release into the environment. Chapter 5 *Radiological Environmental Monitoring Program* discusses the radiological components of this monitoring program.

The nonradiological monitoring program collects and analyzes air, water, sediment, and fish samples from numerous locations throughout SRS and the surrounding area. The program is divided into two focus areas: 1) effluent monitoring, and 2) environmental surveillance. The objective of the effluent monitoring program is to demonstrate permit compliance, and the focus of the environmental surveillance program is to assess the environmental impacts of Site operations on the surrounding area. SRS determines sampling frequency and analyses based on permit-mandated monitoring requirements and federal regulations.

### Chapter 4—Key Terms

***Effluent*** *is a release of treated or untreated water or air from a pipe or a stack to the environment. Liquid effluent flows into a body of water, such as a stream or lake. Airborne effluent (also called emission) discharges into the air.*

***Effluent monitoring*** *is the collection of samples or data from the point a facility discharges liquids or releases gases.*

***Environmental surveillance*** *is the collection of samples beyond the effluent discharge points and from the surrounding environment.*

***Outfall*** *is a place where treated or untreated water flows out of a pipe or ditch.*

SRS conducts nonradiological environmental monitoring on the following categories:

- Atmospheric (airborne emissions and precipitation with a special focus on mercury deposition)
- Water (wastewater, stormwater, sludge, onsite drinking water, and river and stream water quality)
- Stream and river sediment
- Fish

Figure 4-1 shows the types and typical locations (for example, upstream and downstream of SRS influence) of the nonradiological sampling SRS performs.

This chapter summarizes the nonradiological environmental monitoring programs and data results. Sections 8.4 *Environmental Monitoring Program QA Activities* and 8.5 *Environmental Monitoring Program QC Activities* summarize the quality assurance and quality control activities that support the sampling and analysis reported in this chapter. The *2017 Environmental Monitoring Data Report* (SRNS 2018) documents all data associated with the SRS sampling this chapter describes. Appendix Table B-1 of this document summarizes the nonradiological surveillance sampling media and frequencies.

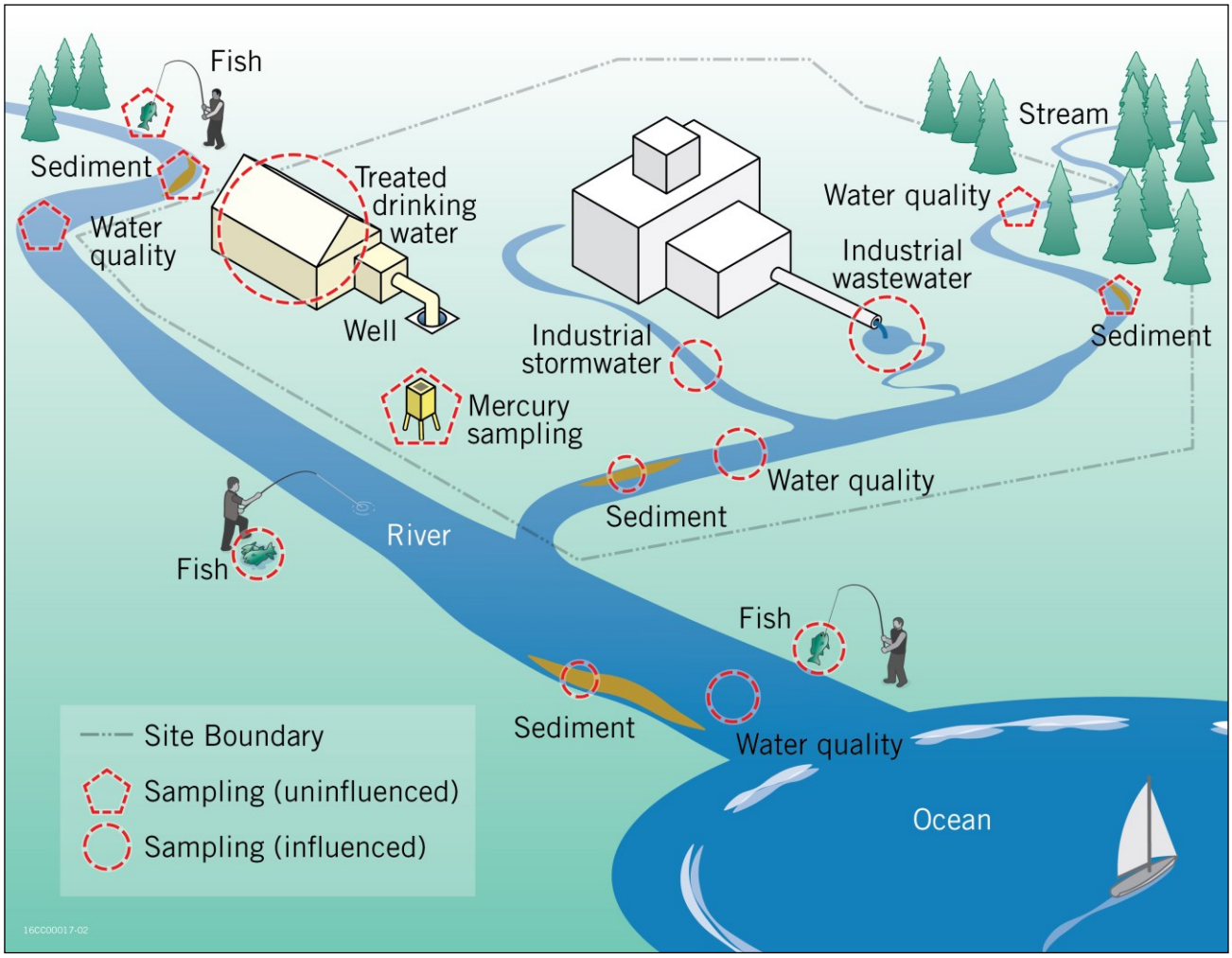


**Figure 4-1 Types and Typical Locations of Nonradiological Sampling**

## 4.2 CALCULATED AIR EMISSIONS

Airborne contaminants can present a risk to public health and the environment. Thus, identifying and quantifying these contaminants is essential to a nonradiological monitoring program. SCDHEC regulates nonradioactive air pollutant emissions from SRS sources. The regulations list pollutants, compliance limits, and methods to use to demonstrate compliance.

SRS uses nonradioactive volatile chemicals (e.g. gasoline, toluene), fuels, and combustion products that can adversely affect the environment if released into the air in sufficient quantities. However, the Site uses most of these materials in very small quantities, and the environmental impact from their potential release is negligible. Because of the nature and quantity of potential air emissions, SRS is not required to sample or monitor the ambient air for chemical pollutants. Following SCDHEC requirements, SRS uses process data to calculate emissions.

Many of the applicable regulatory standards are source-dependent (that is, applicable to certain types of industries, processes, or equipment). The SCDHEC-issued Title V operating permit provides the source-

specific limits for facility operation, source sampling, testing, monitoring, and reporting frequency. SRS demonstrates it is complying with these regulations by performing air dispersion modeling and submitting to SCDHEC an annual emissions inventory of air pollutant emissions. SRS uses SCDHEC and EPA approved calculations that include source-operating parameters, such as hours of operation, process throughput, and EPA-approved emission factors, to determine facility source emissions. SRS then compares the total actual annual emissions for each source to the emission limits contained in applicable permits. Chapter 3 *Compliance Summary*, Section 3.3.6.4 *Air Emissions Inventory* discusses emissions reporting.

## 4.3 WATER MONITORING

SRS nonradiological water monitoring includes collecting water and sediment samples and performing measurements on various water sources onsite and from the Savannah River. The sample results enable SRS personnel to evaluate whether there is long-term buildup of pollutants downstream of discharge points and determine whether SRS is complying with permit requirements. SRS also collects and analyzes fish from the Savannah River to evaluate metal uptake in the flesh. SRS monitors groundwater, as Chapter 7 *Groundwater Management Program* discusses.

### 4.3.1 Wastewater and Stormwater Monitoring

Nonradiological surface water monitoring primarily consists of sampling water discharges (industrial wastewater and industrial stormwater) associated with SRS NPDES-permitted outfalls. SRS monitors nonradiological liquid discharges to surface waters through the NPDES program, as mandated by the Clean Water Act. The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

**A Technician Prepares a Water Sample**

SCDHEC administers the NPDES permit program and is responsible for permitting, compliance tracking, monitoring, and enforcing the program. The permits SCDHEC issues to SRS provide specific requirements for sampling locations, parameters to be tested, monitoring frequency, and analytical and reporting methods.

SRS collects NPDES samples in the field according to 40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants*. This document lists specific methods for sample collecting, preserving, and acceptable analytical methods for the type of pollutant. SRS upgraded field equipment used in the NPDES program, as discussed in Section 8.4 *Environmental Monitoring Program QA Activities*.

In 2017, SRS monitored 28 industrial wastewater outfalls for physical and chemical properties, including flow, dissolved oxygen, potential of hydrogen (pH), ammonia, biochemical oxygen demand, fecal coliform, metals, oil and grease, volatile organic compounds, and total suspended solids (TSS). Figure 4-2 shows these locations. The permits specify how often SRS is to monitor the outfalls. Typically, SRS took samples at the locations once a month, although some locations required monitoring as frequently as once a day and others as infrequently as once a quarter. As specified by permits, SRS collected either composite or grab samples. SRS reported results to SCDHEC in required monthly discharge monitoring reports. In addition,

SRS collected quality control samples as an internal check to ensure representative data. Section 8-5 *Environmental Monitoring Program QC Activities* summarizes the quality control sample results.

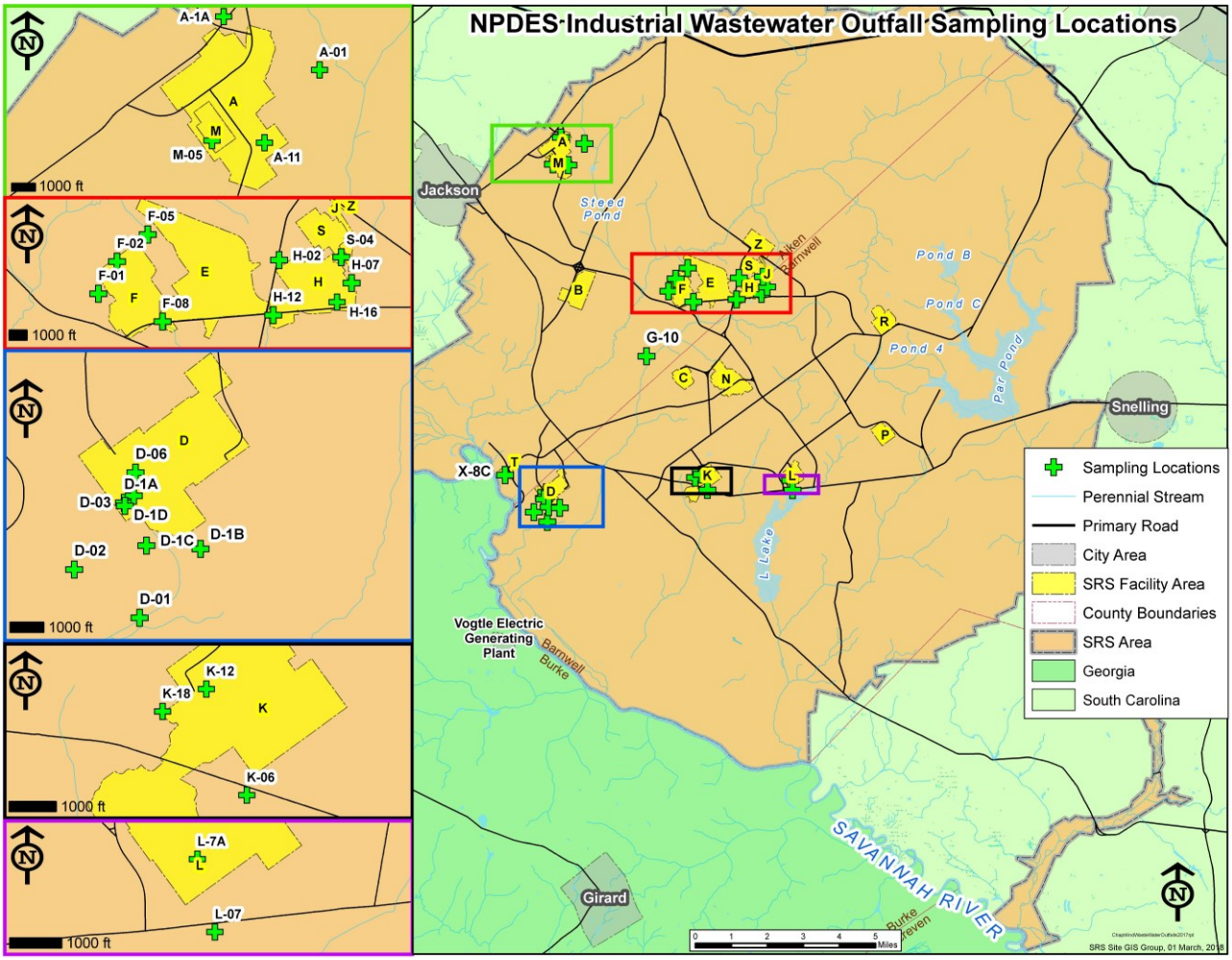


**Figure 4-2 NPDES Industrial Wastewater Outfall Sampling Locations**

In 2017, SRS monitored 34 industrial stormwater outfalls for ammonia, chemical oxygen demand, cyanide, *Escherichia coli* (*E. coli*), metals, nitrite, nitrate, pH, and TSS. In addition, sampling personnel visually assessed the water in these outfalls for color, odor, clarity, solids, foam, and oil sheen. Figure 4-3 shows these locations. SRS monitored the outfalls on the frequency the permit specified, varying from quarterly to annually. It used grab-sample techniques to collect the stormwater samples.

SRS can collect stormwater samples only during a qualifying rain event. To collect a sample, two conditions must be met: 1) at least 72 hours must have elapsed since the previous flow event, and 2) the sample should be collected during the first 30 minutes of the initial flow. SRS continued to use wireless technology to send immediate text notifications of rain events and to start automated samplers at specific locations. This allowed SRS to comply with the SCDHEC permit requirements of sampling within 30 minutes of rain flow.

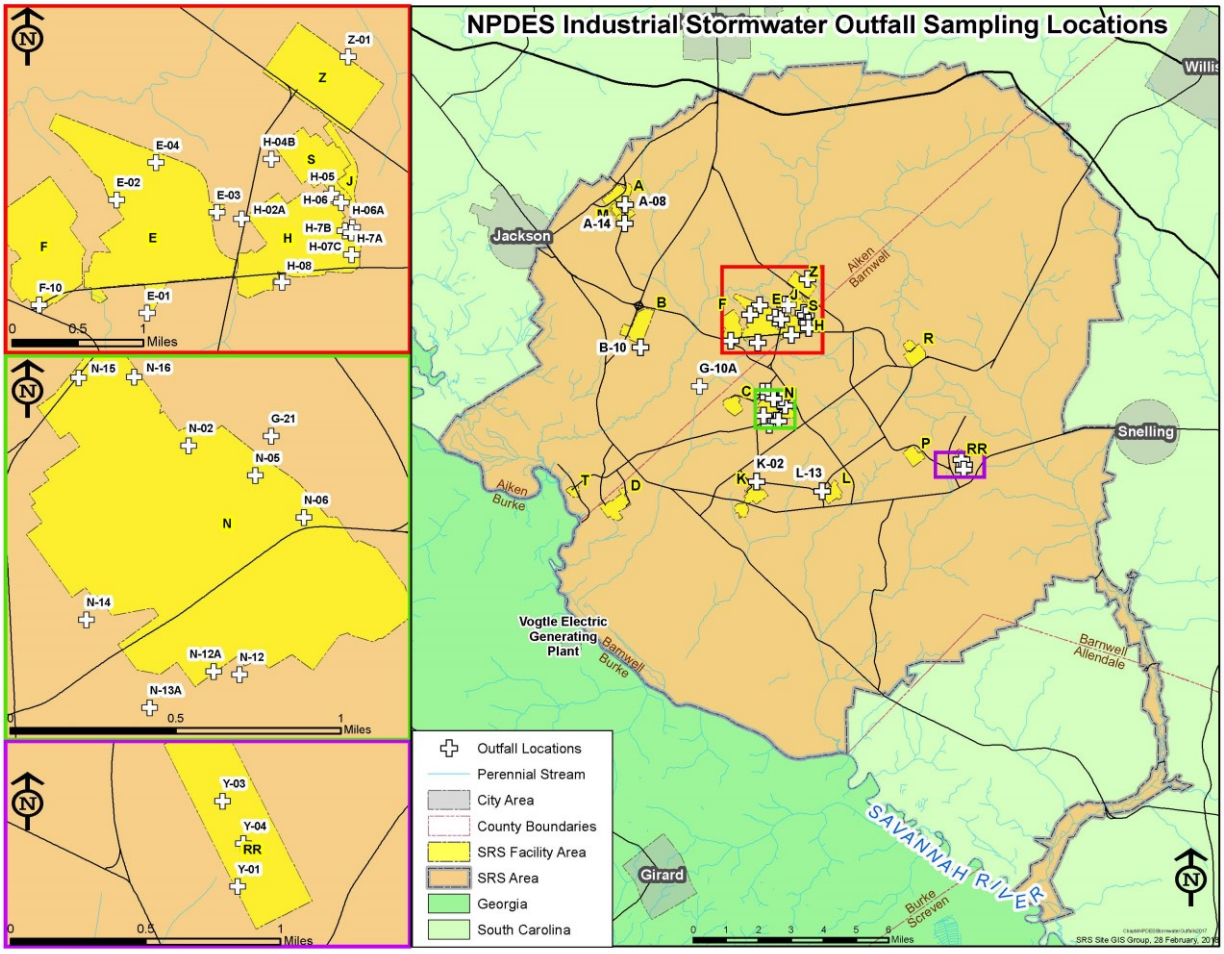


**Figure 4-3 NPDES Industrial Stormwater Outfall Sampling Locations**

### 4.3.1.1 Wastewater and Stormwater Results Summary

SRS reports NPDES industrial wastewater analytical results to SCDHEC through monthly discharge monitoring reports. Only 2 of the approximately 3,210 analyses performed during 2017 exceeded NPDES permit limits, which is a 99.9% compliance rate. SRS had one permit limit exceedance for daily maximum flow at K-12 Outfall (due to 4.5 inches of recorded rainfall from Hurricane Irma) and one permit exceedance for daily maximum of fecal coliform at L-7A Outfall. On December 20, SCDHEC issued a Notice of Violation (NOV) for the fecal coliform exceedance at L-7A Outfall but did not assess a penalty. Chapter 3 *Compliance Summary*, Section 3.3.7.1.1 *National Pollutant Discharge Elimination System* provides additional information regarding the NOV.

SRS monitored all industrial stormwater outfalls according to permit requirements. Zinc average results at Outfalls N-12 and N-06, and copper average results at Outfall N-12A exceeded benchmark limits, triggering corrective actions. To absorb the metals, SRS installed oyster shells on the upstream side of small check dams in the stormwater ditches leading to Outfall N-12A in August and to Outfall N-06 in September. The monitoring results are being used to evaluate and optimize the performance of this treatment method.

Outfall N-12 has been reclassified because the discharge source has been eliminated and will now require visual inspection only.

Sample results from the other stormwater outfalls demonstrated compliance with permit requirements.

**Workers Install Oyster Shells to Absorb Metals in Stormwater Runoff**

### 4.3.2 Onsite Drinking Water Monitoring

SRS uses groundwater sources to supply drinking water to onsite facilities. The A-Area treatment plant supplies most of the drinking water at SRS. The Site also has four smaller drinking water facilities, each of which serves fewer than 25 people. These systems are not required to be sampled for lead and copper due to the small number of people served.

SCDHEC requires SRS to collect 10 bacteriological samples each month from the A-Area treatment plant to ensure that domestic water from that system meets SCDHEC and EPA bacteriological drinking water quality standards. SRS exceeds this requirement by collecting 15 samples each month from various areas. These samples consistently meet SCDHEC and EPA drinking water quality standards, confirming the absence of harmful bacteria.

SRS samples domestic water systems for lead and copper on a three-year, rotating cycle. The A-Area water system is not due for lead and copper sampling again until 2019.

### 4.3.3 River and Stream Water Quality Surveillance

South Carolina Regulation 61-69, *Classified Waters,* classifies SRS streams and the Savannah River as "freshwaters." Freshwaters as defined in Regulation 61-68, *Water Classifications and Standards*, (SCDHEC 2014) support the following:

- Primary and secondary contact recreation and as a drinking water source after conventional treatment in accordance with SCDHEC requirements
- Fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora
- Industrial and agricultural uses

SRS surveys river and stream water quality to identify: 1) any degradation that could be attributed to the water discharges regulated by Site NPDES permits, and 2) materials that may be released inadvertently from sources other than routine release points.

SRS samples 10 streams onsite and 5 Savannah River locations for various physical and chemical properties, including dissolved oxygen, pH, temperature, hardness, metals, nitrate, nitrite, pesticides and herbicides, phosphorus, total organic carbon, and total suspended solids. Figure 4-4 shows the sampling locations. In May, sampling for the upstream location on Upper Three Runs Creek, U3R-1A, was moved

upstream to U3R-0. The sample location was changed to alleviate the potential impacts to water quality results from the planned bridgework along the stream. The river and stream sampling locations are

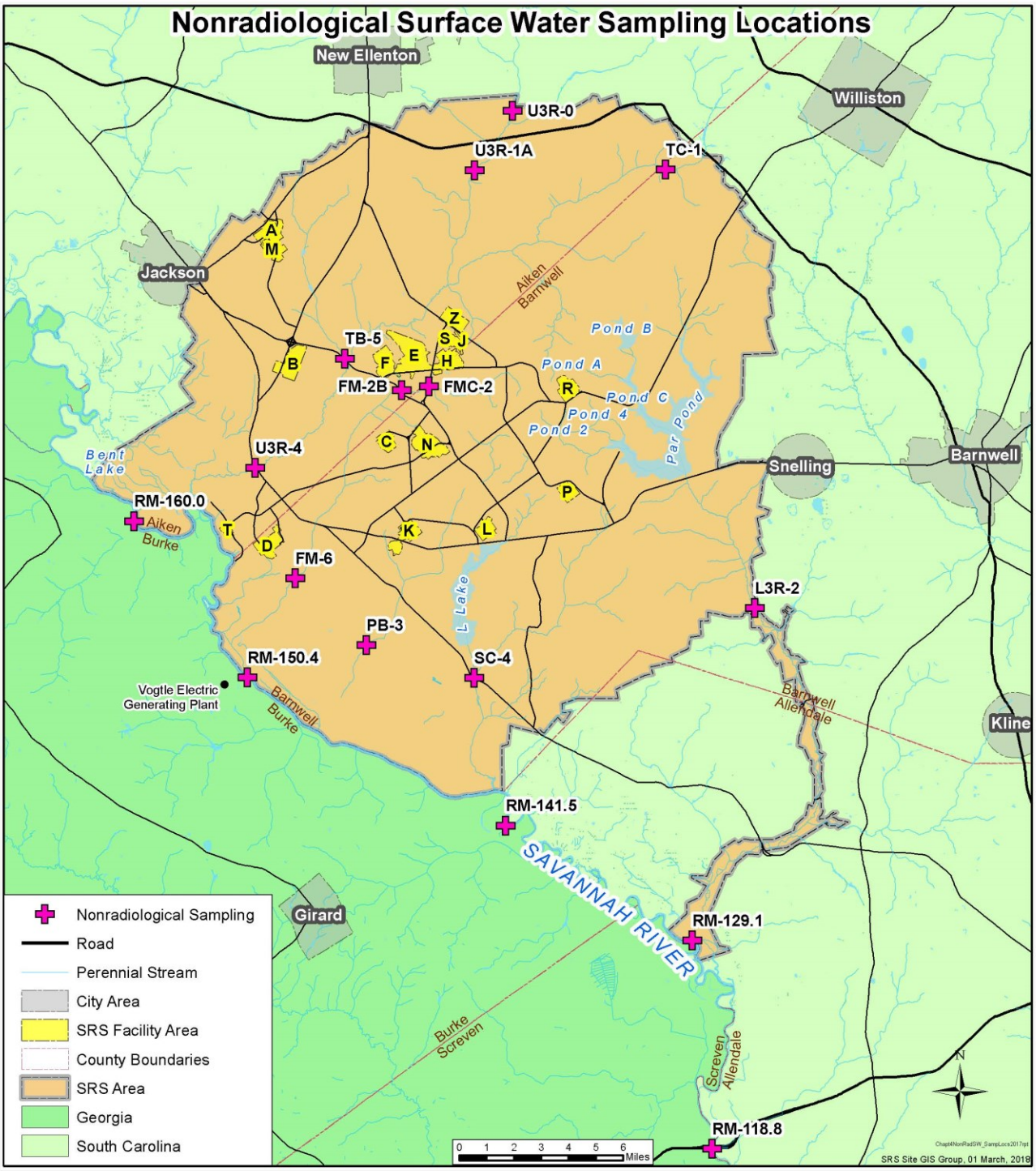


**Figure 4-4 Nonradiological Surface Water Sampling Locations**

upstream, adjacent to, and downstream from the Site. SRS compares results to background levels of chemicals from natural sources and from contaminants produced by municipal sewage plants, medical facilities, and other upstream industrial facilities to assess the environmental impacts of Site operations on

the surrounding area. The water quality locations are sampled monthly and quarterly by the conventional grab-collection technique. SRS collects quality control samples throughout the year, as documented in Section 8.5 *Environmental Monitoring Program QC Activities*. SCDHEC also collects samples at several onsite stream locations; most of them are colocated with SRS sample locations as a quality-control check of the SRS program.

#### 4.3.3.1 River and Stream Water Quality Results Summary

SRS performed 5,400 individual analyses on samples collected from the 15 stream- and river-water quality locations during 2017, with 5,059 (93.7%) meeting South Carolina Freshwater Quality Standards. Averages for each river and stream location met standards for dissolved oxygen, pH, temperature, chromium, mercury, nickel, nitrate, nitrite, and zinc. No sample results showed detectable levels of pesticides, herbicides, or polychlorinated biphenyls (PCBs). Appendix Table C-1 summarizes the analytical results. These results continue to indicate that SRS discharges are not significantly affecting the water quality of onsite streams or the Savannah River.

### 4.3.4 Sediment Sampling

SRS's nonradiological sediment surveillance program measures the nonradiological contaminant concentrations that are deposited and accumulate in stormwater basins, stream systems, and in the Savannah River. One of the important contaminants measured is mercury. Mercury is a contaminant that could pose a health risk to humans through various exposure pathways, including drinking water and eating fish. Mercury enters bodies of water naturally through volcanic activity and mineral weathering of rocks over time, as well as through industrial and urban sources such as coal-burning power plants. Mercury that is released into the air may eventually settle or be washed into water, where it deposits onto streambeds and wetlands. The other nonradiological parameters measured are aluminum, arsenic, barium, cadmium, chromium, copper, cyanide, iron, lead, magnesium, manganese, nickel, selenium, silver, and zinc. Many of these are trace metals that occur naturally in soils and sediments.

The nonradiological sediment program collects sediment samples at various stream, stormwater basin, and Savannah River locations (Figure 4-5). The locations vary from year-to-year, depending on the rotation schedule agreed upon with SCDHEC. SCDHEC duplicates sampling at various locations onsite as a quality control check of the SRS program.

#### 4.3.4.1 Stream and River Sediment Results Summary

In 2017, SRS sampled 15 onsite stream locations, 4 stormwater basin locations, and 9 Savannah River locations. The laboratory analyzed the samples for various inorganic contaminants (metals and cyanide) to determine if there was a human health risk from exposure to sediments. The Site used EPA Regional Screening Levels for Residential Soil for comparison.

In 2017, all mercury results for river and stormwater basin sediment samples were below the lowest levels the laboratory could detect. Three samples from onsite stream locations contained detectable mercury levels that ranged from 0.0085 mg/kg at L3R-2 to 0.27 mg/kg at L3R-1A. All mercury results were well below the EPA Regional Screening Level for resident soil (Figure 4-6).

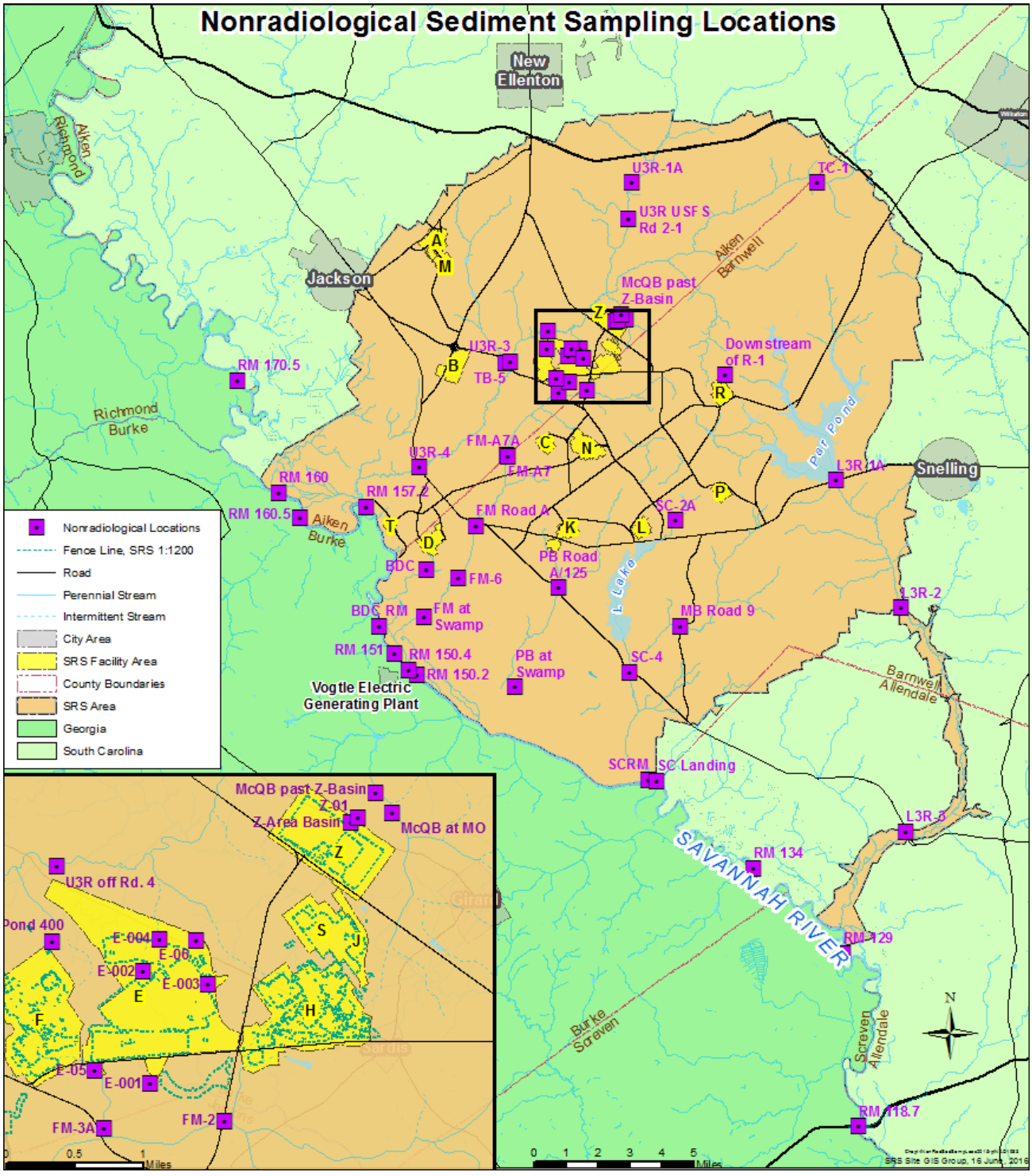


**Figure 4-5 Nonradiological Sediment Sampling Locations**

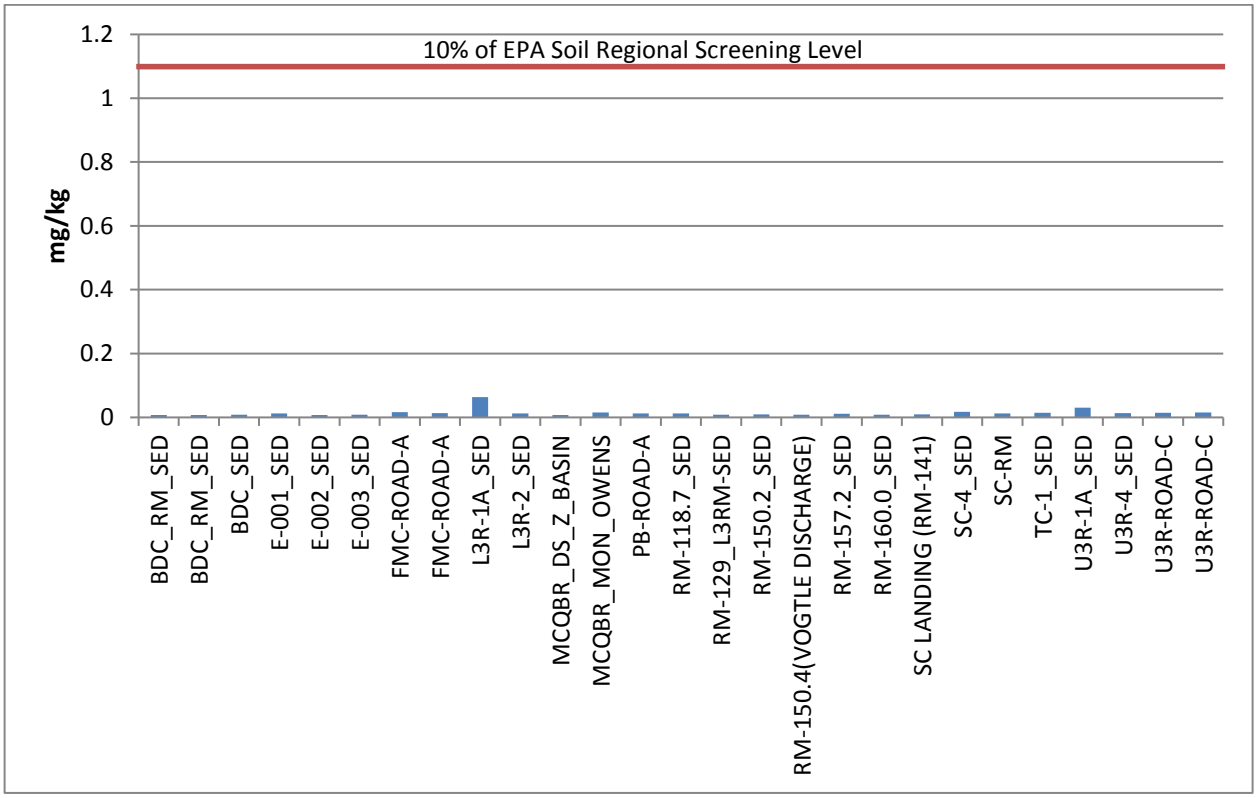


**Figure 4-6 Mercury in Sediment Locations**

All measured analytes except silver were detected in at least one sample at levels greater than the practical quantitation limit but were consistent with the concentrations seen in the background control locations (river location River Mile [RM]-160 and stream location Upper Three Runs U3R-0) and comparable to those of the previous five years. Appendix Table C-2 summarizes the analytical results.

### 4.3.5 Fish Monitoring

SRS samples aquatic species to identify and evaluate any effect of Site operations on contaminant levels in fish. The Site collects freshwater fish (bass, catfish, and panfish) at six locations on the Savannah River from above SRS at Augusta, Georgia to the coast of Savannah, Georgia. SRS collects freshwater fish at the mouth of the streams that flow through the Site. Saltwater fish (red drum, sea trout, and mullet) are collected at the Savannah River mouth near Savannah. SRS analyzes samples of the edible flesh for metals uptake. SRS performs

**Fish Sample Collected from SRS creek mouth**

nonradiological analyses for mercury, arsenic, cadmium, chromium, copper, lead, manganese, nickel, zinc, and antimony.

#### 4.3.5.1 Fish Results Summary

In 2017, SRS performed 1,405 individual analyses on 145 fish flesh samples. The majority (60%) of the results were nondetected (less than the method detection limit). Appendix Tables C-3 and C-4 present summaries of the analytical results. Sixteen percent, or 221 results of the 1,405 individual analyses, were detected and quantified, with the majority being for mercury (79) and zinc (139).

A review of the 2017 zinc data indicates the results for the SRS creek mouths are comparable with the results for the control location at the New Savannah Bluff Lock and Dam. Review of mercury data for the period 2012 through 2017 (Figure 4-7) indicates lower concentrations in catfish and panfish than in bass. Mercury data for bass collected in 2017 are within the expected range based on the previous four-year period (2012–2016).

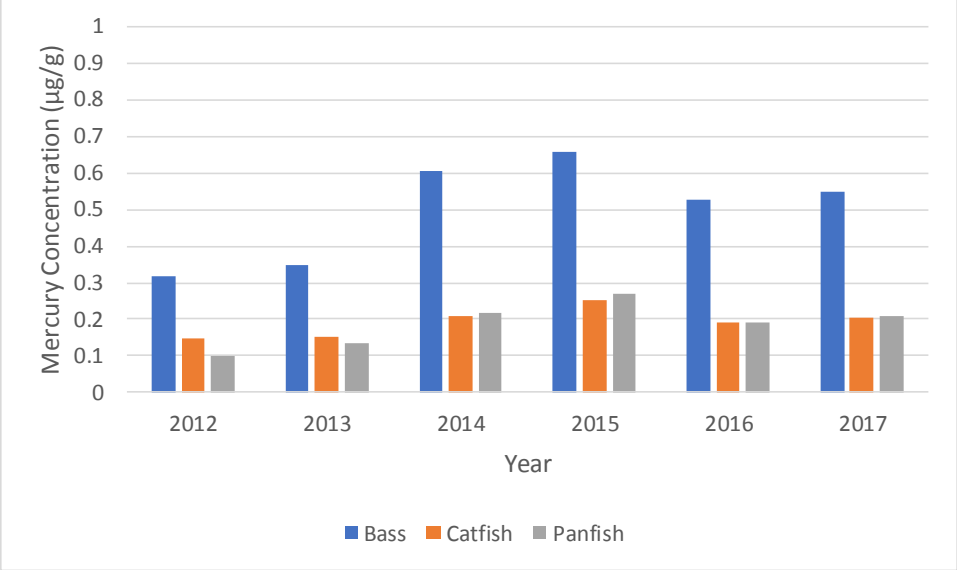


**Figure 4-7 Average Mercury Concentration of Fish Species in the Savannah River Adjacent to the Savannah River Site**

## 4.4 PRECIPITATION CHEMISTRY AND DEPOSITION

The SRS nonradiological air monitoring program includes collecting samples and data to calculate air emissions from Site sources and for the National Atmospheric Deposition Program (NADP). The NADP monitors the geographic distribution of specific airborne contaminants to better understand their effects on the environment. The NADP publishes data one year after analyzing all samples from their network of collection locations. Thus, this section reports 2015 data, which is publicly available.

SRS sponsors a collection station to support the NADP. This station, located near the center of SRS at the Savannah River National Laboratory (SRNL) Central Climatology facility, collects weekly precipitation (rain, sleet, and snow) samples and submits them to NADP laboratories for chemical analysis. Since 2001, this station has been part of the Mercury Deposition Network (MDN) of the NADP. The MDN provides data on the geographic distributions and trends of mercury in precipitation. Mercury is emitted into the atmosphere and surface waters from natural sources, including volcanoes and wildfires. It also occurs naturally in some soils. Yet most of the attention on mercury in the environment has focused on anthropogenic sources: coal combustion, medical waste incineration, and chlorine production, among others. The MDN is the only network providing a long-term record of mercury concentrations in North American precipitation. All monitoring sites follow standard procedures and have uniform precipitation collectors and gauges. Beginning in 2012, the National Trends Network (NTN) added the station at SRS. This network tracks changes in acid rain.

Sample analysis associated with the NTN network includes free acidity (pH), conductivity, calcium, magnesium, sodium, potassium, sulfate, nitrate, chloride, and ammonium. In addition to supporting national-scale observations relating to trends in precipitation chemistry, results from this surveillance provide specific information related to the chemistry of precipitation at SRS.

### 4.4.1 Precipitation Chemistry and Deposition Results Summary

The 2016 average (volume-weighted) concentration of total mercury in precipitation was 8.3 ng/L, and the wet deposition rate was 10.9 µg/m$^2$. These observations were consistent with historical observations associated with this surveillance and are consistent with other observations from the southeastern United States. Data from 2017 will be available in the fall of 2018. The NAPD provides additional information on the MDN, as well as the location and data from surrounding stations.

In 2016, the average pH of precipitation was 5.08. Appendix Table C-5 presents the precipitation results that the NTN reported for 2016. These observations are consistent with other observations from other locations in the southeastern United States. The NAPD provides additional information on the NTN.