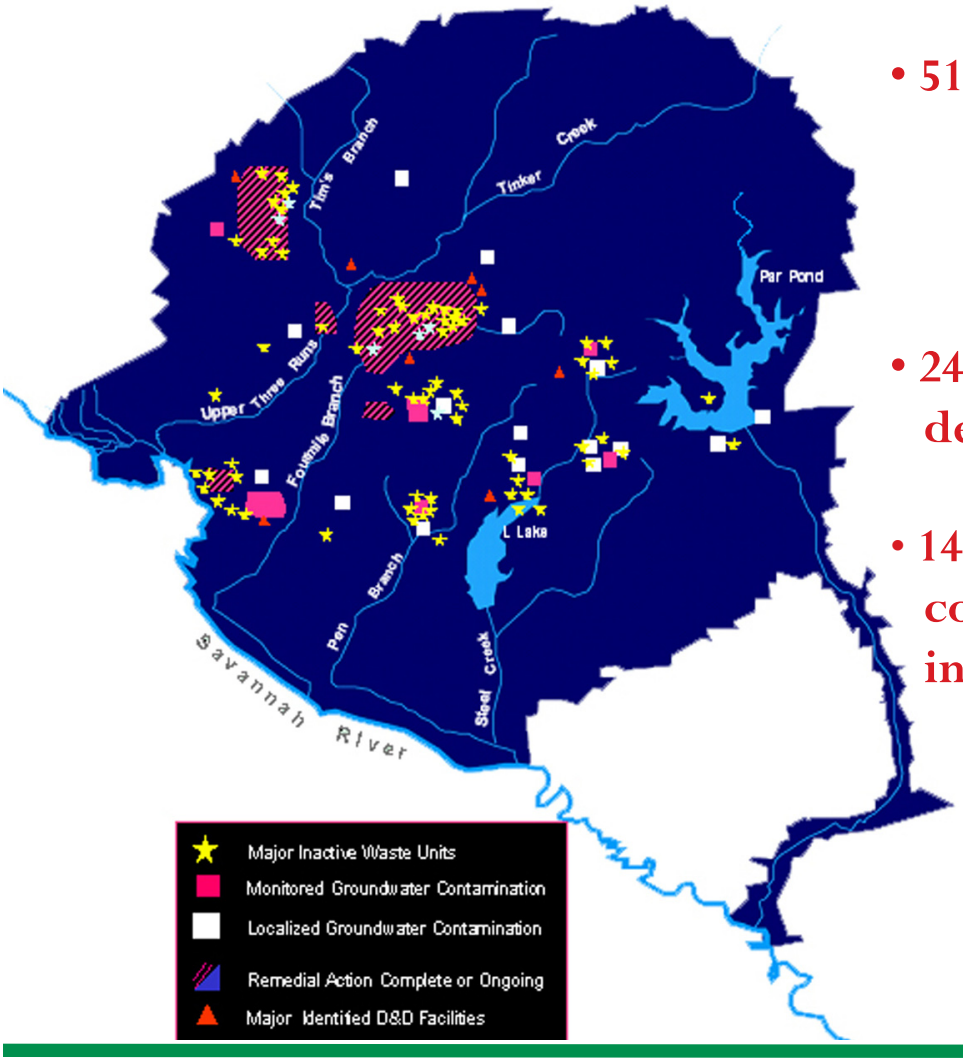
2008 Accomplishments

ACP

AREA COMPLETION PROJECTS

The Savannah River Site Area Completion



- **515 Waste Sites**
  - 360 Completed
  - 13 in Remediation
  - 142 in Assessment
- **248 of 973 facilities decommissioned**
- **14 Major groundwater contamination plumes in 14 closure areas**
  - 12 Remediation systems operating

Area Completion Projects

Area Completion Projects (ACP) was established in early 2008 through the combination of two successful projects; Soil and Groundwater Closure Projects and Site Deactivation and Decommissioning (D&D). The ACP is responsible for assessment and cleanup of waste units, groundwater, surface water and the deactivation and decommissioning of inactive Environmental Management (EM) facilities.

ACP accomplishes its mission by practicing the fundamental principles of working safely, protecting resources, creating and sustaining high performance teams, utilizing project management systems, establishing long range strategic planning, meeting its regulatory commitments and milestones and a strong commitment to customer satisfaction. These principles support the group's vision to continuously exceed the needs and expectations of its customers and to remain a leader and a resource in the field of environmental restoration.

ACP's outstanding reputation across the DOE complex, and the world, can be attributed to the in-house development and application of innovative technologies, an unwavering commitment to effective teamwork, utilizing highly trained personnel and close attention to continuous improvement.

Safety

Area Completion Projects (ACP) employees (including matrixed and subcontractor) completed the 2008 calendar year without a recordable injury.

At the close of 2008, ACP's Soil and Groundwater employees (including matrixed and subcontractor) worked 11 years and 9,003,434 million safe hours since the last "days away" or "lost time" injury involving a day or more of work missed due to a work related injury.

Additionally, ACP's D&D employees have worked over five years without a heat related injury, a tremendous accomplishment considering the high risk, hazardous work the group performs day in and day out.

These are significant accomplishments considering the work scope and potential for injury that ACP employees encounter on a daily basis.

"11 years and 9,003,434 million safe hours worked since the last "lost time" injury involving a day or more of work missed due to a work related injury."

In addition to the group's successful safety records, ACP maintained perfect attendance at monthly safety meetings.

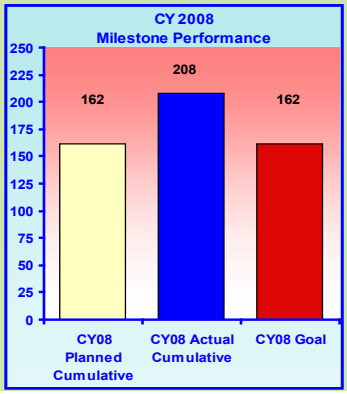
Safety continues to be a fundamental feature of the organization as the group's employees maintain a high level of participation in Behavior-Based Safety and the Local Safety Improvement Team, as well as close adherence to the ISMS and process.

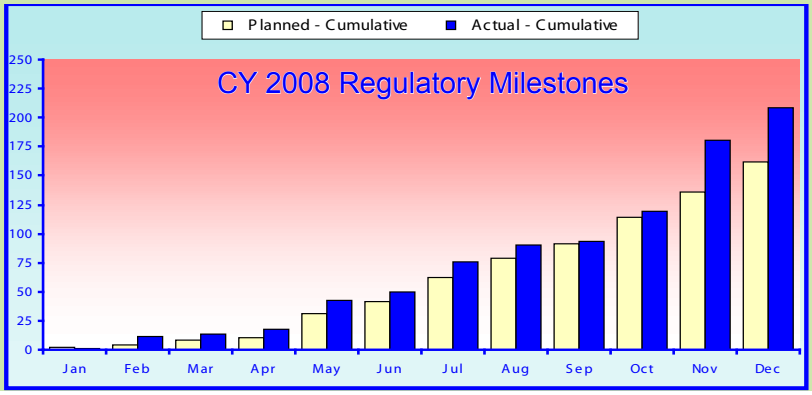
Regulatory Milestones

Area Completion Projects (ACP) is responsible for remediating SRS inactive waste sites and contaminated groundwater and surface water to reduce risk, and to protect human health and the environment. At the end of 2008, 360 of the 515 known waste units were complete, 142 were in the assessment phase, and 13 were in the remediation phase.

The cleanup is regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). This is accomplished through the SRS Federal Facility Agreement (FFA) [FFA, 1993], a tri-party agreement between the U.S. Environmental Protection Agency (EPA), the South Carolina Department of Health and Environmental Control, and DOE.

The FFA establishes requirements for the comprehensive remediation of the Site, ensuring that SRS satisfies RCRA and CERCLA requirements. The FFA also provides cleanup schedules for SRS waste units. In addition, cleanup for RCRA permitted facilities is addressed through the RCRA permit.





General Separations Area Consolidation Unit Closure

Final closure of one of the highest priority waste areas at SRS and in the DOE complex was celebrated on June 19, 2008 as ACP hosted more than 120 guests, including James Rispoli, Assistant Secretary of Energy for Environmental Management, and other representatives from SRS, DOE, SCDHEC and EPA to celebrate the closure of the General Separations Area Consolidated Unit (GSACU).

The GSACU refers to a collection of five waste units and 80 acres of land that were combined under one remedial action. The largest unit, the Old Radioactive Waste Burial Ground (ORWBG), served as the Site's primary radioactive disposal area for 22 years. More than seven million cubic feet of radioactive waste were buried at the unit. Most of the waste was disposed in drums, cans, cardboard boxes, plastic bags, and metal containers and buried in trenches. The unit collected solid radioactive waste produced at SRS, and shipments from other DOE facilities and the Department of Defense. In all, nearly 1.5 million curies of radioactivity had been placed within the unit.

A robust remedial action, that combined the clean-up of the five units was implemented to reduce the schedule and cost. Contaminated soil from the four smaller waste units was consolidated and a geosynthetic cover system was placed over the entire ORWBG. After the cover was installed, the area was backfilled with soil and grass was planted to maintain the integrity of the cover. This method of remediation proved to be timely and cost effective, as the project was completed ahead of schedule and at $150 million less than originally estimated.

Assistant Secretary of Energy for Environmental Management, James Rispoli and ExecutiveVice-President, Bill Poulson,Washington Savannah River Company, were among the 120 guests in attendence at the GSACU closure celebration on June 19.

P-Area Operable Unit

P Reactor was the second reactor at SRS to achieve criticality, in February 1954. Until it was shut down in 1988, it never had a lost time injury, which is why historical pictures of P Area show a sign claiming it to be the safest reactor in the world.

Now, 19 buildings – covering 286,756 square feet – in the area have been removed, leaving only the reactor building and its ancillary structures. The entire area is "cold and dark," which means all historical power sources have been removed.

Part of deactivation is removing hazards, and a major one was removing heavy water – which once served as a moderator for reactor operations – from the facility's massive systems. Although the systems had been drained, small amounts of tritium-containing moderator remained in tanks, transducers, pressure switches, and pipes throughout the building.

Workers had to manually drain hundreds of locations through the facility that could potentially hold leftover water.

The end state for P Reactor is in-situ decommissioning, which means that the majority of the reactor building itself would remain and all the below grade areas will be grouted in place. This decision has been documented in the P Area Operable Unit Early Action Record of Decision (ROD). Since this is the first SRS Reactor Closure, DOE, EPA and SCDHEC offered SRS stakeholders several opportunities to provide input on the final end state decision. The reactor vessel will be filled with grout, including a concrete "monolith" placed over the top of the tank itself to completely encase the vessel. Finally, the building will be sealed, including air inlets, doors and every other area where access could be gained.

Comprehensive sampling of soil, surface water and groundwater covering a footprint nearly 100 acres in size was performed to determine the nature and extent of contamination present in the area. The findings demonstrated that impacts to the environment from reactor operations were relatively benign. Geologists conducting the characterization efforts discovered only minor amounts of solvents in small areas totaling less than one acre where maintenance and degreasing operations took place.

Since P Area is the first of five reactor area cleanups at SRS, the project team recognized the importance of establishing a solid approach that SRS, the regulators and the public all support to set the stage for subsequent reactor area closures. Stakeholders were actively involved in the decision making process through numerous presentations to the SRS Citizens Advisory Board (CAB) and three separate workshops held to discuss end state options for the reactor facility and the 100-acre P Area. The SRS CAB and the public have endorsed the planned cleanup actions for P Area, including an in-situ final end state for the reactor.

Two soil locations containing solvent contamination will be treated using soil vapor extraction, a technology that removes organics from unsaturated soils. Removing the solvents from the P Area vadose zone will prevent their migration to the groundwater beneath.

It is anticipated that P Area cleanup will begin in early 2010 and will be completed within four years. The second SRS reactor area completion is currently underway in R Area and is utilizing the framework that was established in P Area.

View of P-Area Operable Unit

R-Area Operable Unit

In 2008, Area Completion Projects (ACP) completed: remedial actions at the R Reactor Seepage Basins (RRSB), the characterization of the entire 200-acre R-Area Operable Unit (and the groundwater beneath), and characterization of the reactor building. "Cold and Dark" activities (isolation of electrical and mechanical systems) at the R-Reactor building, were also completed to prepare for further deactivation work to take place at the reactor.

ACP also removed 4015 depleted uranium oxide drums from the reactor building and removed seven buildings (396,187 sq. ft.).

The RAOU is located in the east central area of SRS. The R-Reactor is the largest of the five SRS reactors, and on December 28, 1953, it achieved operational start making it the first fully functioning reactor at the Site. R Reactor was shutdown in 1964 due to it no longer being needed for national defense.

In November 1957, a reactor incident occurred when the cladding of a fuel assembly failed while being heated in underwater experiments in the Emergency Basin portion of the Disassembly Basin. As a result, the contaminated water in the emergency disassembly basin was purged to the first of six unlined earthen basins, the R-Area Seepage Basins. The incident also resulted in the release of contaminants to soils on the north side and adjacent to the reactor building.

The reactor was de-fueled and all fissile materials were removed immediately following shutdown. Currently, the reactor vessel has been emptied and there are no fuel assemblies in the disassembly or emergency basins.

In-situ decommissioning (ISD) is the preferred final end state for the R Area reactor and reactor building. DOE, EPA, and SCDHEC are working to achieve three-party agreement for ISD for the reactor complex as established at the PAOU. Excavation covers/caps, and institutional controls are also being considered for remediation of the contaminated soils while Monitored Natural Attenuation (MNA) is anticipated for cleanup of the groundwater. Issuance of both an Early Action Record of Decision (ROD) institutionalizing in situ decommissioning as the final end state for R Reactor, and a final ROD outlining the final selected remedial alternatives for R-Area Operable Unit, are scheduled to be issued in 2010.

View of R-Area Operable Unit

M-Area Operable Unit

View of M-Area Operable Unit

SRS produced special nuclear materials for the Department of Defense between 1952 and 1958. An important step in the production cycle was the manufacture of fuel and target assemblies at M Area. Located in the northwest portion of SRS, M Area covers approximately 85 acres.

Deactivation and decommissioning of 23 buildings (367,290 sq. ft. of hardened facilities at the area) was completed in 2006. Subsequently, starting in 2007, Area Completion Projects (ACP) implemented early actions at the Salvage Yard and Production Area to accelerate the cleanup schedule from 2013 to 2010.

The contaminated soil (metals and polycyclic aromatic hydrocarbons) excavated from the Salvage Yard was hauled to the A-Area Ash Pile where it was used as a foundation layer for the soil cover that was installed over that waste unit in June 2008.

Also in 2008, ACP completed the removal of contaminated concrete and soils at the Production Area. The excavated mixed waste materials were shipped off site to the Nevada Test Site and Energy Solutions in Clive, Utah for disposal; the low level waste was transported and disposed at the SRS Slit Trenches. Soils and concrete rubble contaminated with volatile organic compounds (VOCs) were separated into two groups; approximately 1,100 cubic yards with low VOC concentrations were staged for on-unit treatment using passive soil vapor extraction (PSVE) as part of the final remedial action. Approximately 3,250 cubic yards of soil and concrete rubble with higher VOC concentrations were packaged into 383 lift-liners and staged on unit to allow SRS time to evaluate more cost effective on-unit alternate treatment technologies. M Area is slated as the second closure (following T Area) under the Area Completion Strategy. Closure of the M Area Operable Unit (MAOU) is scheduled for 2011.

Dynamic Underground Stripping

Area Completion Projects (ACP) made significant progress in 2008 to remediate a large source of solvents generated from an onsite production area. By the end of the year (after three years of operation), approximately 427,000 pounds of volatile organic compounds (VOCs) had been successfully removed (since operations commenced in 2005) by utilizing a process referred to as Dynamic Underground Stripping (DUS).

DUS is an innovative technology that involves steam injection to volatilize the subsurface contaminants so they can be extracted with Soil Vapor Extraction Units. DUS began operations in August 2005, and proved successful in the removal of Dense Non-Aqueous Phase Liquid (DNAPL); the majority of the contaminant being tetrachloroethylene (PCE).

The treatment area is adjacent to the M-Area Settling Basin and covers over three acres in size. It is divided into four parcels to allow a systematic approach to remediation. All four parcels have successfully been heated to over 200 degrees Fahrenheit. It is estimated that DUS technology extracts material 15 times faster than soil vapor extraction and 75 times faster than pump-and-treat systems. As a result, over six decades of pump-and-treat remediation will be avoided at SRS's M-Area Settling Basin.

The DUS system offers a significant improvement over baseline processes by greatly increasing remediation speed and completeness.

The use of heating technologies such as DUS allows SRS to accelerate the remediation of these contaminants preventing further impact to the groundwater aquifers.

View of DUS Facility

Chemicals, Metals and Pesticides Pits

View of ERH operations at the CMP Pits

Area Completion Projects (ACP) began operations of the electrical resistance heating (ERH) system in mid-March at the Chemicals, Metals and Pesticides Pits (CMP Pits), located approximately one mile north of L Reactor in the central portion of the Savannah River Site (SRS). Since operations began, ACP has successfully removed over 3,500 pounds of contaminants.

The CMP Pits consist of seven unlined pits that were constructed in 1971 to dispose of chemicals, metals, pesticides, and lighting ballast components; they received waste until 1979.

In 1984, the contents were excavated, the pits were backfilled, and an infiltration cover was installed. In 2001 Soil Vapor Extraction was employed as an interim remedial action to remove volatile organic compounds (VOCs) from the soil and shallow groundwater.

Two VOC groundwater plumes exist at the CMP Pits, designated as the main plume and the northeast plume. Groundwater modeling indicates that a Dense Non Aqueous Phase Liquid (DNAPL) in the vadose zone beneath the CMP Pits is the source of contamination for the main plume.

To eliminate the source of groundwater contamination, a remedial action was approved to utilize a combination of ERH and SVE at the Pits. ERH technology uses electrodes installed below ground to pass an electric current through the soil in the target remediation area. As the current passes through the resistive soil, the soil heats up and the contaminants volatilize. Once heated, the contaminants are removed using soil vapor extraction.

Because ERH/SVE eliminates the source of groundwater contamination, MNA was approved to address groundwater contamination around the Pits. This remedy includes semi-annual groundwater monitoring, surface water sampling, and annual reporting. The natural processes of advection and dispersion will eventually reduce groundwater contaminants to concentrations below the maximum contaminant level.

ERH is a cost effective and timely means of remediating the subsurface soils around the Pits thus eliminating the continual contaminant flux to the groundwater and saving money over traditional DNAPL remediation technologies. ERH/SVE operations are expected to be completed in late 2009.

F-Area Base Injection

Area Completion Projects (ACP) has made significant progress in remediating a large groundwater plume at the F Area Seepage Basins utilizing engineered barrier walls and base injection technology to address tritium, uranium-238, and various other elements found in the groundwater, saving more than $1 million dollars a month over traditional methods.

In 2008, ACP maintained 1300 feet of barrier walls and injected more than 55,000 gallons of base solution into the groundwater at F Area. Thanks to this technology, ACP achieved an approximate 70% reduction in tritium in Fourmile Branch below the F-Area Seepage Basins.

The F-Area Seepage Basins Groundwater Projects consist of the groundwater impacted by operations of the F-Area Hazardous Waste Management Facilities. These facilities are located in the center of the Savannah River Site (SRS), approximately five miles from the nearest plant boundary.

The basins consist of three unlined, earthen surface impoundments that cover approximately 6.5 acres. Over the course of their history (1950-1988), they received approximately 1.8 billion gallons of low-level waste solutions originating from the processing of uranium slugs and irradiated fuel from the F-Area Separations Facility.

Waste solutions from the separations facility were transported to the basins through underground vitrified clay pipes. Once deposited, the wastewater was allowed to evaporate and seep into the underlying soil. Although the basins functioned as designed, the acidic nature of the basin influent caused mobilization of metals and radionuclides, resulting in groundwater contamination plumes. More than 99 percent of the radioactive releases to the basins are attributable to tritium.

In 1991, the basins were closed by dewatering, physically and chemically stabilizing the remaining sludge and covering them with a protective multi-layer system to reduce rainwater infiltration.

Iodine-129 (I-129) is also present in the groundwater and Fourmile Branch and is unaffected by base injection. Due to levels in excess of regulatory standards, ACP and the SRNL began developing an innovative technology using silver chloride (AgCl) to capture I-129. Upon contact with AgCl, I-129 forms silver iodide (AgI), a stable and essentially insoluble compound. A benchscale column study was conducted in 2008 to determine the effectiveness of AgCl to immobilize I-129 in an aqueous solution. The results of the column study demonstrated that solid silver chloride was readily injectable and highly effective at removing dissolved iodine from water and should be an effective means of removing I-129 from groundwater in F-Area.

Due to the success demonstrated by the SRNL benchscale AgCl column study, a Temporary Authorization Request and Underground Injection Control Permit Application was submitted to the South Carolina Department of Health and Environmental Control in December 2008. Also in December 2008, ACP began to design modifications to the existing base injection system to allow for AgCl to be injected into the F-Area groundwater. The AgCl injection field pilot study is scheduled to occur in 2009.

Photos of Base Injection Systems

211-F Deactivation and Decommissioning

211-F Pipe Bridge prior to decommissioning

211-F Pipe Bridge post decommissioning

In 2008, Area Completion Projects completed deactivation and decommissioning (D&D) activities of the 211-F Facility and underlying components.

The 211-F facility was constructed in the 1950s to provide general support for the 200-F Area processing operations and is located entirely within F Area, approximately 7 miles from the northwest boundary of the Savannah River Site (SRS). The facility provided handling, processing, and storage of raw materials and waste for F Canyon and the Savannah River National Laboratory (SRNL) through a series of tanks, evaporators, pumps, and piping.

The 211-F D&D project was addressed in three sections; the waste handling vault, the outside section, and the 805 and 820 tanks. Each section posed D&D workers with unique obstacles to overcome as they accomplished the demolition of the multifaceted facility.

The 211-F Waste Handling Vault consisted of five underground tanks that resided within a 60-foot-long concrete vault. Throughout the course of their operation, the tanks received waste from SRNL, the 772-F Laboratory, segregation solvent and other 800-series tanks. The tanks received the high-activity and low-activity wastes via tanker truck and underground transfer lines.

The Outside Section of the 211-F facility was utilized as storage and dispensed chemicals for F Canyon operations. Additionally, it prepared water for operations, recovered acid for reuse, concentrated and reduced waste volumes, washed and prepared used solvent for reuse, and collected processed and stored waste for disposition. The section consists of chemical storage tanks, water handling facilities, an acid recovery unit, general purpose evaporators, general purpose waste tanks, segregated solvent facilities, and a recycle sump.

The 211-F's 805 and 820 tanks consist of two below-ground tanks that collected waste from operations and rainwater leakage.

Over the course of deactivation, more than five miles of process piping, and 50 large chemical and waste tanks were dispositioned. Also, asbestos abatement was performed on the facility and hazardous wastes were removed (low-level, high-level and transuranic wastes).

To accomplish final deactivation, workers installed over 600 tap-and-drain rigs to empty the facilities massive systems, and over 500 glovebag containments were utilized to cut pipe and remove components. Moreover, ten containment huts were constructed to enter underground cells and clean tanks, removing debris and sludge.

Final decommissioning of the 211-F facility required placement of engineered concrete caps over the tank/process aprons and the three underground tank vaults and the large recycle sump was filled with grout. The D&D of 211-F is an interim action that moves ACP one step closer to the final F-Area Completion effort.

Contributing Author and Designer: Angela N. Emmons