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SRNS℠

We make the world safer.

2023 Annual Site Environmental Report (ASER)

ASER Development Core Team

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What is the ASER?

- **ASER stands for the Annual Site Environmental Report and is the primary document that the U.S. Department of Energy uses to inform the public of environmental performance and conditions at SRS.**

- Annual Site Environmental Reports (ASERs) are required by U.S. Department of Energy (DOE) Orders *231.1B, Environment, Safety, and Health Reporting*, and *458.1, Radiation Protection of the Public and the Environment.*

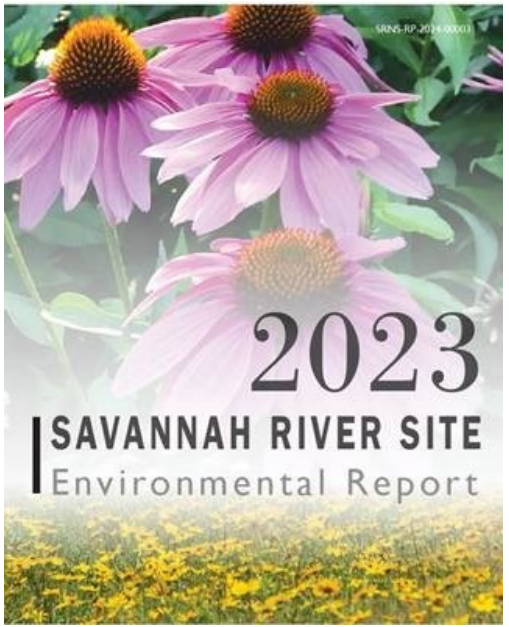
- ASERs provide the public and stakeholders information on:
  - Environmental program performance
  - Site-wide radiological environmental monitoring and surveillance effectiveness
  - Compliance status with environmental standards and requirements

- SRS began publishing the ASER in 1959.

SRS Annual Site Environmental Report

- **The ASER is a public document so anyone who has interest in the site's impacts to the surrounding areas should read it!**
  - DOE Headquarters
  - Regulators
  - Congress

Citizens Advisory Group
Activist Groups
Researchers
Professors and Students

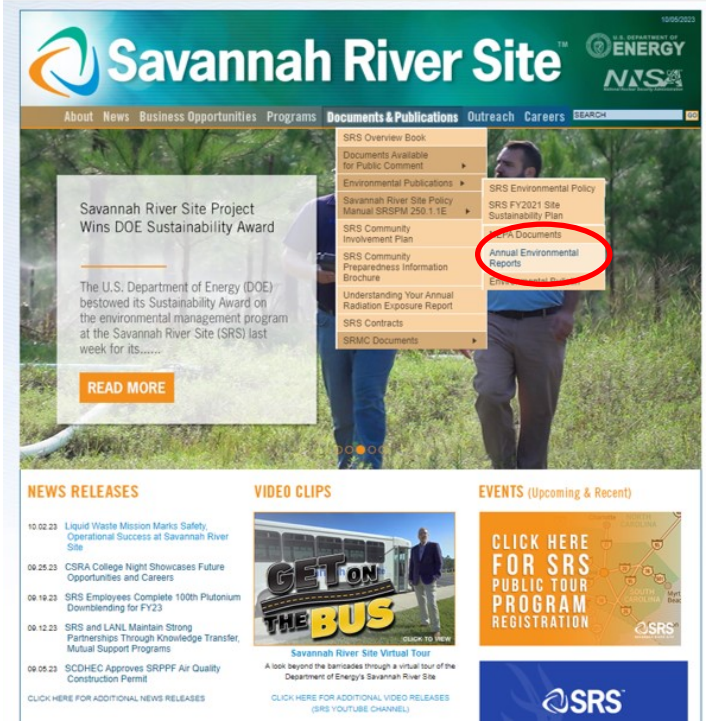


- **The ASER is broken down into 9 chapters and discusses 3 basic themes**
  - Environmental Compliance
  - Environmental Monitoring
  - Environmental Stewardship

https://www.srs.gov/general/pubs/ERsum/index.html

Where is it available?

- The ASER is available electronically to the public on or before October 1 each year
- The data and analysis within the report demonstrate that the safety and health of our workers and the surrounding area is the priority of the Savannah River Site.
- The reports can be found by going to srs.gov and selecting Annual Environmental Reports from the Documents and Publications drop down.
- Last 23 SRS ASERs are available electronically and posted on the SRS website.



2023 ASER Summary Report

- **Uses magazine-style articles to summarize the results of the ASER and further establish SRS's commitment to environmental stewardship**

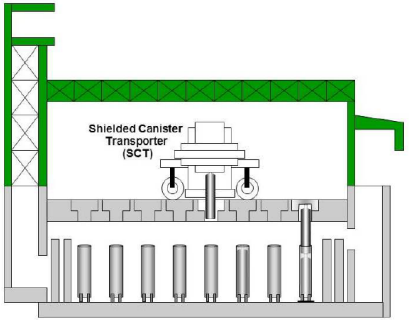
- **Links articles to comparable sections of the full report**
  - *Topics include*
    - *Overview of SRS*
    - *Radiological Monitoring and Dose*
    - *Environmental Accomplishments*
    - *Environmental Sustainability*
    - *Education Outreach*
    - *Engaging the Public*

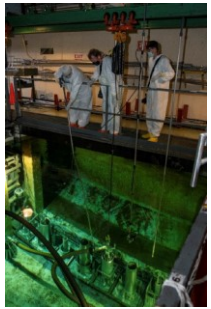
2023 ASER Summary Report

America the Beautiful: Conserve and Restore

Sustainability: Making the Change from Gallons to Volts

SRS Reaches New Landmark in Cost-Saving Double-Stack Project





Not Your Average Vacuum

Outreach: Inaugural Fishing Challenge, MSIPP Program

Environmental Monitoring at Savannah River Site

SRS Environmental Monitoring

- **SRS has performed environmental sampling and monitoring for over 60 years to**
  - Assess impact to the public and environment from Site operations
  - Monitor facility discharges
  - Include extensive on- and off-site locations, extending to Savannah
  - Sample media: air, water, groundwater, soil, food products (including fish) and vegetation
    - *Chemical*
    - *Radiological*

South Carolina and Georgia Counties Where Monitoring Occurs

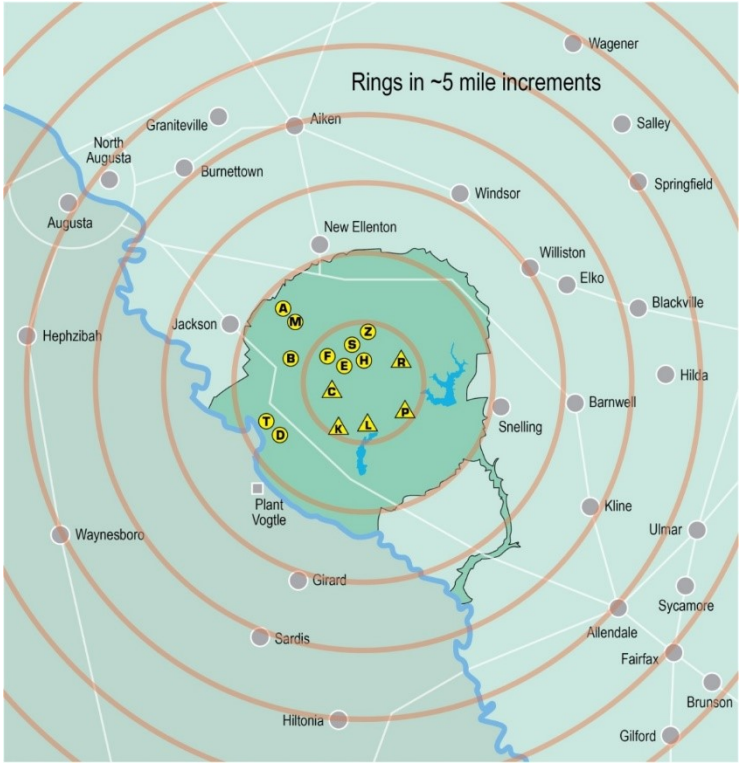
Why SRS Monitors

To ensure protection of the public and the environment

Environmental Monitoring: Site Operations

- **Site operations**
  - Located in the center of site
- **Provides large buffer area**
- **Monitoring focused on Site operational areas**
- **Monitored population centers**

Aiken	Allendale
Williston	Augusta
New Ellenton	North Augusta
Barnwell	Waynesboro



History of SRS Environmental Monitoring

- **Environmental baseline studies during the 1950s were performed by**
  - Scientists from UGA and USC, who ***collected baseline data on plant and animal communities***
  - Academy of Natural Sciences team in Philadelphia, under leadership of Dr. Ruth Patrick, which performed a ***biological study of the Savannah River***
  - Du Pont's Site Survey team of Health Physics personnel, which completed a ***landmark study of local natural radioactivity***
- **Environmental monitoring program established in 1953**

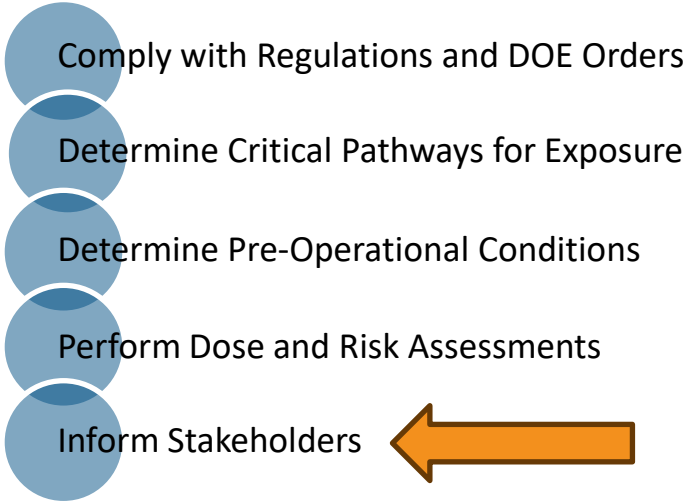
Dr. Ruth Patrick, pioneer in studying the health of freshwater streams and rivers, and member of the Academy of Natural Sciences

Environmental Monitoring Program

Purpose

The SRS Environmental Monitoring Program (EMP) serves the following two main purposes:

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

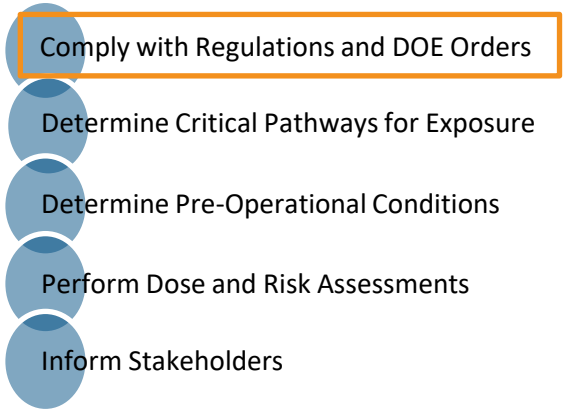


The Site's environmental personnel are responsible for the health of the environment and the impacts that healthy environments have on the people onsite and in surrounding areas.

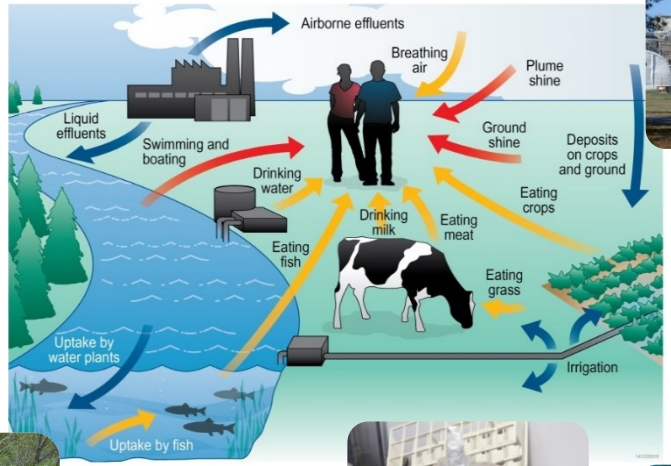
Environmental Monitoring Compliance

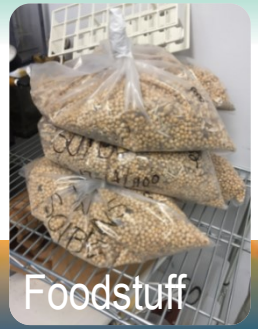
- **Radiological**
  - DOE Order 458.1 All Pathway Exposure Limit
    - All Pathway Total Effective Dose (TED) Limit – 100 mrem/yr
    - *DOE O 458.1 and EPA 40CFR 61, National Emission Standards for Hazardous Air Pollutants*
    - Airborne Total Effective Dose Limit – 10 mrem/yr
    - *EPA Clean Air Act*
      - SCDHEC Issues Part 70 Operating Permit Program
  - DOE O 458.1 and 40 CFR 141
    - Drinking Water Limit – 4 mrem/yr

- **Nonradiological**
  - EPA Clean Air Act (CAA)
    - CAA Part 70 Operating Permit Program
      - SCDHEC Title V Operating Permit
  - EPA Clean Water Act
    - *SCDHEC administers through National Pollutant Discharge Elimination System (NPDES)*
      - NPDES Industrial Stormwater and Industrial Wastewater Permits



Exposure Pathway & Sampling by Media





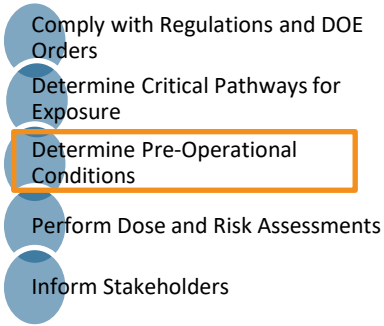
- Comply with Regulations and DOE Orders
- Determine Critical Pathways for Exposure
- Determine Pre-Operational Conditions
- Perform Dose and Risk Assessments
- Inform Stakeholders

Environmental Monitoring Program

Environmental Monitoring Activities are organized into two program areas:

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

- Environmental surveillance: collection of samples beyond the effluent discharge points and from the surrounding environment (which includes the environment beyond each facility)



Effluent Monitoring

The collection of samples or data directly from where liquid or gas is released onsite

- Radiological Effluent Monitoring
  - Air emissions from facility stacks or liquid discharges from facility outfalls

- Nonradiological Effluent Monitoring
  - Air releases are calculated from a model, and liquid data is acquired from facility outfalls

Environmental Surveillance

The collection of samples beyond the facilities and from the surrounding environment

Air

Liquid

- Streams
- Rivers
- Basins
- Drinking Water
- Rainwater

Foodstuffs

- Crops
- Dairy
- Vegetation

Soil and Sediment

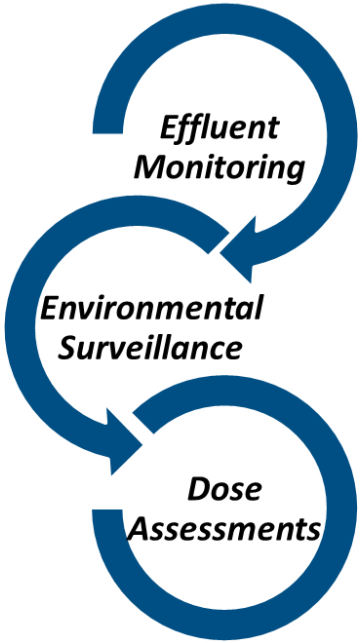
Wildlife

- Fish
- Deer
- Wild Hogs

Environmental Monitoring Program

- **2023 Nonradiological and Radiological monitoring program**
  - Air Pathway
    - All air contaminants released were below applicable permit and regulatory limits.
    - Radiological results for surveillance media were within historical levels.
  - Water Pathway
    - All industrial stormwater outfalls, industrial wastewater and drinking water systems were compliant with applicable standards.
    - Radiological water contaminants released by SRS were all below applicable standards and within historic levels.
  - Surveillance Media
    - Sediment, SRS streams, stormwater basins, and Savannah River samples were consistent with the background control locations and were comparable with historical levels.
    - Fish flesh sample results were consistent with historical levels.
    - All harvested animals that SRS monitored during the annual onsite hunts were below the applicable standards.
      - SRS monitored the deer, feral hogs, turkeys, and coyotes harvested during the hunts and released 355 animals.

How is this information used?



- **Data from effluent monitoring and environmental surveillance is used in assessing the effects of SRS operations, if any, on the local environment by monitoring potential exposure pathways.**

Comply with Regulations and DOE Orders

Determine Critical Pathways for Exposure

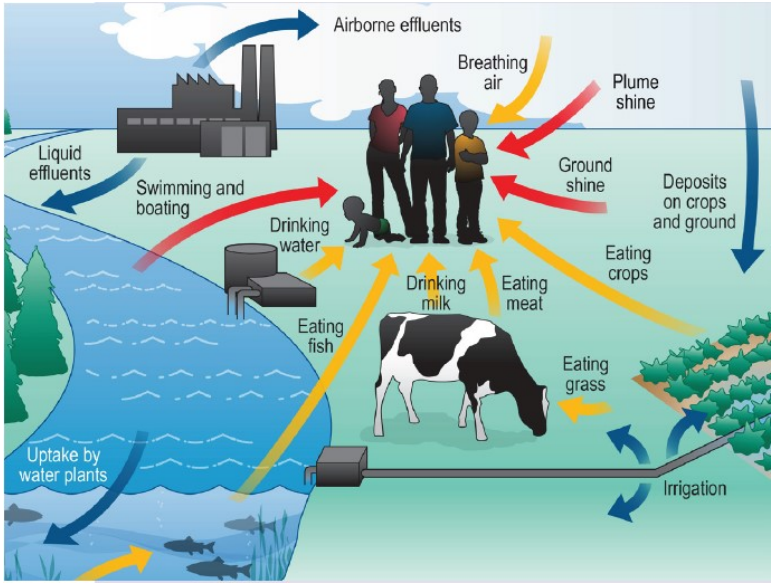
Determine Pre-Operational Conditions

Perform Dose and Risk Assessments

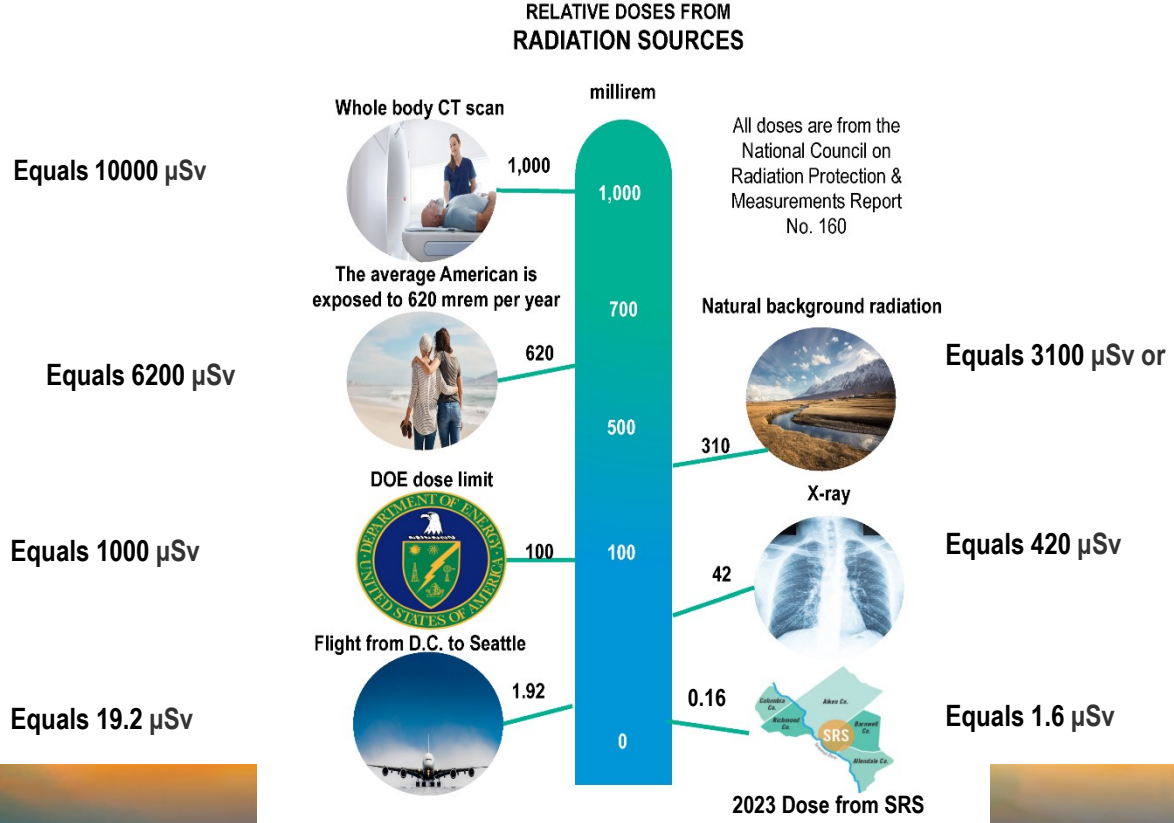
Inform Stakeholders

Dose

- **Radiation dose to a person is the amount of energy the human body absorbs from a radioactive source**
- **Energy is transferred in the form of rays**
- **Exposure to radiation potentially occurs by the following:**
  - Inhaling through the air
  - Ingesting through food and water
  - Absorbing through the skin
  - Experiencing direct (external) exposure to radionuclides in soil, air and water



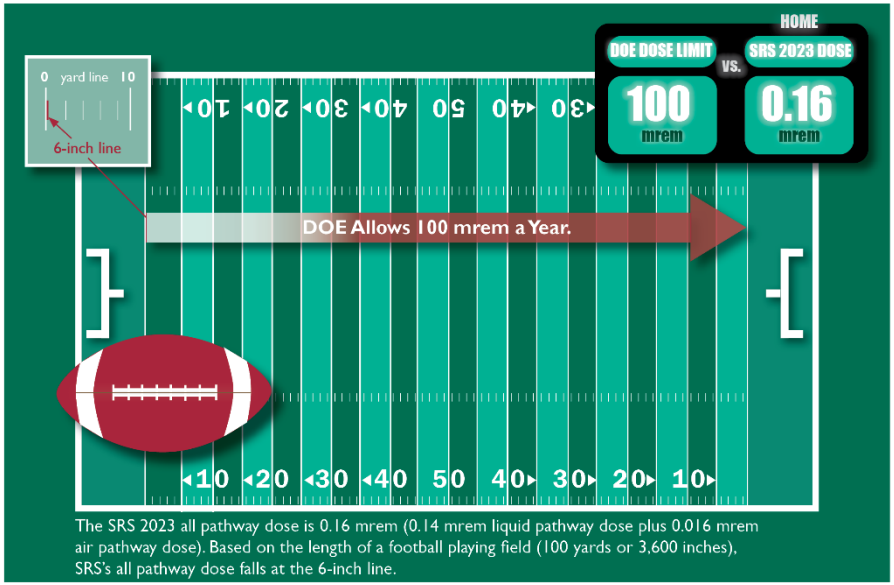
Impact from Radiation Sources



Dose Comparison

There were no specific events during 2023 that negatively impacted results of the Radiological Dose Assessment

- DOE Dose Limit = 100 mrem/yr
- The potential representative person all-pathway dose is very small (<< 1 mrem)
  - Air pathway: 15-20% of all pathway dose
  - Liquid pathway: 80-85% of the all-pathway dose
- For 2023 the total representative person dose was 0.16 mrem, which is 0.16% of the 100 mrem/yr DOE dose limit.
  - 0.14 mrem from liquid releases and 0.016 mrem from air releases
- SRS maintained Environmental Regulatory and DOE Order Compliance throughout 2023.
- All environmental regulatory deliverables were completed on or ahead of schedule.

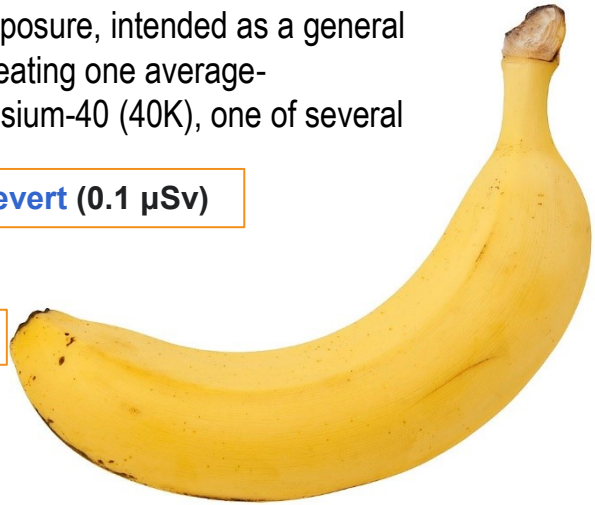


The SRS 2023 all pathway dose is 0.16 mrem (0.14 mrem liquid pathway dose plus 0.016 mrem air pathway dose). Based on the length of a football playing field (100 yards or 3,600 inches), SRS's all pathway dose falls at the 6-inch line.

Banana Equivalent Dose

- Banana equivalent dose (BED) is an informal unit of measurement of ionizing radiation exposure, intended as a general educational example to compare a dose of radioactivity to the dose one is exposed to by eating one average-sized banana. Bananas contain naturally occurring radioactive isotopes, particularly potassium-40 (40K), one of several naturally occurring isotopes of potassium.

One BED is often correlated to 10^{-7} sievert (0.1 µSv)



- The Savannah River Site combined dose from air and water pathways—2023 potential radiation dose also known as the "all pathway" dose—was 0.16 millirem

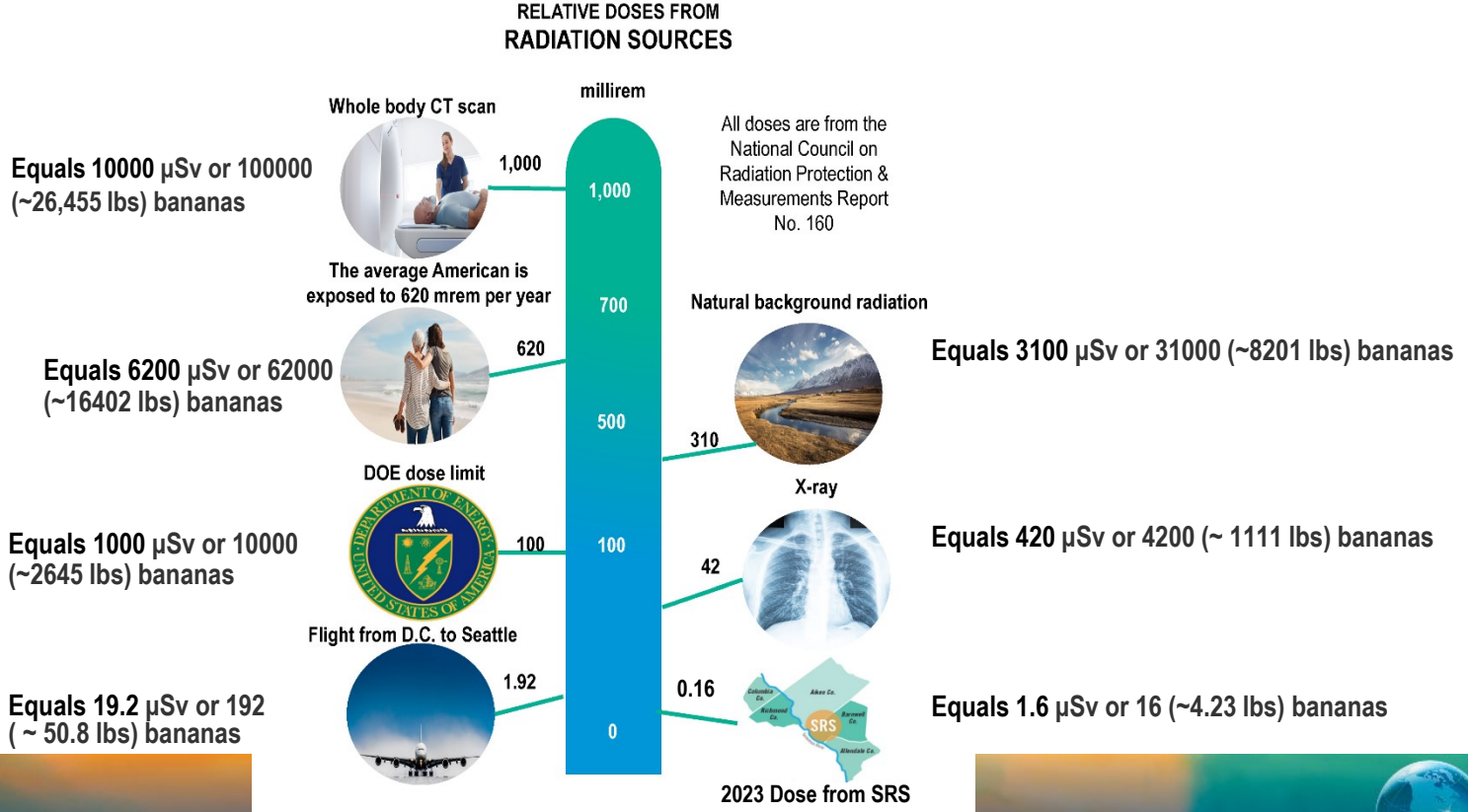
∴ 0.16 Millirem = 1.6 Microsievert

- 1.6 Microsieverts ("all pathway" dose for 2023) divided by 0.1 microsievert (One BED or one averaged-sized banana) equals 16 average-sized bananas.
- In general, most average-sized bananas weigh approximately 120 grams. 16 bananas times 120 grams each equals 1920 grams or 4.23 pounds of bananas.

An average "hand" of bananas weighs between 3 and 7 lbs

The SRS 2023 "all pathway" dose to the public was equivalent to eating 16 average-sized bananas!

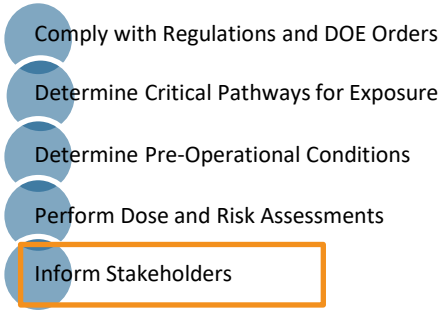
Impact from Radiation Sources



What do we do with this information?

Environmental Monitoring Reporting

- **Compliance Reports**
  - Submit to Federal and State agencies to show compliance with Federal and State regulations
- **Internal Reports**
  - To track historical trends, assess programs and protocols, identify areas for improvement
- **External Reports**
  - Published to provide information to stakeholders and the public
  - *Annual Site Environmental Report* and *Summary Report*



2023 Annual Site Environmental Report Highlights

2023 ASER Highlights

- **Remediation (Environmental Restoration and Cleanup)**
  - At the end of Fiscal Year (FY) 2023, SRS had completed the surface and groundwater cleanup of 412 of the 515 operable units containing or having contained solid or hazardous waste. Also, currently in the process of remediating an additional 8 units.
- **Radioactive Waste Management**
  - In calendar year 2023, SRS sent 16 transuranic waste shipments of down-blended plutonium from K Area to the Waste Isolation Pilot Plant (WIPP) for deep geologic disposal. The number of shipments to WIPP in 2023 was 28.
- **Tank Closure (Radioactive Liquid Waste Processing and Dispositioning)**
  - The Salt Waste Processing Facility (SWPF) treated more than 2.6 million gallons of salt solution.
  - More than 4.2 million gallons of waste was processed into grout and disposed of in the Saltstone Disposal Faciltiy (SDF).
  - The Defense Waste Processing Facility filled 54 canisters with 198,916 pounds of glass waste mixture, immobilizing approximately 5.14 million curies of high-level radioactive waste.
  - The F- and H-Area Effluent Treatment Facility processed approximately 1.32 million gallons of treated wastewater.
- **Release Reporting**
  - SRS did not have any releases exceeding the Comprehensive Environmental Response, Compensation, and Liability Act Reportable Quantity.

Environmental Management: Pollution Prevention

- **During 2023 SRS recycled 79.4% (918 metric tons) of nonhazardous solid waste.**
- **SRS has met and even surpassed federal goals in the continued reduction of greenhouse gas emissions.**
  - Since 2008, the site has reduced
    - *Direct GHG emissions by 54.4%*
    - *Indirect GHG emissions by 90.7%*
- **Fleet management goals were exceeded with 84.3% of current fleet of light-duty vehicles being hybrid, electric, or powered by E85 fuel.**
- **SRS received the Global Electronics Council Electronic Product Environmental Assessment Tool (EPEAT) Purchasers award in 5 categories.**

U.S. DEPARTMENT OF ENERGY
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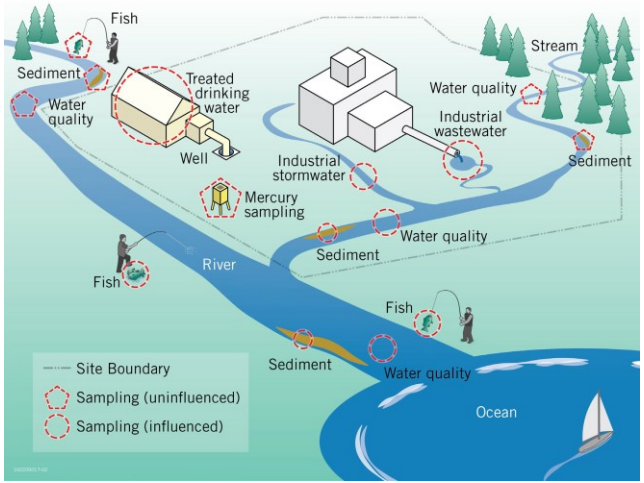
2023 Compliance Summary

- **SRS managed 613 operating and construction permits for the 2023 reporting year.**
- **Permitting**
  - SRS met all Clean Air Act requirements
  - SRS air and water discharges containing radionuclides were well below the DOE public dose limit of 100 millirem (mrem) per year.
  - All 33 SRS industrial stormwater outfalls complied with the Site's Stormwater Pollution Prevention Plan under the National Pollutant Discharge Elimination System (NPDES) Permit.
  - In April 2023, SRS received an administrative NOV for not conducting a sampling requirement of its NPDES Industrial Wastewater Permit. SRS identified and completed corrective actions (Section 3.3.7.1.1).
- **External Audits and Inspections**
  - EPA and SCDES (SCDHEC) audited and inspected various SRS environmental programs to ensure regulatory compliance.
  - The Federal Energy Regulatory Commission performed a dam safety inspection on May 24, 2023.

In 2022, SRS continued construction of additional Saltstone Disposal Units (SDUs)

Nonradiological Environmental Monitoring

- **Effluent Releases**
  - Nonradiological effluent releases for all categories except industrial wastewater met permit limits and applicable standards.
  - SRS reported only two exceptions out of 2,328 analyses at SRS National Pollutant Discharge Elimination System (NPDES) industrial wastewater outfalls, a greater than 99% compliance rate.
  - All SRS industrial stormwater outfalls under the South Carolina general industrial stormwater permit were compliant.
- **Onsite Drinking Water**
  - All SRS drinking water systems complied with South Carolina Department of Health and Environmental Control and U.S. Environmental Protection Agency water quality standards.
- **Surveillance Program**
  - Due to SRS's high rate of compliance, industrial wastewater and industrial stormwater discharges are not significantly affecting the water quality of onsite streams and the Savannah River.
  - Sediment results from SRS streams, stormwater basins, and the Savannah River were consistent with the background control locations and were comparable with historical levels.
  - Samples of fish flesh were collected from the Savannah River and results were consistent with historical levels.



Types and Typical Locations of Nonradiological Sampling

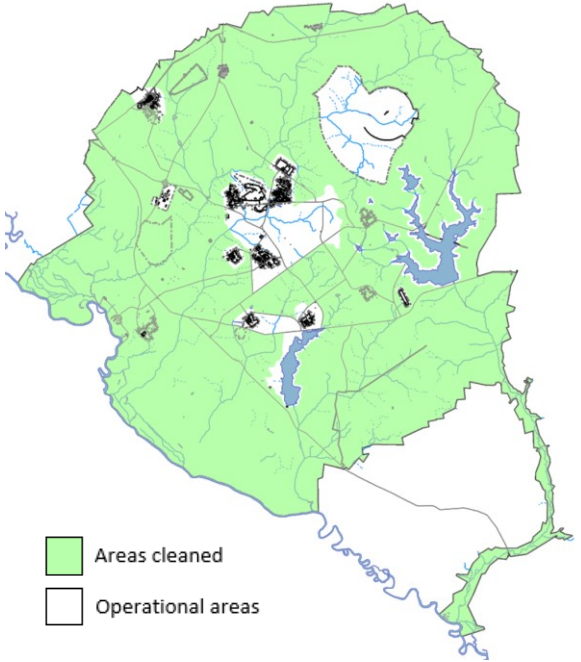
Radiological Environmental Monitoring

- **Air Pathway**—All air contaminants SRS released were below applicable permit and regulatory limits. Radiological results for surveillance media associated with the airborne pathway were within historical levels.
- **Water Pathway**—Water contaminants SRS released were all below applicable standards. Radiological results for surveillance media associated with the liquid pathway were within historical levels.
- **Wildlife Surveillance**—All harvested animals SRS monitored during the annual onsite hunts were below the applicable standard. SRS monitored the deer, feral hogs, turkeys, and coyotes harvested during the hunts and released all 355 animals.

Environmental Remediation: Groundwater

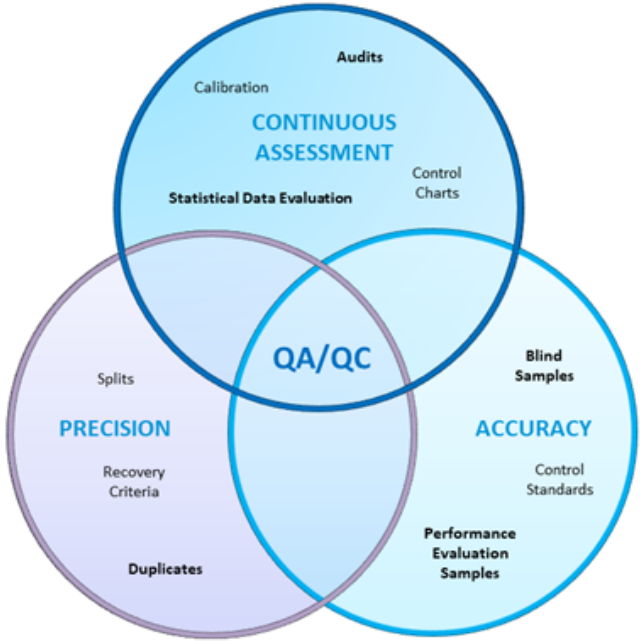
- **Over 85% of the Site's area has been cleaned to regulatory standards**
- **Groundwater Remediation 2023**
  - Removed 9,238 pounds of volatile organic compounds from groundwater and the vadose zone
  - Prevented 24.7 curies of tritium from reaching SRS streams (through the phytoremediation project)

Remaining contamination areas typically within the core of the Site



Quality Assurance

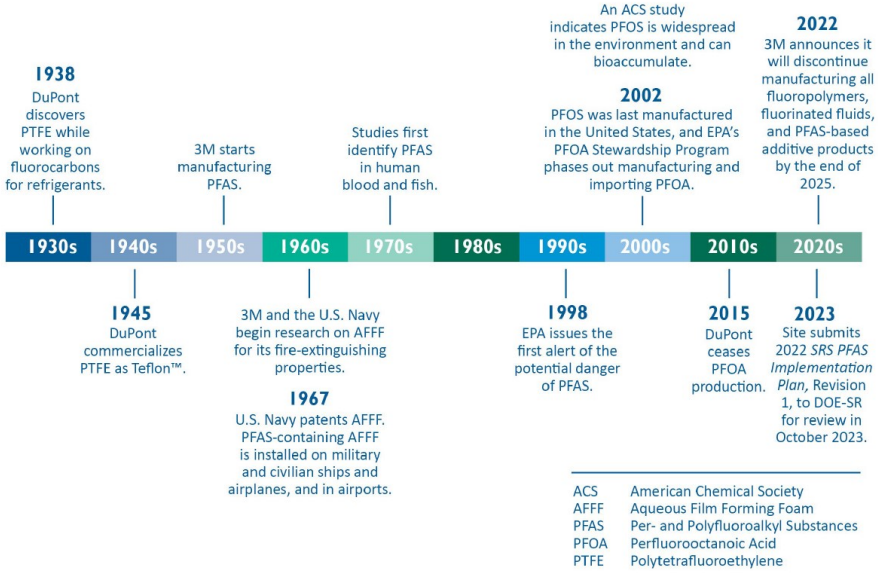
- **Analytical Laboratory Quality Assurance**
  - Multiple external audits of treatment, storage, and disposal facilities determined the facilities to be in good standing and eligible to continue to provide services to DOE.
- **Quality Control Activities**
  - Quality Control samples identified no defects affecting the analytical results of the surveillance and monitoring programs.
- **Continuous Improvement**
  - SRS Radiological Liquid Effluent Program added a basin location to their program.
  - SRS transitioned to a new comprehensive environmental database system.
  - SRS implemented more portable refrigerated samplers, flowmeters with modem communication, and camera technology. Also implemented automatic sampling equipment for NPDES Stormwater Permit.



Interrelationship between QA/QC Activities

PFAS: Emerging contaminants of concern

- **The U.S. Department of Energy (DOE), led by the Office of Environment, Health, Safety, and Security, continues to actively assess and understand per- and polyfluoroalkyl substances (PFAS) presence at DOE sites and to take actions to manage risk.**
  - The SRS PFAS Working Group (PWG) continued working with DOE-Headquarters (HQ) by reviewing draft guidance documents and commenting on proposed U.S. Environmental Protection Agency (EPA) rulemaking and initiatives.
  - In October, DOE-Savannah River (DOE-SR) began reviewing the SRS PFAS Implementation Plan, Revision 1. SRS had submitted the draft document in December 2022 as a DOE PFAS Strategic Roadmap commitment.
  - In October and November, SRS sampled 65 wells and 10 surface water stations in D Area for PFAS constituents as part of an ongoing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigation.
  - In November, SRS briefed the SRS Citizens Advisory Board on SRS PFAS activities during its Full Board Meeting.



Key Dates in the Development and Regulation of PFAS in the United States

Stewardship

- **It is the policy of SRS to be a leader in Environmental excellence through:**
  - Continuous improvement and research in engineering and scientific disciplines
  - Pollution prevention and waste minimization
  - Safeguarding natural, archaeological, and cultural resources on the site and throughout our communities.

Conclusion and Summary

- SRS maintained Environmental Regulatory and DOE Order Compliance throughout 2023.
- 2023 results (chemical and radiological) confirm SRS operations remained protective of the environment and human health.
- The ASER full report was issued on September 12, 2023.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SRNS
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We make the world safer.