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## Savannah River Site

# Environmental Report for 2008

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# Environmental Compliance

CHAPTER 3

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*It is the policy of the U.S. Department of Energy (DOE) that all activities at the Savannah River Site (SRS) will be carried out in full compliance with applicable federal, state, and local environmental laws and regulations, and with DOE orders, notices, directives, policies, and guidance. Compliance with environmental regulations and with DOE orders related to environmental protection is a critical part of the operations at SRS.*

The purpose of this chapter is to report on the status of SRS compliance with these various statutes and programmatic documents. Some key regulations with which SRS must comply, and the compliance status of each, are listed in table 3–1.

This chapter also provides information on Notices of Violation (NOVs) issued by the U.S. Environmental Protection Agency (EPA) or the South Carolina Department of Health and Environmental Control (SCDHEC). NOVs are the procedures that allege potential violations of an organization's permits or environmental laws or regulations. SRS received three allegations of violation in 2008 (two involving sanitary wastewater releases and one involving air emissions). The sanitary wastewater release allegations did not result in an administrative hearing to determine if a violation occurred. The parties continued to negotiate a settlement of the air emissions release dispute in 2008, and were expected to resolve it by consent in 2009. See the "Clean Water Act" and "Clean Air Act" sections of this chapter for additional details.

## Compliance Activities

### Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) was passed in 1976 to address solid and hazardous waste management. The law covers such wastes as spent solvents, batteries, and many other discarded substances potentially harmful to human health and the environment. Amendments to RCRA regulate nonhazardous solid waste, underground storage tanks (USTs) and solid waste management units (units that historically contained or managed solid waste).

Hazardous waste generators, including SRS, must follow specific requirements for handling these wastes.

#### Underground Storage Tanks

The 19 USTs at SRS that contain petroleum products, as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), are regulated under Subtitle I of RCRA. These tanks require a compliance certificate annually from SCDHEC to continue operations. SCDHEC conducts an annual compliance inspection and records audit prior to issuing the compliance certificate. SCDHEC's 2008 inspection and audit found all 19 tanks to be in compliance, marking six straight years without a violation.

#### Land Disposal Restrictions

The 1984 RCRA amendments established Land Disposal Restrictions (LDRs) to minimize the threat of hazardous constituents migrating to groundwater sources. The same restrictions apply to mixed (hazardous and radioactive) waste.

#### Federal Facility Compliance Act

The Federal Facility Compliance Act (FFCAct) was signed into law in October 1992 as an amendment to

**Table 3–1**
**Laws/Regulations Applicable to SRS**

| Legislation | What It Requires | In Compliance |
|---|---|---|
| **RCRA**<br>Resource Conservation and Recovery Act (1976) | The management of hazardous and nonhazardous solid wastes and of underground storage tanks containing hazardous substances and petroleum products | ✓ |
| **FFCAct**<br>Federal Facility Compliance Act (1992) | The development by DOE of schedules for mixed waste treatment to meet LDR requirements | ✓ |
| **CERCLA; SARA**<br>Comprehensive Environmental Response, Compensation, and Liability Act (1980); Superfund Amendments and Reauthorization Act (1986) | The establishment of liability compensation, cleanup, and emergency response for hazardous substances released to the environment | ✓ |
| **EPCRA**<br>Emergency Planning and Community Right-to-Know Act (1986) | The reporting of hazardous substances used on site (and their releases) to EPA, state, and local planning units | ✓ |
| **NEPA**<br>National Environmental Policy Act (1969) | The evaluation of the potential environmental impacts of proposed federal activities and alternatives | ✓ |
| **SDWA**<br>Safe Drinking Water Act (1974) | The protection of public drinking water | ✓ |
| **CWA**[a]<br>Clean Water Act (1977) | The regulation of liquid discharges at outfalls (e.g., drains or pipes) that carry effluents to streams (NPDES, Section 402); regulation of dredge and fill of U.S. waters (Section 404) and associated water quality for those activities (WQC, Section 401). | ✓ |
| **RHA**<br>Rivers and Harbors Act of 1899, Section 10 | The regulation of construction over and obstruction of navigable waters of the U.S. | ✓ |
| **FIFRA**<br>Federal Insecticide, Fungicide, and Rodenticide Act (1947) | The regulation of restricted-use pesticides through a state-administered certification program | ✓ |
| **CAA (NESHAP)**[a]<br>Clean Air Act (1970), (National Emission Standards for Hazardous Air Pollutants) | The establishment of air quality standards for criteria pollutants, such as sulfur dioxide and particulate matter, and hazardous air emissions, such as radionuclides and benzene | ✓ |
| **TSCA**<br>Toxic Substances Control Act (1976) | The regulation of PCBs, radon, asbestos, and lead used in sensitive populations, as well as evaluation and notification to EPA of new chemicals and significant new uses of existing chemicals | ✓ |
| **ESA**<br>Endangered Species Act (1973) | The protection of critically imperiled species from extinction | ✓ |
| **NHPA**<br>National Historic Preservation Act (1966) | The preservation of historical and archaeological sites | ✓ |

[a] A total of three NOVs received by SRS under the CWA and the CAA in 2008 reflected momentary exceedances of standards; however, the programs under these laws generally remained in compliance.

the Solid Waste Disposal Act to add provisions concerning the application of certain requirements and sanctions to federal facilities. A Site Treatment Plan (STP) (WSRC–TR–94–0608) consent order (95–22–HW, as amended) was obtained and implemented in 1995, as required by the FFCAct. A Statement of Mutual Understanding (SMU) for Cleanup Credits was executed by SCDHEC in October 2003, allowing SRS to earn credits for certain accelerated cleanup actions. Credits then can be applied to the STP commitment schedules. SRS submitted to SCDHEC an annual update to the approved STP in November 2008 (SRNS–TR–2008–00101, Rev 0) that identified changes in mixed waste treatment and inventory. Changes in the 2008 STP update include

- updating the commitment summary for the new fiscal year
- updating the status of several waste streams
- updating the treatment technology for SR–W045 PUREX Organic Waste
- revising the salt processing facility information
- revising the current cumulative inventory

Also documented in the 2008 update is SRS's completion of 928 transuranic (TRU) waste shipments (as of September 1) to the Waste Isolation Pilot Plant (WIPP) facility in New Mexico.

STP updates will continue to be produced annually unless provisions of the consent order are modified.

### Liquid Radioactive Waste Tank Closure

The primary regulatory goal of SRS's waste tank closure program at the F-Area and H-Area liquid radioactive waste tank farms is to close the tank systems in a way that protects public health and the environment in accordance with SCDHEC's Regulation 61–82, "Proper Closeout of Wastewater Treatment Facilities." Under this program, the first two high-level waste tanks (i.e., 17F and 20F) were closed in 1997.

During 2008, Tanks 18F and 19F remained isolated, requiring only administrative safety basis controls, and a new enhanced mechanical cleaning technology was deployed to continue waste removal efforts.

### Waste Minimization/Pollution Prevention (WMin/P2) Program

**2008 Program Results and Highlights** The SRS WMin/P2 Program continued to achieve significant results in 2008. All required site waste generators demonstrated active participation in the program through documented pollution avoidance and/or direct mission support activities for site recycling. Site employee P2 awareness was increased through online articles and general employee and job-specific training.

The WMin/P2 Program met all DOE and regulatory agency reporting requirements. Program accomplishments during 2008 included the following:

- SRS documented 27 P2 projects, resulting in an annualized avoidance of 1,108 $m^3$ of hazardous and radioactive waste, which exceeded the site's 2008 P2 Program waste avoidance performance goal of 671 $m^3$ by more than 65 percent. Annual cost avoidance resulting from the 27 documented P2 projects is $8.6 million.
- DOE–HQ announced that SRS won two National DOE P2 Awards. Winning nominations were: *SRS Greening Electronics* and *H-Canyon Pollution Prevention Initiatives*. These awards were forwarded to next-tier competitions, with *SRS Greening Electronics* winning a P2 STAR Honorable Mention Award. SRS prepared input for an "EMCast" highlighting the *SRS Greening Electronics* program for DOE–HQ EM to share with other sites.
- SRS was selected to receive the Department of Energy Transformational Energy Action Management (TEAM) Effectiveness Award—presented by the Federal Energy Management Program (FEMP), Office of Energy Efficiency and Renewable Energy—to honor outstanding achievements to implement the Secretary of Energy's TEAM initiatives.

SRS participates in EPA voluntary P2 programs by maintaining its EPA Waste Wise and EPA National Partnership for Environmental Priorities memberships. SRS continued its participation in the Federal Electronic Reuse and Recycle Campaign, and reported 358,852 pounds of electronics recycled and reused for the contest period.

SRS recycled 37 percent (863 metric tons) of the routine sanitary waste stream using the North Augusta Material Recovery Facility and Three Rivers Regional Landfill services. This exceeded the 35-percent SRS sanitary waste recycling goal established for 2008.

Pollution prevention support was provided to DOE–HQ program offices in 2008. Working through DOE–EM, support was provided to the DOE–EH and DOE–NNSA P2 programs. The EM P2 Program sponsored one employee to attend the Federal Environmental Executive P2 Workshop, which also included a separate DOE–HQ P2 Planning Workshop.

The SRS pollution prevention team also supported P2 awareness in 2008 on site and in the local community, as follows:

- Onsite awareness was increased through online articles and general employee and job-specific training.
- Handout items were provided during the SRS Safety Conference Family Night event to promote pollution prevention.
- The P2 Program provided financial support and voluntary hours for the North Augusta Kids Earth Day, which hosted 30-plus separate exhibits to educate and share with the more than 2,000 attendees.
- The P2 Program provided financial support and voluntary hours for the Environmental Science Educator's Cooperative (ESEC), including sponsorship of a graded session at the 2008 ECOMEET—a hands-on environmental competition for middle school students. This year's event was held at the Watson Brown Foundation Center, Thomson, Georgia, with 22 teams from Georgia and South Carolina participating. In addition, the P2 Program supported two ESEC Electronics Recycle Days, and the Environmental Teacher of the Year Award, both in Augusta, Georgia.

## Comprehensive Environmental Response, Compensation, and Liability Act

SRS was placed on the National Priority List in December 1989, under the legislative authority of CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). In accordance with Section 120 of CERCLA, DOE, EPA Region 4, and SCDHEC entered into the SRS Federal Facility Agreement (FFA), which became effective August 16, 1993, and which directs the comprehensive environmental remediation of the site.

SRS has 515 waste units in the Soil and Groundwater Closure Projects program, including RCRA/CERCLA units, Site Evaluation Areas, and facilities covered under the SRS RCRA permit. At the beginning of FY08, 371 units were complete or in the remediation phase (338 complete and 33 in the remediation phase). At the end of FY08, 373 units were complete or in the remediation phase (360 complete and 13 in remediation). A summary of the FFA Milestones follows.

RCRA Facility Investigation/Remedial Investigation (RFI/RI) Field Starts were initiated for the following units in FY08:

- Gunsite 012 Rubble Pile, Rubble Pile across from Gunsite 012, and Early Construction and Operational Disposal Site (ECODS) G–3, (no building number, NBN)
- Gunsite 218 Rubble Pile (631–23G)
- Upper Three Runs Integrator Operable Unit (Including Tims Branch and Steed Pond) Second Phase II

Remedial Action was initiated at the following units in FY08:

- L-Area Southern Groundwater
- A-Area Burning/Rubble Pits (731–A, –1A), A-Area Rubble Pit (731–2A)
- Miscellaneous Chemical Basin/Metals Burning Pit (731–4A, –5A), A-Area Ash Pile (788–2A)

Remedial Actions were completed and Post-Construction Reports (PCRs) or Post-Construction Reports /Corrective Measures Implementation Report/Remedial Action Completion Reports (PCR/CMIR/RACRs) were submitted for the following units in FY08:

- Chemicals, Metals, and Pesticides (CMP) Pits (080–17G, –17.1G, –18G, –18.1G, –18.2G, –18.3G, –19G)

- M-Area Settling Basin Inactive Process Sewers to Manhole 1, 081-M (including Southern Portions of 313–M Inactive Clay Process Sewer Lines to Tims Branch, NBN and Southern Portions of 320–M Inactive Clay Process Sewer Lines from the Building Slab to the Former Security Fence, NBN)

- General Separations Area Consolidation Unit

- R-Area Reactor Seepage Basins (904–57G, –58G, –59G, –60G, –103G, –104G) and 108–4R Overflow Basin

No Interim Action Post-Construction Reports (IAPCRs) were submitted in FY08.

Removal Action Reports were issued for the following units in FY08:

- Contaminated Surficial Soil in the 741–A Salvage Yard at the M-Area Operable Unit

- Production Area of the M-Area Operable Unit

Records of Decision (RODs) were submitted for the following units in FY08:

- C-Area Burning/Rubble Pit, 131–C and Old C-Area Burning/Rubble Pit, NBN

- P-Area Operable Unit Early Action

- M-Area Operable Unit

A ROD was approved and issued for the following unit in FY08:

- C-Area Burning/Rubble Pit, 131–C, and Old C-Area Burning/Rubble Pit, NBN

The Performance Assesment for F Tank Farm was submitted August 31, 2008, as required by Appendix L of the FFA.

No Explanations of Significant Difference (ESDs) were submitted, and no ESDs were issued in FY08.

Section X ("Site Evaluations") of the FFA requires SRS to submit Removal Site Evaluation (SE) reports to EPA and SCDHEC for those areas with potential or known releases of hazardous substances not identified before the effective date of the agreement.

SRS submitted three Removal SE Reports in FY08, as follows:

- Contaminated Surficial Soil in the 741–A Salvage Yard at the M-Area Operable Unit

- Miscellaneous Rubble Pile #2

- Production Area of the M-Area Operable Unit

Section X of the FFA also requires SRS to submit Remedial SE Reports to the EPA and SCDHEC for those areas listed in Appendix G.I of the Agreement.

SRS did not submit any Remedial SE recommendations or revised SE reports.

A listing of all 515 waste units at SRS can be found in appendices C ("RCRA/CERCLA Units List") and G ("Site Evaluation List") of the FFA.

## Emergency Planning and Community Right-to-Know Act

The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 requires facilities to notify state and local emergency planning entities about their hazardous chemical inventories and to report releases of hazardous chemicals. The Pollution Prevention Act of 1990 expanded the EPCRA-mandated Toxic Chemical Release Inventory report to include source reduction and recycling activities.

### Executive Order 12856

Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements," requires that all federal facilities comply with right-to-know laws and pollution prevention requirements. SRS complies with the applicable reporting requirements for EPCRA, as indicated in table 3–2, and the site incorporates the toxic chemicals on the Toxic Release Inventory Report into its pollution prevention efforts.

### Chemical Inventory Report (Tier II)

Under Section 312 of EPCRA, SRS completes an annual Tier II Chemical Inventory Report for all hazardous chemicals present at the site in excess of specified quantities during the calendar year. Hazardous chemical storage information is submitted to state and local authorities by March 1 for the previous calendar year.

### Toxic Release Inventory (TRI) Report (Form R)

Under Section 313 ("Toxic Chemical Release Reporting") of EPCRA, SRS must file an annual Toxic Release Inventory (TRI) report by July 1 for the previous year. SRS calculates chemical releases to the environment for each regulated chemical that exceeds its established threshold value and (in addition to other inventory data sets) reports the release values to EPA on Form R of the report. Threshold values are those quantities of regulated chemicals (as defined by EPCRA Section 313) above which additional reporting is required using the TRI Report – Form R.

Form R for 2007 was submitted to EPA July 1, 2008. SRS reported the following chemicals that exceeded their thresholds: barium, chlorine, chromium, copper, fluorine, formic acid, hydrochloric acid, lead, manganese, mercury, nickel, nitrate, nitric acid, sodium nitrite, sulfuric acid, and zinc. (NOTE: The term "exceeded" in an EPCRA context does not indicate a violation. Per EPA regulations, SARA chemical limits are established, and reporting requirements are based on these threshold values.) Specific details, including release amounts and detailed information about toxic release inventory reporting, can be viewed on the EPA website at www.epa.gov/tri/tridata.

**Table 3–2**
**SRS Reporting Requirements under "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements" (Executive Order 12856)**

| EPCRA Citation | Activity Regulated | Reported in 2008 |
|---|---|---|
| 302–303 | Planning Notification | NA[a] |
| 304 | Extremely Hazardous Substances Release Notification | NA[a] |
| 311–312 | Material Safety Data Sheet / Chemical Inventory | Yes |
| 313 | Toxic Release Inventory Reporting | Yes |

[a] Did not exceed reporting threshold

During preparation of the 2007 SRS TRI Report Form R, it was discovered that SRS's nitrate release number was substantially higher than those documented in prior years' reports. Additional data review disclosed that the 2007 reported nitrate releases from an onsite wastewater treatment plant outfall were approximately three times greater than the amount reported in 2006. Further investigation determined that the last time analytical data were used to calculate the release of nitrate to the outfall was in 2000; the source of the data was the National Pollutant Discharge Elimination System (NPDES) 2C application. Subsequently, it was determined that a data transcription error from that wastewater treatment plant calculation sheet occurred during preparation of the 2000 TRI Report Form. The nitrate/nitrite value as nitrogen (a substantially smaller number) was transcribed, rather than the nitrate value.

In subsequent years, the new release numbers for nitrate for the sanitary wastewater facilities were calculated by using a ratio method involving flow; higher flows resulted in more nitrate being released, and lower flows resulted in less nitrate being released. Because the 2000 nitrate number was incorrect, use of the "flow ratio" method propagated the reporting error for nitrate through reporting year 2006. Corrective actions were developed in 2008, including a voluntary self-disclosure to EPA, an extent-of-condition analysis to ensure that similar issues had not occurred in the reporting of other release data, and revisions to TRI submissions for reporting years 2000–2006. EPA is reviewing all documentation submitted.

## National Environmental Policy Act

The National Environmental Policy Act (NEPA) is the federal government's basic charter for assuring the protection and wise use of the "human environment" by federal agencies. NEPA's procedures require that federal agencies identify and consider the potential environmental consequences of their proposed actions early in the planning process so they can make informed, environmentally sound decisions regarding project design and implementation. The NEPA process at SRS is initiated by completing

an Environmental Evaluation Checklist (EEC). The EEC is used to characterize the proposed action, identify any potential environmental concerns, and determine which level of NEPA review (if any) will be required {i.e., categorical exclusion determination (CX), environmental assessment (EA), or environmental impact statement (EIS)}. A total of 414 SRS-related NEPA reviews were conducted in 2008 (see table 3–3). The following is a listing of major NEPA reviews conducted during 2008, some of which will complete in 2009:

- *Surplus Plutonium Disposition Supplemental EIS (DOE/EIS–0283–S2)* – In this Supplemental EIS (SEIS), DOE will evaluate the potential impacts of implementing selected surplus plutonium disposition alternatives at SRS. Disposition alternatives being considered include (a) processing in H-Canyon, (b) using the Mixed Oxide (MOX) Fuel Fabrication Facility, and (c) using a can-in-canister immobilization (glass or ceramic) process. Work on the draft EIS was suspended late in 2008 to accommodate feasibility studies of additional alternatives. The schedule for this SEIS is uncertain.

- *Programmatic EIS for Disposition of Scrap Metals (DOE/EIS–0327)* – In this Programmatic EIS (PEIS), DOE will evaluate alternatives for the disposition of scrap metals that may have been in radiological areas. The disposition alternatives include (a) continuation of the suspension on unrestricted release of metals for recycling, (b) unrestricted release of scrap metals for recycling, and (c) disposal. The draft document has not been issued and the schedule for completing this PEIS is uncertain.

- *EIS for the Disposal of Greater-Than-Class-C Low-Level Radioactive Waste (GTCC LLW) (DOE/EIS–0375)* – In this EIS, DOE will evaluate the impacts of disposing GTCC LLW in a geologic repository, in intermediate-depth boreholes, or in enhanced near-surface disposal facilities. Candidate DOE sites being considered for these disposal facilities include SRS, Idaho National Laboratory, Los Alamos National Laboratory, WIPP, Nevada Test Site, Oak Ridge, Hanford, and Yucca Mountain. DOE also will consider generic commercial disposal of GTCC LLW at arid and humid locations. Disposal alternatives being considered for SRS include an intermediate depth borehole facility and an enhanced near-surface facility. Publication of the draft and final EISs is expected in May 2009 and June 2010, respectively.

- *Complex Transformation Supplemental Programmatic EIS (DOE/EIS–0236–S4)* – In this supplemental PEIS, DOE evaluated the environmental impacts associated with the National Nuclear Security Administration's proposed modernization of the nuclear weapons complex. The preferred alternative is to consolidate all tritium R&D activities at SRS. The final PEIS and two RODs were issued October 24 and December 19, respectively. DOE decided to consolidate tritium R&D activities at SRS.

- *Programmatic EIS for the Global Nuclear Energy Partnership (GNEP) Technology Demonstration Program (DOE/EIS–0396)* – The GNEP program would encourage expansion of domestic and international nuclear energy produc-

**Table 3–3**
**Summary of SRS-Related NEPA Reviews in 2008**

| Type of NEPA Review | Number |
|---|---|
| Categorical Exclusion Determinations | 153 |
| "All No" EEC Determinations[a] | 235 |
| Actions Tiered to Previous NEPA Reviews | 16 |
| Environmental Impact Statements[b] | 5 |
| Supplement Analysis[c] | 1 |
| Interim Action | 1 |
| Revised FONSI | 1 |
| Environmental Assessments[d] | 2 |
| **Total SRS-Related NEPA Reviews** | **414** |

[a] Proposed actions that require no further NEPA review

[b] DOE/EIS–0283–S2 (in progress); DOE/EIS–0375 (in progress); DOE/EIS–0236–S4 (complete); DOE/EIS–0396 (in progress); DOE/EIS–0327 (in progress)

[c] Discontinued SA for SRS Salt Processing Alternatives FSEIS not included in the count

[d] DOE/EA–1605 (complete); DOE/EA–1606 (in progress)

tion while reducing nuclear proliferation risks. The Draft PEIS was published October 17. The public comment period, which was extended for 90 days, will close March 16, 2009. DOE anticipates that this PEIS will be cancelled in 2009.

- *Supplement Analysis (SA): SRS Spent Nuclear Fuel Management FEIS (DOE/EIS–0279)* – In this SA, DOE is reviewing the continued use of H-Canyon to process spent nuclear fuel receipts and other highly enriched uranium material through 2019. As of late 2008, there were no projected approval dates for the SA or amended ROD.

- *Interim Action (IA) Determination: Surplus Plutonium Disposition Supplemental EIS (DOE/EIS–0283–S2)* – In this IA, DOE reviewed the proposed processing of a limited amount of plutonium surveillance material in H-Canyon for vitrification at the Defense Waste Processing Facility prior to completion of the SPD SEIS. DOE's review found that the proposed action was an allowable interim action because DOE had evaluated the impacts in the Interim Management Nuclear Materials EIS. The IA was completed in December.

- *Supplement Analysis: SRS Salt Processing Alternatives Final SEIS (DOE/EIS–0082–S2)* – In this SA, DOE was to review the construction of a Saltstone Feed Facility to provide lag storage for low-level liquid waste so that Tank 50 could be placed back into HLW service. This SA was discontinued due to lack of project funding.

- *Environmental Assessment for the Biomass Cogeneration and Heating Facilities at SRS (DOE/EA–1605)* – In this EA, DOE evaluated the potential impacts of constructing and operating a biomass-fueled cogeneration facility at SRS. This plant would replace the existing coal-fired D-Area powerhouse. The proposed action also included replacing the K-Area steam plant with two smaller biomass-fueled boilers in K-Area and L-Area. Clean biomass and bioderived fuels will be the fuel source for all the new boilers. The final EA and Finding of No Significant Impact (FONSI) were published in August.

- *Environmental Assessment for the Proposed Use of SRS Lands for Military Training (DOE/EA–1606)* – In this EA, DOE will evaluate the potential impacts associated with the proposed use of SRS lands for military training by the Department of Defense (e.g., U.S. Army). Publication of the draft EA is expected in 2010.

- *Revised FONSI: EA for the Natural Fluctuation of Water Level in Par Pond and Reduced Water flow in Steel Creek below L-Lake at the SRS (DOE/EA–1070)* – This revised FONSI reduces the required flow from L-Lake into Steel Creek and from PAR Pond into Lower Three Runs to 4.5 cubic feet per second (cfs) and 5 cfs, respectively. DOE had not approved the document by the end of 2008.

## Safe Drinking Water Act

The federal Safe Drinking Water Act (SDWA) was enacted in 1974 to protect public drinking water supplies. SRS domestic water is supplied by groundwater sources. The A-Area, D-Area, and K-Area systems are actively regulated by SCDHEC, while the remaining smaller water systems receive a reduced level of regulatory oversight.

Samples are collected and analyzed periodically by SRS and SCDHEC to ensure that all site domestic water systems meet SCDHEC and EPA bacteriological and chemical drinking water quality standards. All samples collected in 2008 met these standards.

Although the B-Area Bottled Water Facility is not listed by SCDHEC as a public water system, SCDHEC's Division of Food Protection continued to conduct periodic inspections of this facility until it was closed formally in September. Results from routine bacteriological analyses performed in 2008 met SCDHEC and Food and Drug Administration (FDA) water quality standards.

## Clean Water Act

### National Pollutant Discharge Elimination System

The Clean Water Act (CWA) of 1972 created the NPDES program, which is administered by SCDHEC under EPA authority. The program is designed to protect surface waters by limiting releases of nonradiological effluents into streams, reservoirs, and wetlands.

SRS had four NPDES permits in 2008:

- Two permits for industrial wastewater discharges (SC0047431, which covered the D-Area Powerhouse, and SC0000175, which covered the remainder of the site)

- Two general permits for stormwater discharges (SCR000000 for industrial and SCR100000 for construction)

The site also had one no-discharge permit for land applications (ND0072125).

More information about the NPDES permits can be found in chapter 4, "Effluent Monitoring."

The results of monitoring for compliance with the industrial wastewater discharge permit at SRS were reported to SCDHEC in the site's monthly discharge monitoring reports, as required by the permit.

In 2008, SRS received from SCDHEC a final rating of "satisfactory"—the highest rating given—for the annual 2-week NPDES 3560 Compliance Sampling Inspection of the site's NPDES-permitted outfalls.

The outfalls covered by the industrial stormwater permit (SCR000000) were reevaluated again in 2007. This resulted in the development of a new sampling plan implemented in 2008. No new issues were identified in 2008. Results of stormwater outfall sampling appear in an effluent monitoring data table on the CD accompanying this report.

Under the Code of Federal Regulations (CFR) Oil Pollution Prevention regulation (40 CFR 112), SRS must report petroleum product discharges of 1,000 gallons or more into or upon the navigable waters of the United States, or petroleum product discharges in harmful quantities that result in oil sheens. No such incidents occurred at the site during 2008.

SRS has an agreement with SCDHEC to report petroleum product discharges of 25 gallons or more to the environment. No such incidents occurred in 2008.

### Notices of Violation (CWA)

The site reported five NPDES permit condition exceptions in 2008. Such required reporting does not mean a violation of a law, regulation, or permit. Of the five reported events, two resulted in allegations of violations.

On June 4, regarding the K–12 Outfall, SCDHEC notified SRS of an allegation of violation concerning total suspended solids (TSS) at this outfall. SRS notified SCDHEC that extensive maintenance records indicated the plant was properly maintained, and that investigations had failed to determine a reason for any problems involving TSS. Based on the information provided to SCDHEC, the agency decided not to refer for enforcement.

On September 25, SRS received an allegation of violation from SCDHEC based upon a July 16, 2008, exception at the G–10 Outfall, without referring the allegation for an administrative hearing to determine if a violation occurred. SRS sent SCDHEC a response indicating that the wastewater treatment unit was maintained and operated properly, that the samples were taken properly, and that 10 years of data indicated this exception was well beyond any other experienced at the plant. Even with this exception, the compliance ratio at this plant was still 99.60 percent. Based on this review, the high fecal coliform sample result appeared to be an anomaly, and SRS requested that SCDHEC not make a final agency determination that the regulated effluent discharge violated SC Code Section 48-1-110(d). On October 17, SCDHEC informed SRS that it will "absolutely not" take any enforcement action based on this exception.

### Dredge and Fill; Rivers and Harbors

The CWA, Section 404, "Dredge and Fill Permitting," as amended, and the Rivers and Harbors Act (RHA) of 1899, Sections 9 and 10, "Construction Over and Obstruction of Navigable Waters of the United States," protect U.S. waters from dredging/filling and construction activities by the permitting of such projects. Dredge-and-fill operations in U.S. waters are defined, permitted, and controlled through implementation of federal regulations in 33 CFR and 40 CFR.

In 2008, SRS had four open permits under the Nationwide Permits (NWPs) program (general permits under Section 404), as follows:

- Dam construction on an unnamed tributary to Fourmile Branch for the Mixed Waste Management Facility Groundwater Interim Measures project was completed in 2000 under NWP 38,

"Hazardous Waste Cleanup." However, mitigation for the impact to wetlands was still pending in 2008 and must be addressed before the permit can be considered closed. The M&O contractor has requested approval from DOE to use wetland mitigation bank credits to satisfy the mitigation issue and close the permit.

- Minor dredging of a sandbar at the mouth of the 681–3G Pumphouse canal was conducted and covered under NWP 19, "Minor Dredging." The work was completed in February.

- Installation of characterization wells in the wetlands near Joyce Branch and Mill Creek was covered under NWP 5, "Scientific Measurement Devices." The wells will be used to investigate the groundwater in wetlands adjacent to Joyce Branch and Mill Creek near R-Area. The project is scheduled for completion in 2009.

- A minor discharge of material for research purposes was authorized in May 2008 under NWP 18, "Minor Discharges. The material was placed in Steel Creek below the S.C. Highway 125 bridge and used by Savannah River National Laboratory (SRNL) as part of a remediation research project evaluating active caps in streams to remediate contaminants. An active cap is one that actively binds or sequesters contaminants—as opposed to a passive cap, which simply covers contaminants. The cap in this research project consisted of combinations of apatite, sand, organoclay, and a sugar-based polymer.

### Water Quality Certification

Section 401, "Water Quality Certification," of the CWA is administered by SCDHEC to ensure the maintenance of water quality during dredge-and-fill projects. No water quality certifications (WQCs) were active at SRS during 2008.

### Construction in Navigable Waters

SCDHEC Regulation 19–450, "Permit for Construction in Navigable Waters," protects South Carolina's navigable waters. The only state navigable waters at SRS are Upper Three Runs Creek (through the entire site) and Lower Three Runs Creek (upstream to the base of the PAR Pond Dam).

No navigable-waters permits were active at SRS during 2008.

## Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act controls the application of restricted-use pesticides at SRS through a state-administered certification program. The site complies with these requirements through Procedure 8.1, "Federal Insecticide, Fungicide, and Rodenticide Act Compliance for Use of Pesticides," of the Environmental Compliance Manual (3Q).

The SRS pesticide procedure provides guidelines for pesticide use and requires that applicators of restricted-use pesticides be state certified. Extensive revisions of the procedure have been incorporated in recent years to improve the efficiency of the site pesticide-application approval process. The most significant changes involved (1) dropping the requirement for a formal pesticide program plan for the application of unrestricted pesticides and (2) renewing emphasis on the importance of completing a Pesticide Activity Report (PAR) within 14 days (formerly 15) of any site pesticide application. Additional changes in the procedure—some involving expansion of the site's restricted-use pesticide list to include three pesticides formerly on the unrestricted list, but most editorial in nature—also have been completed.

The Environmental Protection Section completed a self-assessment in 2008 that emphasized the need for increased awareness of site spill prevention and control protocol—particularly with respect to pesticide applications. Site pesticide application personnel subsequently were notified of the importance of following the guidance established in applicable Environmental Compliance Manual procedures when they are preparing and applying pesticides at SRS.

## Clean Air Act

### Regulation and Delegation

The Clean Air Act (CAA) and the Clean Air Act Amendments (CAAA) of 1990 provide the basis for protecting and maintaining air quality. Though EPA still maintains overall authority for the control of air pollution, regulatory authority for all types of emission sources has been delegated to SCDHEC. Therefore, SCDHEC must ensure that its air pollution regulations are at least as stringent as the federal requirements. This is accomplished through

SCDHEC Regulation 61–62, "Air Pollution Control Regulations and Standards." The various CAAA Titles covered by these SCDHEC regulations are discussed below.

### Title V Operating Permit Program

Under the CAA, and as defined in federal regulations, SRS is classified as a "major source" and, as such, falls under the CAAA Part 70 Operating Permit Program. On February 19, 2003, SCDHEC's Bureau of Air Quality issued SRS its Part 70 Air Quality Permit (TV–0080–0041), with an effective date of April 1, 2003, and an expiration date of March 31, 2008. SRS submitted a permit application renewal September 18, 2007, as required by SC R61–62.70. The site expected to receive the new Part 70 Air Permit in 2008; however, due to prioritization issues with SCDHEC, renewal of the permit has been delayed until early 2010—and the initial permit was extended. Until SCDHEC issues the permit renewal, SRS will continue to operate in accordance with requirements of the extended permit.

The Part 70 Air Quality Permit regulates both radioactive and nonradioactive toxic and criteria pollutant emissions from approximately 22 nonexempt emission units, with each emission unit having specific emission limits, operating conditions, and monitoring and reporting requirements. The permit also contains a listing, known as the Insignificant-Activities List, identifying approximately 500 SRS sources that are exempt based on insignificant emission levels, or on equipment size or type. Two air construction permit applications were submitted to SCDHEC in 2006 in conjunction with SRS plans to simultaneously (1) install and operate a biomass boiler and an oil-fired boiler to provide steam to A-Area and (2) discontinue operation of the two aging A-Area coal-fired boilers. SRS received the permits in April 2007, and construction began on the biomass and oil-fired boilers in October 2007. Construction on the boilers was completed in 2008, and they began operating August 5 (oil-fired) and 6 (biomass). The two A-Area coal-fired boilers were shut down March 19 and September 13, 2008.

The renewed Title V permit for the D-Area Powerhouse (TV–0300–0036) was issued to SRS May 15, 2007, with an effective date of July 1, 2007, and an expiration date of June 30, 2012. In 2007, DOE–SR proposed replacement of the existing D-Area Powerhouse boilers with two new biomass cogeneration boilers more closely aligned with current and future steam demands. This proposed action would allow for decommissioning of the existing D-Area Powerhouse prior to its current Title V permit expiring June 30, 2012.

SCDHEC issued no revisions to the SRS Part 70 Air Quality Permit (TV–0080–0041) in 2008. One revision was issued by SCDHEC in 2008 to the 484–D Powerhouse Part 70 Air Quality Permit (TV–0300–0036) to incorporate an administrative change.

The Mixed Oxide Fuel Fabrication Facility (MFFF)—a part of the SRS Nuclear Nonproliferation Program—was issued an air construction permit (0080–0139CA) August 22, 2006. Construction of the MFFF began August 1, 2007, and continued throughout 2008.

Compliance with the SRS Part 70 Air Quality Permit conditions was last evaluated by SCDHEC in August 2008, as part of an Air Compliance Inspection. For results of the evaluation, refer to the "Assessments/Inspections" section of this chapter, beginning on page 3-17.

### Notices of Violation (CAA)

SCDHEC issued a Notice of Alleged Violation (NOAV) to SRS June 12 concerning a particulate matter (PM) exceedance related to the biennial stack test of the site's A-Area Boiler #2 conducted February 20, 2008. During a presentation to SCDHEC, SRS provided credible evidence that (1) the boiler was operating within limits required by the permit, (2) the issuance of the NOAV by SCDHEC was not legally supportable, and (3) the only exceedance occurred during testing. SCDHEC agreed there was credible evidence that the boiler test was conducted at an operating level much higher than normal operating conditions, and agreed to include in any order language that SRS did not admit a violation. The parties continued to negotiate settlement of the dispute in 2008, and were expected to resolve it by consent in 2009.

### National Emission Standards for Hazardous Air Pollutants

The National Emission Standards for Hazardous Air Pollutants (NESHAP) is a CAA-implementing regulation that sets air quality standards for air emissions containing hazardous air pollutants, such as radionuclides, benzene, and asbestos.

**NESHAP Radionuclide Program** The current list of 187 hazardous air pollutants includes all radionuclides as a single item. Regulation of these pollutants has been delegated to SCDHEC; however, EPA Region 4 continues to regulate some aspects of NESHAP radionuclides.

NESHAP Radionuclide Program Subpart H of 40 CFR 61 was issued December 15, 1989, after which an evaluation of all air emission sources was performed to determine compliance status. DOE–SR and EPA Region 4 signed a Federal Facility Compliance Agreement (FFCA) October 31, 1991, providing a schedule to bring SRS's emissions monitoring into compliance with regulatory requirements. The FFCA was officially closed—and the site declared compliant—by EPA Region 4 May 10, 1995. Subpart H was revised by EPA September 9, 2002, with an effective date of January 1, 2003. This revision added inspection requirements for existing SRS sources and allowed the use of ANSI N13.1–1999 for establishing monitoring requirements. SRS is performing all required inspections, has monitoring systems compliant with the regulation, and remains in compliance with Subpart H of 40 CFR 61.

During 2008, the maximally exposed individual effective dose equivalent, calculated using the NESHAP-required CAP88 computer code, was estimated to be 0.04 mrem (0.004 mSv), which is 0.4 percent of the 10 mrem per year (0.10 mSv per year) EPA standard (chapter 6, "Potential Radiation Doses").

Compliance with 40 CFR 61, Subpart H, was last evaluated by SCDHEC in June 2008 as part of a radiological NESHAP inspection. For results of the evaluation, refer to the "Assessments/Inspections" section of this chapter, beginning on page 3-17.

**NESHAP Nonradionuclide Program** SRS uses many chemicals identified as toxic or hazardous air pollutants, but most of them are not regulated under the CAA or under federal NESHAP regulations. Except for asbestos, SRS facilities and operations do not fall into any of the "categories" listed in the original subparts. Under Title III of the federal CAAA of 1990, EPA in December 1993 issued a final list of hazardous air pollutant-emitting source categories potentially subject to maximum achievable control technology (MACT) standards.

On September 13, 2004, EPA finalized a MACT rule that applied to the coal-fired steam boilers at the 784–A and 484–D powerhouse facilities. The rule, "National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters" (Boiler MACT), had a compliance date of September 13, 2007, and required facilities to meet more stringent emissions limits dealing with PM, mercury, and hydrogen chloride emissions. During 2006, 484–D Powerhouse Facility personnel prepared to conduct the necessary testing during the 2007–2008 timeframe to demonstrate compliance with the new emission limits without the significant expenditure of capital funds. In June 2006, a MACT extension request was submitted to SCDHEC's Bureau of Air Quality requesting a one-year extension from the September 2007 compliance date so SRS could replace the aging A-Area boilers with a smaller wood-fired boiler and an oil-fired boiler capable of meeting the lower MACT emission limits. That compliance extension request was approved by SCDHEC September 5, 2006. Then, on July 30, 2007, the U.S. Court of Appeals for the District of Columbia vacated the Boiler MACT, thereby leaving it up to each state to enforce the rule. The State of South Carolina—one of the few states that elected to proceed with implementation of the rule—decided to give all facilities in the state a one-year extension until September 12, 2008, to comply. In May 2008, SCDHEC provided an additional 24 months—until September 13, 2010—for the facilities to comply.

**NESHAP Asbestos Abatement Program** SRS began its asbestos abatement program in 1988 and continues to manage asbestos-containing material (ACM) by "best management practices." Site compliance in asbestos abatement, as well as demolitions, falls under South Carolina and federal regulations, including South Carolina Regulation 61–86.1 ("Standards of Performance for Asbestos Projects") and 40 CFR 61, Subpart M ("National Emission Standards for Hazardous Air Pollutants – Asbestos").

SCDHEC finalized extensive revisions to 61–86.1 during 2008. The change that most affected SRS was a measure requiring a follow-up analysis using transmission electron microscopy (TEM) of at least one of three bulk samples should all three samples test negative for the presence of asbestos when using customary polarized light microscopy. RI&ES personnel secured a laboratory to perform the TEM analyses, thus enabling the site to comply with the new requirement. Site Procedure 4.14 ("Asbestos Management Program") of the 3Q Manual will be

revised in 2009 to reflect the TEM requirement.

During 2008, SRS personnel removed and disposed of an estimated 121 square feet and 1,231 linear feet of friable (regulated) asbestos-containing material. SRS personnel also removed an estimated 5,399 square feet, 8,530 linear feet, and 486 cubic feet of nonfriable (unregulated) asbestos-containing material.

Radiologically contaminated asbestos waste was disposed of at the SRS E-Area low-level vaults, engineered trenches, and slit trenches, which are authorized by SCDHEC as asbestos waste disposal sites. Nonradiological asbestos waste was disposed of at the Three Rivers Solid Waste Authority Landfill and the construction and demolition debris (C&D) Landfill (632–G), both of which also are SCDHEC-approved asbestos waste landfills.

### Accidental Release Prevention Program

Under Title III of the CAAA, EPA established a program for the prevention of accidental releases of large quantities of hazardous chemicals. As outlined in Section 112(r), any facility that maintains specific hazardous or extremely hazardous chemicals in quantities above specified threshold values must develop a risk management program (RMP). The RMP establishes methods that will be used for the containment and mitigation of large chemical spills. No such accidental releases occurred at SRS during 2008.

SRS maintains hazardous and extremely hazardous chemical inventories below the threshold value. This cost-effective approach minimizes the regulatory burden of 112(r) but does not eliminate any liability associated with the general duty clause, as stated in 112(r)(1). No reportable 112(r)-related hazardous or extremely hazardous chemical releases occurred at SRS in 2008.

EPA issued a revision to its RMP final rule in 2004, changing reporting requirements in its chemical accident prevention regulations. Chemical facilities subject to these regulations now are required to submit significant-chemical-accident information and emergency contact information. These changes seek to improve and assist federal, state, and local risk management programs in implementing the new homeland security measures. As indicated earlier, SRS maintains hazardous and nonhazardous chemical inventories below threshold values such that there are no associated EPA RMP reporting requirements.

### Ozone-Depleting Substances

Title VI of the CAAA of 1990 addresses stratospheric ozone protection. This law requires that EPA establish regulations to phase out the production and consumption of ozone-depleting substances (ODSs).

Several sections of Title VI of the CAAA of 1990, along with recently established EPA regulations found in 40 CFR 82, apply to the site. The ODSs are regulated in three general categories, as follows:

- *Class I substances* – chlorofluorocarbons (CFCs), Halons, carbon tetrachloride, methyl chloroform, methyl bromide, and hydrobromofluorocarbons (HBFCs)

- *Class II substances* – hydrochlorofluorocarbons (HCFCs)

- *Substitute substances*

The "Savannah River Site Refrigerant Management Plan," completed and issued in September 1994, provides guidance to assist SRS and DOE in the phaseout of CFC refrigerants and equipment. SRS has reduced CFC refrigerant usage in large ODS emission sources more than 99 percent compared to 1993 baseline data used in the September 1994 Plan.

The SRS CAAA of 1990 Title V operating air permit application includes ODS emission sources. All large (greater than or equal to 50-pound charge) heating, ventilation, and air conditioning/chiller systems for which there are recordkeeping requirements are included as fugitive emission sources.

SRS is phasing out its use of Halon as part of a goal to eliminate the use of Class I ODSs by 2010 "to the extent economically practicable." A Halon 1301 management plan (F–ESR–G–00120, November 16, 2005) and schedule have been developed by Fire Protection Services to help meet DOE's goal. The plan includes an SRS Halon 1301 fire suppression system inventory that identifies systems in operation, systems abandoned in place, and systems that have been dismantled and taken to the DOE complex's Halon repository, located at SRS.

Halon 1301 total inventory on site increased slightly

from 71,130 pounds in 2007 to 71,167 pounds in 2008. The site had an inventory of 51,760 pounds of stored Halon 1301 at the end of 2008. In addition, 19,407 pounds were contained in the 85 operating systems at the end of 2008—the same as at the end of 2007 (down from 111 systems in 2002).

### Air Emissions Inventory

SCDHEC Regulation 61–62.1, Section III ("Emissions Inventory"), requires compilation of an air emissions inventory to locate all sources of air pollution and to define and characterize the various types and amounts of pollutants. To demonstrate compliance, SRS personnel in 1993 conducted the initial comprehensive air emissions inventory, which identified approximately 5,300 radiological and nonradiological air emission sources. Source operating data and calculated emissions from 1990 were used initially to establish the SRS baseline emissions and to provide data for air dispersion modeling. In 2006, a rerun of the air dispersion modeling accompanied the site's Title V permit renewal application. This modeling was required to demonstrate sitewide compliance with Regulation 61–62.5, Standards No. 2 ("Ambient Air Quality Standards") and No. 8 ("Toxic Air Pollutants").

Regulation 61–62.1, Section III, which was revised in August 2005, requires that air emissions inventory data be updated and recorded annually but reported to SCDHEC on a specific reporting frequency—either an annual cycle for "Type A" sources or a 3-year cycle for "Type B" and "Nonattainment Area" sources—based on "minimum reporting thresholds." The threshold values depend on the actual tons per year of specific criteria pollutants.

SRS, under Title V Permit TV–0080–0041, is classified as a Type B source, required to report only every third year, thus reducing the cost burden associated with annual emissions inventories for sources with moderate emission rates. However, the acquired D-Area Powerhouse (co-located at SRS), under Title V Permit TV–0080–0044, is a Type A source that must report actual emissions annually. Both facilities (i.e., "SRS" and "D-Area Powerhouse") are required to compile and report CY 2008 emissions to SCDHEC by March 31, 2009. CY 2007 emissions were submitted to SCDHEC March 31, 2008, only for the D-Area Powerhouse, as required.

During 2008, the site collected CY07 operating data for permitted and other significant sources in accordance with SRS procedures and guidelines. Because data collection for all SRS sources begins in January for the preceding year and requires up to 6 months to complete, the 2008 site environmental report contains emissions data for CY 2007. These data were used to generate the site's Title V Permit renewal application. Compilation of 2008 data will be completed in 2009 and documented in the *SRS Environmental Report for 2009*.

## Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) gives EPA comprehensive authority to identify and control chemical substances manufactured, imported, processed, used, or distributed in commerce in the United States. Reporting and record keeping are mandated for new chemicals and for any chemical that may present a substantial risk of injury to human health or the environment.

Polychlorinated biphenyls (PCBs) have been used in various SRS processes. The use, storage, and disposal of these organic chemicals are specifically regulated under 40 CFR 761, which is administered by EPA. SRS has a well-structured PCB program that complies with this TSCA regulation, with DOE orders, and with site policies.

The site's 2007 PCB document log was completed in full compliance with 40 CFR 761, and the 2007 annual report of onsite PCB disposal activities was submitted to EPA Region 4 in July 2008. The disposal of nonradioactive PCBs routinely generated at SRS is conducted at EPA-approved facilities within the regulatory period. For some forms of radioactive PCB wastes, disposal capacity is not yet available, and the wastes must remain in long-term storage. Such wastes are held in TSCA-compliant storage facilities in accordance with 40 CFR 761.

## Endangered Species Act

The Endangered Species Act of 1973, as amended, provides for the designation and protection of wildlife, fish, and plants in danger of becoming extinct. The act also protects and conserves the critical habitats on which such species depend.

Several threatened and endangered species exist at SRS, including the wood stork, the red-cockaded woodpecker, the shortnose sturgeon, the pondberry, and the smooth purple coneflower. Although the bald eagle is no longer on the endangered species list,

it is still protected under the Bald and Golden Eagle Protection Act. Programs are in place to enhance the habitat and survival of such species.

In 2008, as part of the Natural Resource Management Plan, the USDA Forest Service–Savannah River (USFS–SR) developed a threatened and endangered species biological evaluation (TES BE) for the red-cockaded woodpecker and the smooth purple coneflower. The TES BE is being reviewed by DOE as part of the management plan. Also, two biological evaluations were conducted during the year for forestry-related activities. The timber-related BEs are being evaluated by the U.S. Fish and Wildlife Service to determine if there are any adverse or beneficial impacts as a result of timber prescriptions (i.e., intervention actions taken in the present to achieve a desired future condition for the forest).

## National Historic Preservation Act

The National Historic Preservation Act (NHPA) of 1966, Section 106, governs archaeological and historical resources. SRS ensures that it is in compliance with the NHPA through several processes. The Cold War Programmatic Agreement and the SRS Cold War Built Environment Cultural Resource Management Plan are in place and being implemented. The site's artifact selection team—which includes DOE, Savannah River Nuclear Solutions, LLC, (SRNS), and the University of South Carolina's Savannah River Archaeological Research Program (SRARP)—meets monthly and is responsible for overseeing the selection, collection, and curation of Cold War-era artifacts from buildings prior to decommissioning and demolition activities. SRS also helps ensure that it remains in compliance with NHPA through its Site Use Program. All locations being considered for activities such as construction are evaluated by SRARP personnel to ensure that archaeological or historic sites are not impacted. Reviews of timber compartment prescriptions include surveying for archaeological resources and documenting areas of importance with regard to historic and prehistoric significance.

SRARP personnel reviewed 26 site-use permit application packages during FY 2008, of which 16 proposed land modifications resulted in the need to survey 245 acres (15.2 percent) of the total survey coverage for FY08. The remaining site-use packages were found to have no activities of significant impact in terms of the NHPA. SRARP personnel also surveyed 1,372 acres (84.8 percent) of the total survey area coverage in 2008 in support of onsite forestry activities.

Thirty-two surveys were conducted totaling 1,617 acres and consisting of 16 Site Use Application Surveys and 16 Timber Compartment Prescription Surveys. During these surveys a total of 2,875 shovel test pits were dug of which 165 had positive results. These investigations identified 25 new archaeological sites—and resulted in revisits to seven previously recorded sites for cultural resources management within the 1617 acres.

In compliance with NHPA, artifacts recovered through daily compliance activities and the analysis of artifacts recovered during Phase III investigations of site 38AK155 (located within the MOX facility footprint) must be curated. A total of 2,901 artifacts were curated during FY 2008 by SRARP.

## Floodplains and Wetlands

Under 10 CFR, Part 1022 ("Compliance with Floodplains and Wetlands Environmental Review Requirements"), DOE establishes policies and procedures for implementing its responsibilities in terms of compliance with Executive Orders 11988 ("Floodplain Management") and 11990 ("Protection of Wetlands"). Part 1022 includes DOE policies regarding the consideration of floodplains/wetlands factors in planning and decision making. It also includes DOE procedures for identifying proposed actions involving floodplains/wetlands, providing early public reviews of such proposed actions, preparing floodplains/wetlands assessments, and issuing statements of findings for actions in floodplains. A floodplain/wetland assessment was performed for the Biomass Cogeneration and Heating Facility in 2008. The generating facility would have an NPDES discharge into Upper Three Runs Creek. The creek and the adjacent wetlands and floodplain would be affected by the project and would require a U.S. Army Corps of Engineers permit and SCDHEC 401 WQC and Navigable Waters Permit.

### Executive Order 11988

Executive Order 11988 ("Floodplain Management") was established to avoid long- and short-term impacts associated with the occupancy and modification of floodplains. The evaluation of impacts to SRS floodplains is ensured through the NEPA Evaluation Checklist and the site-use system. Site-use ap-

plications are reviewed for potential impacts by the M&O contractor, DOE–SR, the USFS–SR, and the Savannah River Ecology Laboratory (SREL), as well as by professionals from other organizations.

#### Executive Order 11990

Executive Order 11990 ("Protection of Wetlands") was established to mitigate adverse impacts to wetlands caused by the destruction and modification of wetlands, and to avoid new construction in wetlands wherever possible. Avoidance of impact to SRS wetlands is ensured through the site-use process, various departmental procedures and checklists, and project reviews by the SRS Wetlands Task Group. Many groups and individuals—including scientists from SRNL, SREL, and RI&ES—review site-use applications to ensure that proposed projects do not impact wetlands.

## Environmental Release Response and Reporting

### Response to Unplanned Releases

RI&ES personnel respond to unplanned environmental releases, both radiological and nonradiological, upon request by area operations personnel. No unplanned environmental releases occurred at SRS in 2008 that required the sampling and analytical services of RI&ES.

### Occurrences Reported to Regulatory Agencies

Federally permitted releases comply with legally enforceable licenses, permits, regulations, or orders. If a nonpermitted release to the environment of a reportable quantity or more of a hazardous substance (including radionuclides) occurs, CERCLA requires notification of the National Response Center. Reportable quantities—not to be confused with threshold values, as defined by EPCRA Section 313—are those quantities of a hazardous substance greater than or equal to values specified in table 302.4 ("Designation of Hazardous Substances") of 40CFR, Part 302 ("Designation, Reportable Quantities, and Notification").

Also, the CWA requires that the National Response Center be notified if an oil spill causes a "sheen" on navigable waters, such as rivers, lakes, or streams. Oil spill reporting has been reinforced with liability provisions in the CERCLA National Contingency Plan. SRS has had no CERCLA-reportable releases since 1999.

No notifications required by CERCLA or SCDHEC Memoranda of Understanding had to be made by SRS during 2008. The site recorded and cleaned up the following spills that did not require reporting under CERCLA or to SCDHEC: 14 chemical, two radioactive wastewater, five sewage, and 88 petroleum products.

EPCRA (40 CFR 355.40) requires that reportable releases of extremely hazardous substances or CERCLA hazardous substances be reported to any local emergency planning committees and state emergency response commissions likely to be affected by the release. No EPCRA-reportable releases occurred at SRS in 2008.

### Site Item Reportability and Issues Management Program

The Site Item Reportability and Issues Management (SIRIM) program, mandated by DOE Order 232.1A ("Occurrence Reporting and Processing of Operations Information"), is designed to ". . . establish a system for reporting of operations information related to DOE-owned or -operated facilities and processing of that information to provide for appropriate corrective action . . . ." It is the intent of the order that DOE be ". . . kept fully and currently informed of all events which could (1) affect the health and safety of the public; (2) seriously impact the intended purpose of DOE facilities; (3) have a noticeable adverse effect on the environment; or (4) endanger the health and safety of workers."

Of the 149 SIRIM-reportable events in 2008, three were categorized as environmental, involving allegations of violations at the G–10 Outfall, the K–12 Outfall, and the A-Area power plant. See the Clean Water Act section of this chapter on page 3-8 for a discussion of the G–10 and K–12 Outfalls, and the Clean Air Act section on page 3-10 regarding the A–2 Boiler at the A-Area power plant. SCDHEC did

not seek an administrative hearing on any of these matters to determine if a violation occurred.

## Assessments/Inspections

The SRS environmental program is overseen by a number of organizations, both outside and within the DOE complex. In 2008, the site's environmental appraisal program consisted of self and independent assessments. The program ensures the recognition of noteworthy practices, the identification of performance deficiencies, and the initiation and tracking of associated corrective actions until they are satisfactorily completed. The primary objectives of the assessment program are to ensure compliance with regulatory requirements and to foster continuous improvement. The program—an integral part of the site's ISMS—supports the SRS Environmental Management System (EMS), which continues to meet the standards of International Organization for Standardization Standard 14001. (ISO 14000 is a family of voluntary environmental management standards and guidelines.) The Site Tracking, Analysis, and Reporting (STAR) is a database used for scheduling self-assessments as well as documenting results and any issues or concerns identified, tracking corrective actions to closure, and trending accumulated data for process improvement.

The M&O contractor conducted several environmental program-level assessments in 2008. The titles of the self-assessment titles, the media (in parentheses), and brief summaries of the results are as follows:

- *ESS Assessment of NEPA Process Integration into the SRS Environmental Management System (EMS) (National Environmental Policy Act)* – This Environmental Services Section (ESS) self-assessment was conducted –January 31 through April 23. Its purpose was to determine the extent of NEPA process integration into the SRS EMS. The assessment identified four opportunities for improvement (OFIs) and one finding. The OFIs included the following: (1) consistently track and monitor NEPA of commitments; (2) develop centralized, continuously updated comprehensive environmental database; (3) identify resources required to implement NEPA's "adaptive management" approach; and (4) consistently implement use of the formal site selection process for major new missions. The finding related to the lack of EMS support for using NEPA's "adaptive management" approach (i.e., predict, mitigate, implement, monitor, and adapt). Corrective actions for the observations and finding were identified, initiated, and completed.

- *IWT/NPDES Permit Condition Cross-Walk (Surface Water Quality)* – This self-assessment was conducted March 15 through May 14. Its purpose was to conduct an industrial wastewater treatment (IWT)/NPDES Permit Condition Cross-Walk. It identified the following items and/or areas requiring improvement: Documentation involving the facility's industrial wastewater permitting file appears incomplete. A corrective action for the item was identified and documented in STAR and tracked to completion.

- *Polychlorinated Biphenyls Management and Control (Toxic and Chemical Materials)* – This self-assessment was conducted May 19–29. Its scope included a review of PCB activities within selected site organizations. The specific organizations selected for personnel interviews and/or other reviews were: (1) Waste Management Area Project (WMAP); (2) the ESS group supporting F-Area Operations; (3) the Site Deactivation and Decommissioning (SDD) organization; and (4) SRNL. The assessor gathered information for this assessment via document review, personnel interviews, PCB waste storage facilities inspections, and PCB container inspections. Four OFIs to the site-level program were noted, including PCB Management Manual and "Waste Identification Form" revisions. Identified issues were documented in STAR and tracked to completion.

- *ESS Annual Environmental Audit Review 2008 "Pre-CEI" (Waste Management)* – This self-assessment was conducted February 5 through April 2. Its scope included the ESS performance of its annual environmental audit review of the site's solid and hazardous waste management, commonly known as the "Pre-CME" or "Pre-CEI". ESS attempted to review the site as SCDHEC and EPA inspectors would look at it.

This review gives site personnel a feel for how the Compliance Evaluation Inspection (CEI), which evaluates compliance with solid and hazardous waste management regulations, will be conducted by the regulators. The following concerns requiring improvement were identified: issues with documentation in inspection records, contingency plans, and training. Additional areas of concern within hazardous waste management include open containers, unlabeled containers, and secondary containment. Actions taken associated with the pre-CEI were identified, tracked, and completed in STAR.

- *Nonhazardous Solid Waste (Waste Management)* – This self-assessment was conducted July 16–22. Its scope was to determine if prohibited materials, as defined by 3Q ECM 6.2, Rev. 13, are being placed into waste containers transported to the North Augusta Material Recovery Facility. The focus was on five of the 16 listed prohibited materials, which were labeled as radioactive, hazardous waste, fluorescent lamps, lead-acid batteries, and classified material (equipment or documents that contain or reveal classified information, as defined by Executive Order 12958, "Classified National Security Information"). Three SRS areas were assessed—SRNL, SREL, and B-Area Laboratory. Also reviewed was the North Augusta Material Recovery Facility. The assessors gathered information for this self-assessment by reviewing documents, interviewing cognizant personnel, and inspecting both solid waste collection containers (dumpsters) and the North Augusta Material Recovery Facility. All personnel interviewed were knowledgeable of the requirements and procedures regarding prohibited materials and solid waste management. No findings were identified.

- *Environmental Management Functions Self-Assessment (Environmental Management Functions)* – This self-assessment was conducted September 8–18. Its purpose was to ensure that SRNS and subcontractor organizations apply EMS principles and requirements in conducting activities associated with environmental protection. This self-assessment looked at formalized controls based on DOE directives, environmental permits, and applicable federal, state, and local regulations. No findings were identified; however, three observations were recorded as OFIs, which included resource needs and responsibility assignments. Corrective actions for the observations were identified and documented in STAR and tracked to completion.

- *Groundwater Monitoring-Well Network (Groundwater)* – This self-assessment was conducted during the period of October 10–30. Its scope included evaluation of the sitewide groundwater monitoring well network that is in place so that the effects of operations on groundwater quality can be determined and documented. The self-assessment involved a review of procedures and permits, and of well installation, maintenance, and abandonment records. The data engineer responsible for loading well data into the site's database was interviewed, as was the well maintenance coordinator. No OFIs or findings resulted from this assessment.

- *Environmental Surveillance – Groundwater Monitoring Program (Groundwater)* – This self-assessment was conducted October 20–30. Its scope included evaluation of the program that monitors SRS groundwater. The self-assessment also included a review of procedures, DOE orders, the SRS Groundwater Protection Program, and the Environmental Restoration Data Management System (ERDMS) Data Management Plan. A groundwater monitoring program is being implemented. It is made up of multiple site-specific monitoring programs specifically tailored to the requirements of individual regulated units. These individual programs operate under a common set of procedures and feed data into a common database (the ERDMS). The SRS Groundwater Protection Program describes the integration of the individual programs into a sitewide system. No findings resulted from this self-assessment, but two OFIs were identified. Corrective actions for the OFIs were identified as revisions of the SRS Groundwater Protection Plan. This corrective action has been initiated.

- *Air Emissions Inventory* – Completed in July, this effort focused on the adequacy and effectiveness of policies, procedures, and programs, including the Air Information Reporting System (AIRS) database for completing the Air Emissions Inventory. Inquiries covered compliance with the governing procedure, timeliness and accuracy of AIRS updates, verification of select emission factors, and control measures for access/updates to the AIRS database. No findings were noted; however, activities were initiated to identify and evaluate commercially available off-the-shelf

software products to improve data maintenance and upkeep, ensure more accurate emission estimates, reduce omissions and complacency, and increase the level of data ownership/ responsibility.

SCDHEC and EPA personnel conducted external inspections and audits of the SRS environmental program for regulatory compliance. Agency representatives performed several comprehensive compliance inspections and audits in 2008, as follows:

- *RCRA Compliance Evaluation Inspection* – The RCRA compliance evaluation inspection was conducted by SCDHEC June 2–6. A July 22 SCDHEC letter noted, "The facility appeared to be in compliance with all applicable requirements. You are to be commended for your excellent hazardous waste management program."

- *Annual Underground Storage Tank Inspection* – SCDHEC inspected the site's USTs August 20. All were found to be in compliance with applicable regulations for the sixth straight year.

- *632–G C&D Landfill, 288–F Ash Landfill, and 488–4D Ash Landfill Inspections* – SCDHEC conducted quarterly inspections of the 632–G C&D, the 288–F Ash, and the 488–4D Ash landfills; the facilities were found to be satisfactory, with no observed deficiencies.

- *Z-Area Saltstone Solid Waste Landfill Inspections* – The Saltstone Disposal Facility inspections continued to be completed on a weekly basis. Moisture areas were observed on the walls of the facility's Vault 4, and were reported to SCDHEC in accordance with the facility's contingency plan. (NOTE: "Moisture areas" are areas on the external walls of the facility's cells that appear damp due to a combination of saltstone shrinkage from curing, bleed, and process water accumulation at the inner cell walls, and hydrostatic pressure that causes the water to weep through preexisting construction cracks. Such moisture areas are not areas of free-flowing liquid.)

- *Interim Sanitary Landfill* – SCDHEC personnel conducted an annual post-closure inspection September 9, and the landfill was found to be satisfactory, with no observed deficiencies.

- *Groundwater Comprehensive Monitoring Evaluation* – SCDHEC conducted an unannounced RCRA inspection of SRS's groundwater program March 19–24. No deficiencies or permit violations were cited.

- *Site Radionuclide NESHAP Compliance Audit* – SCDHEC's Bureau of Air Quality conducted an air compliance audit June 17. The audit's purpose was to verify that the site's NESHAP Radionuclide Program is in compliance with 40 CFR 61 Subpart H requirements, and with the monitoring, reporting, and recordkeeping requirements contained in the Part 70 Air Quality Permit. One issue, based on a self-reported condition, was identified that related to the late submittal of the relative accuracy testing of the continuous-flow measurement system at F-Canyon. The testing was completed on time, but the report was not submitted to SCDHEC within the 30 days required by the permit. SRS has received a letter from SCDHEC indicating that further evaluation of the late submission is ongoing. No enforcement action was taken in 2008.

- *Quarterly Inspections of SRS Bottled Water Facility* – SCDHEC's Division of Food Protection conducted quarterly inspections of the SRS Bottled Water Facility until the plant was closed formally in September. Prior to the closure, results from routine bacteriological analyses and annual complete chemical analyses met SCDHEC and FDA water quality standards.

- *Site and D-Area Air Compliance Audit* – SCDHEC's Bureau of Air Quality conducted an air compliance audit August 18–20. The audit's purpose was to verify that SRS and the D-Area Powerhouse were in compliance with applicable regulations, including monitoring, reporting, and recordkeeping requirements contained in both Part 70 Air Quality Permits.

- *Annual NPDES Wastewater Program Inspection* – SCDHEC inspected the site's wastewater facilities (e.g., outfalls) in March. All were found to be in compliance with applicable regulations.

## Environmental Training

The SRS environmental training program identifies training needs and appropriate training settings to teach job-specific skills that protect the employee and the environment, in addition to satisfying regula-

**Table 3–4**
**SRS Construction and Operating Permits, 2004–2008**

| Type of Permit | Number of Permits | | | | |
|---|---|---|---|---|---|
| | **2004** | **2005** | **2006** | **2007** | **2008** |
| Air | 3 | 1 | 3[a] | 5[a] | 5 |
| U.S. Army Corps of Engineers Nationwide Permit | 3 | 4 | 5 | 5 | 4 |
| Domestic Water | 203 | 207 | 207 | 207 | 170 |
| Industrial Wastewater | 56 | 63 | 70 | 70 | 70 |
| NPDES Discharge | 1 | 1 | 2 | 2 | 2 |
| NPDES No Discharge | 1 | 1 | 1 | 1 | 1 |
| NPDES Stormwater | 2 | 2 | 2 | 2 | 2 |
| NPDES Construction Stormwater Grading Permit | N/A | 13 | 9 | 10 | 11 |
| RCRA Hazardous Waste | 1 | 1 | 1 | 1 | 1 |
| RCRA Solid Waste[b] | 4 | 4 | 3 | 4 | 4 |
| RCRA Underground Storage Tank | 7 | 7 | 7 | 7 | 7 |
| Sanitary Wastewater | 104 | 106 | 106 | 106 | 98 |
| SCDHEC 401 | 0 | 0 | 0 | 1 | 0 |
| SCDHEC Navigable Waters | 0 | 0 | 0 | 1 | 0 |
| Underground Injection Control | 18 | 21 | 14 | 14 | 15 |
| **Totals** | **403** | **431** | **430** | **436** | **390** |

[a] These numbers were revised to include the Mixed Oxide Fuel Fabrication Facility construction permit received in 2006.

[b] The Saltstone Disposal Facility's landfill permit covers all the Saltstone disposal vaults and cells.

tory training requirements. This process ensures that personnel whose actions could have environmental consequences are properly trained and made aware of their responsibilities to protect the environment, workers, and the public. General environmental awareness training is provided to all employees of SRS via initial General Employee Training (GET) which subsequently is reinforced annually through Consolidated Annual Training (CAT). Specialized training opportunities are developed by and offered through a centralized training organization that relies heavily upon the functional-area subject matter expertise within the environmental organization for the development of environmental and waste management curriculum. Regularly scheduled classes in this program cover such topics as Environmental Laws and Regulations, the Hazardous Waste Worker, Hazardous and Radiological Waste Characterization, and the Environmental Compliance Authority course. A self-taught Environmental Laws and Regulations course—available for technical personnel–is updated annually by environmental subject matter experts. More than 60 environmental program-related training courses are listed in the site training database, and individual organizations schedule and perform other facility-specific, environment-related training to ensure that

operations and maintenance personnel, as well as environmental professionals, have the knowledge and skills to perform work safely and in a manner that protects the environment in and around SRS.

## Environmental Permits

SRS had 390 construction and operating permits in 2008 that specified operating levels for each permitted source. Table 3–4 summarizes the permits held by the site during the past 5 years. These numbers reflect only permits obtained by the M&O contractor for itself and for other SRS contractors that requested assistance in obtaining permits. The numbers include some permits that were voided or closed during the calendar year (2008).

**Editor's note:** The "Environmental Compliance" chapter is unique in that its number of contributing authors is far greater than the number for any other chapter in this report. Space/layout constraints prevent us from listing all of them and their organizations on the chapter's first page, so we list them here instead. Their contributions, along with those of the report's other authors, continue to play a critical role in helping us produce a quality document—and are very much appreciated.

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# Effluent Monitoring

CHAPTER 4

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*Effluent monitoring at the Savannah River Site (SRS) is conducted to demonstrate compliance with applicable standards and regulations. Site effluent monitoring activities are divided into radiological and nonradiological programs. A complete description of sampling and analytical procedures used for effluent monitoring by the Environmental Monitoring Services group of the site's Regulatory Integration & Environmental Services organization can be found in sections 1101–1111 of the Savannah River Site Environmental Monitoring Program, WSRC–3Q1–2, Volume 1, Revision 4, [SRS EM Program, 2002]. A summary of data results is presented in this chapter; more complete data can be found in tables on the CD included with this report.*

## Radiological Monitoring

Radiological effluent monitoring results are a major component in determining compliance with applicable dose standards. SRS management philosophy ensures that potential exposures to members of the public and to onsite workers are kept as far below regulatory standards as is reasonably achievable. This philosophy is known as the "as low as reasonably achievable" (ALARA) concept.

SRS airborne and liquid effluents that potentially contain radionuclides are monitored at their points of discharge by a combination of direct measurement and/or sample extraction and analysis. Each operating facility maintains ownership of, and is responsible for, its radiological effluents.

Unspecified alpha and beta radiation releases (the measured gross activity minus the identified individual radionuclides) in airborne and liquid releases are large contributors—on a percentage basis—to offsite doses, especially for the airborne pathway from diffuse and fugitive releases (see definitions below).

The unspecified alpha and beta releases are listed separately in the effluent release tables. They conservatively include naturally occurring radionuclides such as uranium, thorium, and potassium-40, as well as small amounts of unidentified manmade radionuclides. For dose calculations, the unspecified alpha releases were assigned the plutonium-239 dose factor, and the unspecified beta releases were assigned the strontium-90 dose factor (chapter 6, "Potential Radiation Doses").

### Airborne Emissions

Process area stacks that release, or have the potential to release, radioactive materials are monitored continuously by applicable online monitoring and/or sampling systems [SRS EM Program, 2002].

Depending on the processes involved, discharge stacks also may be monitored with "real-time" instrumentation to determine instantaneous and cumulative atmospheric releases to the environment. Tritium is one of the radionuclides monitored with continuous real-time instrumentation.

The following effluent sampling and monitoring changes were made during 2008:

- Sampling was changed from weekly to twice a year at the 299–H building stack (also referred to as the 299–H decon facility stack), based on the potential impact category.
- Baseline sampling was conducted at the 241–278H Caustic Extraction Facility and set at a quarterly frequency for the new facility, based on the potential impact category.
- Sampling was discontinued at the 105–C Stack Decon Exhaust because no equipment was decontaminated at the facility during 2008.

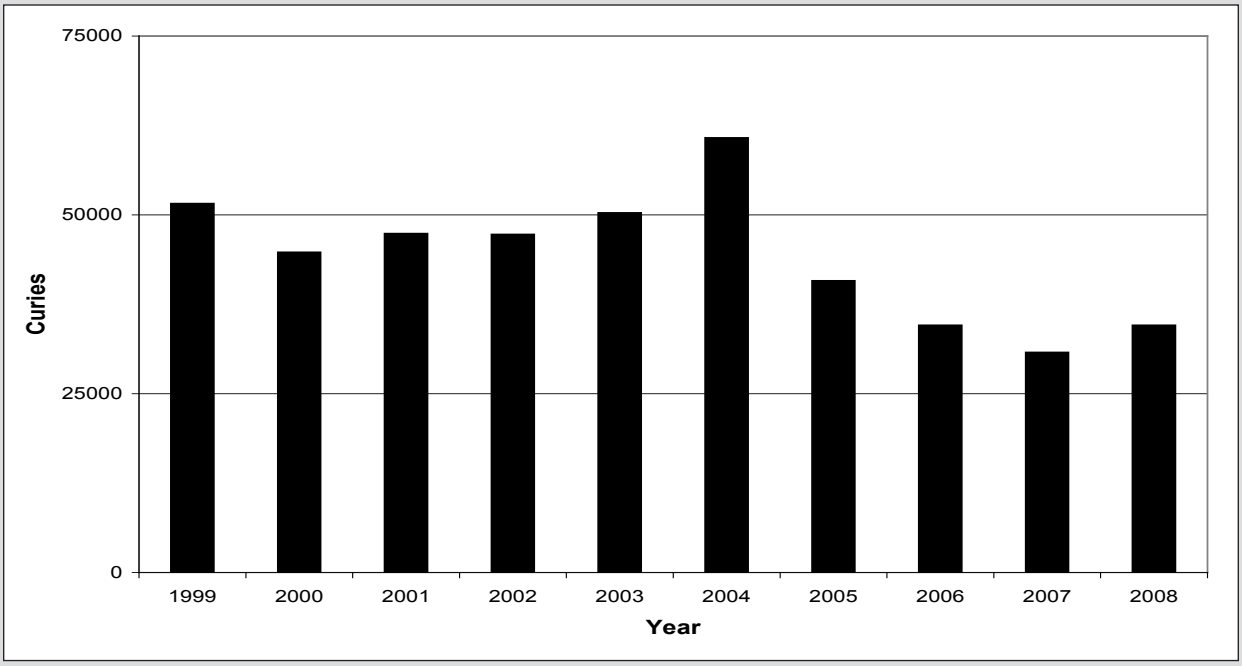


**Figure 4–1 Ten-Year History of SRS Annual Atmospheric Tritium Release**

## Diffuse and Fugitive Sources

Estimates of radionuclide releases from unmonitored diffuse and fugitive sources are calculated on an annual basis and are included in the SRS radioactive release totals. A diffuse source is defined as an area source, such as a pond or disposal area. A fugitive source is defined as an undesignated localized source, such as an open tank or naturally ventilated building.

Diffuse and fugitive releases are calculated using the U.S. Environmental Protection Agency's (EPA's) recommended methods [EPA, 2002]. Because these methods employ conservative assumptions, they generally lead to overestimates of actual emissions. Though these releases are not monitored at their source, onsite and offsite environmental monitoring stations are in place to quantify unexpectedly large diffuse and fugitive releases (chapter 5, "Environmental Surveillance").

## Monitoring Results Summary

The total amount of radioactive material released to the environment is quantified by using (1) data obtained from continuously monitored airborne effluent release points and (2) estimates of diffuse and fugitive sources.

**Tritium** Tritium in elemental and oxide forms accounted for more than 99 percent of the total radioactivity released to the atmosphere from SRS operations. During 2008, about 34,600 Ci of tritium were released from SRS, compared to about 30,800 Ci in 2007. Most of the releases came from the site's tritium facilities.

During the past 10 years, because of changes in the site's missions and the beginning of operations at the Replacement Tritium Facility, the amount of tritium released from SRS has fluctuated but has remained less than 75,000 Ci per year (figure 4–1).

**Comparison of Average Concentrations in Airborne Emissions to DOE Derived Concentration Guides** Average concentrations of radionuclides in airborne emissions are calculated by dividing the amount of each radionuclide released annually from each stack by the respective yearly stack-flow volumes. These average concentrations then can be compared to the DOE derived concentration guides (DCGs) in DOE Order 5400.5, "Radiation Protection of the Public and the Environment," as a screening method to determine if existing effluent treatment systems are proper and effective. The 2008 atmo-

spheric effluent annual-average concentrations, their comparisons against the DOE DCGs, and the quantities of radionuclides released are provided, by discharge point, on the CD accompanying this report.

DCGs are used as reference concentrations for conducting environmental protection programs at all DOE sites. DCGs are applicable at the point of discharge (prior to dilution or dispersion) under conditions of continuous exposure.

Most of the SRS radiological stacks/facilities release small quantities of radionuclides at concentrations below the DOE DCGs. However, tritium (in the oxide form) from the reactor (K-Area main stack, L-Area main stack, and L-Area disassembly basin) and tritium facilities was emitted in 2008 at concentration levels above the DCGs. The offsite dose from all atmospheric releases, however, remained well below the DOE and EPA annual atmospheric pathway dose standard of 10 mrem (0.1 mSv), as discussed in chapter 6.

## Liquid Discharges

Each process area liquid effluent discharge point that releases, or has potential to release, radioactive materials is sampled routinely and analyzed for radioactivity [SRS EM Program, 2002].

Depending on the processes involved, liquid effluents also may be monitored with real-time instrumentation to ensure that releases are managed within established limits. Because the instruments have limited detection sensitivity, online monitoring systems are not used to quantify SRS liquid radioactive releases at their current low levels. Instead, samples are collected for more sensitive laboratory analysis.

### Monitoring Results Summary

Data from continuously monitored liquid effluent discharge points are used in conjunction with site seepage basin and Solid Waste Disposal Facility (SWDF) migration release estimates to quantify the total radioactive material released to the Savannah River from SRS operations. SRS liquid radioactive releases for 2008 are shown by source on the CD accompanying this report. These data are a major component in the determination of offsite dose consequences from SRS operations.

**Direct Discharges of Liquid Effluent** Direct discharges of liquid effluents are quantified at the point of release to the receiving stream, prior to dilution by the stream. The release totals are based on measured concentrations and flow rates.

Tritium accounts for nearly all the radioactivity discharged in SRS liquid effluents. The total amount of tritium released directly from process areas—i.e., reactor, separations, Effluent Treatment Facility (ETF)—to site streams during 2008 was 320Ci. Direct releases of tritium to site streams for the years 1999–2008 are shown in figure 4–2.

Operations at D-Area and TNX were discontinued in 2000 and 2001, respectively. A-Area releases represent only a small percentage of the total direct releases of tritium to site streams. The reactor area releases include the overflows from PAR Pond and L Lake.

Migration/transport of radionuclides from site seepage basins and SWDF are discussed in chapter 5.

**Comparison of Average Concentrations in Liquid Releases to DOE Derived Concentration Guides** In addition to dose standards, DOE Order 5400.5 imposes other control considerations on liquid releases. These considerations are applicable to direct discharges but not to seepage basin and SWDF migration discharges. The DOE order lists DCG values for most radionuclides.

DCGs are applicable at the point of discharge from the effluent conduit to the environment (prior to dilution or dispersion). According to DOE Order 5400.5, exceedance of the DCGs at any discharge point may require an investigation of “best available technology” (BAT) waste treatment for the liquid effluents. Tritium in liquid effluents is specifically excluded from BAT requirements; however, it is not excluded from other ALARA considerations. DOE DCG compliance is demonstrated when the sum of the fractional DCG values for all radionuclides detectable in the effluent is less than 1.00, based on consecutive 12-month-average concentrations. The 2008 liquid effluent annual-average concentrations, their comparisons against the DOE DCGs, and the quantities of radionuclides released are provided—by discharge point—on the CD accompanying this report.

The data show that ETF Outfall U3R–2A at the

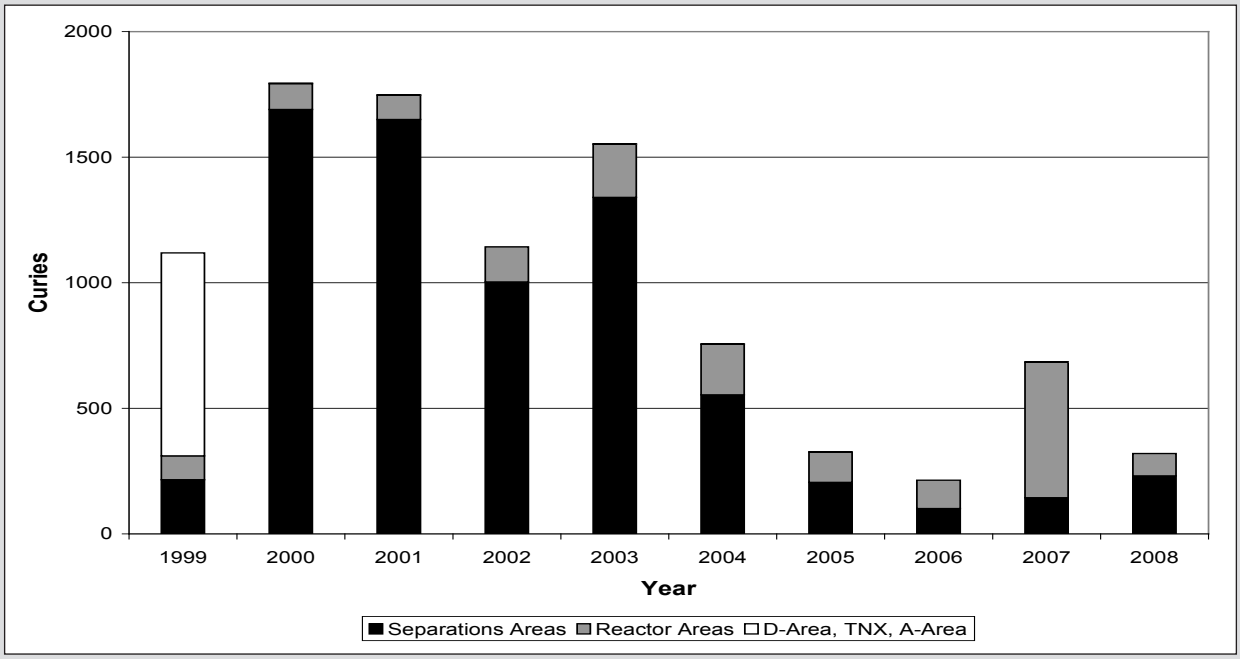


**Figure 4–2 Ten-Year History of Direct Releases of Tritium to SRS Streams**

Road C discharge point exceeded the DCG guide for 12-month-average tritium concentrations again during 2008. However, as noted previously, DOE Order 5400.5 specifically exempts tritium from BAT waste treatment investigation requirements. This is because there is no practical technology available for removing tritium from dilute liquid waste streams.

In January 2008, H-Canyon released a small amount of alpha-contaminated water to the cooling water system in H-Area. The contaminated water was diverted and captured in the 281–8H retention basin, then transferred to the Effluent Treatment Project for treatment until the alpha level fell below the site's operational discharge limit of 3 dpm/mL. At that point, the 281–8H water was released in batches to Fourmile Branch via the H–017 outfall. However, because DCGs are very conservatively applied at the point of discharge, the 12-month average DCG for plutonium-238 was exceeded at H–017 at the 3-dpm/mL level. A BAT assessment was not deemed necessary for this exceedance because it was a known, episodic event that was handled using BAT (i.e., filtration through the Effluent Treatment Project). Although the DCG for plutonium-238 was exceeded at H–017 as a result of this episodic release, the resulting potential increase in offsite dose was small and well below all applicable dose standards (see chapter 6, "Potential Radiation Doses").

No other liquid discharge points exceeded the DOE DCGs during 2008.

## Release of Material Containing Residual Radioactivity (Table)

DOE issued a moratorium in January 2000 prohibiting the release of volume-contaminated metals, and suspended the release of metals from DOE radiological areas in July 2000 for recycling purposes. No volume-contaminated metals or metals for recycling purposes were released from SRS in 2008.

DOE approved an SRS request in 2003 to use supplemental limits for releasing material from the site with no further DOE controls. These supplemental release limits are dose-based, and are such that if any member of the public received any exposure, it would be less than 1 mrem/year. The supplemental limits include both surface and volume concentration criteria. The surface criteria are very similar to those used in previous years. The volume criteria allow the disposal of potentially volume-contaminated material in SRS's Three Rivers Landfill, an onsite sanitary facility. In 2008, no material was released from the site using the SRS Supplemental Release Limits volume concentration criteria.

These measures ensure that radiological releases of material from SRS are consistent with the requirements of DOE Order 5400.5.

# Nonradiological Monitoring

## Airborne Emissions

The South Carolina Department of Health and Environmental Control (SCDHEC) regulates both radioactive and nonradioactive criteria and toxic air pollutant emissions from SRS sources. Each source of air emissions is permitted or exempted by SCDHEC on the SRS Part 70 Air Quality Permit (issued in 2003), with specific limitations and monitoring requirements identified. This section will cover only nonradioactive emissions.

The bases for the limitations and monitoring requirements specified in the Part 70 Air Quality Permit are outlined in various South Carolina and federal air pollution control regulations and standards. Many of the applicable standards are source dependent, i.e., applicable to certain types of industries, processes, or equipment. However, some standards govern all sources for criteria pollutants, toxic air pollutants, and ambient air quality. Air pollution control regulations and standards applicable to SRS sources are discussed briefly in appendix A, "Applicable Guidelines, Standards, and Regulations," of this report. The SCDHEC air standards for toxic air pollutants can be found at http://www.scdhec.gov/environment/baq/docs/regs/.

### Description of Monitoring Program

Major nonradiological emissions of concern from stacks at SRS facilities include sulfur dioxide, carbon monoxide, oxides of nitrogen, particulate matter smaller than (1) 10 micrometers and (2) 2.5 micrometers, volatile organic compounds (VOCs), and toxic air pollutants. With the issuance of the Part 70 Air Quality Permit, SRS has several continuous and periodic monitoring requirements; only the most significant are discussed below.

The primary method of source monitoring at SRS is the annual air emissions inventory. Actual emissions from SRS sources are determined during this inventory from standard calculations using source operating parameters, such as hours of operation, process throughput, and emission factors provided in the EPA "Compilation of Air Pollution Emission Factors," AP–42. Many of the processes at SRS, however, are unique sources requiring nonstandard, complex calculations. The hourly and total actual annual emissions for each source then can be compared against their respective permit limitations.

At the SRS A-Area and D-Area Powerhouses, airborne emission specialists under contract to SRS perform stack compliance tests every two years. The tests include sampling of boiler exhaust gases to determine particulate matter, sulfur dioxide, and visible opacity emissions. The permit for the A-Area Powerhouse also requires a weekly sample and laboratory analysis of coal for sulfur content, and a daily visible-emissions inspection to verify compliance with opacity standards.

For the package steam generating boilers in K-Area, fuel oil-fired water heaters in B-Area, and diesel-powered equipment, compliance with sulfur dioxide standards is determined by analysis of the fuel oil purchased from the offsite vendor. Sulfur content of the fuel oil must be below 0.05 percent—and must be certified by the fuel supply vendor and reported to SCDHEC semiannually.

The monitoring of SRS diesel-powered equipment includes tracking fuel oil consumption monthly and calculating a 12-month rolling total for determining permit compliance with a site consumption limit.

SRS has several soil vapor extraction units and two air strippers that are sources of toxic air pollutants and VOCs. These units must be sampled monthly for VOC concentrations, and the total VOC emissions must be calculated for comparison against a 12-month rolling limit. The VOC emissions then are reported to SCDHEC on a quarterly basis.

Several SRS sources have pollutant control devices—such as multiclone dust collectors, electrostatic precipitators, baghouse dust collectors, or condensers—whose parameters must be monitored continuously or whenever the system is operated. The operating parameters must be recorded and compared against specific operating ranges.

Compliance by all SRS permitted sources is evaluated during annual compliance inspections by the local SCDHEC district air manager. The inspections include a review of each permit condition; i.e., daily monitoring readings, equipment calibrations, control device inspections, etc. SCDHEC performed an air

**Table 4–1**
**SRS Estimated SCDHEC Standard 2 Pollutant Air Emissions, 2005–2007**

| Pollutant Name | Actual Emissions (Tons/Year) | | |
|---|---|---|---|
| | 2005 | 2006 | 2007 |
| Sulfur dioxide ($SO_x$) | 6.97E+03 | 5.10E+03 | 4.25E+03 |
| Total particulate matter (PM) | 9.28E+02 | 5.04E+02 | 4.17E+02 |
| Particulate matter <10 micrometers ($PM_{10}$) | 5.71E+02 | 3.82E+02 | 2.45E+02 |
| Particulate matter <2.5 micrometers ($PM_{2.5}$) | 4.77E+02 | 3.19E+02 | 2.20E+02 |
| Carbon monoxide (CO) | 1.03E+03 | 7.83E+01 | 7.62E+01 |
| Ozone (volatile organic compounds) | 5.48E+02 | 1.69E+01 | 1.61E+01 |
| Gaseous fluorides (as hydrogen fluoride)[a] | 1.43E-01 | 1.42E+01 | 1.27E+01 |
| Nitrogen dioxide ($NO_x$) | 7.18E+03 | 3.15E+03 | 2.63E+03 |
| Lead (lead components) | 1.74E-01 | 7.60E-02 | 1.91E-02 |

[a] The increase in gaseous flourides from 2005 to 2006 is attributed to updated and corrected D-Area Powerhouse (coal boilers) emission factors. In 2005 and previous years, gaseous fluoride emissions from the D-Area Powerhouse were not calculated.

compliance inspection in August 2008 and found no instances of noncompliance.

### Monitoring Results Summary

In 2008, operating data were compiled and emissions calculated for 2007 operations for all site air emission sources. Because this process, which begins in January, requires up to 6 months to complete, this report provides a comprehensive examination of total 2007 emissions, with only limited discussion of available 2008 monitoring results for specific sources.

The 2007 total SCDHEC Standard 2 emission estimates for all SRS permitted sources, as determined by the air emissions inventory conducted in 2008, are provided in table 4–1. A review of the calculated emissions for each source for calendar year 2007 determined that SRS sources had operated in compliance with permitted emission rates. Some toxic air pollutants (e.g., benzene) regulated by SCDHEC also are, by nature, VOCs. As such, the total for VOCs in table 4–1 includes toxic air pollutant emissions.

Three power plants with nine overfeed stoker-fed coal-fired boilers are maintained by Savannah River Nuclear Solutions (SRNS) at SRS. The location, number of boilers, and capacity of each boiler for these plants are listed in table 4–2. A-Area Boiler No. 2 was stack-tested in February 2008. At that time, the boiler's sulfur dioxide and visible emissions were found to be in compliance with its permitted limit; however, the boiler's particulate matter emissions were found to be out of compliance with its permitted limit. The boiler was shut down permanently on March 19, 2008, and on September 13, 2008, A-Area Boiler No. 1 also was shut down permanently. Results from the A-Area Boiler No. 2 test are shown in table 4–3.

To replace the aging A-Area coal-fired boilers, SRS began construction of a biomass boiler and an oil-fired backup boiler in October 2007. Known as

**Table 4–2**
**SRS Power Plant Boiler Capacities**

| Location | Number of Boilers | Capacity (Btu/hr) |
|---|---|---|
| A-Area | 2[a] | 71.7E+06 |
| A-Area | 2[b] | 40.7E+06 |
| H-Area | 3[c] | 71.1E+06 |
| D-Area | 4 | 396.0E+06 |

[a] Shut down permanently in March, September 2008
[b] Operations began in August 2008
[c] Operations discontinued in 2000 and 2001

the 784–7A Steam Facility, those two boilers are substantially smaller and burn cleaner than the two coal-fired boilers they replaced. The biomass boilers produce significantly less particulate matter, sulfur dioxide, and nitrogen dioxide emissions than the two coal-fired boilers. The biomass boiler and backup oil-fired boiler began operations in August 2008.

WSRC assumed operational responsibility for the D-Area Powerhouse (484–D) in February 2006 from South Carolina Electric and Gas (SCE&G), which had operated the facility for DOE under a separate contract since 1995. The D-Area Powerhouse has four coal-fired boilers—each on a biennial stack test schedule required by the Part 70 Air Quality Permit. During 2008, only D-Area Powerhouse boilers D#2 and D#4 were scheduled to be tested. Boiler D#4 could not be tested because of extended maintenance repairs; however the results for boiler D#2 are shown in table 4–3. This boiler's particulate matter, sulfur dioxide, and visible emissions were found to be in compliance with its permitted limit.

The three H-Area Powerhouse boilers have not operated since 2000–2001.

SRS also has two package steam generating boilers in K-Area fired by No. 2 fuel oil. The percent of sulfur in the fuel oil must be vendor certified semiannually to ensure that the fuel meets permit specifications; the certification was documented twice during 2008.
The total diesel fuel consumption for portable air compressors, generators, emergency cooling water

**Table 4–3**
**2008 Boiler Stack Test Results**

| | | Emission Rates | |
|---|---|---|---|
| **Boiler** | **Pollutant** | **lb/10⁶ Btu** | **lb/hr** |
| A-Area Boiler #2 | Particulates[a] | 0.690 | 31.45 |
| | Sulfur dioxide[a] | 1.318 | 53.41 |
| | Opacity[b] | Avg. 12.5% | |
| D-Area Boiler #2 | Particulates[a] | 0.088 | 33.87 |
| | Sulfur dioxide[a] | NC[d] | NC[d] |
| | Opacity[b] | Avg. 6.9% | |
| D-Area Boiler #4[c] | Particulates[a] | | |
| | Sulfur dioxide[a] | | |
| | Opacity[b] | | |

[a] The compliance level is 0.6 lb/million Btu for particulates and 3.5 lb/million Btu for sulfur dioxide.
[b] Opacity limit 40%
[c] Not stack tested during 2008
[d] Not calculated

pumps, and fire water pumps was found to be well below the SRS limit for the entire reporting period. As reported to SCDHEC during 2008, the calculated annual VOC emissions were well below the permit limit for each unit.

### Ambient Air Quality

Under existing regulations, SRS is not required to conduct onsite monitoring for ambient air quality; however, the site is required to show compliance with various air quality standards. To accomplish this, air dispersion modeling is conducted as required as part of the Title V and construction permitting process. Additional information about ambient-air-quality regulations at the site can be found in appendix A of this report.

## Liquid Discharges

### Description of Monitoring Program

SRS monitors nonradioactive liquid discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES), as mandated by the Clean Water Act. As required by EPA and SCDHEC, SRS has NPDES permits in place for discharges to the waters of the United States and South Carolina. These permits establish the specific sites to be monitored, parameters to be tested, and monitoring frequency—as well as analytical, reporting, and collection methods. Detailed requirements for each permitted discharge point can be found in the individual permits, which are available to the public through SCDHEC's Freedom of Information office at 803–898–3882.

In 2008, SRS discharged water into site streams and the Savannah River under three NPDES permits: two for industrial wastewater, SC0047431 (covers D-Area) and SC0000175 (covers remainder of site), and one for stormwater runoff—SCR000000 (industrial discharge). A fourth permit, SCR100000, does not require sampling unless requested by SCDHEC to address specific discharge issues at a given construction site; SCDHEC did not request such sampling in 2008.

SRS submitted a permit application in 2006 for each of nine individual stormwater outfalls for which the average of any four consecutive analyses exceeded the proposed EPA Multisector General Permit benchmarks. At the end of 2008, the site still had no response from SCDHEC regarding the individual permit applications.

Permit ND0072125 is a "no discharge" water pollution control land application permit that regulates sludge application and related sampling at onsite sanitary wastewater treatment facilities.

NPDES samples are collected in the field according to 40 CFR 136, the federal document that lists specific sample collection, preservation, and analytical methods acceptable for the type of pollutant to be analyzed. Chain-of-custody procedures are followed after collection and during transport to the analytical laboratory. The samples then are accepted by the laboratory and analyzed according to procedures listed in 40 CFR 136 for the parameters required by the permit.

### Monitoring Results Summary

SRS reports industrial wastewater analytical results to SCDHEC through a monthly discharge monitoring report (EPA Form 3320–1). Results from only five of the 4,529 sample analyses (includes flow measurements and no-flow designations) performed during 2008 exceeded permit limits. This resulted in a 99.89-percent compliance rate for discharge monitoring results. Of the five exceptions, two warranted SCDHEC Notices of Violation, but no fines were assessed. Details related to the five exceptions appear in table 4–4. A complete presentation of the NPDES data, with the exceptions noted, can be found on the CD accompanying this report.

In 2008, 17 stormwater outfalls were scheduled for compliance sampling. All samples were obtained as scheduled, with the additional sampling of one outfall to determine the effectiveness of an installed best management practice (BMP). In addition to compliance sampling, special grab sampling was conducted at six outfalls to aid in evaluating compliance with the proposed general permit. It was reported in 2006 that 10 outfalls had exceeded EPA benchmarks and would require corrective actions. By the end of 2007, seven of these outfalls were in compliance. Installation of BMPs for the remaining three outfalls was completed in June 2008; evaluation of the effectiveness of these BMPs is ongoing. Complete stormwater data can be found on the CD accompanying this report.

**Table 4–4**
**2008 Exceptions to SCDHEC-Issued NPDES Permit Liquid Discharge Limits at SRS[a]**

| Business Unit | Outfall | Date(s) | Parameter | Possible Cause(s) | Corrective Actions |
|---|---|---|---|---|---|
| Site Infrastructure | K–12 | March 11 | Total Suspended Solids (TSS) (weekly avg)<br>Value: 66 mg/L<br>Limit: 45 mg/L | Infiltration of solids from nearby construction; cement-like material poured in a collection system; inadequate aeration | Eliminated infiltration, verified contaminants not present, replaced air diffuser heads |
| Liquid Waste Operations | H–16 | May 12 | TSS (holding time)<br>Value: 7.9 days<br>Limit: 7 days | Laboratory exceeded holding time because sample not logged in upon receipt at laboratory | Isolated incident, but laboratory took steps to prevent repeat |
| Site Infrastructure | G–10 | July 16 | Fecal Coliform (daily max)<br>Value: 746 col/100 mL<br>Limit: 400 col/100 mL | Cause not identified after thorough investigation; appears to be anomaly | Pursue onsite certification for fecal coliform analyses to reduce potential for contamination or growth during sample transport to offsite laboratory |
| Materials Disposition | H–12 | August 7 | Copper (daily max)<br>Value: 39.9 mg/L<br>Limit: 35 mg/L | Solids in the sample | Unable to determine specific cause; comprehensive sampling plan implemented |
| Defense Programs | H–02 | November 11 | Copper (monthly avg)<br>Value: 0.0073 mg/L<br>Limit: 0.007 mg/L | Until November 1, copper limit was monitor and report (no limit); on November 1, limit of 0.007 mg/l imposed by SCDHEC | Permit modification issued by SCDHEC; effective November 30, monthly average limit raised to 0.032 mg/l |

[a] SRS's compliance rate for 2008 was 99.89 percent.

CHAPTER 5

# Environmental Surveillance

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*Environmental surveillance at the Savannah River Site (SRS) is designed to survey and quantify any effects that routine and nonroutine operations could have on the site and on the surrounding area and population. Site surveillance activities are divided into radiological and nonradiological programs.*

As part of SRS's radiological surveillance program, routine surveillance of all radiation exposure pathways is performed on all environmental media (air, rain, ambient gamma radiation, surface water, soil, sediment, vegetation, drinking water, food products, and wildlife) that could lead to a measurable annual dose above background at and beyond the site boundary.

Nonradioactive environmental surveillance at SRS involves the sampling and analysis of surface water, drinking water, sediment, groundwater, and fish. Results from the analyses of surface water, drinking water, sediment, and fish are discussed in this chapter. A description of the groundwater monitoring program analysis results can be found in chapter 7, "Groundwater."

The Regulatory Integration & Environmental Services Department's Environmental Monitoring (EM) section performs surveillance activities for SRS. The Savannah River also is monitored by other groups, including the South Carolina Department of Health and Environmental Control (SCDHEC), the Georgia Department of Natural Resources, Georgia Power Company's Vogtle Electric Generating Plant (operating in Georgia), and the City of Savannah, Georgia.

A complete description of the EM surveillance program, including sample collection and analytical procedures, can be found in section 1105 of the *Savannah River Site Environmental Monitoring Program*, WSRC–3Q1–2, Volume 1, Revision 4 (SRS EM Program, 2002). Brief summaries of analytical results are presented in this chapter; complete data sets can be found in tables on the CD accompanying this report.

## Radiological Surveillance

### Air

#### Description of Surveillance Program (Table)

EM maintains a network of 15 sampling stations in and around SRS to monitor the concentration of tritium and radioactive particulate matter in the air.

#### Surveillance Results Summary

Except for tritium, monitored radionuclides were not routinely detectable at the site perimeter. Both onsite and offsite radioactivity concentrations were similar to levels observed in previous years (see expanded discussion in paragraphs that follow).

Average gross alpha and gross beta results were slightly lower in 2008 than in 2007, and are consistent with historical results in demonstrating long-term variability.

No 2008 samples contained the detectable manmade gamma-emitting radionuclide cesium-137. Historically, only a small number of air samples have contained detectable cesium-137 activity.

During 2008, detectable levels of uranium-234 were observed in three air samples; however no detectable levels of uranium-238 were observed in any of

the 2008 samples. These results are similar to those observed in 2007. Uranium is naturally occurring in soil, and therefore expected to be present in low concentrations on some particulate filters. Aside from uranium, alpha-emitting radionuclide activity was observed in two samples from two locations—site perimeter and 25-mile. The site perimeter location revealed corresponding increases in plutonium-238, plutonium-239, and americium-241 for the same sampling date, which is consistent with the true presence of plutonium. Generally, these concentrations were consistent with historical results. For the remaining locations, all alpha-emitting isotopes were below detection levels. All 2008 strontium-89,90 results were below the minimum detectable concentration (MDC), whereas, two of the 2007 sample results were above the MDC. The dose consequences are explained in more detail in chapter 6 ("Potential Radiation Doses").

Tritium-in-air results for 2008 were similar to—but generally higher than—those observed in 2007. However, the results are consistent with the long-term variability of historical results. The Burial Ground North (BGN) tritium-in-air results were slightly lower than those observed in 2007. As in previous years, the BGN location showed average and maximum concentrations significantly higher than those observed at other locations. BGN results are expected to be both higher and more variable because of the location's proximity to both the tritium facilities and the phytoremediation project near the center of the site, and are influenced by operations at these facilities. Tritium was detected at every sampling location, although not every sample from a particular location had detectable tritium. As expected, tritium concentrations generally decreased with increasing distance from the tritium facilities.

## Rainwater

### Description of Surveillance Program

SRS maintains a network of 15 rainwater sampling sites as part of the air surveillance program. These stations are used to measure deposition of radioactive materials.

### Surveillance Results Summary (Tables A, B)

No detectable manmade gamma-emitting radionuclides were observed in rainwater samples in 2008. Gross alpha and gross beta results from 2008 were consistent with those of 2007. In 2008, the average gross alpha results generally were slightly lower (four of seven locations showed a decrease) than those of 2007, while average gross beta results were slightly higher (four of seven locations showed an increase). Annual average gross alpha and gross beta concentrations, as well as individual sample results, are consistent with historical results, which demonstrate long-term variability.

Detectable levels of uranium-234 and uranium-238 were present in most samples. Uranium is naturally occurring in soil, and therefore expected to be present at low concentrations in some deposition samples. Elevated uranium-238 results again were observed at the D-Area and BGN locations. Increased airborne particulate matter (dust) is present at these locations as a result of one or both of the following: (1) D&D activities in the immediate vicinity, resulting in the movement of large amounts of soil, and (2) increased vehicle traffic on nearby dirt roads or fields. It is believed that this phenomenon is responsible for the observed increase. All locations showed detectable americium-241 (overall, 18 percent of the samples), with an average concentration of 1.60E-01 pCi/L—well below the drinking water standard. All other actinides, as well as strontium-89,90, either were below detection levels or were present in only a small number of samples in 2008.

As in previous years, tritium-in-rain values were highest near the center of the site—except for one value at the Augusta Lock and Dam that is considered an outlier. The tritium-in-rain result for August 2008 at the Augusta Lock and Dam is believed to be an outlier due to a lab error because (1) it is much higher than historical levels, (2) it is the only result for this location above the minimum detectable concentration for the entire year, (3) it is higher than locations located closer to the center of the site, and (4) the cycles immediately before and after the result in question were consistent with long-term levels. All samples from the center of the site contained detectable tritium. This is consistent with the H-Area effluent release points that routinely release tritium. Beyond the center of the site, tritium was detected in only seven samples representing six locations on the site perimeter. As with tritium in air, concentrations generally decreased as distance from the effluent release point increased.

## Gamma Radiation

### Description of Surveillance Program

Ambient dose rates from gamma radiation exposures in and around SRS are monitored by a system of thermoluminescent dosimeters (TLDs).

### Surveillance Results Summary (Table)

Ambient dose rates at all TLD monitoring locations show some variation based on normal site-to-site and year-to-year differences in the components of natural ambient gamma radiation exposure levels. In 2008, ambient dose rates varied between 67 and 115 mrem per year.

In general, the 2008 ambient gamma radiation monitoring results indicated gamma radiation dose rates slightly higher than those observed at the same locations in 2007. However, due to equipment malfunction, only partial results were available for the fourth quarter of 2008. In addition, results for the control samples from the third quarter were inadequate because of no exposure prior to field use; therefore, all sample results for this quarter were omitted. The averages were based only on the correct data results that were available. The average annual dose rate was 87 mrem in 2008, compared to 76 mrem in 2007; all locations showed higher average annual dose rates in 2008. However, these results generally are consistent with previously published historical results, and indicate that no significant difference in average annual dose rates is observed between monitoring networks—except in the case of population centers. Ambient dose rates in population centers are slightly elevated compared to the other monitoring networks—as expected—because of factors such as buildings and roadways, which emit small amounts of radiation.

## Stormwater Basins

### Description of Surveillance Program

Stormwater accumulating in site stormwater basins is monitored because of potential contamination. In 2008, monitoring was conducted at six E-Area basins, as well as at the Z-Area Basin and F-Area Pond 400.

### Surveillance Results Summary (Table)

There are no active discharges to site stormwater basins. The primary contributor is rainwater runoff. Rain events did not supply enough water to the E–06 basin for sampling purposes in 2008. The highest stormwater basin mean tritium concentration was measured in the E–05 basin, and was consistent with historical results—although slightly higher than the highest stormwater basin concentration in 2007. Fission products were observed in the basins, with no iodine-129 in any basin and with cesium-137 appearing only in the Z-A Basin. Uranium-234, uranium-238, and plutonium-238 were the primary actinides detected in the basins. Gross alpha and gross beta were detected at all basins in concentrations generally consistent with those of previous years.

## Streams

### Description of Surveillance Program

Continuous surveillance monitoring of SRS streams is utilized downstream of several process areas to detect and quantify levels of radioactivity in effluents transported to the Savannah River. The five primary streams are Upper Three Runs, Fourmile Branch, Pen Branch, Steel Creek, and Lower Three Runs. The frequency and types of analyses performed on each sample are based on potential quantity and types of radionuclides likely to be present at the sampling location.

### Surveillance Results Summary (Table)

Detectable concentrations of tritium, the predominant radionuclide detected above background levels in SRS streams, were observed at least once at all stream locations in 2008. Tritium releases to site streams increased slightly during 2008 over 2007—primarily in direct releases to Upper Three Runs and in migration to Fourmile Branch. However, concentrations remain consistent with long-term tritium levels.

No detectable concentrations of cobalt-60 were observed in any of the five major SRS streams. Cesium-137 was detected in these streams, but none was detected at the final discharge measurement points of the streams. As expected, gross alpha and

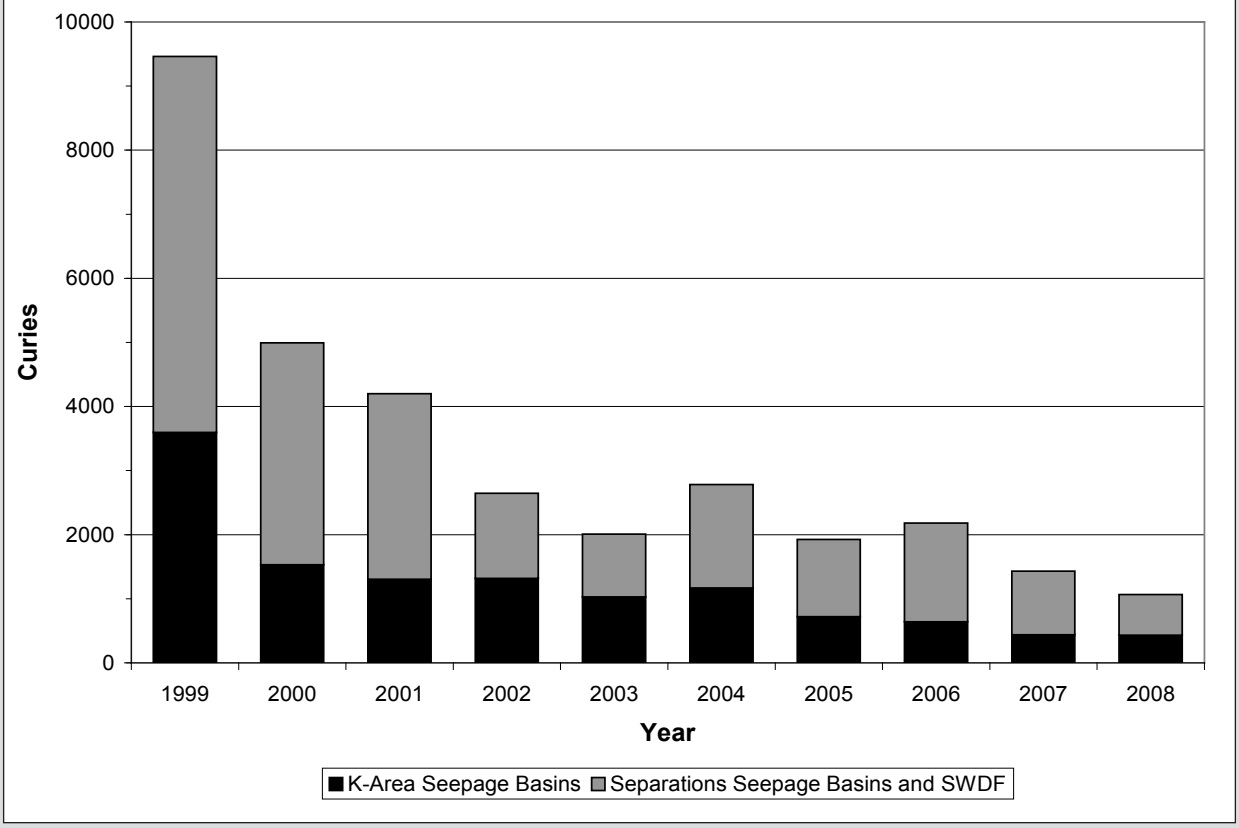


**Figure 5–1 Tritium from SRS Seepage Basins and SWDF to Site Streams, 1999–2008**

gross beta were detected in all streams but concentrations were consistent with levels of recent years. Otherradionuclides were observed at locations throughout the site, but were consistent with the source of the material, and exhibited variations similar to those of previous years. No significant trends were observed in 2008 when compared to recent years.

### Seepage Basin and Solid Waste Disposal Facility Radionuclide Migration (Table)

To incorporate the migration of radioactivity to site streams into total radioactive release quantities, EM personnel continued to monitor and quantify the migration of radioactivity from site seepage basins and the Solid Waste Disposal Facility (SWDF) in 2008 as part of its stream surveillance program. Tritium, strontium-89,90, technetium-99, iodine-129 and cesium-137 were detected in migration releases.

Figure 5–1 is a graphical representation of releases of tritium via migration to site streams for the years 1999–2008. As can be seen in the figure, migration releases of tritium generally have declined the past 10 years, with year-to-year variability caused mainly by the amount of annual rainfall. During 2008, the total quantity of tritium migrating from site seepage basins and SWDF was 1,215 Ci.

Radioactivity previously deposited in the F-Area and H-Area seepage basins and SWDF continues to migrate through the groundwater and to outcrop into Fourmile Branch and Upper Three Runs. Because of their proximity, migration from the SWDF cannot be distinguished from migration from a part of H-Area Basin 4. Measured migration of tritium into Fourmile Branch in 2008 occurred as follows:

- from F-Area seepage basins, 71 Ci—a 54-percent decrease from the 2007 total of 154 Ci

- from SDWF and a part of H-Area seepage basin 4, 493 Ci—a 48-percent increase from the 2007 total of 333 Ci

- from H-Area seepage basins 1, 2, 3, and most of 4, 131 Ci—a 39-percent increase from the 2007 total of 94 Ci

The measured migration from the north side of SWDF and the General Separations Area (GSA) into Upper Three Runs in 2008 was 20 Ci, a 63-percent decrease from the 2007 total of 54 Ci. (The GSA is in the central part of SRS and contains all waste disposal facilities, chemical separations facilities, and associated high-level waste storage facilities, along with numerous other sources of radioactive material.)

The total amount of strontium-89,90 entering Fourmile Branch from the GSA seepage basins and SWDF during 2008 was estimated to be 25.4 mCi. Migration releases of strontium-89,90 vary from year to year but have remained below 100 mCi the past 7 years.

In 2008, 9.7 mCi of technetium-99, 19.9 mCi of iodine-129, and 153 mCi of cesium-137 were estimated to have migrated into Fourmile Branch.

**K-Area Drain Field and Seepage Basin** Liquid purges from the K-Area disassembly basin were released to the K-Area seepage basin in 1959 and 1960. From 1960 until 1992, purges from the K-Area disassembly basin were discharged to a percolation field below the K-Area retention basin. Tritium migration from the seepage basin and the percolation field is measured annually in Pen Branch. The 2008 migration total of 500 Ci represents a slight increase from the 431 Ci recorded in 2007.

**C-Area, L-Area, and P-Area Seepage Basins** Liquid purges from the C-Area, L-Area, and P-Area disassembly basins were released periodically to their respective seepage basins from the 1950s until 1970. Migration releases from these basins are accounted for in the stream transport totals (see "Tritium Transport in Streams" section of this chapter).

### Transport of Actinides in Streams

Transport (flux) in site streams of the actinides uranium, plutonium, americium, and curium no longer is quantified because of the actinides' historically low levels. However, 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. Values for 2008 were consistent with historical data.

## Savannah River

### Description of Surveillance Program

Continuous surveillance is performed along the Savannah River at locations above and below SRS, including a location at which liquid discharges from Georgia Power Company's Vogtle Electric Generating Plant (VEGP) enter the river.

### Surveillance Results Summary (Table)

Based on curies released, tritium is the predominant radionuclide detected above background levels in the Savannah River. The combined SRS and VEGP tritium releases (weekly composites) at River Mile (RM) 118.8 increased in 2008, but levels were well below the drinking water standard. Except for cesium-137 recorded at one location during a one-week period, no gamma emitters were detected. Detectable gross alpha and gross beta activity was observed at all river sampling locations, and was consistent with long-term gross alpha and gross beta levels in the river.

In addition to the weekly composite samples referred to above, SRS collects annual grab samples to provide a more comprehensive suite of radionuclides. Uranium-234 and uranium-238 were quantified in all these grab samples in 2008. Annual sampling also detected the manmade radionuclides americium-241 and technetium-99. Americium-241 has been detected previously in the river, but technetium-99 has not.

## Tritium Transport in Streams (Table)

Tritium is introduced into SRS streams and the Savannah River from former production areas on site. Because of the mobility of tritium in water and the quantities of the radionuclide released during the years of SRS operations, a tritium balance has been performed annually since 1960. The balance is evaluated among the following alternative methods of calculation:

- tritium releases from effluent release points and calculated seepage basin and SWDF migration

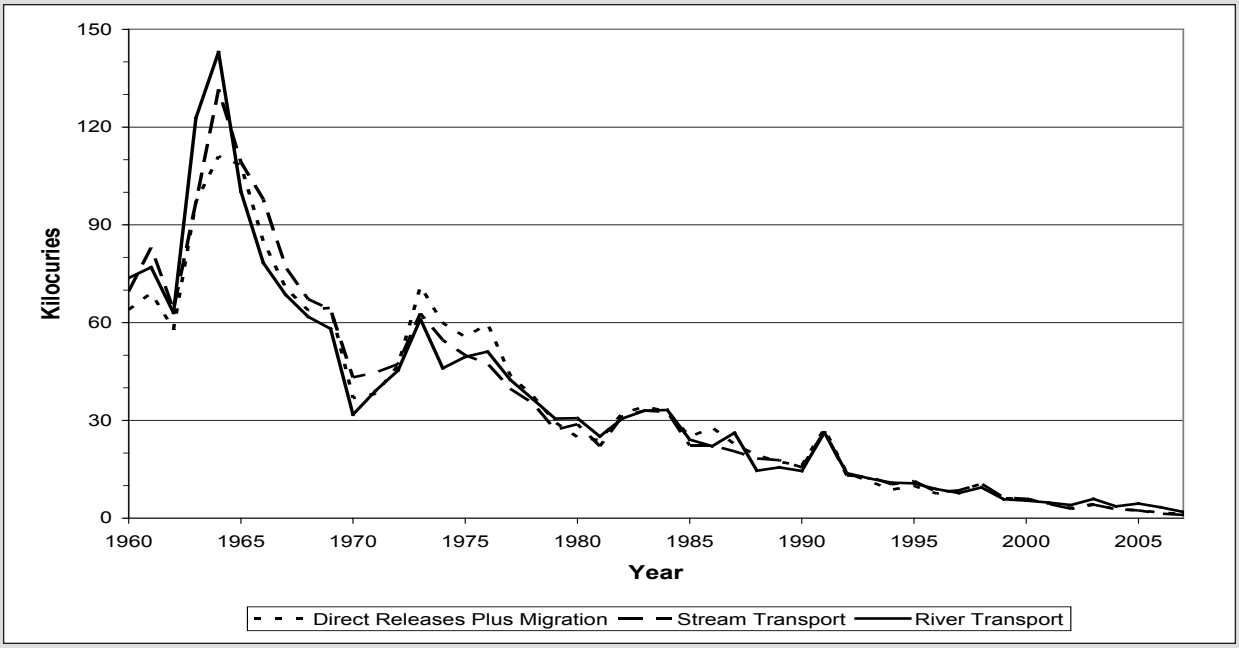


**Figure 5–2 SRS Tritium Transport Summary, 1960–2008**
SRS has maintained a tritium balance of direct releases plus migration, stream transport, and river transport since 1960 in an effort to account for and trend tritium releases in liquid effluents from the site. The general trend over time is attributable to (1) variations in tritium production at the site (production discontinued in the late 1980s); (2) the implementation of effluent controls, such as seepage basins, beginning in the early 1960s; and (3) the continuing depletion and decay of the site's tritium inventory.

(direct releases)

- tritium transport in SRS streams and the last sampling point before entry into the Savannah River (stream transport)

- tritium transport in the Savannah River downriver of SRS after subtraction of any measured contribution above the site (river transport)

Combined tritium releases in 2008 (direct discharges and migration from seepage basins and SWDF) totaled 1,535 Ci, compared to 1,317 Ci in 2007.

The total tritium transported to the Savannah River from SRS streams increased from 1,025 Ci in 2007 to 1,185 Ci in 2008.

The total tritium released to the Savannah River in 2008 was 2,659 Ci, compared with the previous year's 1,938 Ci. Both VEGP and SRS contributed to these release values. SRS's calculated releases of tritium to the river in 2008 totaled 1,364 Ci.

SRS tritium transport data for 1960–2008 are depicted in figure 5–2, which shows the history of direct releases, stream transport, and river transport, as determined by EM.

EM personnel continued to assess the tritium flux in the Lower Three Runs system in 2008. A more extensive tritium flux assessment initially was conducted in 2004—and described in the *SRS Environmental Report for 2004*. As it has during the past several years, a small but measurable amount of tritium from earlier Energy*Solutions* LLC (formerly Chem-Nuclear Systems) low-level radioactive waste disposal facility operations entered the stream system in 2008. The facility is privately owned and located adjacent to SRS. The amount of tritium entering the system is expected to continue a gradual decline over time. Energy*Solutions* LLC began a program of capping the tritium sources in 1991, thereby reducing the amount of tritium entering the groundwater. The tritium currently in groundwater will continue to decay and dilute as it moves from the source toward Lower Three Runs. EM and Energy*Solutions* will maintain a monitoring program for Lower Three Runs to evaluate this tritium migration.

## Domestic Water

### Description of Surveillance Program

EM collected domestic water samples in 2008 from locations at SRS and at water treatment facilities that use Savannah River water. Potable water was analyzed at offsite treatment facilities to ensure that SRS operations did not adversely affect the water supply and to provide voluntary assurance that drinking water did not exceed EPA drinking water standards for radionuclides.

Onsite domestic water sampling consisted of quarterly grab samples at large treatment plants in A-Area, D-Area, and K-Area and annual grab samples at wells and small systems. Composite samples were collected monthly off site from

- the Beaufort-Jasper Water and Sewer Authority's Chelsea and Purrysburg Water Treatment Plants
- the City of Savannah Industrial and Domestic Water Supply Plant
- the North Augusta (South Carolina) Water Treatment Plant

### Surveillance Results Summary (Table)

All domestic water samples collected by EM in 2008 were screened for gross alpha and gross beta concentrations to determine if activity levels warrant further analysis. No domestic water exceeded EPA's 15-pCi/L alpha activity limit or 50-pCi/L beta activity limit. Also, no onsite or offsite domestic water samples exceeded the 20,000-pCi/L EPA tritium limit or the 8-pCi/L strontium-89,90 MDC.

No cobalt-60, cesium-137, uranium-235, plutonium-239, or curium-244 was detected in any domestic water samples in 2008. On site, americium-241 was detected at four locations, uranium-234 at five locations, uranium-235 at one location, and uranium -238 at six locations.

## Terrestrial Food Products

### Description of Surveillance Program

The terrestrial food products surveillance program consists of radiological analyses of food product samples typically found in the Central Savannah River Area (CSRA). These foods include milk, meat (beef), fruit, and green vegetables (collards). Data from the food product surveillance program are not used to show direct compliance with any dose standard; however, the data can be used as required to validate dose models and determine environmental trends.

Samples of food—including meat (beef), fruit (melons or peaches), and a green vegetable (collards)—are collected from one location within each of four SRS quadrants and from a control location within an extended (to 25 miles beyond the perimeter) southeast quadrant. All food samples are collected annually except milk, which is collected quarterly from seven dairies within a 25-mile radius of the site. Four of the seven dairies were open during only two quarters in 2008. The food product surveillance program was expanded in 2005 to include secondary crops on a rotating schedule. Pecans and peanuts were sampled in 2008 as part of this program.

Food samples typically are analyzed for the presence of gamma-emitting radionuclides, tritium, strontium-89,90, uranium-234, uranium-235, uranium-238, plutonium-238, plutonium-239, americium-241, curium-244, gross alpha, and gross beta.

### Surveillance Results Summary (Tables A, B)

The only gamma-emitting radionuclide detected in food products in 2008 was cesium-137, which was found in collards at two locations and pecans and peanuts at one location. Strontium-89,90 was detected in collards at all locations and in beef at one location. Uranium-234 was detected in three collard and three beef samples, while uranium-238 was detected in four beef samples and two collard samples. Plutonium-238 was detected in four beef samples. Americium-241 was detected in one collard, one peanut, and two pecan samples. Gross beta was detected in all food products and gross alpha was detected in one collard sample. The 2008 results appeared to be randomly distributed among the monitoring locations, and no underlying spatial distribution was observed.

Tritium in food products is attributed primarily to releases from SRS; however, tritium was detected only in beef (northeast quadrant, 1.14E-01 pCi/g) and in milk (Girard, 6.00E+02 pCi/L). These results are similar to those of previous years.

## Aquatic Food Products

### Description of Surveillance Program

The aquatic food product surveillance program includes fish (freshwater and saltwater) and shellfish. To determine the potential dose and risk to the public from consumption, both types are sampled.

Nine surveillance points for the collection of freshwater fish are located on the Savannah River—from above SRS at Augusta, Georgia, to the coast at Savannah, Georgia. Composite samples—comprised of three to five fish of a given species—are prepared for each species from each location. Analyses for technetium-99; iodine-129; and the actinide series (uranium-234, uranium-235, and uranium-238, plutonium-238 and plutonium-239, americium-241, and curium-244) were added to all samples in 2006.

### Surveillance Results Summary

Cesium-137 and iodine-129 were the only manmade gamma-emitting radionuclides found in Savannah River edible fish composites during 2008. Strontium-89,90, uranium-234, uranium-238, plutonium-238, and tritium were detected at most of the river locations for freshwater fish. Concentrations were similar to those of previous years. Neptunium-237 was found slightly above the MDC in one composite sample of catfish from Beaver Dam Creek Mouth and one composite from the Highway 301 Bridge vicinity.

Tritium, uranium-234, uranium-235, uranium-238, plutonium-238 and strontium-89,90 were detected in saltwater fish; americium-241, uranium-234, uranium-235, uranium-238, and strontium 89,90 were detected in shellfish. Concentrations were similar to those of previous years.

## Deer and Hogs

### Description of Surveillance Program

Annual hunts, open to members of the general public, are conducted at SRS to control the site's deer and feral hog populations and to reduce animal-vehicle accidents. Before any animal is released to a hunter, EM personnel use portable sodium iodide detectors to perform field analyses for cesium-137. Media samples (muscle and/or bone) are collected periodically for laboratory analysis based on a set frequency, on cesium-137 levels, and/or on exposure limit considerations. SRS established an administrative dose limit of 30 mrem per year for the consumption of game animals in 2006. This limit, which ensures that no single pathway contributes more than 30 percent to the all-pathway dose limit of 100 mrem, is consistent with DOE guidance. The doses from deer and hog consumption are quantified and reported in chapter 6.

### Surveillance Results Summary

A total of 432 deer and 110 feral hogs were taken during the 2008 site hunts. As observed during previous hunts, cesium-137 was the only manmade gamma-emitting radionuclide detected during laboratory analysis. Generally, the cesium-137 concentrations measured by the field and lab methods were comparable. Field measurements from all animals ranged from 1 pCi/g to 12.65 pCi/g, while lab measurements ranged from 1 pCi/g to 8.53 pCi/g. The average field cesium-137 concentration was 2.40 pCi/g in deer (with a maximum of 12.65 pCi/g) and 2.91 pCi/g in hogs (with a maximum of 8.53 pCi/g). This range of concentrations is normal for the site's deer and hog populations.

The muscle and bone samples from a subset of the animals returned to the lab for cesium-137 analysis also are analyzed for strontium-89,90. Typically, muscle and bone samples are collected for analysis from the same animals checked for cesium-137, and the samples are analyzed for strontium-89,90. Strontium was detected in muscle tissue in 2008, with highs of 4.35 pCi/g in deer and 0.016 pCi/g in hogs. Lab measurements of strontium-89,90 in bone ranged from a high of 16.70 pCi/g to below detection in deer and from a high of 5.97 pCi/g to below detection in hogs. These results are similar to those of previous years.

## Turkeys/Beavers

### Description of Surveillance Programs

Prior to 2003, wild turkeys were trapped on site by the South Carolina Department of Natural Resources and used to repopulate game areas in South Carolina and other states. Since that time, the program has remained inactive because of reduced needs.

During April 2008, a special hunt for the mobility impaired was held that resulted in the harvest of 17 turkeys. The average cesium-137 concentration measured in the field was 1.30 pCi/g.

The U.S. Department of Agriculture Forest Service–Savannah River harvests beavers in selected areas within the SRS perimeter to reduce the population and thereby minimize dam-building activities that can result in flood damage to timber stands, to primary and secondary roads, and to railroad beds. This activity resumed during 2006. Although population control activities continued in 2008, no beavers were removed from their habitat for disposal.

## Soil

### Description of Surveillance Program

The SRS soil monitoring program provides

- data for long-term trending of radioactivity deposited from the atmosphere (both wet and dry deposition)
- information on the concentrations of radioactive materials in the environment

The concentrations of radionuclides in soil vary greatly among locations because of differences in rainfall patterns and in the mechanics of retention and transport in different types of soils. Two locations (West Jackson and Windsor Road) were added to the program in 2007. Because of this program's design, a direct comparison of data from year to year is not appropriate. However, the data may be evaluated over a period of years to determine long-term trends.

### Surveillance Results Summary (Table)

In 2008, radionuclides were detected in soil samples from all 23 locations, as follows:

- cesium-137 at 17 locations (three onsite, all 12 perimeter, and two offsite)
- uranium-234 at all locations
- uranium-235 at all locations
- uranium-238 at all locations
- plutonium-238 at nine locations (four onsite, three perimeter, and two offsite)
- plutonium-239 at 13 locations (three onsite, eight perimeter, and two offsite)
- americium-241 at nine locations (three onsite, three perimeter, and three offsite)
- curium-244 at three locations (two onsite and one perimeter)

The concentrations at these locations are consistent with historical results. Uranium is naturally occurring in soil and therefore expected to be present in soil samples.

## Settleable Solids

### Description of Surveillance Program

Settleable-solids monitoring in effluent water is required to determine—in conjunction with routine sediment monitoring—whether a long-term buildup of radioactive materials occurs in stream systems.

DOE limits on radioactivity levels in settleable solids are 5 pCi/g above background for alpha-emitting radionuclides and 50 pCi/g above background for beta/gamma-emitting radionuclides.

Low total suspended solids (TSS) levels result in a small amount of settleable solids, so an accurate measurement of radioactivity levels in settleable solids is impossible. Based on this, an interpretation of the radioactivity-levels-in-settleable-solids requirement was provided to SRS by DOE in 1995. The interpretation indicated that TSS levels below 40 parts per million (ppm) were considered to be in de-facto compliance with the DOE limits.

To determine compliance with these limits, EM uses TSS results—gathered as part of the routine National Pollutant Discharge Elimination System (NPDES) monitoring program—from outfalls co-located at or near radiological effluent points. If an outfall shows that TSS levels regularly are greater than 30 ppm, a radioactivity-levels-in-settleable-solids program and an increase in sediment monitoring will be implemented.

### Surveillance Results Summary

In 2008, only two NPDES TSS samples exceeded 30 ppm. Both samples were collected in March from sanitary waste facility outfall K–12, with results of 80 and 51 ppm. These results were attributed to a plant upset resulting from a combination of factors, including infiltration of solids from nearby construction activities, a possible cement-like material being poured into the collection system, and inadequate aeration basin dissolved oxygen and mixing due in part to a faulty air diffuser head. Despite the two exceptions, the 2008 NPDES TSS results indicate that overall, SRS remains in compliance with the DOE radioactivity-levels-in-settleable-solids requirement.

## Sediment

### Description of Surveillance Program

Sediment sample analysis measures the movement, deposition, and accumulation of long-lived radionuclides in stream beds and in the Savannah River bed. Significant year-to-year differences may be evident because of the continuous deposition and remobilization occurring in the stream and river beds—or because of slight variation in sampling locations—but the data obtained can be used to observe long-term environmental trends.

Sediment samples were collected at eight Savannah River and 13 site stream locations in 2008.

### Surveillance Results Summary (Table)

Cesium-137 was the only manmade gamma-emitting radionuclide observed in river and stream sediments in 2008. The highest cesium-137 concentration in streams, 3.41E+01 pCi/g, was detected in sediment from R-Canal; the lowest levels were below detection at four locations. The highest level found on the river, 1.40E+00 pCi/g, was at River Mile 150.2; the lowest levels were below detection at three locations. Generally, cesium-137 concentrations were higher in stream sediments than in river sediments. This is to be expected because the streams receive radionuclide-containing liquid effluents from the site. Most radionuclides settle out and deposit on the stream beds or at the streams' entrances to swamp areas along the river.

Strontium-89,90 was above the MDC in sediment at four stream locations in 2008. The maximum detected value was 2.06E-01 pCi/g at the Four Mile Creek at Road A–7A location.

Plutonium-238 was detected in sediment during 2008 at eight stream locations and five river locations. The results ranged from a maximum of 8.32E-02 pCi/g at FM–2A at Road 4 to below detection at several locations. Plutonium-239 was detected in sediment at 10 stream and three river locations. The maximum value was 2.55E-02 pCi/g—at FM–A7A. Uranium-234, uranium-235, and uranium-238 were detected at most locations.

The distribution and concentration of radionuclides in river sediment during 2008 were similar to those of previous years.

Concentrations of all isotopes generally were higher in streams than in the river. As indicated in the earlier discussion of cesium-137, this is to be expected. Differences observed when these data are compared to those of previous years probably are attributable to the effects of resuspension and deposition, which occur constantly in sediment media.

## Grassy Vegetation

### Description of Surveillance Program

The radiological program for grassy vegetation is designed to collect and analyze samples from onsite and offsite locations to determine radionuclide concentrations. Vegetation samples are obtained to complement the soil and sediment samples in order to determine the environmental accumulation of radionuclides and to help validate the dose models used by SRS. Bermuda grass is preferred because of its importance as a pasture grass for dairy herds.

Vegetation samples are obtained from

- locations containing soil radionuclide concentrations that are expected to be higher than normal background levels
- locations receiving water that may have been contaminated
- all air sampling locations

### Surveillance Results Summary (Table)

Radionuclides in the grassy vegetation samples collected in 2008 were detected as follows:

- tritium at four locations (one onsite. three perimeter)
- cesium-137 at four locations (perimeter)
- strontium-89,90 at eight locations (one onsite, six perimeter, 100-mile-radius)
- uranium-234 at one location (100-mile-radius)
- uranium-238 at one location (100-mile-radius)
- plutonium-239 at one location (perimeter)
- americium-241 at three locations (perimeter)
- gross beta at all 17 locations
- gross alpha at four locations (three perimeter, one 25-mile-radius)

Overall results show a slight decline in radionuclide concentrations during the past several years.

## Savannah River Swamp Surveys

### Description of Surveillance Program

The Creek Plantation, a privately owned land area located along the Savannah River, borders part of the southern boundary of SRS. In the 1960s, an area of the Savannah River Swamp on Creek Plantation—specifically, the area between Steel Creek Landing and Little Hell Landing—was contaminated by SRS operations. During high river levels, water from Steel Creek flowed along the lowlands comprising the swamp, resulting in the deposition of radioactive material. SRS studies estimated that a total of approximately 25 Ci of cesium-137 and 1 Ci of cobalt-60 were deposited in the swamp.

Comprehensive and cursory surveys of the swamp have been conducted periodically since 1974. These surveys measure radioactivity levels to determine changes in the amount and/or distribution of radioactivity in the swamp. A series of 10 sampling trails—ranging from 240 to 3,200 feet in length—was established through the swamp. Fifty-four monitoring locations were designated on the trails to allow for continued monitoring at a consistent set of locations. [Fledderman, 2007]

The 2008 survey was designated as a cursory survey, requiring limited media sampling and analysis. Cursory surveys provide assurance that conditions observed during the more detailed comprehensive surveys have not changed significantly. A comprehensive survey requiring extensive media sampling and analyses was conducted in 2007.

### Surveillance Results Summary (Table)

As anticipated, based on source term information and historical survey results, cesium-137 was the primary manmade radionuclide detected in the 2008 survey. Cesium-137 was detected in all soil samples while cobalt-60 was detected in one soil sample. Cesium-137 concentrations varied from a low of 0.20 pCi/g to a high of 47.50 pCi/g. These levels are comparable with results of previous surveys. Examination of the 10 shallow core samples showed that in general, higher concentrations of cesium-137 were observed in the shallow depths. Increased activity was observed as far away as trail 10, while higher concentrations were present on trails 1 and 4.

Cesium-137 was detected in all 10 vegetation samples. Concentrations varied from a minimum of 0.29 pCi/g to a maximum of 7.30 pCi/g. These levels are comparable with results of previous surveys. Higher concentrations generally were observed on trails 4, 5, and 8. No relationship was observed between soil and vegetation samples; however, the samples were collected at different times of the year. There was no detectable strontium-90 or cobalt-60 in the vegetation samples.

# Nonradiological Surveillance

## Air

SRS does not conduct onsite surveillance for nonradiological ambient air quality. However, to ensure compliance with SCDHEC air quality regulations and standards, SRNL most recently conducted air dispersion modeling for all site sources of criteria pollutants and toxic air pollutants in 2001. This modeling indicated that all SRS sources were in compliance with air quality regulations and standards.

Since that time, additional modeling conducted for new sources of criteria pollutants and toxic air pollutants has demonstrated continued compliance by the site with current applicable regulations and standards. The states of South Carolina and Georgia continue to monitor ambient air quality near the site as part of a network associated with the federal Clean Air Act.

## Surface Water

SRS streams and the Savannah River are classified by SCDHEC as "Freshwaters," which are defined as surface water suitable for

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

Appendix A ("Applicable Guidelines, Standards, and Regulations") of this report provides some of the specific guidelines used in water quality surveillance, but because some of these guidelines are not quantifiable, they are not tracked at SRS.

### Surveillance Results Summary (Table)

Most water quality parameters and metals were detected in at least one sample at every location. Four samples (two from an onsite stream and two from the Savannah River) had detectable pesticides/herbicides in 2008. These results continue to indicate that SRS discharges are not significantly affecting the water quality of onsite streams or the river.

## Drinking Water

Most of the drinking water at SRS is supplied by three systems that have treatment plants in A-Area, D-Area, and K-Area. The site also has 14 small drinking water facilities, each of which serves populations of fewer than 25 persons.

### Surveillance Results Summary

All samples collected from SRS drinking water systems during 2008 were in compliance with SCDHEC and EPA water quality standards. Additional information is provided in the Safe Drinking Water Act section of chapter 3, "Environmental Compliance."

## Sediment

The nonradiological sediment surveillance program provides a method to determine the deposition, movement, and accumulation of nonradiological contaminants in stream systems. Sample preparation prior to analysis was changed in 2007 from an extraction (toxicity characteristic leaching procedure, or TCLP) to a total sample digestion.

### Surveillance Results Summary (Table)

In 2008, as in the previous 5 years, no pesticides or herbicides were found to be above the quantitation limits in sediment samples. Metals analyses results for 2008 also were comparable to those of the previous 5 years.

## Fish

EM personnel analyze the flesh of fish caught from the Savannah and Edisto Rivers to determine concentrations of mercury in the fish. In 2008, the addition of metals (arsenic, cadmium, manganese, and antimony) to the analytical suite was completed. The fish analyzed represent the most common edible species of fish in the CSRA (freshwater) and at the mouth of the Savannah River (saltwater).

### Surveillance Results Summary (Table)

In 2008, mercury analyses were performed on 336 fish from the Savannah River and 15 from the Edisto River at West Bank Landing. Concentrations of mercury generally were slightly lower than those observed in 2007. The highest concentrations were found in the Savannah River—in bass at the Highway 301 Bridge Area (1.205 µg/g), in catfish at Stokes Bluff (0.871 µg/g), and in bream at the

Highway 301 Bridge Area (0.853 µg/g). The highest concentrations found at West Bank Landing were 1.037 µg/g in bass, 0.940 µg/g in bream, and 0.536 µg/g in catfish.

Arsenic was detected in sixteen samples, with the highest concentration in spottail bass (1.46 µg/g ) at RM-08 of the Savannah River. Cadmium was below detection in all samples. Manganese was detected at all locations, with the highest concentration in bream (5.13 µg/g ) at the mouth of Lower Three Runs. Antimony was detected in 63 samples, with the highest concentration in bream (1.09 µg/g ) at the mouth of Steel Creek.

## River Water Quality Surveys

### Description of Surveys

Academy of Natural Sciences (ANS) personnel conducted biological and water quality surveys of the Savannah River from 1951 through 2003, when EM assumed this responsibility. The surveys were designed to assess potential effects of SRS contaminants and warm-water discharges on the general health of the river and its tributaries. This is accomplished by looking for

- patterns of biological disturbance geographically associated with the site
- patterns of change over seasons or years that indicate improving or deteriorating conditions

EM conducted macroinvertebrate sampling during the spring and fall of 2008, and diatom sampling was conducted monthly. The diatom slides were sent to ANS for archiving. No adverse biological impacts have been identified in the Savannah River diatom communities.

Macroinvertebrates collected from river traps during 2007 were similar in species diversity to those documented in surveys during the 1990s. An overall decrease in total populations was observed that likely is associated with low flow in the river and incipient drought conditions. No evidence of adverse biological impacts was found in the observed macroinvertebrate communities. Collections from 2008 will be sorted and archived during 2009.