

# SRS

## *OVERVIEW*

**Environmental Stewardship • Nuclear Security • Science and Energy**

 **Savannah River Site™**

**U.S. Department of Energy site located in Aiken, South Carolina | July 2023**



*Dedicated to maintaining the highest possible safety and security standards, the Savannah River Site (SRS) is a key U.S. Department of Energy (DOE) industrial complex responsible for environmental stewardship, environmental cleanup, nuclear waste management and disposition of nuclear materials.*

*The Savannah River Site is owned by the U.S. Department of Energy.*

## dedicated to **SAFETY**

SRS is committed to its people, missions and the future. SRS has a long track record of being one of the safest sites in the DOE complex and one of the safest major industrial sites in the world. Protecting workers, the public, the environment and national security interests are our highest goals.

## **MISSION** focused

SRS processes and stores nuclear materials in support of national defense and U.S. nuclear nonproliferation efforts. The Site also develops and deploys technologies to improve the environment and treat solid and liquid nuclear and hazardous wastes left from the Cold War. While current missions remain the highest priority, SRS leadership places great importance on developing broader missions for SRS that use its unique capabilities in order to address critical national missions.

## rooted in **HISTORY**

During the 1950s, SRS began to produce materials used in nuclear weapons, primarily tritium and plutonium-239. Five reactors and support facilities were built to produce these nuclear materials. Irradiated materials were moved from the reactors to one of the two chemical separations plants. In these facilities, known as “canyons,” the irradiated fuel and target assemblies were chemically processed to separate useful products from waste. After refinement, nuclear materials were shipped to other DOE sites for final application. SRS produced about 36 metric tons of plutonium from 1953 to 1988.

## safeguarding the **ENVIRONMENT**

Originally farms and swamp land, SRS now encompasses a timber and forestry research center managed by the U.S. Forest Service-Savannah River. In 1972, SRS was designated as the first National Environmental Research Park. Today, the vast forests of SRS are home to rare and endangered species including wood storks, bald eagles and red-cockaded woodpeckers, as well as wild turkeys, white-tailed deer and otters.

# The 'City' of SRS



fire department and emergency services



230 miles of roads and first South Carolina cloverleaf



medical facilities



information technology networks



weather center



biofuels plant for power generation



locomotive and train tracks



water and electrical utilities



To support operations, SRS maintains an infrastructure similar to a small city.



SRS is owned by the U.S. Department of Energy.

Federal agencies at SRS include:

Department of Energy:  
Savannah River Operations Office

National Nuclear Security  
Administration

U.S. Forest Service-Savannah River

U.S. Nuclear Regulatory Commission

U.S. Army Corps of Engineers

1950

President Harry S. Truman  
authorizes construction of SRS

Six towns were moved to make way for  
the Savannah River Plant (now SRS).

\$3.8

billion  
annual budget

12,700

current employees  
(contractors and federal agencies)



5

reactors originally constructed

Also, two chemical separations plants,  
a heavy water extraction plant,  
a nuclear fuel and target fabrication  
facility, a tritium extraction facility and  
waste management facilities.

310

square-mile site

Located on the Savannah River,  
which borders South Carolina  
and Georgia. SRS covers  
198,046 acres, including parts  
of Aiken, Barnwell and Allendale  
counties in South Carolina.

6

major contractors

Savannah River Nuclear Solutions, LLC  
Management and operations of SRS

Battelle Savannah River Alliance, LLC  
Management and operations of Savannah  
River National Laboratory

Savannah River Mission Completion, LLC  
Liquid waste operations

Ameresco  
Biomass Cogeneration Facility

Centerra Group, LLC  
SRS security

University of Georgia  
Savannah River Ecology Laboratory

# Our Missions

**47% EM**  
Environmental  
Management

- Management, stabilization and disposition of nuclear materials
- Management and disposition of solid, liquid and transuranic wastes
- Spent fuel management
- Environmental remediation and cleanup

**51% NNSA**  
National Nuclear  
Security Administration

- Tritium operations and extraction
- Nonproliferation support
- Foreign fuel receipts
- Pit production mission
- Surplus Plutonium Disposition

**2% WFO**  
Work for Others

- Other federal agencies
- Other DOE sites
- Private industry
- Other minor entities

# Nuclear Materials Management

## Spent Fuel Operations

**2,509** spent nuclear fuel casks received      **3.4** million gallons of water in L Basin

Spent nuclear fuel (SNF) is nuclear fuel that has been irradiated in a nuclear reactor. SNF from the Site's former production reactors and from foreign and domestic research reactor programs is currently safely stored in an underwater storage facility in L Area, called a disassembly basin. L Basin has concrete walls two and a half to seven feet thick and holds approximately 3.4 million gallons of water, with pool depths of 17 to 50 feet. The basin water provides shielding to protect workers from radiation. Since 1964, SRS has received more than 2,509 casks containing over 48,219 SNF assemblies.

## K Area Complex

The K Area Complex (KAC) provides for the handling and interim storage of our nation's excess plutonium (Pu) and other special nuclear materials. In 2017, the KAC initiated Pu downblend operations, a nonproliferation initiative that mixes surplus Pu oxide with an adulterant mixture. The material is then packaged, stored and eventually shipped for safe permanent disposal at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. The downblend process continues as part of the Dilute and Dispose strategy for disposition of much of the surplus Pu inventory for the DOE complex.

Downblending operations were expanded from one to four full shifts in 2021. Site preparation continues on a capital project to expand downblending capability by installing three new gloveboxes and support systems. SRS has also constructed a weather-sheltered concrete pad in K Area to store Criticality Control Overpacks of diluted Pu oxide and initiated shipments of Pu directly from K Area to WIPP in December 2022.



A cask receipt in L Basin



Activities in the K Area Complex

# H Canyon



**1955** H Canyon began operations.  
The facility is still in use

**30** NASA deep-space explorations  
powered by plutonium-238  
recovered in H Canyon

**22** hours to dissolve  
a fuel bundle in  
nitric acid

**ABD** Accelerated Basin De-Inventory

**100** feet tall, or about 10 stories high



**1,028** feet long,  
more than three football fields



## H Canyon/HB Line

SRS' two primary separations facilities, called "canyons," are located in F and H Areas. F Canyon and H Canyon—together with FB Line and HB Line, which are located atop the canyons—are where nuclear materials historically have been chemically recovered and purified. F Canyon and FB Line have been deactivated and await further disposition decisions.

HB Line located on top of H Canyon, is the only chemical processing facility of its kind in the DOE complex. The facility historically performed plutonium and neptunium oxide production, including Pu-238 for NASA. The facility is in lay-up state and also awaits further disposition decisions.

H Canyon is the only remaining operating production-scale, nuclear chemical separations facility in the U.S. The facility's operations originally recovered uranium-235 and neptunium-237 from SNF rods from the Site's production reactors and from domestic and foreign research reactor programs. Some of the uranium recovered in the past was converted into a form usable for commercial nuclear fuel production.

H Canyon's current mission involves dissolving SNF currently stored in the L Area Disassembly Basin and sending it through the Site's liquid waste program to be vitrified and safely stored on-site until a federal repository is identified. H Canyon's mission objective is to disposition up to more than 3,000 SNF bundles in L Basin by 2034.

Remotely controlled cranes are used to perform all work inside of the canyons.



High Flux Isotope Reactor Fuel being lowered into a dissolver in H Canyon with the use of a remote control crane.



H Canyon operators check readings on the wall panel in the H Canyon Control Room (left); An operator works at the Distributed Control System, which controls many of the canyon processes (right).





# National Nuclear Security Administration

SRS plays a vital role in two of the National Nuclear Security Administration's (NNSA's) core missions:

- **Stockpile Support:** *Maintain the safety, security and effectiveness of the U.S. nuclear weapons stockpile through application of unparalleled science, technology, engineering and manufacturing*
- **Nonproliferation:** *Prevent nuclear weapon proliferation and reduce the threat of nuclear and radiological terrorism around the world*

## Stockpile Support

The purpose for establishing SRS in the 1950s was to support the nation's nuclear defense. Today, the Site continues to fulfill that purpose.

## Savannah River Tritium Enterprise

Since its start, SRS carries out crucial missions related to tritium, the radioactive isotope of hydrogen necessary to the modern nuclear stockpile. SRS is the nation's only facility for extracting, recycling, purifying and reloading tritium. SRS supports five tritium and gas transfer system-related missions on behalf of the NNSA.

- Tritium supply - With a half-life of only 12.3 years, tritium must be continually replenished. SRS accomplishes this in two ways: by recycling it from existing warheads and by extracting it from target rods that have been irradiated in a Tennessee Valley Authority commercial power nuclear reactor.
- Stockpile maintenance - SRS helps maintain the U.S. nuclear stockpile by replenishing gas transfer systems that ensure performance of nuclear weapons; reservoirs are loaded with a mixture of tritium and deuterium gases, finished, assembled, inspected, packaged and shipped.
- Stockpile evaluation - In the absence of nuclear weapons testing, designers must rely on SRS evaluation data to certify the reliability of U.S. nuclear weapons; samples of nuclear weapons are removed from the active stockpile, and their gas transfer systems are sent to SRS for testing.
- Helium-3 recovery - Helium-3, which is a by-product of SRS tritium processing, is a precious commodity used in neutron detection equipment and other applications, and SRS is its sole U.S. source.
- Research and development - Savannah River Tritium Enterprise (SRTE) facilities provide a capability not available anywhere else to safely perform research and development (R&D) involving large quantities of tritium. SRTE works closely with Savannah River National Laboratory (SRNL) to support NNSA's tritium R&D initiatives.

To ensure that SRTE remains able to carry out its important missions in support of the nation's nuclear deterrent in the decades to come, a new Tritium Finishing Facility is in the works. This new facility, expected to be completed in FY35, will replace the last of SRTE's Cold War-era operating facilities.

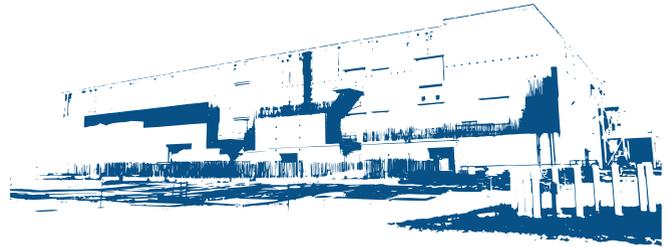
# Savannah River Plutonium Processing Facility

A plutonium pit is a critical component of every nuclear weapon. The United States' current capability to produce them is very limited. In 2018, the Nuclear Weapons Council endorsed the NNSA's approach for supplying plutonium pits to meet stockpile requirements: a two-site strategy with SRS producing no fewer than 50 pits per year (ppy) and Los Alamos National Laboratory producing no fewer than 30 ppy.

Under the two-site strategy, the unfinished Mixed Oxide Fuel Fabrication Facility will be repurposed as the Savannah River Plutonium Processing Facility (SRPPF). Use of this high-hazard, high-security facility will allow NNSA to make use of an existing seismically qualified structure, with numerous supporting facilities. Repurposing this facility requires modifications and installation of manufacturing and support equipment directly associated with the pit production mission.

In June 2021, the SRPPF project received Critical Decision-1 (CD-1) approval. This decision approves the conceptual design and an initial range for the cost and schedule. Additionally, it authorizes SRS to proceed in maturing the design and refining cost and schedule ranges to establish a project performance baseline.

The NNSA is also establishing the Plutonium Modernization Program to develop and train the workforce prior to SRPPF project completion and startup to operate SRPPF once project completion and facility operations are authorized.



## Nonproliferation

SRS' nuclear materials expertise and capabilities make it a valued contributor to NNSA's nonproliferation mission.

## Plutonium Disposition

NNSA's Surplus Plutonium Disposition (SPD) mission at SRS is to permanently dispose of 34 MT of weapons-grade plutonium declared excess to national security, with priority on disposition and removal of plutonium previously consolidated at SRS. NNSA's preferred plutonium disposition approach is the "Dilute and Dispose" method. This method, also referred to as plutonium downblending, uses an adulterant material to dry blend with plutonium oxide. This produces a mixture that is not usable for weapons and can be safely disposed of at the WIPP in New Mexico. In addition, the SPD project, which received CD-1 approval in December 2019, will expand downblend capability by installing three new gloveboxes and other capabilities.



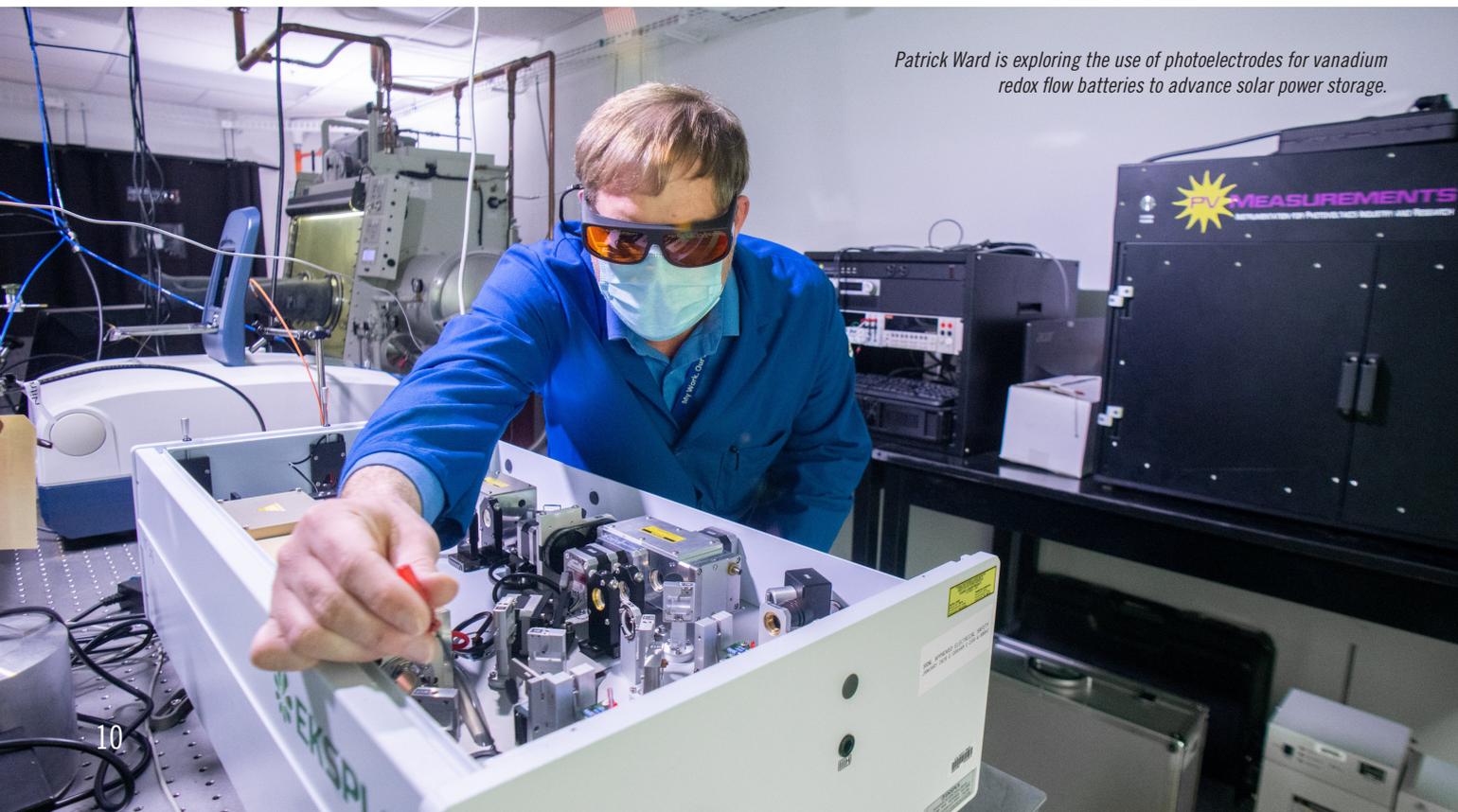
# Savannah River National Laboratory

SRNL puts science to work to help protect our environment, secure our clean energy future, serve our national defense and reduce emerging nuclear threats. SRNL is one of 17 national laboratories and it is the only national lab sponsored by the Department of Energy's Office of Environmental Management.

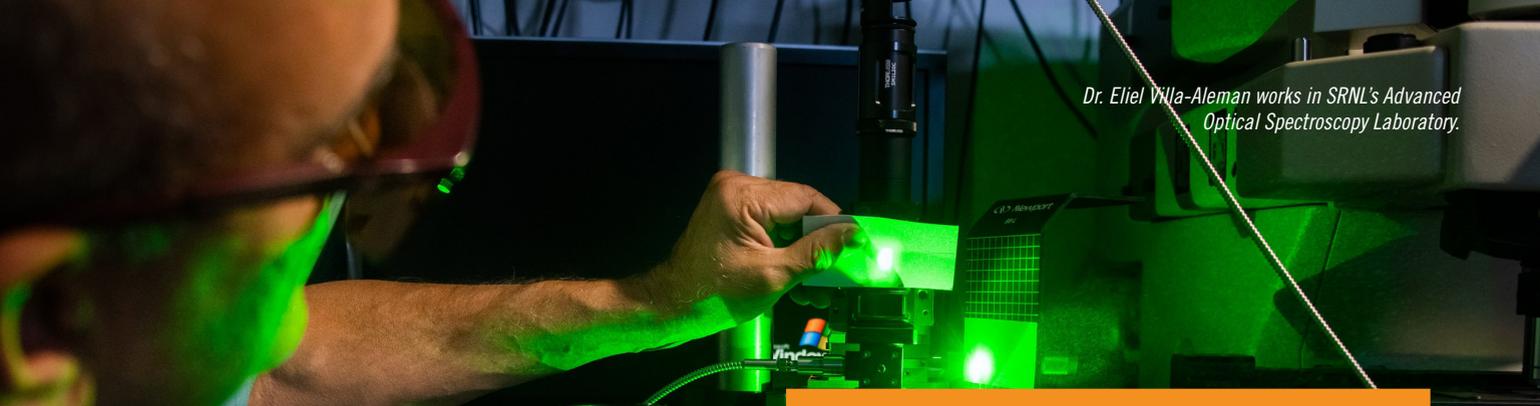
SRNL is a multi-program national laboratory with an annual operating budget of \$400M, is a leading research and development institution for the Offices of Environmental Management and Legacy Management at the U.S. Department of Energy and the Weapons and Nonproliferation programs for the National Nuclear Security Administration.

The Battelle Savannah River Alliance—a partnership with the University of South Carolina, Clemson University, South Carolina State University, Georgia Tech, the University of Georgia and small business partners Longenecker & Associates and TechSource—manages and operates SRNL.

Scientists and engineers at SRNL use leading edge science and technology to advance DOE's critical mission outcomes.



*Patrick Ward is exploring the use of photoelectrodes for vanadium redox flow batteries to advance solar power storage.*



Dr. Eliel Villa-Aleman works in SRNL's Advanced Optical Spectroscopy Laboratory.

## SRNL *by the numbers*

We Put Science to Work

**830,000** + Square feet, with 200,000+ square feet of radiologically controlled labs

**500** + patents associated with SRNL since the 1950s

**100** + public and private partners

**50** + U.S. federal office and agency clients

**\$400M** + annual operating budget

Providing applied science & engineering to **16** active and **100** post-closure DOE sites



# Nuclear Waste Management

## Liquid Waste Operations

Past SRS nuclear material production created unusable by-products, such as radioactive liquid waste. About 34 million gallons of radioactive liquid waste are stored in 43 operational underground tanks at SRS.

The Defense Waste Processing Facility (DWPF) is processing the high-activity waste from the tanks by immobilizing radioactive elements as a borosilicate glass form that is then put into stainless steel canisters. The glassified waste is a stable form for permanent disposal. Since DWPF began operations in March 1996, more than 16.8 million pounds of radioactive glass have been produced. The canisters are currently stored on-site in one of two Glass Waste Storage Buildings (GWSB). These buildings consist of a below-grade seismically qualified, steel-reinforced concrete vault containing support frames for vertical storage of canisters.

Originally, the first GWSB was designed to hold 2,262 single-stacked canisters. In 2015, the existing design of GWSB 1 was re-evaluated and determined through several studies that, with some minor modifications to the shielded storage plug and removal of the canister support crossbars, a second canister could be safely stored on top of the first one. This innovation, which is recognized as Canister Double-Stack Project, increased the available storage capacity in GWSB 1 to 4,524 canisters.

GWSB 2, with a similar design to GWSB 1, has 2,340 canister storage locations. Double-stack modifications like GWSB 1 are planned for GWSB 2 and will increase the capacity to 4,680 canisters, negating the need for an additional interim storage building.

Most of the liquid waste in the tanks is low-activity salt waste, and it is removed from the tanks and decontaminated at the Salt Waste Processing Facility (SWPF), which began processing waste in October 2020. SWPF is the key liquid waste facility for processing approximately 90 percent of the SRS tank waste. SWPF is separating the salt waste into a low-volume, high-activity fraction for vitrification in DWPF and a high-volume, decontaminated salt solution (DSS) for treatment at the Saltstone Production Facility (SPF) to be disposed as saltstone.

DSS from salt processing is sent through SWPF to SPF, where it is mixed with dry materials to form a grout and poured into above-ground, cylindrical concrete units called Saltstone Disposal Units (SDUs) for permanent disposal. These SDUs hold approximately 33 million gallons of grouted DSS. Filled units will eventually be capped with an engineered cover consisting of several layers of impermeable materials, isolating them from the environment.



*Saltstone Disposal Units at SRS*

# 16.8

million pounds of radioactive glass produced in DWPF since 1996

# 8

of 51 radioactive liquid waste tanks operationally closed since 1997

# 36

million gallons of grout produced at the Saltstone Production Facility

*Empty canisters await being used in the Defense Waste Processing Facility*



# Liquid Radioactive Waste Tank Closure

SRS waste tanks have provided more than 60 years of safe storage for radioactive liquid waste. Removing waste from the tanks will allow for operational closure of the Site's high activity waste tanks.

SRS is home to the first two liquid radioactive waste operational tank closures in the nation. These two closures in 1997 were followed with two in 2012, two in 2013, one in 2015 and one in 2016.

DOE, the South Carolina Department of Health and Environmental Control (SCDHEC), the U.S. Environmental Protection Agency and the public worked closely together to establish strict closure requirements that supported all state and federal regulations.

Closure activities for the tanks began years before the actual operational closing of the tanks. Initially, once agreements and closure plans with state and federal regulators are finalized, radioactive waste is removed from each tank to the maximum extent practical. The final closure activities begin with workers pouring specially formulated grout (a cement-like substance) into the approximately one-million-gallon tanks. This special grout stabilizes the tank and is used to impede the leaching and migration of the waste. Over the course of several weeks, the tanks are filled with grout using cement trucks, and tank top penetrations are sealed.

The old-style waste tanks are being closed in accordance with the Federal Facility Agreement (FFA). This process reduces risks to human health and the environment by securing residual waste in the tanks, which minimizes the potential for groundwater contamination.



*F tank farm in process of closure*



*A TRU PACT III waste container at SRS.*

## Solid Waste

Solid Waste Management is responsible for the disposition of SRS solid waste, which includes hazardous, sanitary, and construction and demolition (C&D) waste, plus low-level (LLW) and transuranic (TRU) radioactive waste. Sanitary waste is household materials and items that are recycled or disposed of at the Three Rivers Landfill. C&D waste is generated by SRS construction activities and is disposed of in a SCDHEC permitted landfill. Hazardous waste is collected and disposed of off-site at a permitted facility. Radioactive waste is classified into two categories, the majority of which is LLW, which is contaminated with predominately short-lived isotopes and is disposed of at SRS in engineered facilities. LLW that is also hazardous waste is disposed of off-site at a permitted facility.

The second category of radioactive waste is TRU waste. This waste typically consists of protective clothing, tools, rags, equipment and miscellaneous items contaminated with small amounts of Pu. TRU waste (including mixed TRU waste) is collected, characterized and packaged for off-site disposal at WIPP in New Mexico.

When the SRS TRU Ship-to-WIPP program began, over 30,000 containers of TRU waste were stored at SRS. The Site has made over 1,700 shipments of TRU waste to WIPP through March 2023.



**10,000** environmental and groundwater samples collected annually both on and off-site

**80%** of the 515 inactive waste units where remediation is complete

**4,105** environmental milestones and commitments met on or ahead of schedule since 1993

**317** inactive facilities that have been deactivated, decommissioned and demolished



# Environmental Compliance and Area Completion Projects

SRS Environmental Compliance and Area Completion Projects (EC&ACP) coordinates and provides environmental support and compliance-based oversight of SRS operations. EC&ACP ensures that SRS activities are conducted in accordance with state and federal environmental regulations while ensuring the safety and protection of workers, the public and the environment.

EC&ACP also manages extensive environmental and groundwater monitoring programs to determine impacts, if any, from SRS operations to the public, surrounding communities and the environment. SRS collects approximately 10,000 samples annually on and off-site in surrounding communities and analyzes them for radionuclides, metals and other chemicals.

EC&ACP investigates and remediates environmental contamination by removing, treating, capping or immobilizing the source of contamination, which prevents it from spreading to the environment. SRS performs these remedial activities in accordance with the FFA, the Comprehensive Environmental Response, Compensation, and Liability Act and the Resource Conservation and Recovery Act (RCRA), with public involvement and the full support of DOE-SR, the U.S. Environmental Protection Agency-Region 4 and SCDHEC. Since 1993, Area Completion Projects has achieved 4,105 FFA milestones and RCRA Permit commitments on or ahead of schedule.

Additionally, EC&ACP deactivates and decommissions inactive facilities across the Site and conducts closure and post-closure care and maintenance of inactive SRS waste units (e.g., seepage basins, rubble pits, rubble piles and disposal facilities).

Remediation at SRS remains a top priority. To date, more than 80% of the 515 waste units have been completed, and over 28% of the 1,126 excess facilities have been safely dispositioned.

Cleanup and decommissioning will continue until all areas at SRS are completed, returning them to the Site for repurposing or to be placed under post-closure care with institutional controls (access and land use restrictions, inspections, maintenance, long-term monitoring and reporting and ground water corrective actions and effectiveness monitoring) as appropriate.

In an ever-changing and always-challenging world, SRS looks toward the future with anticipation. It is our priority that each employee arrives, works and goes home safely, and our nation's valuable nuclear materials are protected.

Our employees will be at the heart of a successful future. Engaging our employees in developmental opportunities and increasing our recruitment will ensure a diverse workforce with priceless expertise and enthusiasm.

As always, SRS will strive to earn the community's support, trust and respect, with reliable stewardship of the environment and the nation's assets.

If you are interested in seeing SRS first-hand, please check the availability of public tours by visiting [www.srs.gov/general/tour/public.htm](http://www.srs.gov/general/tour/public.htm)

For general information about SRS, we invite you to visit [www.srs.gov](http://www.srs.gov).

*We're also on social media, including Facebook, YouTube, Twitter and Flickr.*



# Acronyms

C&D

construction and demolition

CD-1

Critical Decision -1

DOE

Department of Energy

DSS

Decontaminated Salt Solution

DWPF

Defense Waste Processing Facility

EC&ACP

Environmental Compliance  
and Area Completion Projects

EM

Environmental Management

FFA

Federal Facility Agreement

GWSB

Glass Waste Storage Building

LLW

low-level waste

KAC

K Area Complex

NASA

National Aeronautics and Space Administration

NNSA

National Nuclear  
Security Administration

PPY

Pits Per Year

Pu

Plutonium

R&D

research and development

RCRA

Resource Conservation and Recovery Act

SCDHEC

South Carolina Department  
of Health and Environmental Control

SDU

Saltstone Disposal Unit

SNF

spent nuclear fuel

SPD

Surplus Plutonium Disposition

SPF

Saltstone Production Facility

SRNL

Savannah River National Laboratory

SRPPF

Savannah River Plutonium Processing Facility

SRS

Savannah River Site

SWPF

Salt Waste Processing Facility

TRU

transuranic waste

WIPP

Waste Isolation Pilot Plant



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