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ENVIRONMENTAL MONITORING PROGRAM MANAGEMENT PLAN	Effective Date:	06/11/15
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1.0 PURPOSE [S/RID 1, 2, 3, 4, 5]

This Environmental Monitoring (EM) Program Management Plan documents the rationale, objectives, and activities associated with the routine monitoring and surveillance program at the Savannah River Site (SRS). The Savannah River Site-Environmental Monitoring Program (SRS-EM) serves two main purposes:

- Confirms compliance with applicable federal, state, and local regulations, as well as with the U.S. Department of Energy (DOE) Orders
- Monitors any effects of SRS operations on the environment, both on-site and off-site.

2.0 SCOPE

The SRS-EM Program has the following program focus areas:

- Radiological effluent and surveillance monitoring governed by DOE Order 458.1, *Radiation Protection of the Public and the Environment*, and guided by DOE 1991, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*
- Non-radiological liquid effluent monitoring regulated by the South Carolina Department of Health and Environmental Control (SCDHEC) under U.S. Environmental Protection Agency (EPA) authority and defined under the National Pollutant Discharge Elimination System (NPDES)
- Non-radiological and radiological air effluent monitoring regulated and defined by the SCDHEC under EPA authority and defined under The National Emission Standards for Hazardous Air Pollutants (NESHAP).

Program changes of the SRS-EM Program are reviewed annually by U.S. Department of Energy-Savannah River (DOE-SR) Operations Office.

Situations such as inclement weather, emergency conditions, furloughs, and increased river levels/flows can prevent the sample collection at the prescribed frequencies listed in the Attachments. Deviations from the routine sample collection schedule will be recorded in the sample collection logbook.

3.0 DEFINITIONS AND ABBREVIATIONS

A list of terms, definitions, and abbreviations associated with this procedure can be found in Manual 3Q1, *Glossary*. Other pertinent terms and abbreviations are expanded within the text.

4.0 RESPONSIBILITIES

4.1 Environmental Compliance and Area Completion Projects (EC&ACP) Group

The Environmental Compliance and Area Completion Projects Group have overall responsibility for executing all requirements in this program management plan. Environmental Compliance and Area Completion Projects is further responsible for anticipating, planning, and providing environmental management services that support the needs of the SRS.

- Environmental Compliance and Area Completion Projects Group support includes the following:
 - Working with community stakeholders and regulatory agencies to proactively identify potential issues and compliant solutions
 - Providing technical expertise to support satisfaction of regulatory requirements and compliance milestones
 - Developing and executing a site-wide regulatory integration process that meets the needs of regulators and stakeholders
 - Executing effective permitting strategies that provide operational flexibility while ensuring environmental stewardship
 - Using historic surveillance and monitoring data to make critical environmental decisions
 - Maintaining an industry recognized staff that actively supports the requests of DOE, the EPA, SCDHEC, and the public.
- Environmental Compliance and Area Completion Projects Group provides the following EM and Compliance Services:
 - Effluent Monitoring
 - Surveillance Monitoring
 - Environmental Data Integration
 - Groundwater Monitoring
 - SRS Policy and Site Strategy for SCDHEC Permit and EPA Closure Actions
 - National Environmental Policy Act Analysis and Documentation
 - Environmental Data Collection and Reporting

4.1.1 Environmental Compliance (EC)

The Environmental Compliance function of EC&ACP has primary responsibility for coordinating and providing environmental support and compliance-based oversight of SRS operations to ensure that site activities are conducted in accordance with all applicable state and federal environmental regulations, as well as DOE Directives and Orders, in a manner that will have minimal impact on workers, the public, and the environment.

The Environmental Compliance has a team of highly qualified environmental professionals, including Environmental Subject Matter Experts, available for support. Value-added environmental solutions include:

- Providing subject matter expertise to support EM compliance in the areas of air emissions, liquid effluent, and storm water and drinking water surveillance and monitoring
- Assigning a representative to support completion of the assigned areas of the Annual Environmental Report
- Providing assistance to ensure that site contaminant releases are monitored using equipment, sampling regimes, and analytical methods consistent with applicable regulatory permits
- Facility and construction oriented environmental compliance experts to support seamless operations
- Industry-recognized staff to satisfy regulatory/permit requirements and operational compliance milestones
- Effective, schedule-compliant permitting strategies that provide operational flexibility and ensure environmental stewardship
- Strong, working relationships with regulatory agencies (e.g., SCDHEC, EPA) and community stakeholders
- Detailed, historic knowledge of the SRS operational experience and environmental conditions.

4.1.2 Environmental Compliance Authority (ECA)

The Environmental Compliance Authority is responsible for:

- Having a working knowledge of their facility operations and processes
 - Providing direct, day-to-day, environmental support to the management of line organization facilities/projects
 - Having a working knowledge of the environmental regulations applicable to their facility(s)/project(s)
 - Assisting their organization to ensure compliance with all applicable federal, state and local environmental regulations, DOE Orders, and environmental procedures
 - Identifying, interpreting, and implementing environmental compliance requirements as applicable to their facility(s)/project(s)
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4.1.2 Environmental Compliance Authority (ECA) (cont.)

- Ensuring timely submittal of environmental regulatory documentation and permit applications
- Communicating with other facilities/projects on environmental-related issues, as applicable
- Recommending work or processes be stopped immediately upon observance of an actual or imminent hazard to the environment. Such action must be taken by contacting the facility management having immediate jurisdiction over the work/process
- Identifying environmental protection improvement opportunities and supporting environmental program assessments
- Developing the necessary Environmental Compliance Programs and strategies for their facility(s) in conjunction with other EC&ACP staff, as appropriate.

4.1.3 Sample Data Management (SDM) Group

The Sample Data Management Group of EC&ACP is primarily responsible for:

- Characterizing and defining long-term trends in the physical, chemical, and biological environment
- Supporting facilities in the identification and quantification of new or existing environmental problems
- Assessing actual or potential contaminant exposures to critical groups and populations
- Conducting studies aimed at improving knowledge of the transfer of contaminants in the environment
- Designing and supervising programs for sampling and analysis of environmental media
- Providing assistance to ensure that site contaminant releases are monitored using equipment, sampling regimes, and analytical methods consistent with applicable DOE, EPA, SCDHEC permits, Environmental Radiation Protection Program (ERPP) requirements, and referenced national standards. Ownership responsibility for all, active and passive, Air Effluent Monitoring Systems remains with Facility Operations/Line Management
- Ensuring, when notified that facility changes affecting contaminant releases are made, that appropriate changes are made to the ERPP
- Identifying monitoring, sampling, and analytical equipment deficiencies; ensuring proper maintenance, repair, and calibration of the effluent monitoring and analytical equipment used by SDM
- Assigning a representative to the Environmental As Low As Reasonably Achievable (ALARA) Committee to serve as the committee chairperson and ensuring that the committee's administrative requirements are met
- Issuing Radioactive Releases Reports as described in Manual 3Q, Procedure 18.5, *Radiological Effluent Monitoring, Reporting and Environmental ALARA Process*

4.1.3 Sample Data Management (SDM) (cont.)

- Producing annual reports on monitored radiological effluents for the Effluent Information System/On-Site Discharge Information System
- Completing the annual review of the EM Program
- Producing annual reports on the status of environmental conditions on and around the site, and on yearly and cumulative contaminant releases at the site (i.e., Annual Site Environmental Report)
- Providing other reports that utilize EM program data include, but are not limited to, Discharge Monitoring Reports required by the site NPDES permit, Tritium Inventory Report, Water Treatment Plant Analysis Results Report, and various compliance reports as specified in DOE Order 458.1, *Radiation Protection of the Public and the Environment*.

5.0 REQUIREMENTS

The EM Program is divided into two components, Effluent Monitoring and Surveillance Monitoring, to implement the requirements and objectives. The specific requirements of Effluent Monitoring and Surveillance Monitoring are described in Sections 5.2 and 5.3, respectively of this procedure.

The technical basis document SRNS-TR-2012-00202, *Environmental Monitoring Program*, provides additional "discussion" on each SDM area of EM responsibility.

5.1 General Requirements and Objectives of the SRS-EM Program

The general requirements and objectives of the SRS-EM Program are listed below:

- To assess actual or potential exposures to the public, critical groups and populations from the presence of radioactive and non-radioactive materials from normal site operations or from accidents
 - To demonstrate compliance with authorized limits and regulatory requirements
 - To verify the adequacy of facility containment of radioactivity and the effectiveness of effluent control
 - To notify proper officials of unusual or unforeseen conditions and, where appropriate, to activate a special EM Program
 - To communicate accurately and effectively the monitoring EM Program's results to DOE, to other government agencies, and to the general public
 - To maintain a continuous record of the effects of SRS operations on the environment
 - To determine concentrations of radioactive and non-radioactive contaminants in environmental media for the purpose of assessing immediate and long-term consequences of normal operations and accidental releases
 - To distinguish between contributions from environmental contamination and the environmental effects of SRS operations and contributions from other sources
-

5.1 General Requirements and Objectives of the SRS-EM Program (cont.)

- To evaluate and revise the SRS-EM Program in response to changing conditions in transfer pathways and to the site's changing mission
- To provide site-specific data for risk assessment and uncertainty analyses for human populations in the SRS vicinity and to determine the effectiveness of models in predicting the concentration of pollutants in the environment
- To conduct scientific studies to identify radioactive and non-radioactive contaminants and their transfer pathways in the environment.

5.1.1 Critical Radionuclide and Pathway Analysis for the Savannah River

SRNL-STI-2011-00503, *Critical Radionuclide and Pathway Analysis for the Savannah River Site*, documents radiological releases through the performance of public radiation dose and risk assessments. The major steps in performing the aforementioned public radiation dose and risk assessments are as follows:

- Characterization and quantification of source terms
- Calculation of atmospheric and surface water transport (dispersion/dilution)
- Characterization and quantification of environmental pathway transport to humans (exposure pathways)
- Calculation of radiation dose and subsequent potential risk.

5.1.2 Site-Specific Environmental Monitoring Criteria

Site-Specific Environmental Monitoring Criteria uses the Critical Radionuclide and Pathway Analysis as a basis for establishing and ensuring that representative measurements of quantities and concentrations of radiological contaminants are conducted and that the effects from DOE radiological activities on members of the public and the environment are monitored sufficiently to demonstrate compliance with DOE Order 458.1, *Radiation Protection of the Public and the Environment*.

5.1.3 Monitoring of Non-Radioactive Constituents

Non-radioactive constituents in SRS liquid discharges are regulated by SCDHEC under the NPDES Program. The monitoring requirements vary at each outfall, depending on the type of facility (i.e., the types of materials that potentially are present) and on the known characteristics of the wastewater.

Monitoring of non-radioactive constituents in SRS atmospheric releases is designed to determine compliance with permits issued by SCDHEC under the NESHAP.

5.2 Effluent Monitoring

Effluent Monitoring Objectives

- Determine compliance with federal, state, and local regulations, DOE Orders, and commitments made in environmental impact statements and environmental assessments
- Identify potential environmental problems and evaluate the need/effectiveness of effluent treatment and control practices
- Provide support for permitting and compliance activities
- Detect, characterize, quantify, and report unplanned releases.

Effluent monitoring is categorized in two categories in the EM Program, Liquid and Airborne. In general, the Liquid Effluent Monitoring Program is designed to directly monitor effluents and/or to collect and analyze samples from all site process outfalls that have the potential to release contaminants. The monitoring of airborne effluents is necessary because the atmosphere is a primary transport medium through which both site workers and individuals of the population surrounding SRS can be exposed to contaminants generated by SRS operations.

Derived Concentration Standards (DCS) are quantities used in the design and conduct of environmental radiological protection programs at DOE facilities and sites. These quantities provide reference values to control effluent releases from DOE facilities and are used in implementing the ALARA process for the SRS EM Programs. These quantities represent the concentration of a given radionuclide in either water or air that results in a member of the public receiving 1 millisievert (mSv) [100 millirem (mrem)] effective dose following continuous exposure for 1 year for each of the following pathways: ingestion of water, submersion in air, and inhalation.

DCSs are provided to address the need to conduct Best Available Technology (BAT) analyses and to aid in performing dose estimates. The ALARA provisions are applicable to all liquid discharges containing radioactive material derived from DOE operations, including those that are less than the DCS values and meet BAT requirements. Radioactive waste streams that otherwise would contain radionuclide concentrations of more than the DCS reference values at the point of discharge to a surface waterway are required to implement BAT treatment to further reduce concentration. BAT treatment also may be required for waste streams with concentrations of radionuclides that are less than the DCSs, if the waste streams do not conform to other specific requirements.

5.2 Effluent Monitoring (cont.)

BAT applies at the discharge point if:

- The average concentration of a given radionuclide is greater than the DOE-approved DCS value for water, or for multiple radionuclides, the composite DCS must be the sum of the fractional DCS values derived from DOE approved DCS values
- The discharge contributes greater than 10 mrem annual Total Effective Dose to members of the public
- The collective dose from all DOE sources is greater than 100 mrem person and the liquid discharge contributes 50 percent or more of this collective dose.

Tritium and sanitary sewers are excluded from BAT at the point of discharge under the previously stated conditions. Tritium in liquid effluents is specifically excluded from BAT requirements, but not from the ALARA process. Discharges of waste water containing radioactivity into SRS Sanitary Sewer Systems are controlled in accordance with Manual 3Q, Procedure 2.18, *Treatment of Non-Routinely Generated (Scavenger) Waste Water*. DCS values also are provided for airborne radionuclides, but there are no specific DOE Order requirements for their use. However, as part of the SRS Environmental ALARA Program, the airborne DCS values (except for tritium) are trended in a similar manner to the liquid DCS values.

5.2.1 Liquid Effluent Monitoring

Liquid effluent monitoring must ensure representative sampling during sample collection. This is a key component of the program so results properly and accurately characterize the chemical and radiological components of the effluent. Liquid Effluent Monitoring Systems, both radiological and non-radiological, provide representative measurements of the streams being monitored.

To ensure such measurements, the Effluent Monitoring Systems utilized at an emission point:

- Reflect the specific type and levels of contaminants present
- Collect data at appropriate frequencies
- Incorporate quality assurance measures at the collection and analysis phases.

Representative measurements provide acceptable data for meeting the following Liquid Effluent Monitoring Program objectives:

- Verify compliance with applicable federal, state, and local effluent regulations as well with DOE orders
 - Determine compliance with commitments made in Environmental Impact Statements Environmental Assessments, or other official documents
 - Evaluate effectiveness of effluent treatment
 - Identify potential environmental problems and evaluate the need for remedial actions or mitigation measures
-

5.2.1 Liquid Effluent Monitoring (cont.)

- Support permit revision/reissuing
- Detect, characterize, and report unplanned releases
- Provide data to ensure that radiological liquid releases remain ALARA.

SRS will conduct activities so that liquid releases of radioactive materials from the activities shall be treated by the BAT if any of the following conditions exist:

- The surface waters otherwise would contain, at the point of discharge to surface waters and prior to blending, an annual average concentration of a given radionuclide that is greater than the DCS value. For multiple radionuclides, the composite DCS must be the sum of the fractional DCS values
- The total effective dose to the public would otherwise exceed 10 mrem (0.1 mSv), with the liquid discharge contributing a significant portion of that dose.

Notification of Releases

Planned and unplanned liquid releases will be characterized consistent with the potential for on- and off-site impacts. The SRS-EM Program will initiate notification of proper officials of unusual or unforeseen conditions and, where appropriate, will activate special EM Programs. Notification may be based on monitoring data from Liquid Effluent/notification from Facility Operations/Line Management as required by the Radiological Effluent Monitoring, Reporting, and Environmental ALARA Process.

In the event of an unplanned release, a formal Courtesy Notification would be initiated through the SRS emergency response process and Sample Data Management would be contacted through this process. If an unplanned release exceeds an Emergency Planning and Community Right-to-Know Act/Comprehensive Environmental Response, Compensation and Liability Act/Clean Air Act/Clean Water Act Reportable Quantity a formal notification process would be initiated through the SRS emergency response process.

5.2.1 Liquid Effluent Monitoring (cont.)

Sanitary Sewers

NOTE

1. The discharge of liquid wastes from an SRS activity into a Chemical or Sanitary Sewerage System owned by the U.S. Government is not subject to requirements stated above, if the system provides treatment according to an approved interim strategy prior to discharge of liquid wastes to surface waters, and if sludge from the system is disposed of according to all applicable federal regulations.
2. Liquid Radiological Effluent Monitoring Systems are based on the characterization of the source(s), pollutant(s), sample system(s), treatment system(s), and release point(s).
3. The details of this monitoring and collection are shown in Table 8.1, Liquid Effluent Monitoring.

An SRS activity shall be conducted in a manner such that the concentration of radionuclides in liquid wastes discharged from the activity into sanitary sewerage shall:

- Be treated by the BAT to reduce the concentration level to less than 5 times the DCS values listed in SRNL-L4310-2012-00007, *Derived Concentration Standards for the SRS Environmental ALARA Program*, if the average monthly level otherwise would be greater than 5 times the DCS values at the point of discharge into the sanitary sewer
- Not result in an annual discharge (above background) into public sewers in excess of five Ci (185 GBq) of tritium: 1 Ci (37 GBq) of C-14 or 1 Ci (37 GBq) of all other radionuclides
- Be evaluated through pathway analyses or environmental surveillance to verify that the total annual discharge of radioactive material to the Sanitary Sewer System will not cause members of the public to receive incremental doses of more than 2 mrem per year from that source.

SRS monitors non-radioactive releases to surface waters as required by the site's two NPDES permits, which are administered by SCDHEC under EPA authority. The program is designed to protect surface waters by limiting releases of non-radiological contaminants into streams, reservoirs, and wetlands by requiring the physical properties and concentrations of chemicals in SRS effluents meet specific requirements before being released to the environment.

The permits provide specific requirements for sampling locations, parameters to be tested, and monitoring frequency, as well as analytical, reporting, and collection methods. The EM Program NPDES monitoring locations and parameters are identified in Table 8.2, NPDES Industrial Wastewater Permit Monitoring.

5.2.1 Liquid Effluent Monitoring (cont.)

NOTE

Soil Column Exemption

1. Soil columns are prohibited at SRS in accordance with DOE Order 458.1, *Radiation Protection of the Public and the Environment*. A soil column is defined as an in-situ volume of soil through which liquid waste streams percolates from ponds, cribs, trenches, drain fields, or other areas or facilities used for the primary purpose of removing or retaining the suspended or dissolved radionuclides contained within the liquid process waste stream.

The following interpretation, rendered by DOE Headquarters (DOE-HQ) in Washington, D.C. The DOE-HQ addressing construction modifications to convert Engineered Storm Surge Basins to Retention/Settling Basins, does not constitute the creation of a soil column.
2. Engineered storm surge basins at SRS collect storm water and storm water runoff. Storm water streams may contain small concentrations of radionuclides, as a result of contact with legacy contaminated areas of facilities and atmospheric washout. SRS retention/settling basins retard the flow of non-radioactive process water, to allow particulates to settle out and potentially retain non-radioactive metals. For example, basins may collect discharges of both types:
 - Non-contact cooling water, chiller steam condensate, and Air Handling Unit atmospheric, steam condensate, and other streams. All of these industrial streams may contain metals, but no radioactivity
 - Storm water and storm water runoff. Most will contain extremely low, but measurable concentrations of radioactivity.
3. Accordingly, SRS has received an interpretation and concurrence from DOE-HQ that retention/settling basins meeting the following criteria are not considered soil columns:
 - The industrial process stream discharges continuously and does not contain any radioactive constituents
 - Any retention effect is for settling of non-radioactive metals and solids
 - Storm water runoff influent, that sporadically contains low quantities of radionuclides, is intermittent due to rainfall and acts of nature and not the result of operational processes
 - Monitoring for radiological solids and sediments will be conducted
 - Protocols to mitigate radioactive sediment buildup will be established, if necessary.

5.2.1 Liquid Effluent Monitoring (cont.)

A subset of the NPDES Monitoring Program is the Industrial Storm Water Program. Outfalls which can receive runoff from areas with industrial activity are subject to compliance requirements as outlined in the industrial storm water general permit. Any storm water runoff with the potential to contain radionuclides from DOE activities will be evaluated as a possible pathway of exposure for on and off-site impacts using a graded approach. Retention basin releases with storm water components and potential for radionuclide impacts are monitored through the Liquid Effluent Monitoring Program as identified in Table 8.1. An evaluation of possible changes in storm water runoff contribution and proposed monitoring revisions will be included in the Annual Program Review.

The EM Program industrial storm water monitoring locations and parameters are identified in Table 8.3, NPDES Storm Water Monitoring. Industrial storm water monitoring locations and parameters are reviewed annually for applicability for the upcoming year.

5.2.2 Airborne Effluent Monitoring

Responsibilities for airborne monitoring cross many organizational lines at SRS. Each facility manager is responsible for facility emissions. A variety of methods including, but not limited to, monitoring data, operational information, engineering evaluations, and standard calculations are utilized to develop the annual site Air Emissions Inventory (AEI) for chemical, non-radionuclide emissions. The data in the AEI files are used to demonstrate site compliance with emissions standards, to complete the SRS Title V permit application, and to determine future monitoring needs.

In accordance with WSRC-IM-2002-00014, *SRS Air Emissions Monitoring Graded Approach*, all new airborne radioactive sources and modifications to airborne radioactive sources must be evaluated by 40 Code of Federal Regulations (CFR), *Protection of Environment*, Part 61, *National Emission Standards for Hazardous Air Pollutants*, Appendix D, *National Emission Standards for Hazardous Air Pollutants Compliance Status Information*, calculation or an approved alternative calculation to determine the potential to emit and monitoring criteria for each source.

The SDM group of EC&ACP supports the Site Airborne Radioactive Effluent Program through the collection of filter paper and other media and also through management of analytical data to provide representative samples/analyses for the stacks and emission points identified in Table 8.4, Airborne Effluent Monitoring. Some airborne radioactive sources (not included in the table) with a lower potential for release, in lieu of monitoring, may have an annual administrative review of the facility to confirm absence of radioactive materials in forms and quantities not conforming to prescribed specifications and/or limits. The annual review includes estimating emissions based on the 40 CFR Part 61, *National Emission Standards for Hazardous Air Pollutants*, Appendix D calculation or an approved alternative calculation.

5.3 Surveillance Monitoring

The Environmental Surveillance Program conducted at SRS is designed to survey and quantify any short- or long-term effects that routine and non-routine on-site operations may have on the site, the surrounding area, or people living in the vicinity of SRS (the on-site and off-site environment). The Environmental Surveillance Program is conducted to meet the following criteria:

- Verify compliance with DOE Orders, environmental commitments made by the site in environmental impact statements, environmental assessments, and other documents
- Characterize and define trends in the physical, chemical, and biological environs
- Establish environmental baselines of environmental quality
- Continually assess pollution abatement programs
- Identify and quantify new or existing environmental problems
- Characterize and monitor contaminant migration into the environment.

To accomplish these goals, the program monitors both radioactive and non-radioactive constituents in a wide range of environmental media, including atmosphere, surface water, groundwater, drinking water, food products, wildlife, soil, sediment, vegetation, and biota. The program monitors gamma radiation through the use of Thermoluminescent Dosimeters (TLDs). In addition, the program includes a special monitoring program developed for site-specific purposes: the Steel Creek Plantation survey. Details of each of the program elements are discussed below.

5.3.1 Atmospheric Surveillance

The atmospheric surveillance program is divided into two main program areas:

- Air
- Rainwater

The goal of this program is to quantify the amount of radioactivity in the atmosphere resulting from routine and non-routine SRS releases. Air sampling is conducted at sites located on and off-site. Sampling of rain for tritium also is conducted at all designated air surveillance locations, while sampling of rain for other radionuclides is conducted at a subset of these sites. The atmospheric surveillance stations are placed in the center of the site, in a ring around the site on the site perimeter, at a regional reference location assumed to be uninfluenced by site operations at approximately 25 miles, and in population centers at 25 miles. Placement on the site boundary was designed to ensure that at least one monitoring station is located in every 45-degree sector. These locations are identified in Table 8.5, Atmospheric Surveillance. This program is used to validate the dose pathway models used for airborne releases from the site.

5.3.2 Surface Water Surveillance

The Surface Water Surveillance Program monitors on-site streams, basins, and the Savannah River. The objective of the Surface Water Surveillance Program is to work with the Effluent Monitoring Program to:

- Determine compliance with all applicable environmental quality standards and public exposure limits
- Establish background levels and quantify site contributions of radioactive materials in the environment
- Verify the effectiveness of effluent treatment and controls in reducing effluents
- Accumulate trending information on the buildup and migration of radioactive materials in the environment
- Quantify contaminant transport or migration into the environment
- Detect and quantify unplanned releases.

Tritium is introduced into SRS streams and the Savannah River from historical production areas on-site. As part of Surface Water Surveillance and Effluent Monitoring, total direct tritium releases, including releases from facility effluent discharges and measured shallow groundwater migration of tritium from inactive waste units and Solid Waste Disposal Facility migration are estimated in the Tritium Inventory Report and annually in the Site Environmental Report. Tritium transport in SRS streams is measured at the last sampling point before entry into the Savannah River (stream transport). Tritium transport in the Savannah River is measured downriver of SRS (near River Mile 118.8) after subtraction of any measured contribution above the site (river transport). Tritium transport and river transport are also reported in the Tritium Inventory Report and annually in the Site Environmental Report.

Routine tritium monitoring includes reporting of tritium concentration levels in the river to the downstream water consumers, SCDHEC, Southern Nuclear, DOE-SR and SRS management. For the River Monitoring Programs, the notification list is updated at the biannual Radiological EM Programs meeting.

Migration of the actinides uranium, plutonium, americium, and curium into site streams is no longer routinely quantified because of the actinides' historically low levels. However, if gross alpha or beta levels are above the EPA screening levels (15 pCi/L alpha, 50 pCi/L beta), isotopic separation analyses are performed and this data is used for migration estimates. In addition, the streams are sampled and analyzed annually for the presence of these actinides. The resulting concentrations are compared to those of previous years to identify any trends.

The Surface Water Surveillance Program consists of locations on and off-site. These sampling locations are identified in Table 8.6, Surface Water Surveillance.

5.3.3 Groundwater Surveillance

The Groundwater Surveillance Program gathers information to determine and document the effects of SRS operations on groundwater quality. SRS conducts extensive groundwater monitoring in support of Resource Conservation and Recovery Act (RCRA)/Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and commonly known as Superfund, compliance. The EM Program conducts groundwater monitoring at the locations identified in Table 8.7, Groundwater Surveillance.

Wells and analytes for groundwater surveillance are determined to meet the specific regulatory requirements. Sampling requirements may change through negotiations with the regulators. These changes are implemented as approved and documented in the Sampling Mobilization Request.

5.3.4 Drinking Water Surveillance

The Drinking Water Surveillance Program for radiological parameter monitors both on-site and off-site suppliers (municipal water treatment plants at two locations, one up-river and one down-river). Sampling these supplies provides a means to determine if any contamination from site operations has escaped into groundwater and the surrounding communities' water supply.

Both the Beaufort-Jasper Water Treatment Facility near Beaufort, South Carolina, and the North Augusta Water Treatment Plant in North Augusta, South Carolina, uses the Savannah River as a water supply. Finished water is sampled at these off-site locations because it is representative of the water consumed by the public via these municipal water systems. The North Augusta location is the control location as it is up-river from SRS.

The EPA has established maximum contamination levels (MCLs) for several radionuclides and a generic limit of 4 millirems per year for beta particle and photon radioactivity from man-made radionuclides in drinking water. The drinking water sampling locations are identified in Table 8.8, Drinking Water Surveillance. Drinking water surveillance results are compiled and distributed to off-site suppliers participating in the SRS Surveillance Program and other interested parties in an annual Water Treatment Plant Analysis Results report which includes alpha, nonvolatile beta, and tritium results. In addition, as a part of the annual fee for permitted Domestic Water Systems, SCDHEC samples major On-Site Drinking Water Systems for radiological and non-radiological constituents as required to support comparisons to MCLs provided in South Carolina Hazardous Waste Management Regulations R.61-58, *South Carolina Primary Drinking Water Standard*, which implements 40 CFR Part 141, *National Primary Drinking Water Regulations*. These results are provided to SRS and included in the drinking water surveillance information published in the annual Site Environmental Report, which includes a description of dose due to drinking water pathway and a comparison to EPA MCLs.

5.3.5 Food Product Surveillance

A variety of items are included in the Food Product Surveillance Program. The program is designed to determine any effects site releases may have on the food chain and quantify the exposure of the representative person from the food pathway. Because of this, the program concentrates on locally produced food products. Food products are divided into two categories, terrestrial and aquatic.

Terrestrial Food Product Surveillance

Terrestrial food products include milk, beef, fruit, and vegetables (deer and hogs are included in the *Wildlife Surveillance* Section). Milk, beef, fruits, and collards are collected each year. Corn, soybeans, wheat, cabbage, pecans, and peanuts are collected on a 3-year rotational schedule. Where applicable, samples are collected from the farm or point of production during harvest. Samples of these items are collected in each of the four quadrants (northeast, southeast, southwest, and northwest) surrounding the site.

Collection takes place between 0 and 16 kilometers (10 miles) from the site, with one control collection taken between 16 kilometers and 40 kilometers (25 miles) from the site center in the southeast quadrant. Sampling frequency is adjusted if increasing concentration trends are observed. Table 8.9, Terrestrial Food Product Surveillance, presents a list of terrestrial food products collected and the analyses performed.

Aquatic Food Product Surveillance

The Aquatic Food Product Surveillance Program consists of both fish and shellfish. A variety of fish species are collected at locations near and downstream of the site in order to quantify possible impacts of fish consumption. The Shellfish Surveillance Program is designed to quantify any effect of SRS operations on shellfish downstream of the site on the coast near Savannah, Georgia. Samples of two types of shellfish, such as oysters and crabs are collected and analyzed. The shellfish sampled in a calendar year are based on the robustness of the harvest. Details of the program are identified in Table 8.10, Aquatic Food Product Surveillance. The SRS Fish Sampling and Analytical Plan, and Shellfish Sampling and Analytical Plan, are reviewed annually with revisions made, as needed, and submitted for SCDHEC and Georgia Department of Natural Resources review.

5.3.6 Wildlife Surveillance

SRS provides a protected area in which many species of wildlife thrive. The Wildlife Surveillance Program was established to monitor wildlife from SRS to help assess any impact of site operations on the wildlife populations and to calculate and track the dose of the hunter. Field measurements are performed on deer, feral hogs, turkey, and sometimes beavers as described below.

Monitoring of on-site deer, feral hogs, and turkeys is accomplished during site-sponsored, controlled hunts. These deer and hog hunts are conducted in the fall of the year and are open to members of the general public. Turkey hunts for the mobility impaired are conducted during the spring. The program uses a Field Detection System to monitor each animal and determine the hunter's cumulative committed effective dose equivalent prior to release of the animal. Animals with concentrations that would cause a hunter to exceed the U.S. Department of Energy-Savannah River (DOE-SR) administrative limit for wild game (annual limit of 22 mrem either a single animal or a combination of multiple animals) are not released to the hunter.

Deer and hog samples (tissue, bone) are collected during field monitoring activities (e.g., annual wildlife hunts).

Feral hogs are also trapped by subcontractors throughout the year. Since these animals are not released off-site, no monitoring is performed.

Occasionally, beavers are trapped throughout the year by the United States Department of Agriculture Forest Service-Savannah River (USDA FS-SR).

5.3.7 Soil Surveillance

The Soil Surveillance Program performs two functions:

- To observe and trend the deposition patterns of radioactive materials to the environment for long-term trending of radioactivity deposited from the atmosphere (both wet and dry deposition)
- To provide an indication of concentrations of radioactive materials in the environment.

Radioactive materials deposited in the environment come from both SRS operations and worldwide fallout. Material is deposited by both dry and wet (rainfall) deposition processes. The Soil Surveillance Program is designed to perform long-term trending of radioactive material levels in the environment, rather than quantifying regional concentrations of activity. Soil samples are collected annually from on-site, perimeter, and off-site locations. Samples are collected from uncultivated and undisturbed areas. Locations are identified in Table 8.11, Soil Surveillance.

5.3.8 Sediment Surveillance

Sampling and analysis of sediment provide a method to determine the movement, deposition, and accumulation of radioactive materials in stream systems. Radionuclide levels in the sediment may show significant changes from year to year as stream conditions change, resulting in increased deposition or remobilization. Sediment samples are collected annually at locations on and off-site including site streams and the Savannah River. These locations are identified in Table 8.12, Sediment Surveillance.

Settleable Solids

Liquid release from SRS activities shall not result in the release of settleable solids to natural waterways if the concentration of radioactive material in the solids in the waste stream exceeds either or both of the following:

- 5 pCi (0.2 Bq) per gram above background of settleable solids for alpha-emitting radionuclides
- 50 pCi (2 Bq) per gram above background of settleable solids for beta-emitting radionuclides.

An interpretation of the radioactivity levels in settleable solids requirement was provided to SRS by DOE in 1995. The interpretation indicated that Total Suspended Solids (TSS) levels below 40 parts per million (ppm) were considered to be in de-facto compliance with the DOE limits. Monitored natural waterways are identified in Table 8.6, Surface Water Surveillance.

5.3.9 Vegetation Surveillance

Vegetation can accumulate radioactive contamination from either fallout or uptake from soil and water by the roots. The Vegetation Surveillance Program is divided into two groups:

- Timber
- Grassy vegetation

Timber sampling is conducted in support of USDA FS–SR activities.

Samples are collected at the request of the U.S. Forest Service from areas designated for harvest; thus, sampling is conducted at infrequent intervals and from various areas. Samples are collected as wood chips or chain-sawdust. Approximately 1 – 2 kg of timber is collected from each tree. Samples are analyzed for gamma-emitting radionuclides and tritium.

Grassy vegetation samples are collected from locations on and off-site. These locations are monitored for trends in radionuclide mobility and uptake by plants. Sample locations are identified in Table 8.13, Vegetation Surveillance.

5.3.10 Gamma Radiation Surveillance

In general, the ambient Gamma Radiation Surveillance Program is conducted to characterize the radiation levels at SRS and to provide an indication of the effect, if any, of SRS operations on the environment. It is also available for emergency response actions and special environmental surveys. Specific program objectives are to:

- Provide ongoing environmental radiation dosimetry during routine operations
- Measure photon radiation levels at SRS and in areas surrounding SRS
- Provide an expedient and reliable means of establishing population exposure levels and doses in the event of a release of airborne radioactivity.

To quantify the ambient gamma radiation environment, SRS uses TLDs. TLDs are placed in sets of seven: five indicator badges and two badges used for fade correction. The badge sets are placed in free air on hangers one meter above the ground. They are exposed for 1 calendar quarter prior to processing. The TLD locations are identified in Table 8.15, TLD Locations.

5.3.11 Steel Creek Plantation Surveillance

Steel Creek Plantation is a privately owned land area located on the southeastern border of the site. A portion of the area is a low-lying swamp which is used as an undeveloped wildlife habitat and for occasional private hunts. A portion of this swamp was contaminated due to historical site operations. A comprehensive survey is performed every 5 years. This contaminated area is monitored by the collection of soil and vegetation samples along with the placement and collection of TLDs. Soil and vegetation samples are collected along a series of transects that span the contaminated area and is analyzed for gamma-emitting radionuclides and strontium-89, 90. TLDs are also placed and collected along the series of transects for determination of ambient gamma exposure rates.

5.3.12 Pre-Operational Monitoring

Pre-operational monitoring provides the framework from which an acceptable monitoring program would be established for a new SRS facility or activity. An SRS activity is defined as one taken for or by SRS that has the potential to release radioactive or non-radioactive contaminants to the environment and to result in the exposure of members of the public or the environment to the contaminated material. The activity may be – but is not limited to – design, construction, operation, or decommissioning. To the extent appropriate, the activity may occur in a single facility or across the entire site.

The need for a pre-operational monitoring will be determined – based upon review of the potential environmental impact of the new SRS activity – as per instructions for site environmental permitting in Manual 3Q, *Environmental Compliance Manual*, and of Manual 3Q1, Section 200, *SRS Environmental Permitting Requirements Documents (Formerly WSRC-IM-91-69)*, and Section 9000, *Hydrogeologic Data Collection Procedures and Specifications*. SDM is responsible for ensuring that pre-operational studies are documented in the SRS EM Program.

5.3.12 Pre-Operational Monitoring (cont.)

As outlined in DOE Order 458.1, *Radiation Protection of the Public and the Environment*, preoperational studies must be conducted prior to startup (at least 1 year) for new facilities or activities that have a potential for significant adverse environmental impact. Each study will serve to:

- Characterize existing physical, chemical, and biological conditions that could be affected
- Establish background levels of radioactive and chemical components
- Characterize pertinent environmental and ecological parameters
- Identify potential pathways for human exposure or environmental impact as a basis for determining the nature and extent of the subsequent routine operational and emergency Effluent Monitoring and Environmental Surveillance Programs
- Determine the types and quantities of airborne effluents to be expected and will establish the associated airborne effluent monitoring needs
- Determine the types and quantities of effluents to be expected and will establish the associated Environmental Surveillance Program

5.4 Flow Monitoring

Monitoring of flow rates in surface water is used in order to determine the discharge volumes used for the effluent release estimates in both the effluent and surveillance elements of the EM Program. For most locations, flows are measured using stage-to-flow rating tables, area-velocity measurement and calculations, or a combination of the two methods. Flow locations are identified in Table 8.15, Stream Flow Measurement Locations.

5.5 Environmental Monitoring Procedures

5.5.1 Manual 3Q, Environmental Compliance Manual

Environmental procedures/policies are presented in Manual 3Q, *Environmental Compliance Manual*. Manual 3Q provides guidance and detailed information concerning proper procedures and activities as prescribed by federal and state regulations, DOE Orders, and SRNS policies. Manual 3Q is divided into sections covering specified topics including: groundwater; spills and discharges; wells and drinking water; air protection; environmental evaluation; wastes; insecticides, fungicides, and rodenticides; RCRA and Superfund documentation; reporting; relationships of land, water, chemicals, and health; appraisals, site coordination; systems certified operators; and quality control.

5.5.2 Manual 3Q1, Environmental Requirements and Program Documents

Manual 3Q1, *Environmental Requirements and Program Documents*, includes implementing procedures that are applicable to the EM Program. These include the following categories:

- Administration
- Quality Assurance (QA)
- Equipment Operation and Calibration
- Environmental Monitoring Sampling and Measurement
- Sample Receiving and Laboratory
- Waste Sampling and Shipping
- Data Reporting and Quality Control
- Hydrogeologic Data Collection Procedures and Specifications

5.6 Quality Assurance Program

The SRS comprehensive environmental QA Program follows the QA requirements defined in the Manual 1Q, *Quality Assurance Manual*. Each environmental organization has developed and implemented procedures that address these QA requirements. The blueprint that EM uses to obtain the type and quality of environmental data needed for specific decisions or applications is documented in Manual 3Q1, Procedure 102, *Environmental Monitoring Quality Assurance Project Plan*.

In addition, a Cognizant Quality Function (CQF) from the site's independent QA organization is assigned responsibility for environmental program oversight. The CQF periodically performs QA surveillances on environmental programs to ensure compliance with site requirements. Environmental professionals periodically conduct self-assessments on specific environmental program activities per the EC&ACP Self-Assessment Plan. Opportunities for improvement and Findings actions from assessments and reviews are documented in the Site Tracking, Analysis and Reporting (STAR) system. EC&ACP management participates in the Management Field Observation process, and the results from these reviews also are documented in STAR.

5.7 Reports

NOTE

Additional reports – related information may be referred to in Section 7.0, *Records*.

The primary report associated with the EM Program is the Annual Savannah River Site Environmental Report, which meets the reporting criteria required by DOE Order 231.1B, *Environment, Safety and Health Reporting*. This report is issued annually and includes a compliance summary for the site, program information for monitoring and surveillance, a discussion of potential doses to the public, and a summary of environmental data. The Annual SRS Site Environmental Report will also include public notification of clearance of property. Information on materials released containing residual activity is summarized in the Site Environmental Report and is managed in accordance with Manual 5Q1.1, Procedure 5.17, *Radiological Release of Material*, including use of approved Authorized Limits, surveys of cleared property with type and quantity of property cleared, and independent verification results, as appropriate.

A documented Program Review of the SRS-EM Program will be performed each year and submitted to DOE-SR. The review includes:

- Evaluation and proposed revisions to the program in response to changing conditions in transfer pathways and to the site's changing mission
- Evaluation of any storm water runoff with the potential to contain radionuclides from DOE activities as a possible pathway of exposure
- Proposed improvements and enhancements to the program
- Proposed scientific studies to identify radioactive and non-radioactive contaminants and their transfer pathways in the environment

Other reports that utilize EM Program include, but are not limited to, tritium concentration in the Savannah River report, radiological release report, Discharge Monitoring Reports required by the site NPDES permit, tritium inventory report, the air emissions inventory, and various compliance reports as specified in DOE Order 458.1, *Radiation Protection of the Public and the Environment*.

Information on materials released containing residual activity is summarized in the Site Environmental Report and is managed in accordance with Manual 5Q1.1, Procedure 5.17 including the use of approved Authorized Limits, surveys of cleared property with type and quantity of property cleared, and independent verification results, as appropriate.

Unless otherwise specified, the quantities used in reports and records will be clearly indicated in special units of curie, rad, roentgen, or rem; including multiples and subdivisions of these units, or other conventional units, such as dpm, dpm/100 cm², or mass units. The International System of Units (SI) units, Becquerel (Bq), Gray (GY), and Sievert (Sv) may provide parenthetically for reference with scientific standards.

5.8 Dose Assessments

Radiological dose assessments and non-radiological exposure assessments will be performed at SRS using (1) standard EPA or DOE dose analytical models prescribed in statutes or regulations applicable to DOE sites, and (2) EPA or DOE approved dose coefficients.

These assessments will be utilized to:

- Demonstrate regulatory compliance of routine operations
- Determine the effects of unplanned releases
- Support the reporting requirements of the annual SRS Environmental Report
- Support the SRS Environmental ALARA Program.

To demonstrate compliance with applicable dose standards, human doses will be assessed at SRS for all significant pathways of radiological exposure (i.e., plume, terrestrial, meat, milk, vegetation, inhalation, drinking water, aquatic foods, river recreation, and crop irrigation) for each dose receptor (individual or collective group). Appropriate pathway doses for receptors will be summed to provide total doses for atmospheric and liquid effluents.

Doses calculated for radioactive atmospheric and liquid effluents will include:

- Dose to maximally exposed individual or a representative person
- Collective Dose to 80-km (50-mile) population.

In addition, dose calculated for radioactive liquid effluents will also include:

- Dose to maximally exposed individual customer of downstream water treatment plants
- Collective dose to customers of downstream water treatment plants
- Potential individual and collective doses from irrigation with river water

Doses from radioactive atmospheric releases for the maximally exposed off-site individual will also be calculated with EPA-prescribed methods to demonstrate compliance with the 10 mrem per year dose standard of 40 CFR Part 61, *National Emission Standards for Hazardous Air Pollutants*. Dose to aquatic organisms in SRS surface streams will be assessed at SRS using DOE recommended dose models.

Potential direct dose impacts to members of the public and workers from radiation sources are achieved by measuring direct penetrating radiation exposures both on and off-site. The direct measurements taken at on-site, plant perimeter, and off-site locations (direct penetrating gamma radiation) are measured using an extensive network of environmental radiation dosimetry (i.e., TLDs) strategically placed at designated environmental air surveillance stations, population centers, and Steel Creek Plantation. These devices measure direct, penetrating beta/gamma radiation originating from cosmic and terrestrial sources, as well as any contribution from SRS operations. The air surveillance stations TLD's accuracy is verified by using TLDs exposed to known sources of radiation as controls, and by participating in intercomparison testing programs.

5.8 Dose Assessments (cont.)

Additionally, direct dose-measurements are obtained for determining the sportsman dose for an off-site hunter and an off-site fisherman (i.e., deer, hog, and fish consumption – also includes soil exposure).

The data obtained from these monitoring activities, are used for characterizing source terms, exposure trends, exposure modes, support for potential routine and emergency response calculation models, and other information associated with evaluating dose.

6.0 REFERENCES

1B, *Management Requirements and Procedures Manual*

1B, 3.31, *Records Management*

1Q, *Quality Assurance Manual*

3Q, *Environmental Compliance Manual*

3Q, 2.18, *Treatment of Non-Routinely Generated (Scavenger) Waste Water*

3Q, 18.5, *Radiological Effluent Monitoring, Reporting and Environmental ALARA Process*

3Q1, *Environmental Requirements and Program Documents*

3Q1, 102, *Environmental Monitoring Quality Assurance Project Plan*

3Q1, 200, *SRS Environmental Permitting Requirements Documents*

3Q1, 9000, *Hydrogeologic Data Collection Procedures and Specifications*

5Q, 7, *Radiological Control Records*

5Q1.1, 5.17, *Radiological Release of Material*

5Q1.2, *Radiation Monitoring*

5Q1.4, *Water Monitoring*

5Q1.5, *Air-Effluent Monitoring*

10 CFR Part 835, *Occupational Radiation Protection*

Standards/Requirements Identification Document [S/RID 2] 10 CFR Part 962, *Byproduct Material*

40 CFR Part 61, *National Emission Standards for Hazardous Air Pollutants*

40 CFR Part 141, *National Primary Drinking Water Regulations*

Environmental Monitoring Program Management Plan	Manual:	3Q1
	Procedure:	101
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6.0 REFERENCES (cont.)

[S/RID 3] ANSI N42.18 – 1980, *American National Standard, Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents*

[S/RID 5] DOE O 231.1B, *Environment, Safety and Health Reporting*

[S/RID 4] DOE O 450.1A, *Environmental Protection Program*

[S/RID 1] DOE O 458.1, *Radiation Protection of the Public and the Environment*

ESH-ESS-96-0086, *DOE Order Requirements for Control of Settleable Solids*

South Carolina Hazardous Waste Management Regulations R.61-58, *South Carolina Primary Drinking Water Standard*

SRNL-STI-2010-00447, *Land and Water Use Characteristics and Human Health Input Parameters for Use in Environmental Dosimetry and Risk Assessments at the Savannah River Site*

SRNL-STI-2011-00503, *Critical and Radionuclide Pathway Analysis for the SRS*

SRNL-TR-2010-00274, *Environmental Dose Assessment Manual*

SRNS-RP-2012-00243, *Environmental Radiological Protection Program for DOE Order 458.1 Radiation Protection of the Public and the Environment*

SRNS-TR-2012-00202, *Environmental Monitoring Program*

WSRC-IM-2002-00014, *SRS Air Emissions Monitoring Graded Approach*

7.0 RECORDS

The annual Savannah River Site Environmental Report provides a public record of SRS-EM Program performance. It presents summary environmental data that characterize site environmental management performance, confirms compliance with environmental standards and requirements, and highlights significant programs and efforts. The report will be distributed each year to government officials, universities, public libraries, environmental and civic groups, news media, and interested individuals.

Records generated as a result of implementing this procedure include results of effluent monitoring and environmental surveillance, results of surveys for radiation, results used to determine dose, meteorological data used in assessing dose, and results of pre-operational monitoring.

Records generated as a result of implementing this procedure are maintained in accordance with Manual 1B, Procedure 3.31, Records Management. Analytical data records shall be managed in accordance with Manual 3Q1, Procedure 102, Environmental Monitoring Quality Assurance Project Plan. Radiological release records shall be managed in accordance with Manual 5Q, Chapter 7, Radiological Control Records.

8.0 ATTACHMENTS

Table 8.1	Liquid Effluent Monitoring
Table 8.2	NPDES Industrial Wastewater Permit Monitoring
Table 8.3	NPDES Industrial Storm Water Monitoring
Table 8.4	Airborne Effluent Monitoring
Table 8.5	Atmospheric Surveillance
Table 8.6	Surface Water Surveillance
Table 8.7	Groundwater Surveillance
Table 8.8	Drinking Water Surveillance
Table 8.9	Terrestrial Food Product Surveillance
Table 8.10	Aquatic Food Product Surveillance
Table 8.11	Soil Surveillance
Table 8.12	Sediment Surveillance
Table 8.13	Vegetation Surveillance
Table 8.14	TLD Locations
Table 8.15	Stream Flow Measurement Locations
Table 8.16	Wildlife Surveillance

TABLE 8.1
Liquid Effluent Monitoring
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Location	Collection	Analyses	Frequency	Run
TB-2	Time Proportional Composite	Gross alpha/Beta, tritium, gamma spectrometry, actinides	Monthly	Effluent and E-Basin
F-012 281-8F Retention Basin	Flow-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry, actinides, I-129, Tc-99, total strontium	As required	Effluent Basins
F-013 200-F Cooling Water Basin	Flow-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry, actinides, I-129, Tc-99 total strontium	As required	Effluent Basins
FMC-3	Flow-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry, actinides, C-14, Tc-99, total strontium, iodine-129	Monthly	Effluent and E-Basin
U3R-2A	Flow-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry, actinides, C-14, total strontium	Weekly	Effluent and E-Basin
FM-1C	Time-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry, actinides, total strontium, C-14	Monthly	Effluent and E-Basin
H-004	Flow-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry, actinides, total strontium	Monthly	Effluent and E-Basin
H-017 H Area Retention Basin	Flow-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry, actinides, I-129, Tc-99, total strontium	As required	Effluent Basins
K Canal	Flow-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry, total strontium	Monthly	Effluent and E-Basin
HP-52	Time-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry, actinides, total Strontium,	Monthly	Effluent and E-Basin
L007	Time-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry	Monthly	Effluent and E-Basin
S-004	Flow-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry, actinides, total strontium	Monthly	Effluent and E-Basin
HP-15	Time-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry	Weekly	Effluent and E-Basin
F-05	Flow-Proportional Composite	Gross alpha/beta, tritium, gamma spectrometry, actinides, C-14, I-129, Tc-99, total strontium	Monthly	Effluent and E-Basin
Z-01	Flow-Proportional Composite	Gross alpha/beta, tritium, Tc-99, gamma spectrometry	As required	Effluent Basin

TABLE 8.2
NPDES Industrial Wastewater Permit Monitoring
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Location	Collection	Effluent Characteristic	Frequency
A-01	Grab and Composite	BOD, pH, TSS, O&G, Fe Flow	1/Month 1/Day
A-11	Grab and Composite	BOD, pH, TSS, Low Level Hg, Flow	1/Month
A-1A	Grab	TCE, PCE Flow	1/Month 1/Day
D-1A	Grab and Composite	DO, BOD, pH, TSS, Fecal Coliform Flow	1/Month 1/Day
F-01	Grab and Composite	pH, TSS, Cu, Zn, Flow	1/Month
F-02	Grab and Composite	pH, Cu, Zn, Flow	1/Month
F-05	Grab and Composite	pH, TSS, Cu, Pb, Zn, Low Level Hg, Flow	1/Month
F-08	Grab and Composite	pH, Pb, Zn, Flow	1/Month
G-10	Grab and Composite	DO, BOD, pH, TSS, Ammonia, Fecal, Coliform Flow	2/Month 1/Day
H-02	Grab and Composite	pH, Cu, Pb, Zn, Flow	1/Month
H-07	Grab and Composite	pH, TSS, Flow	1/Quarter
H-12	Grab and Composite	pH, Cu, Zn, Flow	1/Month
TH-1&2 (H-16)	Grab and Composite	BOD, pH, TSS, Cd, Cr, Cu, Pb, Ni, Ag, Zn, Hg, Flow	1/Week
K-06	Grab and Composite	pH, Cu, Pb, Zn, Low Level Hg, Flow	1/Month
K-12	Grab and Composite	DO, BOD, pH, TSS, Fecal Coliform Flow	1/Month 1/Day
K-18	Grab and Composite	pH, TSS, Flow	1/Quarter
L-07	Grab and Composite	pH, TSS, Flow	1/Quarter
L-7A	Grab and Composite	DO, BOD, pH, TSS, Fecal Coliform Flow	1/Month 1/Day
M-05	Grab	TCE, PCE Flow	1/Month 1/Day
S-04	Grab and Composite	pH, Cu, Pb, Mn, Ni, Zn, Flow	1/Month
X-8C	Grab	TCE, PCE, Mn, Flow	1/Month

TABLE 8.2
NPDES Industrial Wastewater Permit Monitoring
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Location	Collection	Effluent Characteristic	Frequency
D-01	Grab and Continuous	Temp, Temp Diff. Mn, Al, TRC pH, Flow Whole Effluent Toxicity	1/Day 1/Occurrence 1/Month 1/Quarter
01B (D-1B)	Grab	TSS, O&G, Cu, Ni, Zn, Flow	1/Occurrence
01C (D-1C)	Grab	TSS, O&G, Flow	1/Month
01D (D-1D)	Grab	TSS, O&G Flow	1/Month 1/Day
D-03	Grab	pH, TSS, O&G, Cu, Ni, Zn, Al, Flow TRC	1/Month 1/Occurrence
D-06	Grab	pH, TSS, O&G, Cu, Ni, Al, Flow Total Petroleum Hydrocarbon, TRC	1/Month 1/Occurrence
002 (D-02)	Grab	TSS, pH, O&G, Cu, Ni, Zn, Flow	1/Quarter

TABLE 8.3
NPDES Industrial Storm Water Monitoring
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Industrial Storm Water Effluent Monitoring:

Location	Collection	Analyses	Frequency
H-07B (no discharge expected)	Grab	pH	1/Year

Industrial Storm Water Benchmark Monitoring:

Formerly, outfalls E-01, E-02, E-03, E-04, E-06, G-21, H-02A, H-04B, H-05, H-06, H-06A, H-07A, H-07C, H-08, N-06, N-12, and N-15 required benchmark sampling. Because the four-quarter sampling averages did not exceed their respective benchmark limits, no further monitoring is required for duration of the permit term at these locations.

Location	Collection	Analyses	Frequency
G-10A	Grab	Fecal Coliform	1/Quarter
N-02	Grab	Zn	1/Quarter
N-12A	Grab	Cu, Zn	1/Quarter
Z-01(no discharge expected)	Grab	TSS, NH ₃ -N, COD, Ag, As, Cd, Hg, Se, Pb, Cyanide	1/Quarter

Industrial Storm Water Visual Monitoring:

Outfalls listed in parentheses are substantially identical and are rotated on a yearly basis.

Location	Collection	Analyses	Frequency
A-08 (L-13)	Grab	Visual analysis	1/Quarter
A-14	Grab	Visual analysis	1/Quarter
B-10	Grab	Visual analysis	1/Quarter
C-08 (F-10, FT-3, N-05, N-14, and N-16)	Grab	Visual analysis	1/Quarter
D-04 (D-06A and D-07)	Grab	Visual analysis	1/Quarter
E-01 (E-02, E-03, and E-04)	Grab	Visual analysis	1/Quarter
E-06	Grab	Visual analysis	1/Quarter
G-10A	Grab	Visual analysis	1/Quarter
G-21	Grab	Visual analysis	1/Quarter

TABLE 8.3
NPDES Industrial Storm Water Monitoring
Page 2 of 2

Industrial Storm Water Visual Monitoring: (cont.)

Outfalls listed in parentheses are substantially identical and are rotated on a yearly basis.

Location	Collection	Analyses	Frequency
H-02A (N-06 and N-12)	Grab	Visual Analysis	1/Quarter
H-04B	Grab	Visual Analysis	1/Quarter
H-05 (H-06 and H -07C)	Grab	Visual Analysis	1/Quarter
H-06A	Grab	Visual Analysis	1/Quarter
H-07A	Grab	Visual Analysis	1/Quarter
H-07B (no discharge expected)	Grab	Visual Analysis	1/Quarter
H-08	Grab	Visual Analysis	1/Quarter
K-02	Grab	Visual Analysis	1/Quarter
N-02	Grab	Visual Analysis	1/Quarter
N-12A	Grab	Visual Analysis	1/Quarter
N-13A	Grab	Visual Analysis	1/Quarter
N-15	Grab	Visual Analysis	1/Quarter
Y-01 (Y-03 and Y-04)	Grab	Visual Analysis	1/Quarter
Z-01 (no discharge expected)	Grab	Visual Analysis	1/Quarter

Industrial Storm Water Impaired Water Monitoring:

Formerly, outfalls B-10, C-08, E-01, E-02, E-03, E-04, FT-3, F-10, G-21, H-04B, H-05, H-06, H-07A, H-07C, H-08, N-05, N-14, N-15, and N-16 required impaired water sampling for fecal coliform. Because fecal coliform was not detected above natural background levels in the storm water discharge, no further monitoring is required for duration of the permit term at these locations.

Outfalls listed in parentheses are substantially identical and are rotated on a yearly basis.

Location	Collection	Analyses	Frequency
A-08 (L-13)	Grab	Fecal Coliform	1/Year
E-06	Grab	Fecal Coliform	1/Year
G-10A	Grab	Fecal Coliform	1/Year
H-02A (N-06 and N-21)	Grab	Fecal Coliform	1/Year
H-06A	Grab	Fecal Coliform	1/Year
H-07B (no discharge expected)	Grab	Fecal Coliform	1/Year
N-02	Grab	Fecal Coliform	1/Year
Z-01 (no discharge expected)	Grab	Fecal Coliform	1/Year

TABLE 8.4
Airborne Effluent Monitoring
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Monitoring Program requirements are subject to change due to mission/process changes. Additions or deletions to this list are documented in the NESHAPs Evaluation Group Document Library. Required sampling frequency can be found in the WSRC-IM-2002-00014, *SRS Air Emissions Monitoring Graded Approach*.

Location	Collection	Analyses
735-A Stack	Paper Filter	Gross alpha/beta, gamma spectrometry
773-A B Stack	Paper Filter	Gross alpha/beta, gamma spectrometry
773-A C Stack	Paper Filter	Gross alpha/beta, gamma spectrometry
773-A F Wing	Paper Filter	Gross alpha/beta
776-A Stack	Paper Filter	Gross alpha/beta, gamma spectrometry
791-A Sandfilter Discharge	Paper Filter and Charcoal ¹	Gross alpha/beta, gamma spectrometry, I-129
C-Area Main Stack	Bubbler	Tritium
235-F Sandfilter	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides
292-F Main Stack	Paper Filter and Charcoal ¹	Gross alpha/beta, gamma spectrometry, I-129, actinides, Sr-89/90
772-1F Stack	Paper Filter	Gross alpha/beta, gamma spectrometry
772-4F	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
241-84H ETP Lab Stack	Paper Filter	Alpha/beta, gamma spectrometry, actinides, Sr-89/90
241-81H ETP Process Stack	Paper Filter	Alpha/beta, gamma spectrometry, actinides, Sr-89/90
292-H Main Stack	Paper Filter and Charcoal ¹	Gross alpha/beta, gamma spectrometry, I-129, actinides, Sr-89/90
241-278H Caustic Extraction	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
241-2H Mercury Stack	Paper Filter	Gross alpha/beta, gamma spectrometry

¹ Charcoal canisters are routinely analyzed for I-129 only; however, should there be a reason to expect short-lived radioiodines, such as, if SRS were to obtain a Californium source or when there is an external event (i.e., Fukushima), then additional gamma spectroscopy analyses will be performed and the need for more frequent sampling will be considered.

TABLE 8.4
Airborne Effluent Monitoring
Page 2 of 3

Location	Collection	Analyses
Saltstone SDU-2	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
Saltstone SDU-3	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
Saltstone SDU-5	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
K-Area Main Stack	Paper Filter and bubbler	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90, tritium
KIS Stack	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
L-Area Disassembly	Paper Filter and bubbler	Gross alpha/beta, gamma spectrometry, tritium
L-Area Main Stack	Paper Filter and bubbler	Gross alpha/beta, gamma spectrometry, tritium
221-S Personnel Area	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
250-S Building 1488	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
250-S Building 1509	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
250-S Building 3928	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
250-S Building 3940	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
251-S Vault A	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
251-S Vault B	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
251-S Vault C	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
251-S Vault D	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
291-S Vit Process	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
511-S Low Point Pump Pit	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
512-S Late Wash	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90

TABLE 8.4
Airborne Effluent Monitoring
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Location	Collection	Analyses
232-H Stack	Bubbler	Tritium
233-H	Bubbler and Kanne Monitoring Systems	Tritium
234-H	Kanne Monitoring Systems	Tritium
238-H	Kanne Monitoring System	Tritium
264-H Stack	Paper Filter and Kanne Monitoring Systems	Gross alpha/beta, gamma spectrometry, tritium
210-Z Building Stack	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90
451-Z Saltstone Vaults	Paper Filter	Gross alpha/beta, gamma spectrometry, actinides, Sr-89/90

TABLE 8.5
Atmospheric Surveillance
Page 1 of 1

Location	Collection	Analyses	Frequency	Run
Burial Ground North	P, C, SG, RW, RIC	P, C, SG, RW, RIC	P, C, SG- Biweekly RW, RIC- Monthly	OP
Aiken Barricade	P, C, SG, RW	P, C, SG, RW	P, C, SG- Biweekly RW, RIC- Monthly	OP
Allendale Gate	P, C, SG, RW	P, C, SG, RW	P, C, SG- Biweekly RW, RIC- Monthly	OP
Barnwell Gate	P, C, SG, RW	P, C, SG, RW	P, C, SG- Biweekly RW, RIC- Monthly	OP
Dark Horse	Dark Horse	P, C, SG, RW, RIC	P, C, SG- Biweekly RW, RIC- Monthly	OP
East Talatha	P, C, SG, RW	P, C, SG, RW	P, C, SG- Biweekly RW, RIC- Monthly	OP
Green Pond	P, C, SG, RW, RIC	P, C, SG, RW, RIC	P, C, SG- Biweekly RW, RIC- Monthly	OP
Highways 21 and 167	P, C, SG, RW	P, C, SG, RW	P, C, SG- Biweekly RW, RIC- Monthly	OP
Jackson, SC	P, C, SG, RW	P, C, SG, RW	P, C, SG- Biweekly RW, RIC- Monthly	OP
Patterson Mill Road	P, C, SG, RW, RIC	P, C, SG, RW, RIC	P, C, SG- Biweekly RW, RIC- Monthly	OP
400-D	P, C, SG, RW, RIC	P, C, SG, RW, RIC	P,C,SG- Biweekly RW,RIC- Monthly	OP
Aiken Airport	P, C, SG, RW	P, C, SG, RW	P, C, SG- Biweekly RW, RIC- Monthly	25 Mile
Augusta, GA	P, C, SG, RW	P, C, SG, RW	P, C, SG- Biweekly RW, RIC- Monthly	25 Mile
Hwy 301	P, C, SG, RW, RIC	P, C, SG, RW, RIC	P, C, SG- Biweekly RW, RIC- Monthly	25 Mile

Key:

P = Particulate Filter analyzed for gamma spectrometry, and gross alpha/beta. Total strontium and actinides are performed annually.

C = Charcoal Canister analyzed annually for gamma spectrometry

SG = Silica Gel analyzed for tritium oxide

RW = Rainwater analyzed for monthly tritium oxide

RIC = Rain Ion Column analyzed monthly for gamma spectrometry, gross alpha/beta, total strontium, and actinides

TABLE 8.6
Surface Water Surveillance
 Page 1 of 5

Location	Collection	Analyses	Frequency	Run
Tims Branch – 5	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Tims Branch – 5	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
Upper Three Runs – 1A	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Bi-weekly	Stream
Upper Three Runs – 1A	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
Crouch Branch	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Crouch Branch	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
Upper Three Runs - 3	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Upper Three Runs - 3	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
Upper Three Runs – 4	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Upper Three Runs - 4	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
Upper Three Runs-2F (F-02)	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Upper Three Runs-2F (F-02)	Grab	Sr-89/90, Tc-99, I-129, Np-237, actinides	Annual	Stream
Beaver Dam Creek @ River	Time Proportional Composite	Tritium	Weekly	Stream
Beaver Dam Creek @ River	Grab	Tc-99, Gross alpha/beta, gamma spectrometry, Sr-89/90, actinides	Annual	Stream
F-01	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
F-01	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
Four Mile – 2	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium, Tc-99, I-129, Sr-89/90	Monthly	Stream
Four Mile – 2	Grab	Actinides	Annual	Stream

TABLE 8.6
Surface Water Surveillance
 Page 2 of 5

Location	Collection	Analyses	Frequency	Run
Four Mile – 2B	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium, Tc-99, I-129, Sr-89/90	Monthly	Stream
Four Mile – 2B	Grab	actinides	Annual	Stream
Four Mile – 3A	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium, Tc-99, I-129, Sr-89/90	Monthly	Stream
Four Mile – 3A	Grab	Actinides	Annual	Stream
Four Mile – 6	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Four Mile – 6	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
Four Mile – A7	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Four Mile – A7	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
G-10	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium, actinides, Sr-89/90, Tc-99, I-129	Monthly	Stream
HP-52	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium, actinides, Sr-89/90	Monthly	Stream
Pen Branch – 3	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Pen Branch – 3	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
Steel Creek – 2A	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Steel Creek – 2A	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
Steel Creek – 4	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Steel Creek – 4	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
Lower Three Runs – 1A	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Lower Three Runs – 1A	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream

TABLE 8.6
Surface Water Surveillance
Page 3 of 5

Location	Collection	Analyses	Frequency	Run
Lower Three Runs – 2	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Lower Three Runs - 2	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
Lower Three Runs – 3	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Monthly	Stream
Lower Three Runs - 3	Grab	Sr-89/90, Tc-99, I-129, actinides	Annual	Stream
TNX-008	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium, actinides (w/o Cm and Am)	Monthly	Stream
McQueen's Branch	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium, Tc-99	Monthly	Stream
TNX-008	Grab	Tc-99	Annual	Stream
River Mile 118.8	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Weekly	River
River Mile 118.8	Grab	Sr-89/90, Tc-99, actinides	Annual	River
River Mile 141.5	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Weekly	River
River Mile 141.5	Grab	Sr-89/90, Tc-99, actinides	Annual	River
River Mile 150	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Weekly	River
River Mile 150	Grab	Sr-89/90, Tc-99, actinides	Annual	River
River Mile 150.4	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Weekly	River
River Mile 150.4	Grab	Sr-89/90, Tc-99, actinides	Annual	River
River Mile 160	Time Proportional Composite	Gross alpha/beta, gamma spectrometry, tritium	Weekly	River
River Mile 160	Grab	Sr-89/90, Tc-99, actinides	Annual	River

TABLE 8.6
Surface Water Surveillance
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Location	Collection	Analyses	Frequency	Run
E-001	Grab	Gross alpha/beta, gamma spectrometry, tritium, Tc-99	Monthly	Storm Water Basins
E-002	Grab	Gross alpha/beta, gamma spectrometry, tritium, Tc-99	Monthly	Storm Water Basins
E-003	Grab	Gross alpha/beta, gamma spectrometry, tritium, Tc-99	Monthly	Storm Water Basins
E-004	Grab	Gross alpha/beta, gamma spectrometry, tritium, Tc-99	Monthly	Storm Water Basins
E-005	Grab	Gross alpha/beta, gamma spectrometry, tritium, Tc-99	Monthly	Storm Water Basins
E-006	Grab	Gross alpha/beta, gamma spectrometry, tritium, Tc-99	Monthly	Storm Water Basins
Pond 400	Grab	Gross alpha/beta, gamma spectrometry, tritium, Tc-99	Monthly	Storm Water Basins
Z-Area	Grab	Gross alpha/beta, gamma spectrometry, tritium, Sr-89/90, Tc-99, I-129, actinides	Monthly	Storm Water Basins
Mary's Branch	Time Proportional Composite	Tritium, U-234, U-235, U-238, gross alpha/beta	Monthly	Streams

TABLE 8.6
Surface Water Surveillance
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Location	Collection	Analyses	Frequency	Run
Beaver Dam Creek (no discharge expected)	Grab	Water Quality Parameters ¹	Monthly/Quarterly	Stream Water Quality
Four Mile Creek – 2	Grab	Water Quality Parameters ¹	Monthly/Quarterly	Stream Water Quality
Four Mile – 2B	Grab	Water Quality Parameters ¹	Monthly/Quarterly	Stream Water Quality
Four Mile – 6	Grab	Water Quality Parameters ¹	Monthly/Quarterly	Stream Water Quality
Lower Three Runs – 2	Grab	Water Quality Parameters ¹	Monthly/Quarterly	Stream Water Quality
Pen Branch - 3	Grab	Water Quality Parameters ¹	Monthly/Quarterly	Stream Water Quality
Steel Creek – 4	Grab	Water Quality Parameters ¹	Monthly/Quarterly	Stream Water Quality
Tims Branch – 5	Grab	Water Quality Parameters ¹	Monthly/Quarterly	Stream Water Quality
Tinker Creek – 1	Grab	Water Quality Parameters ¹	Monthly/Quarterly	Stream Water Quality
Upper Three Runs – 1A	Grab	Water Quality Parameters ¹	Monthly/Quarterly	Stream Water Quality
Upper Three Runs – 4	Grab	Water Quality Parameters ¹	Monthly/Quarterly	Stream Water Quality
River Mile 118.8	Grab	Water Quality Parameters ¹	Monthly/Quarterly	River Water Quality
River Mile 129.1	Grab	Water Quality Parameters ¹	Monthly/Quarterly	River Water Quality
River Mile 141.5	Grab	Water Quality Parameters ¹	Monthly/Quarterly	River Water Quality
River Mile 150.4	Grab	Water Quality Parameters ¹	Monthly/Quarterly	River Water Quality
River Mile 160	Grab	Water Quality Parameters ¹	Monthly/Quarterly	River Water Quality

¹ **Water Quality Parameters:**

Monthly: Aluminum, Beryllium, Cadmium, Chromium, Copper, Dissolved Oxygen, Iron, Lead, Manganese, Mercury, Nickel, Nitrate-N, Nitrite-N, pH, Hardness, Phosphorus, Temperature, Thallium Total Organic Carbon, Total Suspended Solids, and Zinc

Quarterly: Aldrin, Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, alpha-BHC, beta-BHC, delta-BHC, gamma-BHC (Lindane), Chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Heptachlor, Heptachlor epoxide, Toxaphene, 2,4-D and 2,4,5-TP (Silvex)

TSS levels below 40 parts per million (ppm) are considered to be in de-facto compliance with the DOE Limits for settleable solids radioactive releases.

TABLE 8.7
Groundwater Surveillance
Page 1 of 1

SRS Area	Groundwater Units¹	Regulatory Driver²
A/M Area	Boundary Wells (includes JAX Wells)	DOE Order 360.1
B Area	Interim Sanitary Landfill	Solid Waste Permit
D Area	488-4D Dry Ash Basin Groundwater	Solid Waste Permit
	715-D UST Groundwater	UST Permit
F Area	288-F Ash Basin Groundwater	Solid Waste Permit
	F-Area Tank Farm Groundwater	IW Water Permit
G Area	C&D Landfill (632-G)	IW Water Permit
H Area	H-Area Tank Farm Groundwater	IW Water Permit
K Area	K-Area Disassembly Basin	DNFSB Request 1990
L Area	L-Area Disassembly Basin	DNFSB Request 1990
N Area	N-Area Heating Oil Plume	UST Program
Z Area	Saltstone Disposal Facility	Solid Waste Permit
Off-Site	Georgia Tritium Monitoring	DOE Request

¹ Sampling frequency, at a minimum, is annually.

² Analytes may be radionuclides or chemical constituents depending on the regulatory driver.

TABLE 8.8
Drinking Water Surveillance
 Page 1 of 1

Location	System	Analyses	Frequency	Run
617-G	Small Domestic	Gamma, alpha, beta, tritium, actinide, Sr-89/90	Annual	Annual
681-3G	Small Domestic	Gamma, alpha, beta, tritium, actinide, Sr-89/90	Annual	Annual
704-16G	Small Domestic	Gamma, alpha, beta, tritium, actinide, Sr-89/90	Annual	Annual
709-1G	Small Domestic	Gamma, alpha, beta, tritium, actinide, Sr-89/90	Annual	Annual
737-G	Small Domestic	Gamma, alpha, beta, tritium, actinide, Sr-89/90	Annual	Annual
905-112G	Production well for A-Area treatment facility	Gamma, alpha, beta, tritium, actinide, Sr-89/90	Annual	Annual
905-113G	Production well for A-Area treatment facility	Gamma, alpha, beta, tritium, actinide, Sr-89/90	Annual	Annual
905-67B	Production well for A-Area treatment facility	Gamma, alpha, beta, tritium, actinide, Sr-89/90	Annual	Annual
905-125B	Production well for A-Area treatment facility	Gamma, alpha, beta, tritium, actinide, Sr-89/90	Annual	Annual
782-3A	Large Domestic	Gamma, gross alpha/beta, tritium ¹	Quarterly	Quarterly
782-3A	Large Domestic	Gamma, alpha, beta, tritium, actinide, Sr-89/90	Annual	Annual
Beaufort-Jasper (Purrysburg) Finished	Municipal	Gamma, alpha, beta, tritium, actinide, Sr-89/90 ²	Monthly	Off-Site Drinking Water
North Augusta Finished	Municipal	Gamma, alpha, beta, tritium, actinide, Sr-89/90 ²	Monthly	Off-Site Drinking Water

¹ Quarterly samples are collected in three of the four quarters of the calendar year. The Annual sample for this location, collected in the remaining quarter of the calendar year, includes the quarterly analytes.

² Samples are provided to SRS by municipal water treatment plants.

TABLE 8.9
Terrestrial Food Product Surveillance
Page 1 of 1

Location	Product	Analyses	Frequency	Run
NE 15 km	Collards, Meat, Fruit	Gamma ¹ , tritium, Tc-99, Sr-89/90, actinides ²	Annual	Annual
SE 15 km	Collards, Meat, Fruit	Gamma ¹ , tritium, Tc-99, Sr-89/90, actinides ²	Annual	Annual
SW 15 km	Collards, Meat, Fruit	Gamma ¹ , tritium, Tc-99, Sr-89/90, actinides ²	Annual	Annual
NW 15 km	Collards, Meat, Fruit	Gamma ¹ , tritium, Tc-99, Sr-89/90, actinides ²	Annual	Annual
SE 25 km	Collards, Meat, Fruit	Gamma ¹ , tritium, Tc-99, Sr-89/90, actinides ²	Annual	Annual
All quadrants	Pecans, Peanuts, Soybeans, Corn, Cabbage, Wheat	Gamma ¹ , tritium, Tc-99, Sr-89/90, actinides ²	Annual Rotational	Annual
Local Dairies	Milk	Gamma, Tritium, Sr-89/90	Quarterly	Annual

¹ Gamma consists of Co-60 and Cs-137.

² Actinides consist of Am-241, Cm-244, Np-237, Pu-238/239, and U-234/235/238.

TABLE 8.10
Aquatic Food Product Surveillance
Page 1 of 1

NOTE

1. Sr-89/90 is analyzed in both the flesh and the bone of freshwater and saltwater fish.
2. Seven individual fish from each product and each location are analyzed for mercury, arsenic, antimony, cadmium, chromium, copper, lead, manganese, nickel, and zinc on an annual basis.

Location	Product	Analyses	Frequency	Run
Savannah Bluff Lock and Dam	Bass, catfish, bream	Gross alpha/beta, gamma ¹ , Sr-89/90, Tc-99, tritium	Three composites per year per product	Fish
Upper Three Runs Mouth	Bass, catfish, bream	Gross alpha/beta, gamma ¹ , Sr-89/90, Tc-99, tritium	Three composites per year per product	Fish
Four Mile Creek Mouth	Bass, catfish, bream	Gross alpha/beta, gamma ¹ , Sr-89/90, Tc-99, tritium	Three composites per year per product	Fish
Steel Creek Mouth	Bass, catfish, bream	Gross alpha/beta, gamma ¹ , Sr-89/90, Tc-99, tritium	Three composites per year per product	Fish
Lower Three Runs Mouth	Bass, catfish, bream	Gross alpha/beta, gamma ¹ , Sr-89/90, Tc-99, tritium	Three composites per year per product	Fish
Hwy 301 Bridge	Bass, catfish, bream	Gross alpha/beta, gamma ¹ , Sr-89/90, Tc-99, tritium	Three composites per year per product	Fish
Hwy 17 Bridge	Mullet, redfish, sea trout	Gross alpha/beta, gamma ¹ , Sr-89/90, Tc-99, tritium	Three composites per year per product	Fish
Savannah River below Hwy 17 Bridge	Two species (oyster, crab, shrimp, or clam)	Gross alpha/beta, gamma ¹ , Sr-89/90, Tc-99	Annual	Annual

¹ Gamma = Co-60, Cs-137 and I-129

TABLE 8.11
Soil Surveillance
Page 1 of 1

Location	Collection	Analyses	Frequency	Run
F-Area W	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
H-Area E	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Z-Area No. 3	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Burial Ground North	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Patterson Mill Road	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
D-Area	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Darkhorse	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Green Pond	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Hwy 301 Bridge	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Jackson	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Allendale Gate	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Aiken Airport	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Augusta Lock and Dam	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Barnwell Gate	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Hwy 21/167	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
East Talatha	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Talatha Gate	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual
Steel Creek Plantation Trail 1	Grab	Gamma, gross alpha/beta, Sr-89/90, actinides	Annual	Annual

TABLE 8.12
Sediment Surveillance
 Page 1 of 3

NOTE

Analyses and locations could change based upon SCDHEC split sampling schedule.

Location	Collection	Analyses	Frequency	Run
Upper Three Runs – 1A	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides, pesticides/herbicides, metals, cyanide	Annual	Annual
Tims Branch - 5	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides, pesticides/herbicides, metals, cyanide	Annual	Annual
Tinker Creek TC-1	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides, pesticides/herbicides, metals, cyanide	Annual	Annual
E-001 Basin	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
E-002 Basin	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
E-003 Basin	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
E-004 Basin	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
E-005 Basin	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
E-006 Basin	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
FM-2	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
FM-3A	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
FMC-A7A	Grab	Gross alpha/beta, gamma, Sr-89/90, Actinides	Annual	Annual
FM Swamp	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
PB Swamp	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
SC-2A	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
FMC-A7	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual

TABLE 8.12
Sediment Surveillance
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Location	Collection	Analyses	Frequency	Run
Z-Basin	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
Z-01 Outfall	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
SC-4	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides, metals, cyanide	Annual	Annual
R Canal	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
L3R-1A	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
River Mile 160.5	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
River Mile 160	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides, metals, cyanide	Annual	Annual
River Mile 157.2	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
River Mile 150.4	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
River Mile 151.0	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
River Mile 150.2	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides, metals, cyanide	Annual	Annual
River Mile 134.0	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
River Mile 129.0	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides	Annual	Annual
River Mile 118.7	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides, metals, cyanide	Annual	Annual
BDC River Mile	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides, metals, cyanide	Annual	Annual
BDC at Rd A	Grab	Metals, cyanide	Annual	Annual
L3R-2, Patterson Mill Road	Grab	Gross alpha/beta, gamma, Sr-89/90, actinides, metals, cyanide	Annual	Annual
Pen Branch at Rd A	Grab	Gross alpha/beta, gamma, Sr-89/90, Actinides, metals, cyanide	Annual	Annual
Four Mile Creek at Rd A	Grab	Gross alpha/beta, gamma, Sr-89/90, Actinides, metals, cyanide	Annual	Annual
U3R-4	Grab	Gross alpha/beta, gamma, Sr-89/90, Actinides, metals, cyanide	Annual	Annual
Pond 400	Grab	Gross alpha/beta, gamma, Sr-89/90, Actinides	Annual	Annual

TABLE 8.12
Sediment Surveillance
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Location	Collection	Analyses	Frequency	Run
U3R-River Mouth	Grab	Metals, cyanide	Annual	Annual
Four Mile Creek River Mouth	Grab	Metals, cyanide	Annual	Annual
Steel Creek River Mouth	Grab	Metals, cyanide	Annual	Annual
River Mile 170.5	Grab	Metals, cyanide	Annual	Annual
McQueen's Branch at Monroe Owen's Road	Grab	Gross alpha/beta, gamma, metals, cyanide	Annual	Annual
McQueen's Branch downstream of Z-Basin	Grab	Gross alpha/beta, gamma	Annual	Annual
U3R-3	Grab	Metals, cyanide	Annual	Annual
L3R-3	Grab	Metals, cyanide	Annual	Annual
Meyers Branch	Grab	Metals, cyanide	Annual	Annual

TABLE 8.13
Vegetation Surveillance
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Location	Collection	Analyses	Frequency	Run
Burial Ground North	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
Dark Horse	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
Green Pond	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
Patterson Mill Road	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
400-D	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
Hwy 301	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
Jackson	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
Allendale Gate	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
Barnwell Gate	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
Augusta Lock and Dam	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
Aiken Airport	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
Hwy 21/167	Grab	Gross alpha/beta, gamma, , Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
East Talatha	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual
Talatha Gate	Grab	Gross alpha/beta, gamma, Sr-89-90, actinides, tritium, Tc-99, Th-228, Th-230, Th-232	Annual	Annual

TABLE 8.14
TLD Locations
Page 1 of 1

Site Perimeter Stations (9 Locations):

Site Perimeter TLD 15	Site Perimeter TLD 61.25
Site Perimeter TLD 42	Site Perimeter TLD 65.75
Site Perimeter TLD 48	Site Perimeter TLD 72.25
Site Perimeter TLD 51	Site Perimeter TLD 75.75
Site Perimeter TLD 57.75	

Air Monitoring Stations (14 Locations):

400 D	Hwy 301
Aiken Airport	Intersection of Highways 21 and 167
Allendale Gate	Jackson
Augusta Lock and Dam	Patterson Mill Road
Barnwell Gate	
Burial Ground North	Talatha Gate
Darkhorse	
East Talatha	
Green Pond	

Population Centers (9 Locations):

Barnwell	McBean
Beech Island	New Ellenton
Girard	Williston
Jackson	Windsor
Martin	

Vogtle Electric Generating Plant Vicinity (18 Locations):

Georgia Power TLD 1 HIGH	Georgia Power TLD 5 LOW
Georgia Power TLD 1 LOW	NRC TLD 1
Georgia Power TLD 2 HIGH	NRC TLD 2
Georgia Power TLD 2 LOW	NRC TLD 3
Georgia Power TLD 3 HIGH	NRC TLD 4
Georgia Power TLD 3 LOW	NRC TLD 5
Georgia Power TLD 4 HIGH	NRC TLD 6
Georgia Power TLD 4 LOW	NRC TLD 7
Georgia Power TLD 5 HIGH	NRC TLD 8

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TABLE 8.15
Stream Flow Measurements Locations
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Daily monitoring, using area-velocity measurements at 15-minute intervals. The measurements are taken weekly, biweekly, or monthly depending on flow conditions.

Four Mile 6

Four Mile 3-A

Four Mile 2-B

Steel Creek 4

HP-52

Four Mile A-7

Pen Branch 3

Upper Three Runs 4

D-01

Lower Three Run 2

Mary's Branch

McQueen's Branch

Periodic Measurements are taken at other locations, as follows:

Daily: Sanitary Wastewater Treatment Plants (D-1A, G-10, K-12 and L-7A)

Weekly: H-16 (ETP - batch discharge)

Quarterly: D-02, H-07, K-18, L-07, Lower Three Runs 1-A (backup to Lower Three Runs 2)

TABLE 8.16
Wildlife Surveillance
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Location	Product	Analyses	Frequency
Various	Deer/Hog Muscle	Gross alpha/beta, gamma, Sr-89/90	Annual
Various	Deer/Hog Bone	Sr-89/90	Annual