Chapter 1: **Introduction**

The "Savannah River Site (SRS) Environmental Report" is the primary document that the U.S. Department of Energy (DOE) uses to inform the public of environmental performance and conditions at SRS. This report meets the requirements of DOE Order 231.1B, "Environment, Safety, and Health Reporting." The "SRS Environmental Report" is also the principal document that demonstrates how the Site complies with the requirements of DOE Order 458.1, "Radiation Protection of the Public and the Environment."

The "SRS Environmental Report" summarizes the Site's environmental information and data to achieve the following:

- *Highlight significant Site programs*
- *Report environmental occurrences and responses*
- *Describe SRS's compliance with environmental standards and requirements*
- *Describe SRS's Environmental Management System and sustainability performance*
- *Provide the results from monitoring material containing residual radioactivity before its release from SRS*

Chapter Background

This chapter presents the following:

- A brief history of SRS, along with a summary of its current missions
- Highlights of SRS organizations and their primary responsibilities
- Descriptions of the physical characteristics and attributes of the environment in and around SRS
- Updates of SRS's primary mission and annual programs

1.1 HISTORY

On November 28, 1950, President Harry S. Truman tasked the E. I. Du Pont de Nemours Company to design, build, and operate what was then to be known as the Savannah River Plant. The construction project relocated citizens, homes, and businesses from the six South Carolina towns that had existed on the land. By 1953, SRS began producing the basic materials used to create nuclear weapons for the nation's defense. The work performed during the Site's early days was key to the United States winning the Cold War. For the seven decades since the Site's beginning, SRS has been a leader within the DOE complex.

An *Overview of the Savannah River Site,* available on the SRS website, details much of the Site's history and accomplishments.

1.2 MISSION AND CURRENT OPERATION

The SRS mission is to safely and efficiently protect public health and the environment while supporting the nation's nuclear deterrent programs and transforming the Site for future use. The Site is a recognized long-term national asset in the areas of environmental stewardship, innovative technology, national security, and energy independence. It acts with an inspired workforce and mature, efficient management processes, while sustaining public confidence in its employees and capabilities. The SRS core values include performing safe and effective operations, along with maintaining good relations with Site stakeholders. The Site's main activities are currently treating and processing waste, environmental cleanup and remediation, tritium processing, and protecting nuclear material.

The DOE Office of Environmental Management (DOE-EM) and the National Nuclear Security Administration (NNSA) oversee the Site mission. DOE-EM's primary mission at the Savannah River Operations Office is to ensure that SRS operations and the cleanup of legacy waste protect public health and the environment. DOE-EM executes this mission with the support of contractors and subcontractors, universities, and federal agencies. Additionally, DOE-EM has various agreements with the United States Forest Service-Savannah River (USFS-SR), the University of Georgia (UGA), the University of South Carolina (USC), and Ameresco (via contract) to manage and conserve the Site's environmental resources. The USFS-SR oversees SRS's natural resources through an interagency agreement with DOE-SR. UGA has operated the Savannah River Ecology Laboratory (SREL) since 1951, independently evaluating the environmental risk associated with Site activities. Since 1978, USC has overseen the Savannah River Archaeological Research Program (SRARP), a research unit that provides the technical expertise to manage SRS cultural resources. Ameresco Federal Solutions maintains a cogeneration power plant that uses renewable materials to supply steam, eliminating the need for coal.

The NNSA's Savannah River Field Office (SRFO) is responsible for the defense programs, and the NNSA Office of Defense Nuclear Nonproliferation is responsible for the nuclear nonproliferation elements of the national security missions.

Savannah River Nuclear Solutions (SRNS), Savannah River Remediation (SRR), Centerra-SRS, and Battelle Savannah River Alliance (BSRA) contract with DOE to directly contribute to both the DOE-EM and NNSA missions. SRNS, as the management and operations contractor, oversees and ensures safe and efficient operations at SRS, managing landlord services and supporting both DOE-EM cleanup (excluding liquid waste operations) and NNSA activities. SRR, the liquid waste operations contractor, treats and disposes radioactive liquid waste and is responsible for tank closures. SRR works closely with Parsons Government Services, Inc., a limited-service contractor to DOE-EM, to design, construct, and commission the Salt Waste Processing Facility (SWPF) to accomplish SRR's goals. Centerra-SRS provides a uniformed protective force and physical protection of DOE and NNSA security interests at the Site. In June, BSRA became the management and operations contractor for the Savannah River National Laboratory (SRNL), whose mission is applied research and development in environmental remediation and risk reduction, nuclear materials processing and disposition, nuclear detection and national security, and clean energy applications.

1.3 SITE LOCATION, DEMOGRAPHICS, AND ENVIRONMENT

SRS borders the Savannah River and encompasses about 310 square miles of Aiken, Allendale, and Barnwell counties in South Carolina. SRS is about 12 miles south of Aiken and 15 miles southeast of Augusta, Georgia (Figure 1-1). The Savannah River flows along the Site's southwestern border. The capital letters on the Figure 1-1 map reference the operational areas within the SRS borders.

Based on the U.S. Census Bureau's 2010 data, the population within a 50-mile radius of H Area is 1.4 million people. This translates to about 107 people per square mile outside the SRS boundary, with the largest concentration in the Augusta metropolitan area.

1.3.1 Water Resources

An Aerial View of the Savannah River as it Borders SRS

SRS activities potentially impact water resources, including the Savannah River, Site streams, and the underlying groundwater. The Savannah River bounds SRS on the southwest for 35 river miles. The upriver boundary of SRS is about 160 river miles from the Atlantic Ocean. The nearest downriver municipal facility that uses the river as a drinking water source (Beaufort-Jasper Water and Sewer Authority's Purrysburg Water Treatment Plant) is about 90 river miles from the Site. Commercial fishermen, sport fishermen, and boaters also use the river. The Savannah River is not currently used for any large-scale irrigation projects downriver of the Site. The groundwater at SRS migrates through the subsurface, primarily discharging into the Savannah River and its tributaries. SRS uses groundwater for both industrial processes and drinking water.

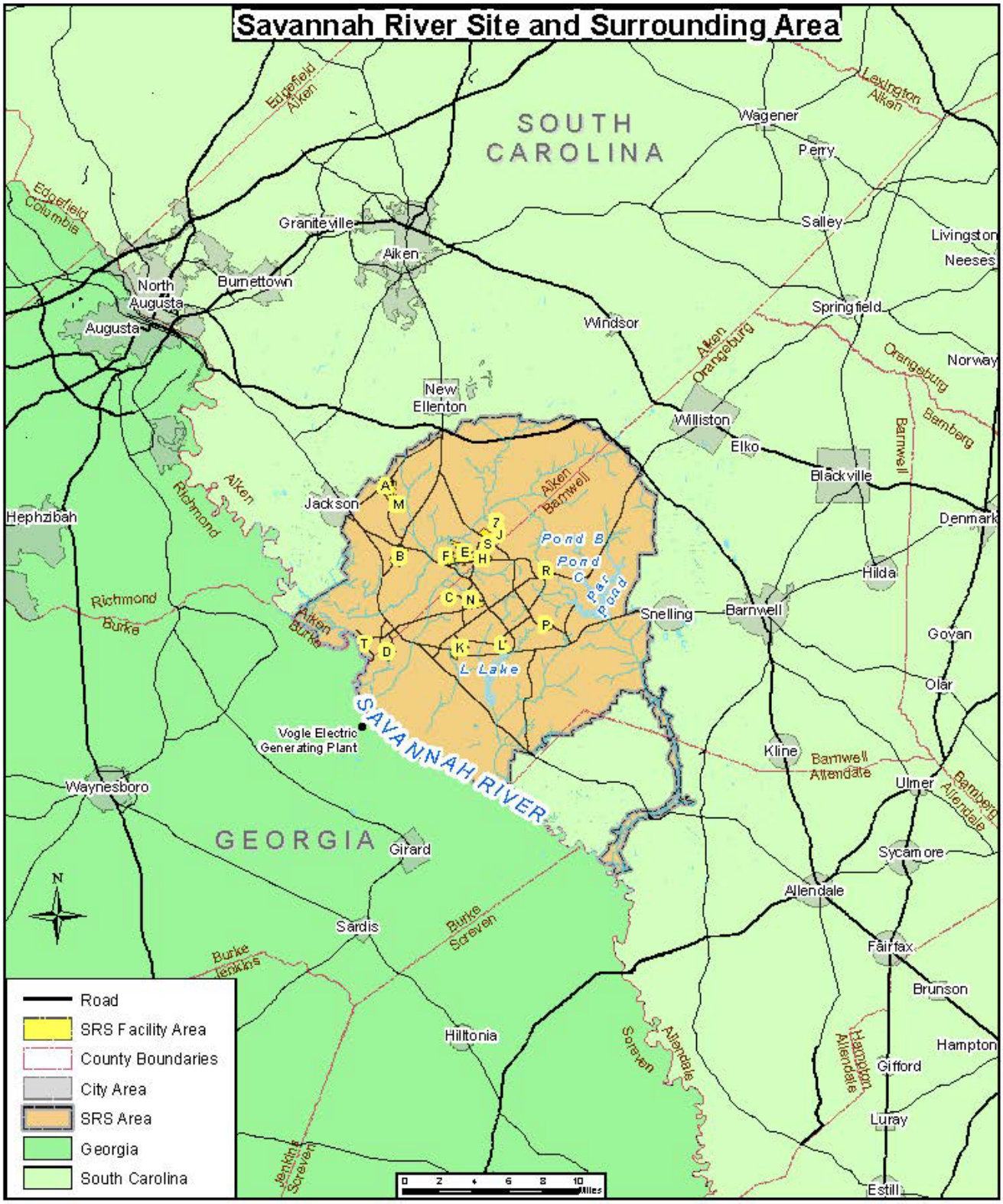

Figure 1-1 The Savannah River Site and Surrounding Areas

1.3.2 Geology

An Aerial View of a Carolina Bay at SRS

SRS is located on the southeastern Atlantic Coastal Plain in the Aiken Plateau. The center of SRS is about 25 miles southeast of the geologic fall line that separates the Coastal Plain from the Piedmont. The Aiken Plateau slopes gently to the southeast and is generally well-drained, although many poorly drained depressions exist. Elliptical-shaped Carolina bays, for example, are common on the Aiken Plateau. All major streams on SRS originate onsite, except for Upper Three Runs, which begins above the Site. All onsite streams drain into the Savannah River (Denham 1995).

1.3.3 Land and Forest Resources

About 10% of SRS's land is industrial; the remaining 90% consists of natural and managed forests that the USFS-SR plants, maintains, and harvests. SRS consists of four major forests: 1) mixed-pine hardwoods, 2) sandhills pine savanna, 3) bottomland hardwoods, and 4) swamp floodplain forests. These forests, as well as Carolina bays, are accessible to the public when visiting the Crackerneck Wildlife Management Area and Ecological Reserve near Jackson, South Carolina. Carolina bays provide important wetland habitat and refuge for many plants and animals. As many as 300 Carolina bays exist on SRS.

1.3.4 Animal and Plant Life

SRS is home to many varieties of plants and animals, including

- More than 100 species of reptiles and amphibians
- Approximately 50 species of mammals
- Nearly 100 species of fish
- Nearly 600 species of aquatic insects
- Approximately 1,500 species of plants, of which at least 40 are of state or regional concern
- More than 250 species of birds, some of which are migratory and do not make SRS their permanent home

This Young Alligator, which is Part of the SREL Outreach Program, is One of the Many Reptiles Found at SRS.

The Site also provides habitat for federally listed as threatened or endangered animal and plant species, including the wood stork, the red-cockaded woodpecker, the gopher tortoise, the pondberry, and the smooth coneflower.

1.4 DOE-EM PRIMARY SITE ACTIVITIES

DOE's Environmental Management Program oversees many Site activities. The following sections highlight key programs. Additional information is available on the SRS website.

1.4.1 Nuclear Materials Management

Nuclear Materials Management operations provide an interim storage location for a portion of the nation's excess plutonium. SRS has two facilities designated for the handling and extended safe storage of plutonium and other special nuclear materials. Facility infrastructure and security upgrades are being addressed to ensure safe plutonium storage until the Surplus Plutonium Project is fully implemented.

1.4.2 Nuclear Materials Disposition

H Canyon is the only operating radiologically shielded chemical separations facility in the United States. Since 2003, H Canyon has recovered highly enriched uranium from various sites across the DOE complex and from foreign test reactors. DOE now uses H Canyon to blend down highly enriched uranium into low-enriched uranium fuel. Blending down, or down blending, as it is sometimes referred, mixes the uranium with natural uranium to not only render it undesirable to use in nuclear weapons, but also to make it useable for commercial nuclear reactors. However, H Canyon has not shipped blended-down uranium since 2011, and DOE is evaluating the direct transfer of dissolved spent nuclear fuel, including uranium, into liquid waste batches for disposition.

1.4.3 Spent Nuclear Fuel Storage

SRS supports the DOE National Security mission by safely receiving and storing spent fuel elements from foreign and domestic research reactors, pending disposition. Currently, SRS stores spent nuclear fuel at the L-Area Complex.

1.4.4 Waste Management

SRS manages radiological and nonradiological waste created by legacy operations as well as newly generated waste from ongoing Site operations.

1.4.4.1 Radioactive Liquid Waste Management

SRS generates radioactive liquid waste as the byproduct of processing nuclear materials for national defense, research, and medical programs. The Site safely stores approximately 34 million gallons of radioactive liquid waste underground in the F-Tank Farm and H-Tank Farm in F Area and H Area, respectively. Closing these tanks is a high priority for DOE-EM. To do this, SRS must first remove the waste from the tanks, which is mostly salt waste, and then process and treat the waste before disposing of it.

SRS mixes the salt solution at the Saltstone Production Facility to make saltstone and disposes of this low-activity liquid waste in cylindrical tanks, known as Saltstone Disposal Units (SDUs). The Saltstone facilities processed and disposed of more than 3.14 million gallons of waste during 2021. SDU-6, the first mega-vault at SRS, continues to receive the saltstone for disposal, and SRS completed construction of SDU-7, the second of seven SRS mega-vaults. Construction of the next two mega-vaults, SDU-8 and SDU-9, continued in 2021.

SRS uses the Defense Waste Processing Facility (DWPF) to process high-activity waste from the F-Tank Farm and H-Tank Farm. Since DWPF began operating in March 1996, it has produced more than 16.6 million pounds of glass—immobilizing 63.2 million curies (Ci) of radioactivity—and pouring more than 4,288 canisters. In 2021, DWPF produced 62 canisters of glass, weighing 230,000 pounds and immobilizing 1.06 million Ci of radioactivity.

DWPF is Key to Liquid Waste Processing. It Has Immobilized More Than 63 Million Ci of Radioactivity since 1996.

SWPF is a major piece of the liquid waste system and will process most of the Site's salt waste inventory by separating the highly radioactive waste from the less radioactive salt solution. Hot commissioning of SWPF was completed in January 2021, and operations began on January 17, 2021. The primary focus in the first year was safe and successful operations of the new facility. During 2021, SWPF processed just over 2 million gallons of liquid waste.

1.4.4.2 Solid Waste Management

SRS manages the following types of solid waste:

- Low-level waste: ordinary items, such as coveralls, gloves, and hand tools, contaminated with small amounts of radioactive material
- Transuranic (TRU) waste: protective clothing, equipment, and job waste containing alpha-emitting isotopes with an atomic number greater than that of uranium (92)
- Hazardous waste (nonradiological): toxic, corrosive, reactive, or ignitable material that could affect human health or the environment
- Mixed waste: construction debris, laboratory samples, and soils containing both hazardous and radioactive components
- Sanitary waste: office waste, other wastes similar to household waste, and industrial or construction waste that is neither radioactive nor hazardous

SRS manages all solid waste it generates, including radioactive, hazardous, and nonhazardous, according to federal and state requirements. The Site disposes of all hazardous waste it generates in offsite RCRA-permitted facilities. The Site also emphasizes recycling and minimizing waste to reduce the waste volume that it must manage.

SRS packages TRU waste and transports it in U.S. Department of Transportation-approved containers for underground disposal at the Waste Isolation Pilot Plant (WIPP), DOE’s geologic repository in New Mexico.

SRS began shipping TRU waste to WIPP in May 2001 and has made more than 1,670 shipments. It made eight TRU shipments in 2021.

DOE conducts annual reviews to ensure that Site operations are within DOE's performance standards. The annual reviews for the E-Area Low-Level Waste Facility Performance Assessment (PA) and the Saltstone Disposal Facility PA showed that SRS continued to operate these facilities in a safe and protective manner.

SRS Has Sent 1,670 TRU Waste Shipments to WIPP during the Last 20 Years.

1.4.5 Area Completion Projects

SRS's Area Completion Projects (ACP) is responsible for investigating and remediating waste units, surface water, and groundwater onsite. The EPA and SCDHEC have oversight of the remedial programs that reduce the footprint of legacy wastes and contamination, treat and immobilize contamination in soil and groundwater, and slow contaminate transport. Cleanup can include capping inactive waste sites; installing and operating efficient groundwater treatment units; deactivating and decomissioning excessed EM facilities; and using natural remedies, such as bioremediation (employing naturally occurring microbes).

1.4.6 Environmental Monitoring

SRS has an extensive environmental monitoring program, with records and documents from 1951, prior to the start of Site operations. Beginning in 1959, SRS made offsite environmental surveillance data available to the public. SRS reported onsite and offsite environmental monitoring separately until 1985, when it merged data from both programs into one publicly available document, the *U.S. Department of Energy Savannah River Plant Environmental Report for 1985.*

SRS continues to conduct an extensive environmental monitoring program to determine impacts, if any, from SRS to the surrounding communities and the environment, both on and offsite. In addition to the onsite environmental monitoring the Site conducts, SRS also monitors a 2,000-square-mile area beyond the Site boundary. This area includes neighboring cities, towns, and counties in South Carolina and Georgia. SRS collects samples of air, rainwater, surface water, drinking water, groundwater, food products, wildlife, soil, sediment, and vegetation. The Site evaluates these samples for radionuclides, metals, and other chemicals that could be in the environment because of SRS activities.

1.5 NNSA PRIMARY SITE ACTIVITIES

The NNSA operates tritium facilities at SRS to supply and process tritium, a radioactive form of hydrogen gas that is a vital component of nuclear weapons. SRS also plays a critical role in the NNSA's nonproliferation missions, helping the United States meet its commitments to security and disposing of plutonium and uranium.

1.5.1 Tritium Processing

SRS has the nation's only facility for extracting, recycling, purifying, and reloading tritium. SRS replenishes tritium by recycling it from existing warheads and by extracting it from target rods irradiated in nuclear reactors that the Tennessee Valley Authority operates. SRS purifies recycled and extracted gases to produce tritium used by the Department of Defense for nuclear weapons. Helium-3 gas, a byproduct of the tritium production process, is used for neutron-detection equipment. SRS is the sole producer of helium-3 gas in the United States.

In 2021, Savannah River Tritium Enterprise (SRTE) continued facility infrastructure improvements to ensure robust plant operation, contributing to overall efficiency and the ability to meet future mission needs.

SRS tritium facilities are part of the NNSA's Defense Program at SRS. The Defense Programs page of SRS's website includes more information.

1.5.2 Nuclear Nonproliferation

In continued support of nonproliferation goals, SRS continued carrying out the Surplus Plutonium Disposition mission to permanently dispose of weapons-grade plutonium declared excess to national security, with priority on disposition and removing plutonium previously consolidated onsite.

1.5.3 Pit Production

In June 2021, the NNSA announced approval for the recommended approach to produce at least 50 plutonium pits per year at the Savannah River Plutonium Processing Facility (SRPPF) project. The approval marked the completion of the project definition phase and the conceptual design as part of DOE's process for acquiring capital assets outlined in DOE's Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets.*

1.6 SPECIAL ENVIRONMENTAL STUDIES

SRS provides a unique setting for environmental study. Several organizations at the Site—SREL, USFS-SR, SRARP, and SRNL—conduct research to support a better understanding of human impact on both plants and animals.

SREL and USFS-SR provide annual reports on the environmental studies and research they conduct on SRS. These reports, available on the *SRS Environmental Report 2021* webpage, present and discuss environmental studies and research that occurred during the reporting year. Special environmental studies and research directly impacting the SRS environmental monitoring program and dose calculations are presented and discussed in their respective chapters.