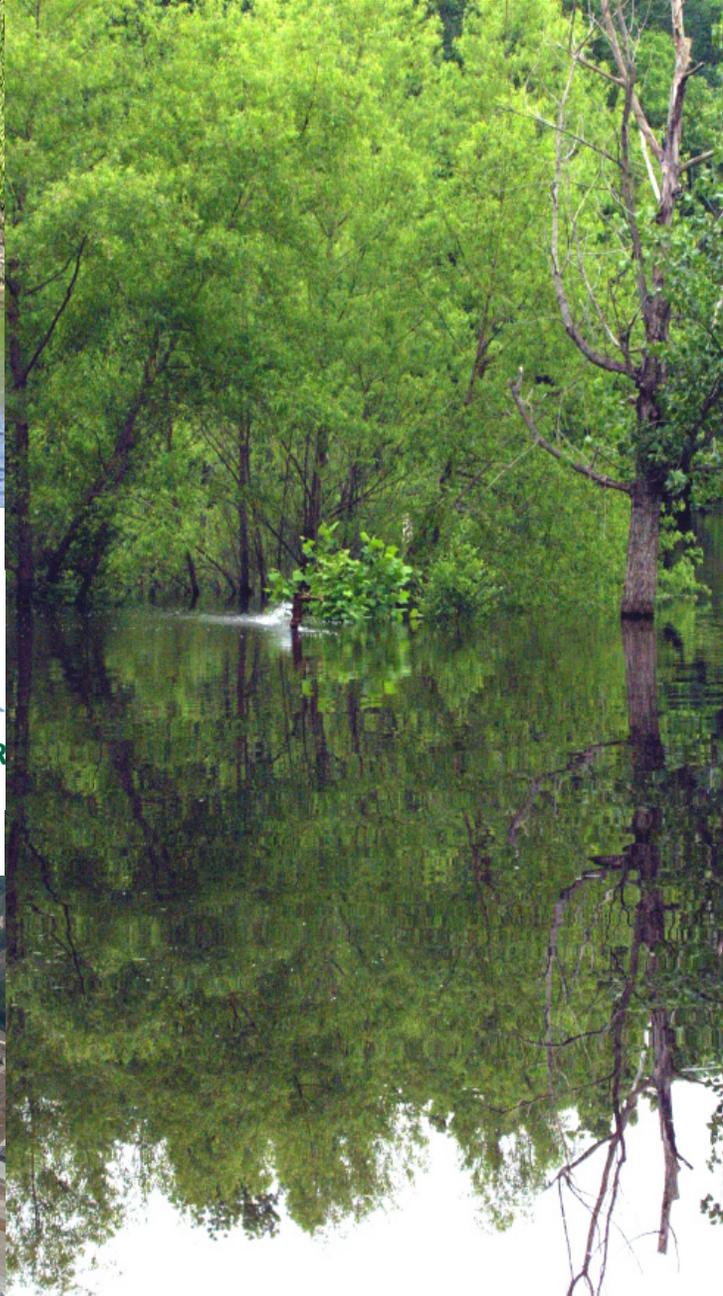


Soil and Groundwater Closure Projects



Accomplishments
2007

Safety

Soil and Groundwater Closure Projects (SGCP) demonstrates its commitment to maintaining a safe environment for both its workers and the public by continuing to maintain a record-setting safety performance including more than 10 years and 8.6 million safe hours, which means there have been no “lost time” injuries since 1997.

To increase safety awareness, many SGCP personnel participate in Behavior-Based Safety (BBS) by serving on Local Safety Improvement Teams, by becoming active BBS observers, or by volunteering for a BBS observation

of their own activities.

Every employee is encouraged to practice STAR (Stop, Think, Act and Review) while participating in activities for which safety is a concern. SGCP has effectively demonstrated that a team-oriented approach to safety can be a successful method of maintaining a safe workplace.

An important element of SGCP’s safety program is that all work is planned and executed with safety in mind. Safety Engineers, Radiological Controls personnel and an Industrial Hygienist participate in the planning for every project. This ensures that all safe-

ty, health and radiological hazards are identified and adequate controls are in place to reduce the potential for an incident or injury.

SGCP’s management team also conducts regularly scheduled Management Field Observations to monitor work in progress and identify potential hazards or at-risk behaviors.

All of these actions have a primary goal of injury and incident prevention. Through safe planning and execution, SGCP, including all matrixed and subcontractor employees, continues to complete work with above average safety performance.

Soil and Groundwater Closure Projects

The Savannah River Site’s (SRS) Soil and Groundwater Closure Projects is responsible for waste site and groundwater remediation.

In its efforts to remediate waste sites and groundwater units, SGCP approaches environmental restoration by utilizing effective project management, thorough communications, and strong working relationships with regulatory agencies. SGCP also increases productivity through the support and deployment of numerous innovative technologies to expedite the cleanup process for

the Department of Energy.

Moreover, SGCP has successfully implemented an aggressive remediation known as the Area Completion Strategy which consolidates all waste units and facilities within a geographic area into a single Record of Decision. This

approach streamlines the regulatory documentation process and provides multiple regulatory and public involvement meetings.

Remediation of SGCP waste sites and groundwater began in the early 1990s and continues at an aggressive pace with more than 68

percent of the 515 waste sites complete. By the end of 2007, SGCP will have successfully completed 352 waste sites.

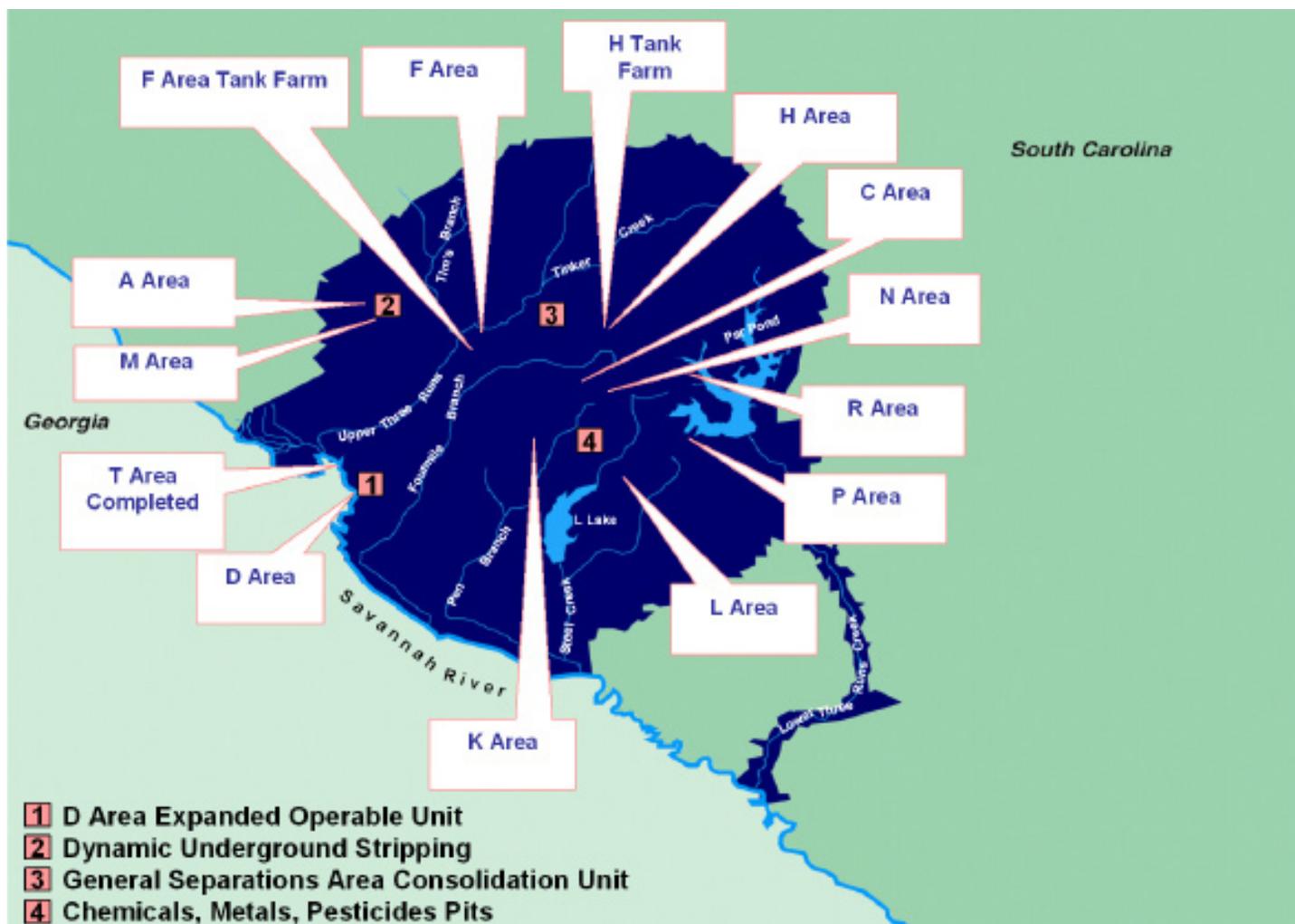
SGCP is executing remediation in a fashion that completes environmental cleanup and facility decommissioning area by area until all areas at SRS are completed by 2031.



Employees install the geosynthetic cover at the General Separations Area Consolidation Unit

The Savannah River Site

The Savannah River Site Area Completion



Area Completion Strategy

In 2007, SGCP teamed with Deactivation and Decommissioning (D&D) to aggressively address various areas throughout the Savannah River Site in support of the Area Completion Strategy that was agreed upon on May 22, 2003 by the Department of Energy-Savannah River, United States Environmental Protection Agency (USEPA), and South Carolina Department of Health and Environmental Control (SCDHEC).

Area Completion is defined as a strategy for accelerating environmental cleanup at SRS through the completion of broad areas, including any and all waste units and facilities that contain contamination. Each area will be addressed under a final Record of Decision and all subunits are listed in the SRS Federal Facility Agreement (FFA).

An Area Completion Strategy has been established for 14 major industrial areas at SRS which are designated into Area Operable Units (AOUs). This approach allows SGCP to accelerate the cleanup process, reduce regulatory documentation and reduce operational cost over past remedial strategies.

Areas and their operable units addressed under this strategy in 2007 include: M, P and R Areas.

Area Completion



M Area demolition and decommissioning was completed in 2007 while characterization and remedial objectives were established.

M Area (Second Area Completion)

In 2007, SGCP completed an early action that removed soils contaminated with metals and polycyclic aromatic hydrocarbons from the M-Area Operable Unit (MAOU). The soil was then beneficially used as part of the foundation for a soil cover, resulting in cost savings as shipping for off site disposal was avoided. Additionally, this was the first use of the DOE Indefinite Deliverable/Indefinite Quantity (ID/IQ) Contractor program at SRS.

Also, SGCP completed the removal of radiologically contaminated concrete and soils from the core revery room and autoclave sumps as well as contaminated concrete, bricks and soils from the solvent tank pits and the tube cleaning pit.

Located in the northwest portion of SRS and covering ap-

proximately 45 acres, SRS produced special nuclear materials for the Department of Defense between 1952 and 1958 at M-Area. An important step in the production cycle was the manufacture of fuel and target assemblies.

M Area is the second area to be remediated under the area completion strategy (following T Area) as a means of completing the environmental cleanup of SRS. As part of the environmental strategy, the facilities in the former M Area industrial area were consolidated into a single operable unit, the MAOU.

The M-Area Completion Strategy integrates deactivation and decommissioning (D&D) of facilities with waste unit cleanup. Integrating D&D with other environmental cleanup actions provides efficient area closure while saving

both time and money. Most importantly, the strategy serves to reduce risk to workers, the public, and the environment.

The MAOU Core Team selected an accelerated schedule to take advantage of a comprehensive pre-characterization program to establish nature and extent of contamination and support problem identification. Several early actions, performed within the M Area are part of the MAOU Operable Unit Strategy.

Any remaining contamination after early actions will be addressed through selection of appropriate remedial actions in the MAOU Statement of Basis/Proposed Plan and Record of Decision. All MAOU remedial actions will include institutional controls.

Area Completion

P Area

SGCP continued work at the P-Area Operable Unit throughout 2007 to obtain regulatory approval to start final remediation work.

P Area is located in the southeastern portion of SRS, adjacent to the headwaters of Steel Creek, and between L Lake and Par Pond.

The 100-acre area is the location of the P Reactor which began operation in February 1954 and was placed in shutdown status in 1991.

After shutdown, all irradiated fuel and target assemblies, as well as the moderator were removed.

Currently, the radioactive and contaminated process equipment are fully contained within the reactor building and poses no threat to the environment.

The remediation of P-Area is being accomplished under an Area Completion Approach with the goals of accelerating the cleanup process and reducing

assessment, documentation, and remediation costs. Final completion of all remaining units and remnant facilities will be documented in a final P Area Operable Unit Record of Decision.

Through various stakeholder and regulatory meetings, including public involvement meetings, it has been agreed that the end-state for the P Reactor is in situ decommissioning with waste consolidation from other P-Area subunits.



In 2007, the P-Area Operable Unit obtained regulatory approval to begin final remediation work.

Area Completion



The R-Area Operable Unit was characterized to identify contaminants in the soils and groundwater surrounding the reactor complex in 2007.

R Area

Throughout 2007, SGCP completed field investigation of the waste units of the R-Area Operable Unit (RAOU), including radiological surveys, soil and groundwater sampling.

The RAOU is located in the east central area of SRS. The R Reactor is the largest of the five SRS reactors. On December 28, 1953, it achieved operational start making it the first fully functioning reactor at the Site.

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 Emergency Disassembly Basin water was purged to the first of six unlined earthen basins, the R-Area Seepage Basins.

These radioactive contaminated basins were remediated under a separate Record of Decision (ROD) in 2007. However, this incident resulted in the release of contaminants to soils on the north side and adjacent to the reactor building.

R Reactor was shutdown in 1964 due to a reduced requirement for defense related products. Immediately following deactivation, the

reactor was de-fueled and all fissile materials were removed. The facilities in R Area are in an advanced state of deactivation. The reactor vessel has been emptied, there are no fuel assemblies in the Disassembly Basin or Emergency Basin and reactor fluids systems have been drained.

In situ decommissioning is the anticipated end state for the reactor vessel and building complex. Excavation, covers/caps, and institutional controls are being considered for remediation of the contaminated soils while Monitored Natural Attenuation (MNA) is anticipated for cleanup of the groundwater.

Key Projects 2007

D Area Expanded Operable Unit (DEXOU) Closure



The D-Area Expanded Operable Unit achieved completion in late August 2007. The area was capped with a geosynthetic cover system and sod was placed on top of the site.

On August 29, 2007, SGCPC submitted the Post-Construction Report for the D Area Expanded Operable Unit (DEXOU) marking final area completion.

The DEXOU is located in D Area, in the southwest quadrant of SRS, approximately 3,000 feet east of the Savannah River. It consists of two subunits, the 488-D Ash Basin (488-DAB) and D-Area Rubble Pit (DRP). Past practices at these facilities contaminated the soil, sediment, surface water, and groundwater.

Surface soils and sediments outside the basin contained elevated levels of arsenic, coal-related met-

als and radionuclides; presenting a carcinogenic risk to future industrial workers and a risk to ecological receptors. Surface water at the dead and stressed vegetation area and surrounding the basin drainage were also a risk to ecological receptors.

Cleanup objectives included preventing contaminants in the basin from leaching to groundwater; preventing exposure of future industrial workers to unacceptable levels of arsenic, coal-related metals and radionuclides; and protecting ecological receptors from exposure to the low pH surface

water and contaminated sediments and soils.

The selected alternative outlined in the Record of Decision was to excavate and remove the waste materials (soils and sediments) from the DRP and areas outside of the 488-DAB and relocate them inside the 488-DAB. Once consolidation was complete, the DAB was permanently covered with a geosynthetic cover system.

This method of consolidation and isolation of contaminants prevents further harm to the environment as well as future workers at the site.

Key Projects 2007

Mixed Waste Management Facility (MWMF) Phytoremediation Upgrades

SGCP completed an irrigation upgrade during 2007 that included the replacement of the supply and distribution pumps and associated pipes, filtration system, intake structure and holding tank at the Mixed Waste Management Facility (MWMF). Additionally, 24 acres of pine to the east of the existing irrigation site were developed to aid in future remediation efficiency.

The MWMF is located in the northern portion of the Burial Ground Complex (BGC). The BGC occupies approximately 330 acres, is located between F and H Separations Areas and is in the center of SRS; it includes several adjacent facilities which are former, current, and planned disposal sites for hazardous, radioactive, and mixed wastes.

An aggressive, phased characterization program, including geological, hydrological and ecological studies, was conducted to delineate the Southwest Plume's extent of contamination and to develop a remediation strategy.

Tritium contamination in groundwater presents a special challenge since it readily combines with oxygen to form tritiated water.

The tritiated water that discharges from the MWMF Southwest Plume is currently being addressed with phytoremediation technology which used an existing 22-acre pine forest. A sheet-pile dam was constructed downhill from the MWMF Southwest Plume in October 2000 to reduce water discharges containing tritium to the Fourmile Branch and to create a retention pond to supply an irrigation system.

In March 2001, the irrigation system for the phytoremediation tech-



Top: The MWMF irrigation retention pond

Bottom: Irrigation to the phytoremediation pine forest

nology began operations. The initial design intent of this technology was to reduce tritiated water discharges to Fourmile Branch by 70 percent. Since the sheet-pile dam began retaining water in the retention pond, the tritium concentrations in the water discharged to Fourmile Branch has been reduced by approximately 65 percent.

The irrigation system transfers tritiated water from the reten-

tion pond to an adjacent forest. The pine trees take up the contaminated water through their root systems and release trace amounts of tritium to the atmosphere through their foliage, a safe and natural process called transpiration. The trees will naturally flush themselves of the tritium over time. When their tritium content has dropped to acceptable levels, the trees may then be harvested.

Key Projects 2007

General Separations Area Consolidation Unit Closure

In April 2007, the completion of the geosynthetic cover for the Old Radioactive Waste Burial Ground (ORWBG) set the stage for final closure of what was formerly the highest risk inactive waste unit at SRS.

The final cleanup of one of the highest priority waste areas at SRS and in the Department of Energy (DOE) complex was completed, thanks to the aggressive implementation of a Record of Decision issued by DOE, the South Carolina Department of Health (SCDHEC) and the Environmental Protection Agency (EPA).

Through the agreement, four nearby discreet waste units were consolidated with the ORWBG, and thereby formed the General Separations Area Consolidation Unit (GSACU).

The ORWBG is a 76-acre section of land located, along with the other GSACU waste units, near the center of SRS. The burial ground received radioactive waste from 1952-1972 with a small additional quantity of waste being disposed in 1974.

The ORWBG contains over 600,000 curies of radioactive materials and over 93 tons of hazardous waste. The area also contains 22 underground tanks, formerly used to store radioactive solvents.

Through the course of its operation as the site's primary disposal area, more than 7 million cubic feet of radioactive wastes were buried at the ORWBG. Most wastes disposed in the ORWBG were placed in drums, cans, cardboard boxes, plastic bags, and metal containers and buried in trenches. Waste included solid radioactive waste produced at SRS, shipments from other DOE facilities,

and shipments from the Department of Defense. At one point, approximately 5.1 million curies of radioactivity had been placed in the waste unit.

While much of the radioactivity has decayed, a large inventory of radioactive and hazardous substances remains buried in the ORWBG. Characterization of the type and extent of contamination was based on historical information augmented by non-intrusive investigation such as ground penetrating radar surveys. This characterization approach was selected to protect worker health and safety at this radiologically contaminated

waste site. This approach also provided a basis to proceed with a final closure strategy that was agreed to in a record of decision.

Fieldwork on the final closure of the GSACU began in December 2003 and was originally scheduled for completion in 2008. At the end of FY06, most of the actions were completed on all of the waste units besides the ORWBG. As an added benefit of consolidation of the waste units, offsite disposal was eliminated, which in combination with in-situ decommissioning of material in the ORWBG saved taxpayers more than \$150M.



The General Separations Area Consolidation Unit achieved final closure in 2007. The area was capped with a geosynthetic cover and vegetation.

Key Projects 2007

M-Area Dynamic Underground Stripping (DUS)

SRS has made significant progress in 2007 to remediate a large source of solvents generated from an onsite production area. By the end of 2007, 381,673 pounds of VOCs had been successfully removed 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 covers over three acres in size and is divided into four parcels to allow a systematic approach to remediation, and 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 M-Area Settling Basin

received process effluent containing various heavy metals and chlorinated degreasing solvents; primarily trichloroethylene (TCE) and PCE. 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.

The Facility operations began on August 8, 2005. Completion of the steam injection phase of the project is expected in 2008.



In 2007, the Dynamic Underground Stripping technology successfully removed over 380,000 pounds of DNAPL from the soil.

Key Projects 2007

Chemicals, Metals and Pesticides (CMP) Pits Electrical Resistance Heating

In 2007, SGCP completed installation of the Electrical Resistance Heating (ERH) system and initiated start-up testing. Additionally, a team based assessment was successfully performed ensuring that operations of the facility were effective and safe.

The Chemicals, Metals, and Pesticides (CMP) Pits Operable Unit (OU) is located in the central portion of SRS, approximately one mile north of L Reactor.

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.

Two VOC groundwater plumes exist at the CMP Pits, designated as the main plume and the northeast plume. Groundwater modeling indicates that the vadose zone beneath the CMP Pits are 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 soil vapor extraction (SVE) at the Pits.

ERH technology uses electrodes installed below ground to pass an electric current through the soil in the target remediation area. This current generates heat and volatilizes the contaminants. Once volatilized, 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, comparison to modeling results, 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 Dense Non Aqueous Phase Liquid (DNAPL) remediation technologies. ERH/SVE operations are expected to be completed in early 2009.



In 2007, Electrical Resistance Heating was installed, tested and approved for operations at the CMP Pits.

Soil and Groundwater Closure Projects

- 
- Safely restoring our environment
 - Actively protecting our people
 - Cost-effectively achieving our commitments
 - Accelerating closure through area completion