United States Department of Energy

Savannah River Site

enterprise·srs

Statement of Basis/Proposed Plan for the B-Area Operable Unit (U)

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Prepared by:
Savannah River Nuclear Solutions, LLC
Savannah River Site
Aiken, SC 29808

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Aiken, South Carolina

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LIST OF ABBREVIATIONS AND ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
ARRA	American Recovery and Reinvestment Act
BAOU	B Area Operable Unit
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
ECODS	Early Construction and Operational Disposal Site
EC	engineering control
FFA	Federal Facility Agreement
ft	foot / feet
HWCTR	Heavy Water Components Test Reactor
IC	institutional control
IOU	integrator operable unit
kg	kilogram
km	kilometer
km^2	square kilometer
LLC	Limited Liability Company
LUC	Land Use Control
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Plan
m	meter
m^3	cubic meter
MCL	maximum contaminant level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan (commonly referred to as the National Contingency Plan)
NFA	no further action
NPL	National Priorities List
NTCR	non-time critical removal
O&M	operation and maintenance
OU	operable unit
PCB	polychlorinated biphenyl
PTSM	principal threat source material
RAO	remedial action objective
RAR	Removal Action Report
RCOC	refined constituent of concern
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RG	remedial goal
RGO	remedial goal option
RI	remedial investigation
ROD	Record of Decision
RSER/EE/CA	Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis

LIST OF ABBREVIATIONS AND ACRONYMS *(Continued/End)*

SB/PP	Statement of Basis/Proposed Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SE	site evaluation
SCHWMR	South Carolina Hazardous Waste Management Regulations
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
TSD	treatment, storage or disposal
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
WSRC	Westinghouse Savannah River Company (before October 2005)
WSRC	Washington Savannah River Company, LLC (after October 2005)
yd^3	cubic yard

I. INTRODUCTION AND BACKGROUND

Introduction

This Statement of Basis/Proposed Plan (SB/PP) is being issued by the United States Department of Energy (USDOE), which functions as the lead agency for Savannah River Site (SRS) remedial activities, with concurrence by the United States Environmental Protection Agency (USEPA) and the South Carolina Department of Health and Environmental Control (SCDHEC). The purpose of this SB/PP is to describe the preferred remedial alternative(s) for the B Area Operable Unit (BAOU), and to provide for public involvement in the decision-making process.

SRS occupies approximately 310 square miles (803 km^2) of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina. SRS is located approximately 25 miles (40 km) southeast of Augusta, Georgia, and 20 miles (32 km) south of Aiken, South Carolina.

SRS is owned by the USDOE. Management and operating services are provided by Savannah River Nuclear Solutions, LLC (SRNS). SRS has historically produced tritium, plutonium, and other special nuclear materials for national defense. Chemical and radioactive wastes are byproducts of nuclear material production processes. Hazardous substances, as defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), are currently present in the environment at SRS.

SRS has implemented a remediation strategy to perform environmental cleanup for entire areas of the SRS. The BAOU was formed to manage the environmental restoration and decommissioning activities in B Area under a single Area Operable Unit (OU). The BAOU is located at the SRS in Aiken County, South Carolina (Figure 1). The BAOU consists of the following subunits:

- Early Construction and Operational Disposal Sites (ECODS) B-3 and B-5
- Building 770-U, Heavy Water Components Test Reactor (HWCTR)

Funding through the American Recovery and Reinvestment Act (ARRA) of 2009 supported acceleration of the original milestone dates for these subunits, and the USDOE has performed a non-time critical removal (NTCR) action at each in order to achieve the accelerated schedule commitments.

The ECODS B-3 and B-5 were used to dispose of waste material associated with the construction of B Area from 1951 to 1955. The USDOE completed a NTCR action in 2010 to address contaminants in the soil (arsenic and seven pesticides) and construction waste (potential exposure to buried asbestos) that posed a threat to human health and the environment. The NTCR action consisted of excavation and off-site disposal of impacted soil and construction debris totaling approximately 8,550 yd^3 (6,537 m^3). Currently there are no surficial exposure issues at ECODS B-3 and B-5 and the potential for exposure to asbestos in the subsurface has been eliminated by virtue of the removal action. The NTCR action met residential cleanup goals. In the current state, the ECODS B-3 and B-5 subunit poses no risk to human health and the environment and supports unrestricted

land use. Therefore, the preferred remedial alternative for the ECODS B-3 and B-5 subunit is No Further Action (NFA).

The HWCTR facility was a pressurized heavy water test reactor designed to test candidate fuel designs for heavy water power reactors. The facility operated from March 1962 until December 1964 when it was placed in a standby condition, including the removal of fuel and heavy water. Prior to the completion of the NTCR action in 2011, approximately 2,100 curies of radioactivity (activated metal and concrete) remained in the HWCTR facility that posed a potential threat to human health and the environment. More than 99 percent of the radioactivity in the HWCTR facility was associated with activated metal in the internal structure of the reactor vessel and steam generators. In addition, the facility also contained hazardous materials such as lead, asbestos, and polychlorinated biphenyls (PCBs) associated with existing equipment or previous operations (e.g., lights, piping, paints, etc.).

The selected NTCR action for HWCTR was to remove the reactor vessel, steam generators, steel containment dome, and all above-grade components of the facility, with the exception of the transfer coffin refueling machine, and dispose of the removed items at the appropriate disposal facilities. Following removal of these items, the transfer coffin refueling machine was placed in the reactor vessel void space and the below-grade portions of the facility were sealed in place with a grout material to form a stabilized structure. The area was then covered with concrete at the ground surface to prevent infiltration and eliminate direct exposure to contaminants left in place for future industrial workers. Because some residual contamination is still present below ground surface at this facility, the preferred remedial alternative for the HWCTR facility subunit of the BAOU is Land Use Controls (LUCs) with Groundwater Monitoring. As part of the selected remedy, the future land use for the HWCTR facility will be industrial.

SRS Compliance History

SRS manages certain waste materials that are regulated under the Resource Conservation and Recovery Act (RCRA), a comprehensive law requiring responsible management of hazardous waste. SRS received a RCRA hazardous waste permit from the SCDHEC, which was most recently renewed on September 30, 2003 (SC1 890 008 989). Module VIII of the Hazardous and Solid Waste Amendments portion of the RCRA permit mandates corrective action requirements for non-regulated solid waste management units subject to RCRA 3004(u). The BAOU is a solid waste management unit under RCRA Section 3004(u).

On December 21, 1989, SRS was included on the National Priorities List (NPL). The inclusion created a need to integrate the established RCRA Facility Investigation (RFI) program with CERCLA requirements to provide for a focused environmental program. In accordance with Section 120 of CERCLA 42 U.S.C. § 9620, USDOE has negotiated a Federal Facility Agreement (FFA) (FFA 1993) with the USEPA and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements. The FFA lists the BAOU as a RCRA/CERCLA unit requiring further evaluation using an investigation/assessment process that integrates and

combines the RFI process with the CERCLA Remedial Investigation (RI) process to determine the actual or potential impact to human health and the environment of releases of hazardous substances to the environment.

Both RCRA and CERCLA require the public to be given an opportunity to review and comment on the draft RCRA permit modification and proposed remedial alternatives. Public participation requirements are listed in South Carolina Hazardous Waste Management Regulations (SCHWMR) R.61-79.124 and Sections 113 and 117 of CERCLA 42 U.S.C. § 9613 and 9617. These requirements include establishment of an Administrative Record File that documents the investigation and selection of remedial alternatives and allows for review and comment by the public regarding those alternatives (see Section II). The Administrative Record File must be established at or near the facility at issue. The SRS FFA Community Involvement Plan (WSRC 2011b) is designed to facilitate public involvement in the decision-making process for permitting, closure, and the selection of remedial alternatives. SCHWMR R.61-79.124 and Section 117(a) of CERCLA, as amended, require the advertisement of the draft permit modification and notice of any proposed remedial action and provide the public an opportunity to participate in the selection of the remedial action.

SCHWMR R.61-79.124 requires that a brief description and response to all significant comments be made available to the public as part of the RCRA Administrative Record. Community involvement in consideration of this evaluation of alternatives for the BAOU is strongly encouraged. All submitted comments will be reviewed and considered. Following the public comment period, a Responsiveness Summary will be prepared to address issues raised during the public comment period. The Responsiveness Summary will be made available with the final RCRA permit modification and the Record of Decision (ROD).

The final remedial decision will be made only after the public comment period has ended and all the comments have been received and considered. The final remedial decision under RCRA will be in the form of a final permit modification, which is made by SCDHEC. Selection of the remedial alternative that will satisfy the FFA requirements will be made by USDOE, in consultation with USEPA and SCDHEC. It is important to note that the final action(s) may be different from the preferred alternative discussed in this plan depending on new information or public comments. The alternatives chosen will be protective of human health and the environment and comply with all federal and state laws.

II. COMMUNITY PARTICIPATION

The FFA Administrative Record File, which contains the information pertaining to the selection of the response action, is available at the following locations:

US Department of Energy
Public Reading Room
Gregg-Graniteville Library
University of South Carolina – Aiken
171 University Parkway
Aiken, South Carolina 29801
(803) 641-3465

Thomas Cooper Library
Government Documents Department
University of South Carolina
Columbia, South Carolina 29208
(803) 777-4866

Hard copies of the SB/PP are available at the following locations:

Reese Library
Government Information Section
Augusta State University
2500 Walton Way
Augusta, Georgia 30910
(706) 737-1744

Asa H. Gordon Library
Savannah State University
Tompkins Road
Savannah, Georgia 31404
(912) 356-2183

The RCRA Administrative Record File for SCDHEC is available for review by the public at the following locations:

The South Carolina Department of Health and Environmental Control
Bureau of Land and Waste Management
8911 Farrow Road
Columbia, South Carolina 29203
(803) 896-4000

The South Carolina Department of Health and Environmental Control – Region 5
Aiken Environmental Quality Control Office
206 Beaufort Street, Northeast
Aiken, South Carolina 29801
(803) 641-7670

The public will be notified of the public comment period through mailings of the SRS Environmental Bulletin, a newsletter sent to citizens in South Carolina and Georgia, and through notices in the *Aiken Standard*, the *Allendale Citizen Leader*, the *Augusta Chronicle*, the *Barnwell People-Sentinel*, and *The State* newspapers. The public comment period will also be announced on local radio stations.

USDOE will provide an opportunity for a public meeting during the public comment period if significant interest is expressed. The public will be notified of the date, time, and location. At the meetings, the proposed action will be discussed, and questions about the action will be answered.

To request a public meeting during the public comment period, to obtain more information concerning this document, or to submit written comments, contact one of the following:

Paul Sauerborn
Savannah River Nuclear Solutions, LLC
Public Involvement
Savannah River Site
Building 730-1B
Aiken, South Carolina 29808
(803) 952-6658
paul.sauerborn@srs.gov

South Carolina Department of Health and Environmental Control
Attn: Richard Haynes, P.E., Director
Division of Waste Management
Bureau of Land and Waste Management
2600 Bull Street
Columbia, South Carolina 29201
(803) 896-4000

Following the public comment period, a ROD will be signed, and a final decision for the SRS RCRA permit will be issued. The ROD and RCRA permit will detail the remedial alternative chosen for the BAOU and include responses to oral and written comments received during the public comment period in the Responsiveness Summary.

III. OPERABLE UNIT BACKGROUND

ECODS B-3 and B-5 Site History

Construction activities at the SRS were initiated in 1951, with the majority of production facilities and related support facilities completed by 1955. During that period, an abundance of construction waste was generated which required disposal. Aerial

photographs of SRS were utilized to search for potential environmental hazards related to historical waste disposal practices. Historical photographs revealed that, prior to SRS construction, land around B Area was used as farm land. However, in aerial photographs taken after SRS construction began, several anomalies (i.e., disturbed soil) were observed within B Area. These anomalies were subsequently identified as land burial tracts where construction waste had been placed. Upon identification, these areas were denoted as ECODS and were added to Appendix G.1 (Areas To Be Investigated) of the FFA.

ECODS B-3 and B-5 were two of the twenty-five ECODS identified at SRS that were used to dispose of waste material associated with the construction of SRS facilities. ECODS B-3 and B-5 were associated with the construction of B Area and are located between B Area and the Sanitary Landfill (Figure 2). Construction waste was buried in shallow, elongated trenches, and several trenches were also used as burn pits for combustible waste disposal.

ECODS B-3 and B-5 were sampled in 2001 and 2002 under the Site Evaluation (SE) program to determine the nature and extent of contamination in soils from construction waste. The analytical results for the soil media that are documented in the SE Reports (WSRC 2002 and WSRC 2003) demonstrated that these ECODS contained metals, organic chemicals, pesticides, PCBs, and minor amounts of other contaminants, predominantly in the subsurface soils. Based on evaluations of other ECODS at SRS, friable asbestos was also thought to be present at ECODS B-3 and B-5. Therefore, ECODS B-3 and B-5 were subsequently transferred to Appendix C (RCRA/CERCLA Units) of the FFA for further evaluation.

Funding through the ARRA of 2009 supported acceleration of the original FFA milestone dates for this operable unit. In order to achieve the accelerated schedule, the USDOE performed a NTCR action at the ECODS B-3 and B-5 OU.

The *Removal Site Evaluation Report / Engineering Evaluation / Cost Analysis (RSER/EE/CA) for the Early Construction and Operational Disposal Sites (ECODS) B-3 and B-5 Operable Unit (OU) (U)* (SRNS 2010a) identified the objectives of the removal action, evaluated the alternatives that addressed the potential threats from release of contaminants to the environment, and provided a vehicle for public comment per the National Oil and Hazardous Substances Contingency Plan (NCP), 40 Code of Federal Regulations 300.415.

Arsenic and pesticides (alpha-chlordane, gamma-chlordane, DDD [dichlorodiphenyldichloroethane], DDE [dichlorodiphenyldichloroethylene], DDT [dichlorodiphenyltrichloroethane], heptachlor and heptachlor epoxide) were identified as human health refined constituents of concern (RCOCs) in the surface soils at ECODS B-3 and B-5. RCOCs are those constituents that have been determined to require a removal action. In addition, the potential for exposure to asbestos that may have been buried was also identified as a problem that required a removal action response.

An evaluation for source materials that could potentially migrate to groundwater or are highly toxic, (i.e., identified as principal threat source material [PTSM]) was conducted. No ecological

risk, contaminant migration or PTSM RCOCs were identified for ECODS B-3 or B-5. The preferred removal action for the ECODS B-3 and B-5 OU was "Removal and Offsite Disposal" as documented in the RSER/EE/CA (SRNS 2010a).

The Revision 1 RSER/EE/CA was submitted to the USEPA and SCDHEC on March 3, 2010. The RSER/EE/CA was made available for public review and comment from March 16, 2010 to April 14, 2010. The USDOE submitted the Action Memorandum and Responsiveness Summary (for comments received during the RSER/EE/CA public comment period) to the regulators on April 28, 2010, and they were issued to the public on May 6, 2010.

The removal action for this area included the excavation of approximately 7,350 yd^3 (5,620 m^3) from ECODS B-3 and 1,200 yd^3 (918 m^3) from ECODS B-5 of construction debris and impacted soil to a depth of 12 ft (3.7 m). The excavations extended to a minimum of two feet (0.6 m) beyond the waste (both horizontally and vertically) in each area. Primarily cafeteria waste was identified in the excavated media at both ECODS. All excavated material was transported to the Three Rivers Landfill, which is approved for off-site disposal of CERCLA waste.

Upon completion of the excavation activities, confirmation sampling of the remaining soil in each trench was conducted per the *Sampling and Analysis Plan for Removal Confirmation at ECODS B-3 and B-5 (U)* (SRNS 2010b). The confirmation sampling results indicated satisfactory completion of the removal action, and the affected area was subsequently backfilled (to a depth of approximately 12 ft [3.7 m]) with clean fill material, contoured, graded, and stabilized for establishment of vegetative cover. The filled/contoured/graded area was then seeded for vegetative stabilization. An evaluation of the analytical results of the clean fill material indicated that it met the requirements for an unrestricted (residential) land use scenario.

The *Removal Action Report (RAR) for the Early Construction and Operational Disposal Sites (ECODS) B-3 and B-5 Operable Unit (OU) (U)* (SRNS 2011a) documents the USDOE performance of the NTCR action. The RAR concluded that implementation of the selected alternative met the objectives of the removal action and was protective of human health and the environment in the short- and long-terms. Currently there are no surficial exposure issues at ECODS B-3 and B-5 and the potential for exposure to asbestos in the subsurface has been eliminated by virtue of the removal action. Furthermore, the NTCR action met residential cleanup goals and will not require any land use restrictions. SCDHEC approved the RAR document on June 8, 2011 and the USEPA approved it on June 16, 2011.

HWCTR Site History

The HWCTR facility is located on approximately 2 acres (8,094 m^2) in the northwest quadrant of the SRS (Figure 1) in an area formally known as U Area. This area is now part of B Area (Figure 2), which is composed primarily of administrative, protective force operations, laboratory, and warehouse facilities. The HWCTR facility is located approximately 3 miles (4.8 km) from the nearest SRS property boundary and about 2.5 miles (4.5 km) from any major nuclear materials production facilities on the site.

The HWCTR was a pressurized heavy water reactor designed to test candidate fuel designs for heavy water power reactors. The test reactor was not a defense-related facility like the five production reactors at the SRS. The HWCTR facility operated from March 1962 until December 1964 when operations were terminated and the facility was placed in a standby condition, including the removal of fuel and heavy water. The radiation levels in most accessible areas of the HWCTR containment building were low (i.e., less than 1 millirem per hour) and the residual radioactivity and contamination from operation and maintenance of the reactor and its associated components remained inside the containment building. In 2009, the total amount of radioactivity estimated in the facility was approximately 2,100 curies. More than 99 percent of the radioactivity in the HWCTR was associated with activated metal in the internal structure of the reactor vessel and associated steam generators.

The USDOE determined that a NTCR action was warranted to decommission the HWCTR to address the potential threat of contaminant releases which could impact both human health and the environment. The purpose of the removal action was to protect future industrial workers from exposure to radionuclides and hazardous constituents in the reactor vessel, steam generators and associated equipment in the HWCTR facility and to prevent potential migration of radionuclides and hazardous constituents from the HWCTR so they would not contribute contamination to the groundwater above maximum contaminant levels (MCLs).

The *Removal Site Evaluation Report / Engineering Evaluation / Cost Analysis (RSER/EE/CA) for the Heavy Water Components Test Reactor (HWCTR) (770-U) (U)* (SRNS 2010c) selected the NTCR action for HWCTR to be "In Situ Decommissioning with Reactor Vessel and Steam Generator Removal." The USEPA and SCDHEC received the Revision 1 RSER/EE/CA on February 5, 2010, and it was made available for public review and comment from February 8, 2010 to March 10, 2010. The USDOE submitted the Action Memorandum and Responsiveness Summary (for comments received during the RSER/EE/CA public comment period) to the regulators on March 18, 2010, and they were issued to the public on March 31, 2010.

The *Removal Action Report (RAR) for the Heavy Water Components Test Reactor (770-U) (U)* (SRNS 2011b) describes the details of the NTCR action. Under this selected removal action, the reactor vessel, steam generators, steel containment dome, and all above-grade components of the facility, with the exception of the transfer coffin refueling machine, were removed and disposed of at appropriate disposal facilities. The majority of the waste generated (approximately 16,430 ft^3) was low level radioactive waste that was dispositioned to the E-Area Low-Level Waste Facility (Slit Trench Disposal Units) and included pump cooling motors, piping and conduit, the polar crane, trolley, crane bridge, reactor shield ring, equipment cabinets, the reactor vessel top drive platform, and the containment dome. The reactor vessel (approximately 2,000 ft^3), steam generators (approximately 1,800 ft^3) and PCB Bulk Product Waste (approximately 13,770 ft^3) were also dispositioned to the E-Area slit trench disposal units as low level CERCLA waste. Mixed waste in the form of oil (approximately 50 gallons), lead shielding

and brass valves (approximately 2,000 ft^3) were staged at the Mixed Waste Storage Facility (645-1N) at SRS until final disposition at a permanent treatment, storage or disposal (TSD) facility. In addition, approximately 40 ft^3 of universal waste (a category of waste materials designated as hazardous waste, but containing materials that are very common) was brought to the Construction Shop Building (725-1N) at SRS until final disposition at a permanent TSD facility. Nonhazardous solid waste was disposed of at the C&D Landfill (approximately 2,270 ft^3) and Three Rivers Landfill (approximately 650 ft^3). Following removal of these components, the transfer coffin refueling machine was placed in the reactor vessel void space and the below-grade portions of the facility were sealed in place with a grout material to form a stabilized structure. The area was then covered with concrete at the ground surface to prevent infiltration and eliminate direct exposure to contaminants left in place for future industrial workers.

In addition, four groundwater monitoring wells were installed at HWCTR in 2009 to confirm that there was no impact to groundwater from historical releases and to provide a future monitoring network if needed (i.e., if potential sources were not stabilized or removed). The 2009-2010 sampling results acknowledged that there was no historical impact to groundwater from HWCTR operations or a former underground storage tank location. LUCs and ongoing surveillance and maintenance activities were implemented with the preferred removal alternative.

The RAR concluded that implementation of the selected alternative met the objectives of the removal action and was protective of human health and the environment in the short- and long-terms. Removal of the reactor vessel and steam generators provided the additional benefit of reducing the residual activity at the HWCTR by approximately 99 percent and consolidating the highly radioactive materials in a facility designed and operated for their long-term management. Furthermore, grouting below grade and covering portions of the facility at-grade removed pathways for industrial worker exposure to remaining contaminants while requiring minimal surveillance and maintenance costs and reducing any future risk of contaminant migration to groundwater. SCDHEC approved the RAR document on January 31, 2012 and the USEPA approved it on January 23, 2012. A site model of the HWCTR facility after implementation of the NTCR action is provided in Figure 3.

Due to the time between completion of the removal action and the BAOU final decision document submittals and approvals, signs were installed at the HWCTR to ensure that ongoing surveillance and maintenance activities would be in effect during the interim period. The area subject to these activities is shown on Figure 4.

The HWCTR facility is in an area designated for industrial use and is primarily used as an administrative area. Future industrial land use will be controlled in accordance with the SRS Land Use Control Assurance Plan (LUCAP) (WSRC 2011a). Because residual contamination remains at HWCTR, LUCs will be part of any final action to ensure protection against unrestricted uses (e.g., residential). All of the residual contamination is limited to the below-grade portions of the facility that were sealed in place with grout material to form the stabilized

structure; there is no evidence that contaminants have migrated in the past or will migrate in the future from the facility to the surrounding soil or groundwater media.

IV. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

Due to the complexity and size of multiple OUs located in different areas of the SRS, the site is divided into watersheds for the purpose of managing a comprehensive cleanup strategy. The SRS is segregated into six watersheds: Upper Three Runs, Lower Three Runs, Fourmile Branch, Steel Creek, Pen Branch, and the Savannah River and Floodplain Swamp. In addition, the SRS also identifies six Integrator Operable Units (IOUs) which are the surface water bodies and associated wetlands that correspond to the six respective watersheds. OUs within a watershed may be evaluated and remediated individually or grouped with other OUs and evaluated as part of a larger Area OU. Upon disposition of all the OUs within a watershed, a final comprehensive ROD for the corresponding IOU (i.e., surface water and associated wetlands) will be pursued with additional public involvement. The BAOU is located within the Upper Three Runs watershed (Figure 1).

In 2003, a new completion strategy for environmental restoration at SRS was developed to accelerate cleanup completion. A key component of the plan is to implement an area-by-area remediation strategy. Through the sequencing of environmental restoration and decommissioning activities, environmental cleanup can be completed for entire areas of the SRS. The USDOE, USEPA, and SCDHEC convened and agreed that using the Area OU strategy to manage surface units at the BAOU was appropriate and the OUs and facilities in the area were consolidated to form a single Area OU. Therefore, the purpose of this SB/PP for the BAOU is to describe the preferred final remedial alternatives for the ECODS B-3 and B-5 subunit and for the HWCTR facility subunit following completion of the NTCR actions.

V. SUMMARY OF SITE RISKS

ECODS B-3 and B-5

Prior to implementation of the NTCR action, contaminants in the soil (arsenic and seven pesticides) and construction waste (potential exposure to buried asbestos) posed a threat to human health and the environment. Upon completion of the removal action, both the soil remaining after excavation and the material used to fill the void and bring the site to surface grade met the requirements for a residential (unrestricted) land use scenario. Currently, there are no surficial exposure issues at the ECODS B-3 and B-5 OU and the potential for exposure to asbestos in the subsurface has been eliminated by virtue of the removal action. The cleanup goals for a residential scenario have been attained and the objectives of the removal action have been met.

HWCTR

Prior to the removal action, approximately 2,100 curies of radioactivity (activated metal and concrete) remained in the HWCTR facility, which exceeded the industrial worker risk threshold (risk >1E-06) and PTSM levels (risk >1E-03) should exposure occur. More than 99 percent of the radioactivity in the HWCTR facility was associated with activated metal

in the internal structure of the reactor vessel and associated steam generators. It is estimated that following deactivation activities and removal of the above grade structure, the reactor vessel and the steam generators, approximately 21 curies remain in the below grade structure. The primary radionuclides contributing to the estimated 21 curies remaining in the below grade structure are mostly fission products (e.g., strontium-90, cesium-137) and transuranics (e.g., plutonium-239, plutonium-241, americium-241). This residual contamination is present in the primary heat transfer loops that lead to the steam generators from the reactor vessel, in fixed contamination in the spent fuel basin, and within cracks and crevices in the concrete floors (USDOE 1996). In addition, the facility also contained hazardous materials such as lead, asbestos, and PCBs associated with existing equipment or previous operations (e.g., lights, piping, paints, etc.). The estimated mass of PCBs contained in paint and cables remaining in HWCTR is approximately 100 pounds (45 kg). All of the residual contamination is limited to the below-grade portions of the facility that were sealed in place with grout material to form the stabilized structure; there is no evidence that contaminants have migrated in the past or will migrate in the future from the facility to the surrounding soil or groundwater media. Following the NTCR action, grouting below grade and covering portions of the facility at-grade removed pathways for industrial worker exposure to remaining contaminants while reducing any future risk of contaminant migration to groundwater.

Summary of Human Health Risk Assessment

ECODS B-3 and B-5

There are no human health risks to current or future receptors following the NTCR action. The ECODS B-3 and B-5 is suitable for unrestricted use (i.e., residential).

HWCTR

The NTCR action of grouting below-grade and covering portions of the facility at-grade eliminated the pathways for industrial worker exposure to remaining contamination.

The HWCTR facility is in an area designated for industrial land use; LUCs will be part of any final action to ensure protection against unrestricted uses (i.e., residential).

Summary of Ecological Risk Assessment

There are no ecological risks to any wildlife receptors following the NTCR actions at either the ECODS B-3 and B-5 OU or the former HWCTR facility.

Summary of Contaminant Fate and Transport Analysis

ECODS B-3 and B-5

There are no contaminant migration to groundwater risks following the NTCR action at ECODS B-3 and B-5.

HWCTR

Four groundwater monitoring wells were installed at HWCTR in 2009 to confirm that there was no impact to groundwater from historical releases and to

provide a future monitoring network if needed (i.e., if potential sources were not stabilized or removed). The 2009-2010 sampling results acknowledged that there was no historical impact to groundwater from HWCTR operations or a former underground storage tank location. The NTCR action to remove the majority of the contaminated equipment and stabilize the remaining contaminants in situ reduced the potential for future impacts to groundwater provided there is no unacceptable degradation of the stabilization material. Approximately 99% of the estimated 2,100 total curies were removed from the HWCTR facility as part of the NTCR action. The major radionuclides were activation products (e.g., cobalt-60, nickel-63) associated with the reactor vessel and fission products (e.g., strontium-90, cesium-137) contamination within the steam generators. It is estimated that following deactivation activities and removal of the above grade structure, the reactor vessel and the stream generators, approximately 21 curies remain in the below grade structure. The primary radionuclides contributing to the estimated 21 curies remaining in the below grade structure are mostly fission products (e.g., strontium-90, cesium-137) and transuranics (e.g., plutonium-239, plutonium-241, americium-241).

Conclusion

ECODS B-3 and B-5

There are no human health, ecological, or contaminant migration risks following the NTCR action at the ECODS B-3 and B-5 subunit. This BAOU subunit is suitable for unrestricted use.

HWCTR

The NTCR action successfully eliminated the potential for industrial worker exposure and minimized the potential to impact groundwater, but some residual contamination is still present in the below grade portions of the facility. This condition requires a remedial action.

Actual or threatened releases of hazardous substances from the HWCTR facility subunit of the BAOU, if not addressed by the Preferred Alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

VI. REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are media- or OU-specific objectives for protecting human health and the environment. RAOs usually specify potential receptors and exposure pathways, and are identified during project scoping once the conceptual site model is understood. RAOs describe what the remediation must accomplish and are used as a framework for developing remedial alternatives. The RAOs are based on the nature and extent of contamination, threatened resources, and the potential for human and environmental exposure.

ECODS B-3 and B-5

There is no current or potential threat to public health, welfare, or the environment from the ECODS B-3 and B-5 subunit, and there are no applicable or relevant and appropriate requirements (ARARs). Therefore, no RAOs are required and no remedial goal options are established for ECODS B-3 and B-5.

HWCTR

The future land use of the BAOU is assumed to be industrial land use with USDOE maintaining control of the land. The following RAOs have been identified for the HWCTR facility to support the future land use:

- Eliminate or control all routes of exposure to residual below grade radioactive or chemical contamination posing human health risks exceeding 1E-06 in media or structures associated with the HWCTR facility.

- Prevent the potential migration of residual radionuclides and chemical constituents remaining below grade so that they will not contribute contamination to groundwater above MCLs.

Remedial Goal Options

Remedial goal options (RGOs) serve to provide a range of cleanup goals for each constituent of concern (COC) and are typically identified along with the RAOs. These cleanup goals are either concentration levels that correspond to a specific risk or hazard or are based on ARARs. Following public comment and approval of the SB/PP, the RGOs for the selected remedy are documented as final cleanup goals or remedial goals (RGs) in the ROD.

The removal goals identified in the removal action decision documents (SRNS 2010a and SRNS 2010c) have been achieved by virtue of performing the NTCR actions at the ECODS B-3 and B-5 OU and the HWCTR facility. The post-removal RARs (SRNS 2011a and SRNS 2011b) document attainment of these goals. Therefore, concentration-based RGOs have not been developed for the final remedial action.

Applicable or Relevant and Appropriate Requirements

ARARs are cleanup standards, standards of control and other substantive requirements, criteria or limitations promulgated under federal, state, or local environmental laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Section 121(d) of CERCLA, as amended by the Superfund Amendments Reauthorization Act, requires that remedial actions comply with requirements and standards set forth under federal and state environmental laws.

Three categories of ARARs are identified to clarify how to identify and comply with environmental requirements. They include action-specific, location-specific, and chemical-specific requirements:

- Action-specific ARARs control or restrict the design, performance, and other aspects of implementation of specific remedial activities;

- Location-specific ARARs reflect the physiographic and environmental characteristics of the unit or the immediate area, and may restrict or preclude remedial actions depending on the location or the characteristics of the unit;

- Chemical-specific ARARs are media-specific concentration limits promulgated under federal or state law.

ARARs for the NTCR actions were previously identified in the respective RSER/EE/CA documents

(SRNS 2010a and SRNS 2010c). ARARs were re-evaluated for the preferred action for BAOU. Because no remedial action is needed for ECODS B-3 and B-5, no ARARs are presented for this subunit. A summary of the potential ARARs for the preferred remedial alternative for the HWCTR subunit is presented in Table 1.

VII. SUMMARY OF REMEDIAL ALTERNATIVES

This section presents and summarizes the remedial alternatives for the BAOU. Under CERCLA, it is desirable, when practical, to offer a range of alternatives to compare during the detailed analysis to arrive at the most effective cost-efficient remedial action. The range of alternatives may include options that (1) immobilize chemicals, (2) reduce the contaminant volume, or (3) reduce the need for long-term, onsite management. For the subunits that comprise the BAOU, alternatives were previously evaluated in the removal action decision documents (SRNS 2010a and SRNS 2010c). No further evaluation of alternatives is needed for the ECODS B-3 and B-5 subunit. For the final action at the HWCTR subunit, the following three remedial alternatives were evaluated.

Alternative BAOU-1: No Further Action

The No Further Action (following the NTCR action) alternative does not restrict access, limit exposure, or reduce contaminant toxicity, mobility or volume. This alternative would leave the BAOU in its current condition with no additional LUCs. This alternative does not include five-year remedy reviews.

The detailed present value cost estimate is provided in Table 2. A summary of the costs for this alternative is provided below:

Capital	$0
Operation and Maintenance (O&M) Costs	$0
Total Present-Worth Cost	$0

Alternative BAOU-2: Land Use Controls

Under this alternative, LUCs (i.e., engineering controls [ECs] and institutional controls [ICs]) would be implemented. ECs (e.g., physical barriers and signs) and ICs (e.g., excavation permit restrictions and deed restrictions) would be used to restrict access or activities that can be performed. As part of the NTCR action, a concrete cover was installed at the ground surface, access control signs were installed, and surveillance and maintenance activities were initiated. LUCs implemented as part of the removal action would be continued as a final action for the BAOU. The area subject to these activities is shown in Figure 4.

The surveillance and monitoring activities will include an annual inspection to verify the following: 1) that the area is accessible for authorized maintenance and inspections; 2) that the warning signs (4 total) are in acceptable condition, have the correct information, and are legible from a distance of 25 ft (7.6 m); (3) that excessive deterioration of the concrete cover has not occurred and the cover is free of vegetation, and; 4) that there are no unauthorized excavations, digging, or construction activities within the HWCTR boundaries. Maintenance activities will be performed on an as-needed basis pending the results of these inspections. This alternative includes five-year remedy reviews.

The detailed present value cost estimate for this alternative is provided in Table 2. A summary of the costs is provided below:

Capital	$0
O&M Costs	$1,784,129
Total Present-Worth Cost	$1,784,129

Alternative BAOU-3: Land Use Controls and Groundwater Monitoring

Under this alternative, the LUCs that are described previously in Alternative BAOU-2 apply. Although groundwater is not part of the BAOU, periodic groundwater monitoring will be implemented for four wells at the HWCTR facility subunit to confirm that there is no future impact to groundwater should an unacceptable degradation of the stabilization materials (i.e., in-situ grout and surface concrete cover) occur. Groundwater monitoring for the HWCTR facility adds another layer of protection in addition to LUCs and is consistent with other in-situ remedies performed at the SRS.

The groundwater monitoring will consist of sampling the uppermost aquifer at HWCTR using the existing network of four wells (Figure 5). The wells will be sampled for gross radionuclide parameters (i.e., gross alpha and nonvolatile beta), iodine-129, tritium, lead, and PCBs (i.e., Aroclor 1254 and Aroclor 1260). Groundwater samples will be collected every five years to support the five-year remedy reviews for the HWCTR facility end state.

The detailed present value cost estimate for this alternative is provided in Table 2. A summary of the costs is provided below:

Capital	$0
O&M Costs	$1,808,843
Total Present-Worth Cost	$1,808,843

According to USEPA guidance, if there is no current or potential threat to human health and the environment and no action is warranted, the CERCLA 121 requirements are not triggered. If the requirements are not triggered, there is no need to evaluate other cleanup alternatives or to evaluate the No Further Action alternative against the nine remedy selection criteria under CERCLA. These nine criteria are used as a basis for selecting cleanup remedies that are protective of human health and the environment, implementable, cost-effective, and acceptable to the state regulatory agency.

The proposed No Further Action alternative will be the final action for the ECODS B-3 and B-5 OU. This alternative will provide protection to human health and the environment at the ECODS B-3 and B-5 subunit of the BAOU.

The following section summarizes the results of the evaluation of the three remedial alternatives for the HWCTR subunit. The NCP [40 Code of Federal Regulations 300.430(e)(9)] requires that potential remedial alternatives undergo detailed analysis using relevant evaluation criteria that will be used to select a final remedy. USEPA has established nine evaluation criteria to address the statutory requirements under CERCLA. The criteria fall into categories of threshold criteria, primary balancing criteria, and modifying criteria. The nine evaluation criteria are detailed in Table 3.

Comparative Analysis of Alternatives for HWCTR

The potential remedial alternatives have been evaluated against the threshold and primary balancing criteria. Modifying criteria (i.e., state or support agency acceptance and community

acceptance) will be evaluated after the public comment period on the SB/PP. Provided below is a summary of the comparison of the alternatives against the CERCLA evaluation criteria. Key advantages and disadvantages for each alternative relative to one another and in relation to the two threshold criteria and five primary balancing criteria are discussed below and summarized in Table 4.

Overall Protection of Human Health and the Environment

Alternative BAOU-1 is not protective of human health since no controls are in place to prevent potential exposure to contaminated media or structures. Alternatives BAOU-2 and BAOU-3 are protective of human health (industrial workers and residents) by preventing potential exposure to contaminated structures and media through LUCs (i.e., ECs and ICs). Alternative BAOU-3 provides additional assurance regarding the protection of the groundwater by inclusion of a monitoring program.

Compliance with ARARs

ARARs are associated with the proposed action at HWCTR (Table 1). Chemical and action-specific ARARs identified in the NTCR action were met during the removal. The only chemical-specific ARAR applicable to the remedial alternative evaluation for the HWCTR subunit is for the groundwater monitoring component. The chemical specific-ARAR is not met for Alternatives BAOU-1 or BAOU-2 because groundwater monitoring is not a component of either alternative. Alternative BAOU-3 includes groundwater monitoring to ensure that the HWCTR NTCR action is effective in preventing migration of residual radionuclides and chemical constituents above MCLs.

Short-Term Effectiveness

The remedial alternatives are assessed considering factors relevant to implementation of the remedial action, including risks to the community during implementation, impacts to workers, potential environmental impacts and the time until protection is achieved. Alternative BAOU-1 does not provide short-term effectiveness since there are no controls in place to prevent potential exposure to contaminated structures and media. Alternatives BAOU-2 and BAOU-3 achieve RAOs in a short period of time with essentially no risk to workers and the public.

Long-Term Effectiveness and Permanence

The remedial alternatives are assessed based on their ability to maintain reliable protection of human health and the environment after implementation. Alternative BAOU-1 does not provide long-term effectiveness and permanence since there are no controls in place to prevent the potential exposure to contaminated structures and media. Alternatives BAOU-2 and BAOU-3 are protective and provide long-term effectiveness and permanence as long as LUCs are maintained. Alternative BAOU-3 provides additional assurance regarding the protection of the groundwater by inclusion of a monitoring program.

Reduction of Toxicity, Mobility, or Volume through Treatment

None of the remedial alternatives provide reduction of toxicity, mobility, or volume through active treatment. These objectives were addressed at the ECODS B-3 and B-5 subunit and the HWCTR facility subunit by the implementation of the NTCR actions.

Implementability

The remedial alternatives are assessed by considering the difficulty of implementing the alternative, including technical feasibility, constructability, reliability of technology, ease of undertaking remedial actions (if required), monitoring considerations, administrative feasibility (regulatory requirements), and availability of services and materials. All three alternatives are easily implementable.

Cost

Alternative BAOU-1 is the least expensive ($0) as compared to Alternatives BAOU-2 ($1,784,129) and BAOU-3 ($1,808,843). Detailed cost analyses are provided in Table 2. Five year remedy reviews are provided for Alternatives BAOU-2 and BAOU-3. Groundwater monitoring for 100 years is included in Alternative BAOU-3.

VIII. PREFERRED ALTERNATIVE

The preferred alternatives for the BAOU subunits are described below. However, USEPA, in consultation with SCDHEC, may modify the preferred alternative or choose another response action presented in this SB/PP based on new information or public comments.

ECODS B-3 and B-5

The No Further Action alternative is the preferred alternative for the ECODS B-3 and B-5 subunit of the BAOU. There is no waste to treat, no institutional or engineering controls are required, and there are no ARARs after completion of the NTCR action. Because there are no problems warranting action at the ECODS B-3 and B-5, no remedial action will be taken. The ECODS B-3 and B-5 OU poses no risk to human health and the environment and supports unrestricted land use.

No capital and/or operation and maintenance costs will be involved for this action.

HWCTR

The preferred remedial action for the HWCTR portion of the BAOU is Alternative BAOU-3: LUCs with Groundwater Monitoring. The NTCR action reduced the human health risk by eliminating the human exposure pathway and minimized the potential of contaminants to migrate to groundwater. This alternative implements LUCs as part of the remedial action and also provides additional assurance regarding the protection of the groundwater by inclusion of a monitoring program.

Alternative BAOU-3 will achieve the following LUC objectives:

- Maintain the integrity of ECs which provide an exposure barrier (including in-situ grouting and concrete cover);
- Maintain the integrity of the groundwater monitoring well system;
- Restrict or prohibit groundwater use as determined to be necessary based on monitoring results;
- Restrict access by posting and maintaining warning signs and enforcing SRS security procedures;

- Prohibit the development and use of property for any use other than industrial; no residential use, school use, child care facilities or recreational use shall be allowed.

The LUC objectives will be accomplished through:

- Implementation of a detailed Land Use Control Implementation Plan (LUCIP) for providing annual inspections of ECs, maintenance of engineering and access controls (i.e., concrete cover, warning signs), and institutional controls limiting land and groundwater use, as necessary;

- Administrative controls to ensure worker safety including the Site Use/Site Clearance Program, worker training on use restrictions and health and safety requirements;

- Implementation of access controls limiting exposure to trespassers as described in the 2000 RCRA Part B Permit Renewal Application, Volume 1, Section F.1, which describes the security procedures and equipment, 24-hour surveillance system, artificial or natural barriers, control entry systems, and warning signs in place at the SRS boundary.

The preferred remedy for the HWCTR subunit of the BAOU leaves hazardous substances in place that pose a potential future risk; therefore, LUCs will be maintained until the concentration of hazardous substances are at such levels to allow for unrestricted use and exposure. As negotiated with USEPA, and in accordance with USEPA - Region 4 Policy (*Assuring Land Use Controls at Federal Facilities*, April 21, 1998), SRS has developed a LUCAP to ensure that land use restrictions are maintained and periodically verified. The unit-specific LUCIP that will be referenced in the ROD for the HWCTR subunit of the BAOU will provide details and specific measures required for the LUCs selected as part of this preferred remedy. The USDOE is responsible for implementing, maintaining, monitoring, reporting upon, and enforcing the LUCs described in this SB/PP. Upon final approval, the LUCIP will be appended to the LUCAP and is considered incorporated by reference into the BAOU ROD, establishing LUC implementation and maintenance requirements enforceable under CERCLA. The approved LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the unit. The LUCIP will remain in effect until modified as needed to be protective of human health and the environment. LUCIP modification will only occur through another CERCLA document. Approval by USEPA and SCDHEC is required for any modification or termination of the LUCs.

The preferred alternative(s) can change in response to public comment or new information.

Based on information currently available, the lead agency believes that Alternative BAOU-3: Land Use Controls with Groundwater Monitoring provides the best balance of tradeoffs among the other alternatives with respect to the evaluation criteria. The USDOE expects the Preferred Alternative to satisfy the statutory requirements in CERCLA Section 121(b) to: 1) be protective of human health and the environment, 2) comply with ARARs, and 3) be cost-effective.

IX. POST-ROD SCHEDULE

An implementation schedule showing the ROD submittal date, post-ROD document submittals, and remedial action start date is provided in Figure 6. A Groundwater Monitoring Plan will be included in the Corrective Measures Implementation Report/ Remedial Action Completion Report.

X. REFERENCES

FFA 1993. *Federal Facility Agreement for the Savannah River Site,* Administrative Docket No. 89-05-FF (Effective Date: August 16, 1993)

SRNS 2010a. *Removal Site Evaluation Report / Engineering Evaluation / Cost Analysis (RSER/EE/CA) for the Early Construction and Operational Disposal Sites (ECODS) B-3 and B-5 Operable Unit (OU) (U),* Revision 1, SRNS-RP-2009-01443, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken SC

SRNS 2010b. *Sampling and Analysis Plan for Removal Confirmation at ECODS B-3 and B-5 (U),* SGCP-SAP-2010-00002, Revision 1, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken SC

SRNS 2010c. *Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis (RSER/EE/CA) for the Heavy Water Components Test Reactor (HWCTR) (U),* SRNS-RP-2009-01102, Revision 1, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

SRNS 2011a. *Removal Action Report (RAR) for the Early Construction and Operational Disposal Site (ECODS) B-3 and B-5 Operable Unit (OU) (U),* Revision 1, SRNS-RP-2011-00210, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken SC

SRNS 2011b. *Removal Action Report (RAR) for the Heavy Water Components Test Reactor (770-U) (U),* SRNS-RP-2011-01213, Revision 1, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

USDOE, 1996. *Analysis of Removal Alternatives for the Heavy Water Components Test Reactor at the Savannah River Site,* United States Department of Energy, Savannah River Site, Aiken, SC

WSRC 2002. *Site Evaluation Report for the Early Construction and Operational Disposal Site (ECODS) B-3 (NBN) (U),* WSRC-RP-2001-4274, Revision 0, Westinghouse Savannah River Company, Aiken, SC

WSRC 2003. *Site Evaluation Report for the Early Construction and Operational Disposal Site (ECODS) B-5 (NBN) (U),* WSRC-RP-2003-4012, Revision 0, Westinghouse Savannah River Company, Aiken, SC

WSRC 2011a. *Land Use Control Assurance Plan for the Savannah River Site,* WSRC-RP-98-4125, Revision 1.1, August 1999, updated October 2011, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

WSRC 2011b. *Savannah River Site Federal Facility Agreement Community Involvement Plan (U),* Revision 7, WSRC-RP-96-120, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

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XI. GLOSSARY

Administrative Record File: A file that is maintained and contains all information used to make a decision on the selection of a response action under the Comprehensive Environmental Response, Compensation and Liability Act. This file is to be available for public review, and a copy is to be established at or near the Site, usually at one of the information repositories. Also a duplicate file is held in a central location, such as a regional or state office.

ARARs: Applicable, or Relevant and Appropriate Requirements. Refers to the federal and state requirements that a selected remedy will attain. These requirements may vary from site to site.

Baseline Risk Assessment: Analysis of the potential adverse health effects (current or future) caused by hazardous substance release from a site in the absence of any actions to control or mitigate these releases.

Characterization: The compilation of all available data about the waste units to determine the rate and extent of contaminant migration resulting from the waste site, and the concentration of any contaminants that may be present.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 1980: A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act.

Corrective Action: A USEPA requirement to conduct remedial procedures under RCRA 3998(h) at a facility when there has been a release of hazardous waste or constituents into the environment. Corrective action may be required beyond the facility boundary and can be required regardless of when the waste was placed at the facility.

Exposure: Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, digestive tract, etc.) and available for absorption.

Federal Facility Agreement (FFA): The legally binding agreement between regulatory agencies (USEPA and SCDHEC) and regulated entities (USDOE) that sets the standards and schedules for the comprehensive remediation of the SRS.

Land Use Controls: Legal and/or administrative mechanisms as well as physical installations that modify or guide human behavior at operable units where residual contamination remains in place. Institutional controls and engineering controls are types of land use controls.

Media: Pathways through which contaminants are transferred. Five media to which a release of contaminants may occur are groundwater, soil, surface water, sediments, and air.

National Priorities List: USEPA's formal list of the nation's most serious uncontrolled or abandoned waste sites, identified for possible long-term remedial response, as established by CERCLA.

Operable Unit (OU): A discrete action taken as one part of an overall site cleanup. The term is also used in USEPA guidance documents to refer to distinct geographic areas or media-specific units within a site.

A number of operable units can be used in the course of a cleanup.

Operation and Maintenance (O&M): Activities conducted at a site after a response action occurs to ensure that the cleanup and/or systems are functioning properly.

Overall Protection of Human Health and the Environment: The assessment against this criterion describes how the alternative, as a whole, achieves and maintains protection of human health and the environment.

Proposed Plan: A legal document that provides a brief analysis of remedial alternatives under consideration for the site/operable unit and proposes the preferred alternative. It actively solicits public review and comment on all alternatives under consideration.

Reasonable Maximum Exposure (RME): This is the value that the average concentration will fall below 95 percent of the time.

Record of Decision (ROD): A legal document that explains to the public which alternative will be used at a site/operable unit. The record of decision is based on information and technical analysis generated during the remedial investigation/ feasibility study and consideration of public comments and community concerns.

Resource Conservation and Recovery Act (RCRA), 1976: A Federal law that established a regulatory system to track hazardous substances from their generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous substances. RCRA is designed to prevent the creation of new, uncontrolled hazardous waste sites.

Responsiveness Summary: A summary of oral and/or written comments received during the proposed plan comment period and includes responses to those comments. The responsiveness summary is a key part of the ROD, highlighting community concerns.

Statement of Basis: A report describing the corrective measures/remedial actions being conducted pursuant to South Carolina Hazardous Waste Management Regulations, as amended.

Superfund: The common name used for CERCLA; also referred to as the Trust Fund. The Superfund program was established to help fund cleanup of hazardous waste sites. It also allows for legal action to force those responsible for the sites to clean them up.

Target Risk Range: USEPA guidance for carcinogenic risk due to exposure to a known or suspected carcinogen between one excess cancer in an exposed population of ten thousand (1.0×10^{-4}) and one excess cancer in an exposed population of one million (1.0×10^{-6}). Risks within this range require risk management evaluation of remedial action alternatives to determine if risks can be reduced below one excess cancer in one million (1.0×10^{-6}). Risks greater than 1.0×10^{-4} indicate that remedial action is generally warranted.

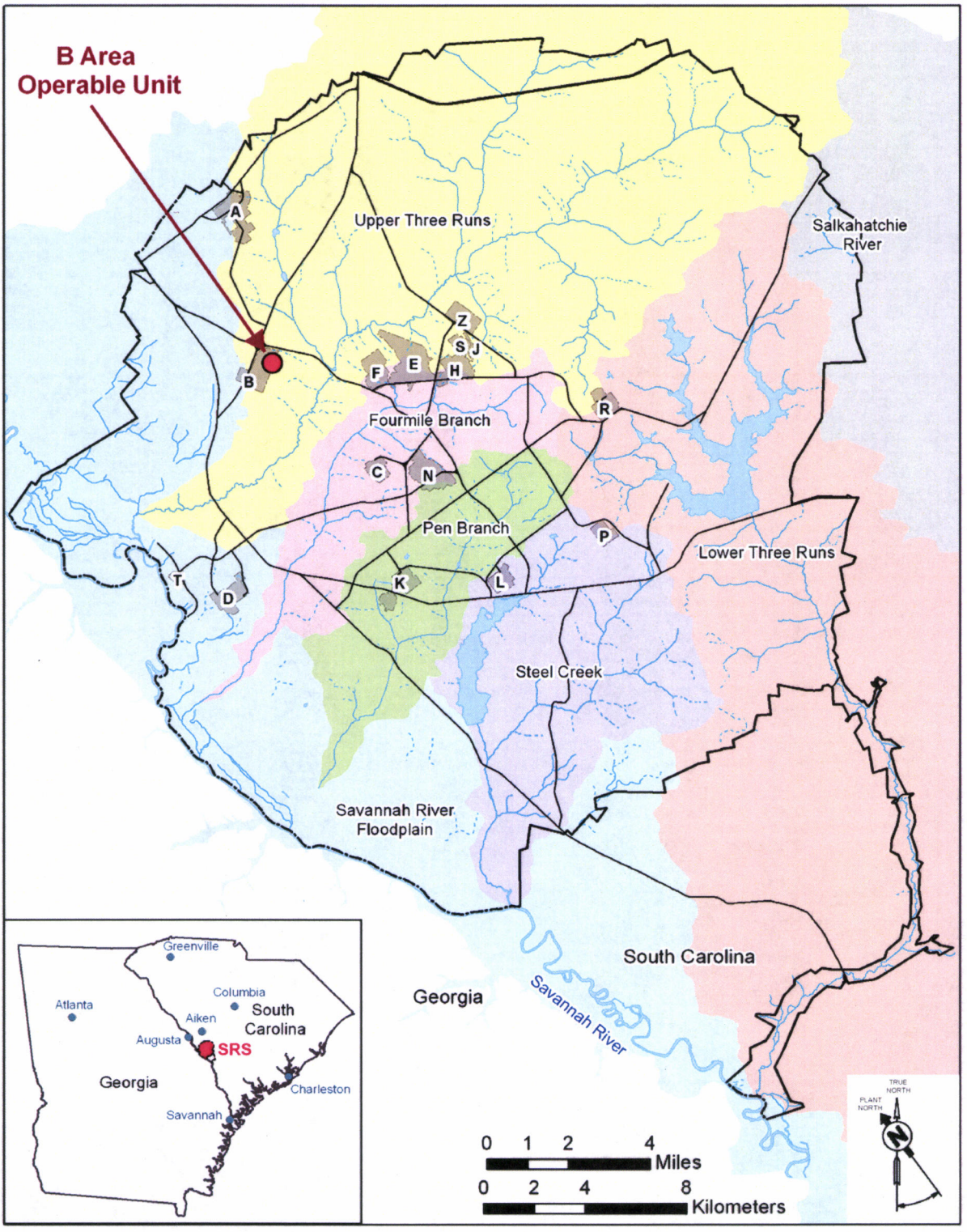
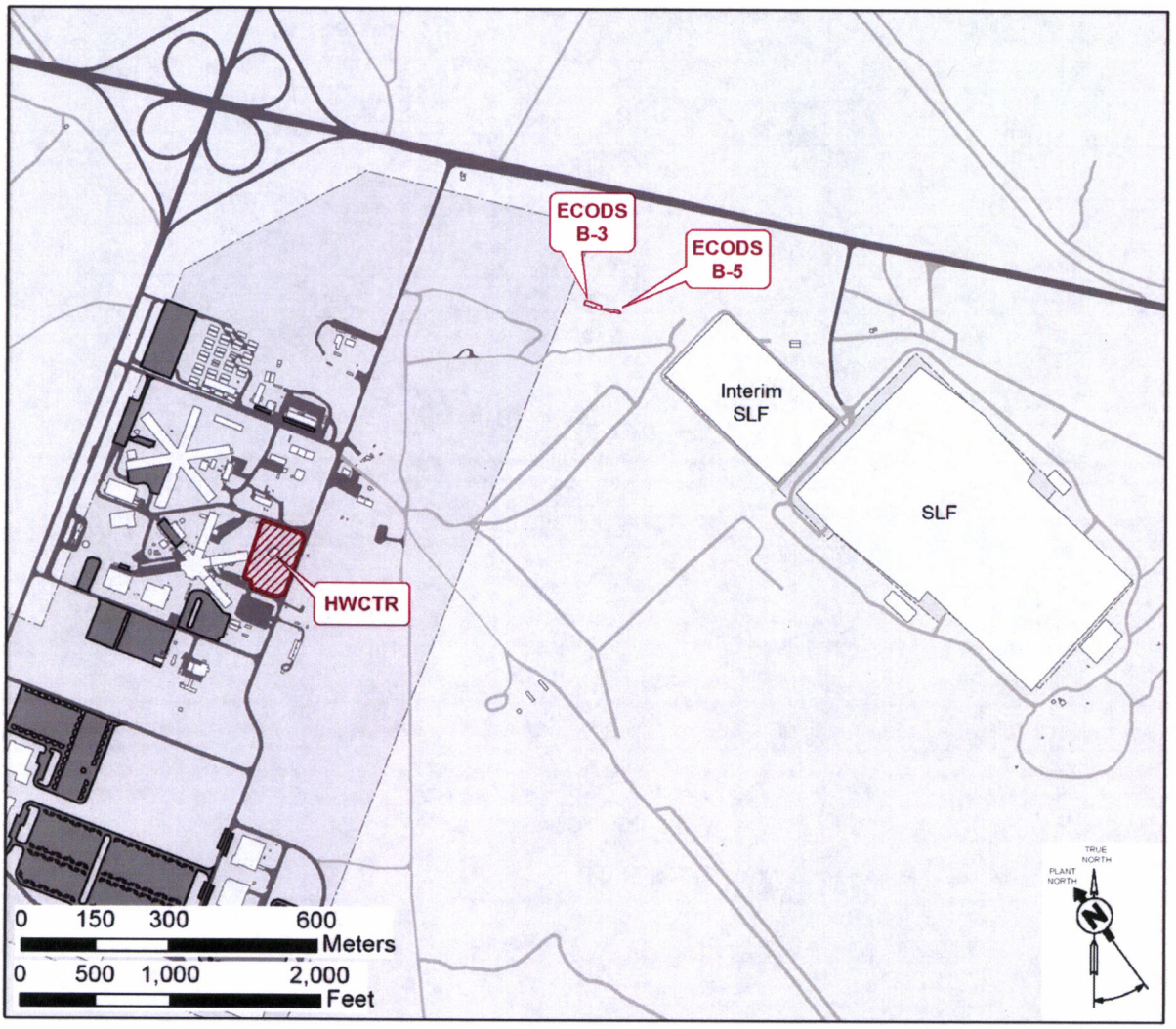


Figure 1. Location of the BAOU within the Savannah River Site



SLF = Sanitary Landfill

Figure 2. Layout of the BAOU

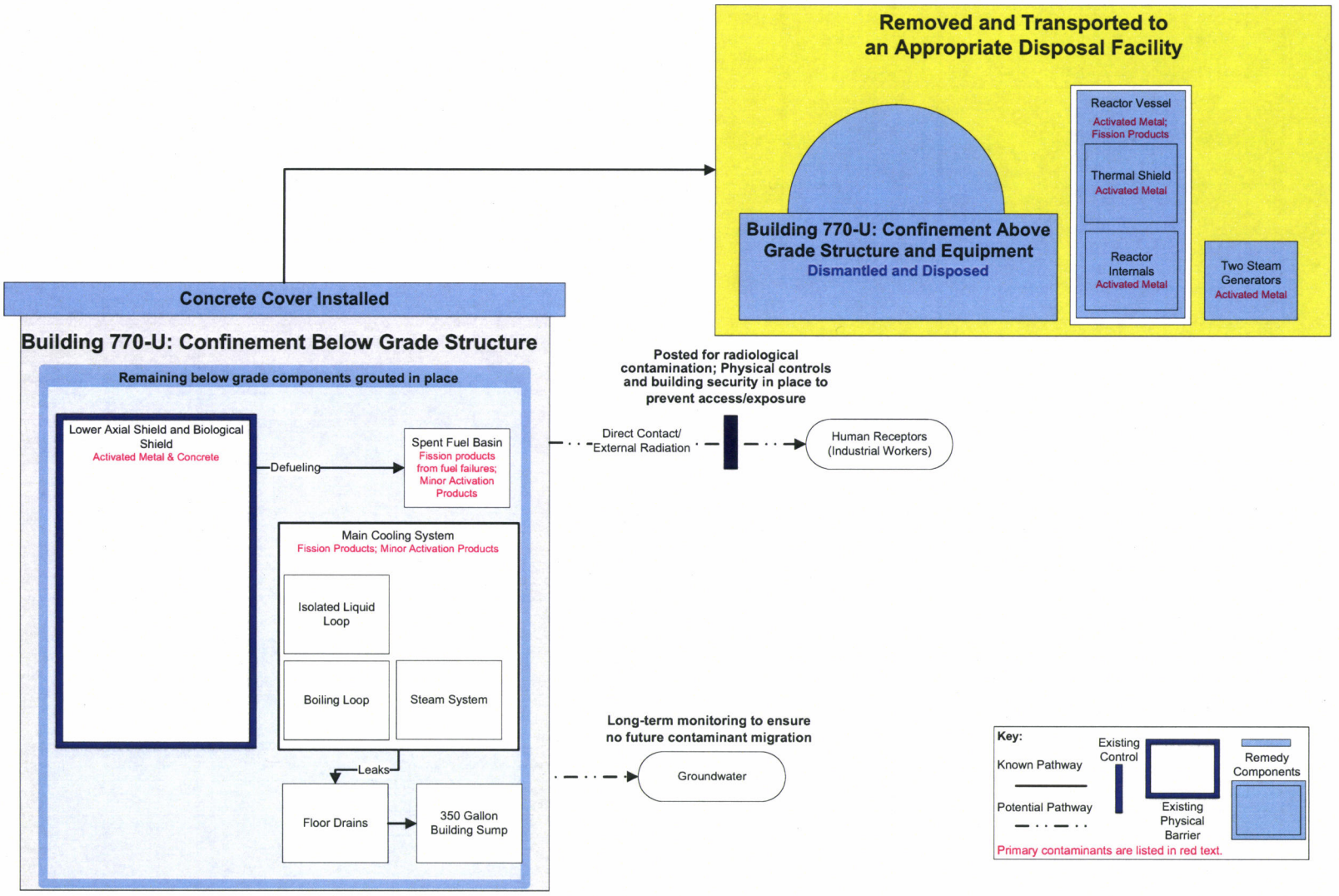


Figure 3. HWCTR Site Model After Implementation of the NTCR Action

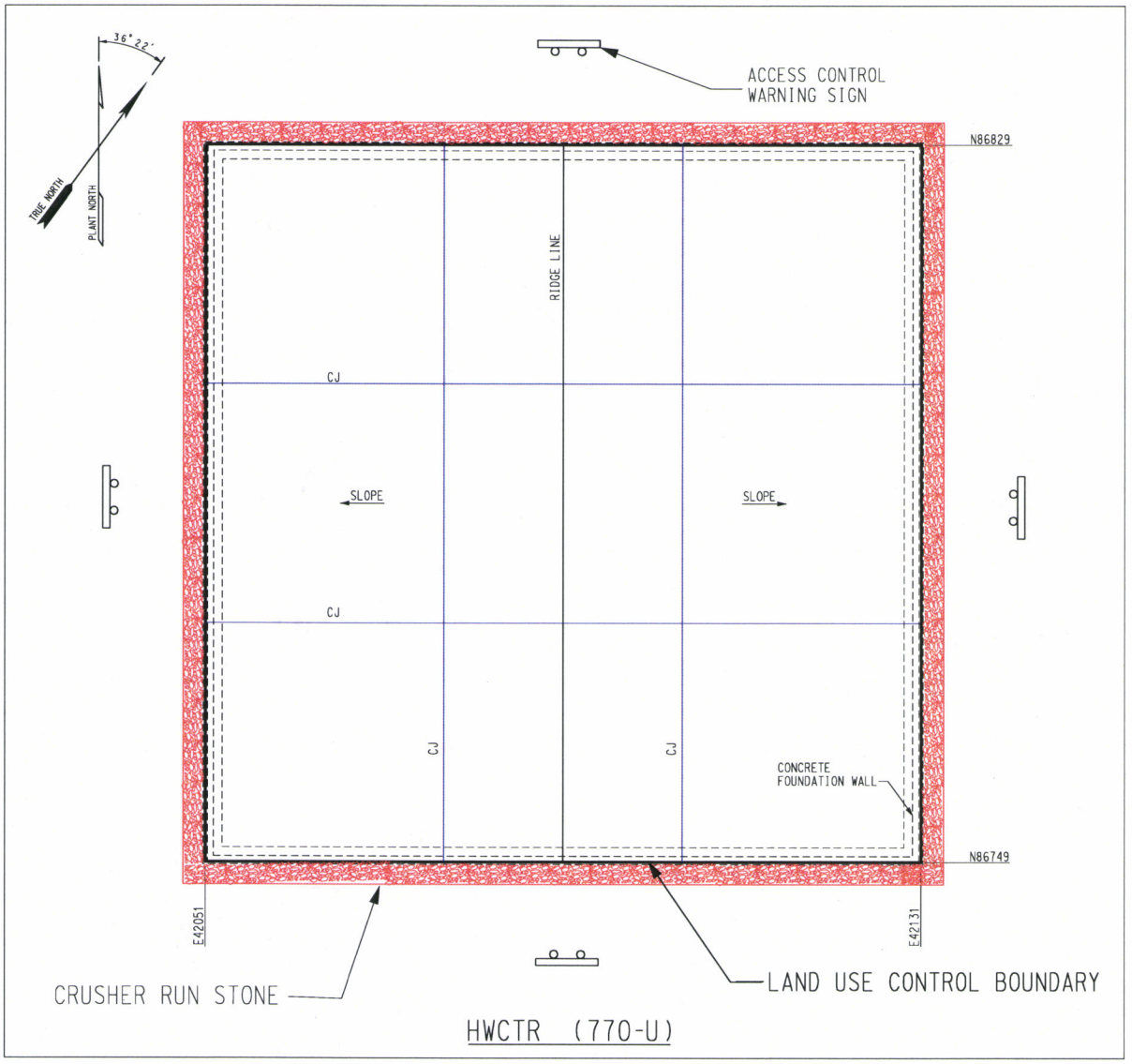


Figure 4. HWCTR Land Use Control Boundary

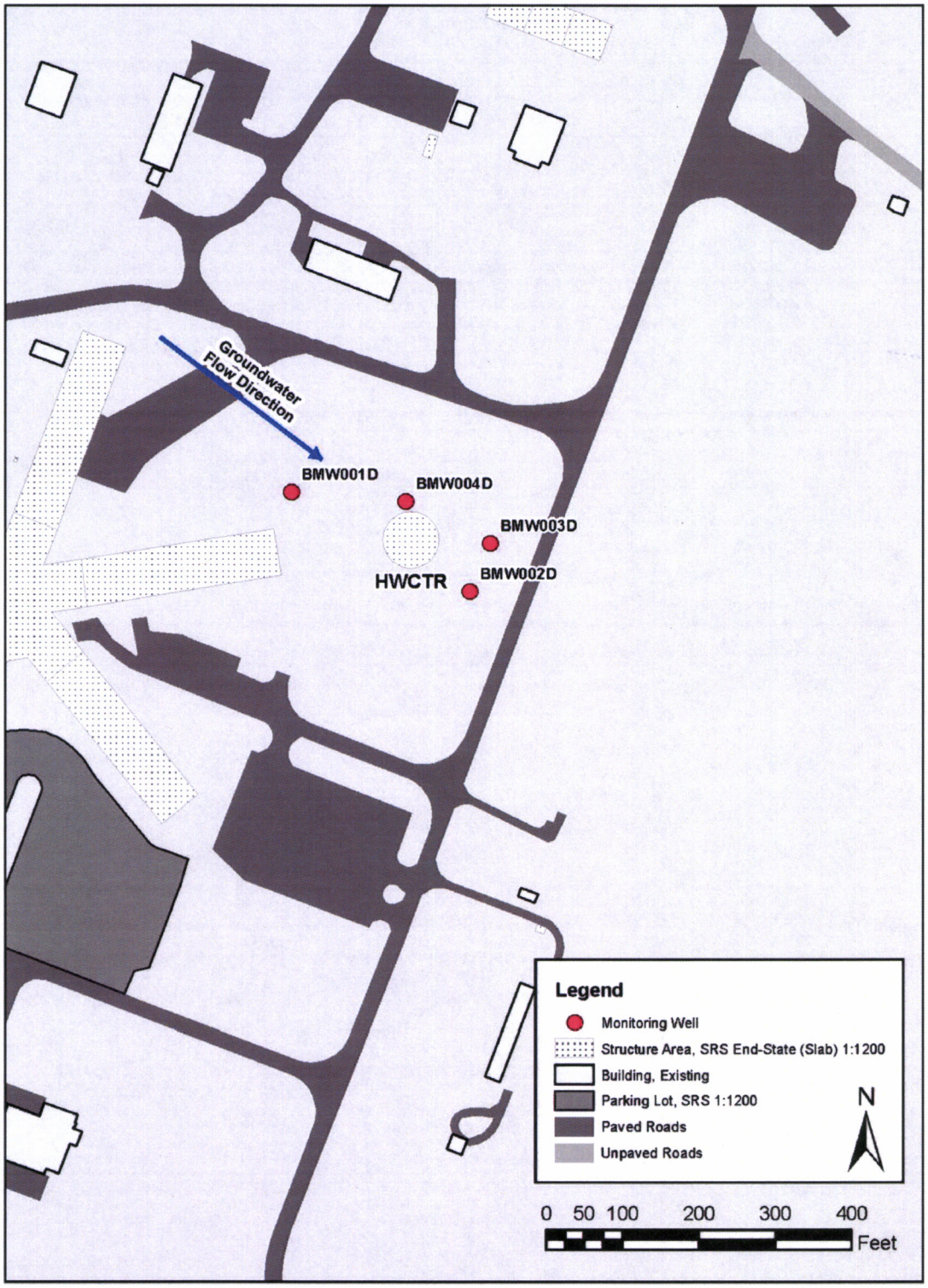


Figure 5. Location of Groundwater Monitoring Wells at HWCTR

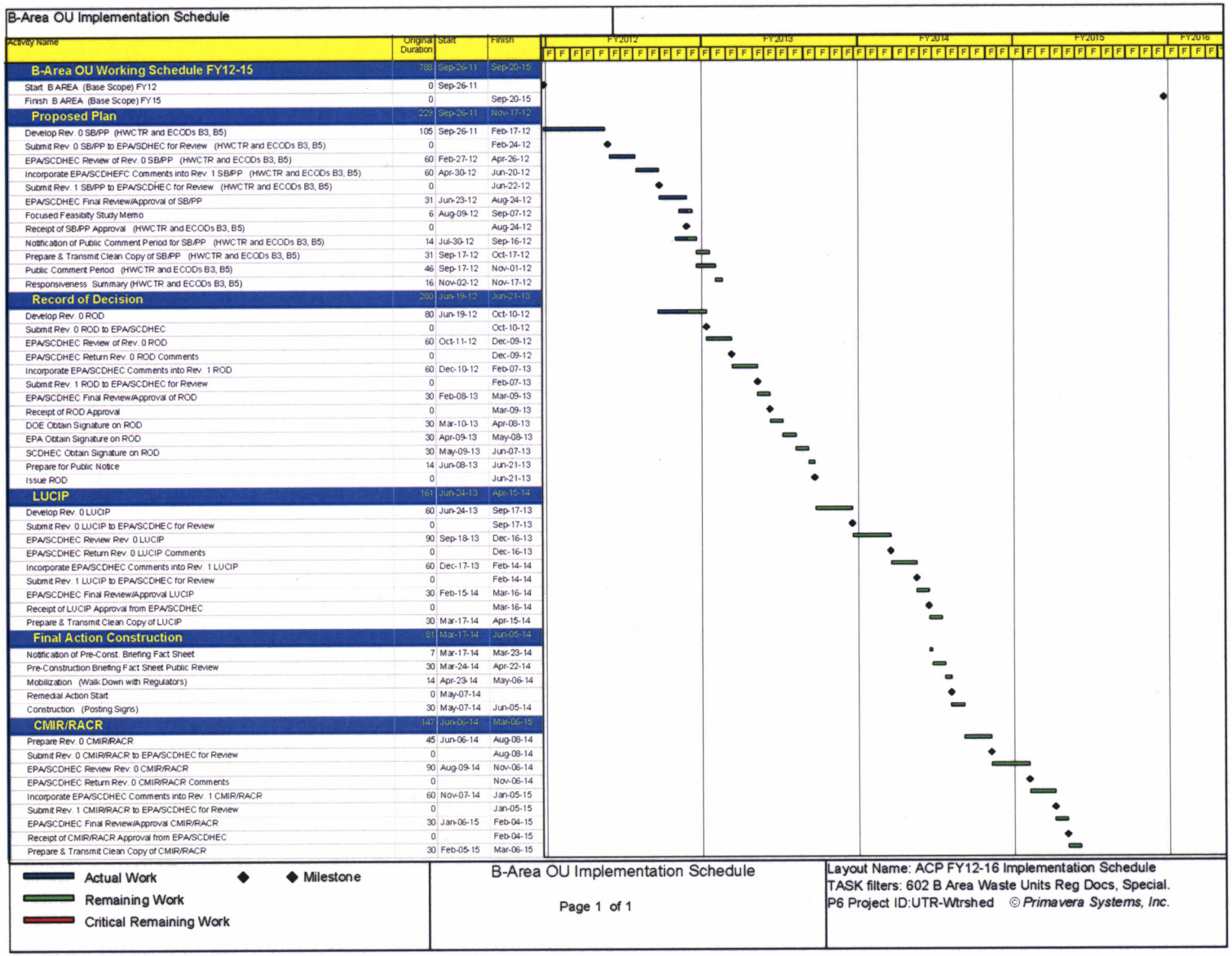


Figure 6. Post-ROD Schedule

Table 1. Potential ARARs for the Preferred Remedial Alternative for the HWCTR Subunit of the BAOU

Citation(s)	Status	Requirement Summary	Reason for Inclusion
Chemical Specific			
National Primary Drinking Water Regulations 40 CFR 141 SC R. 61-58 State Primary Drinking Water Regulations SC R. 61-68 Water Classification and Standards	Applicable	Establishes requirements and standards for chemicals and radionuclides to protect human health from the potential effects of drinking-water contamination.	The state of South Carolina classifies all groundwater as potential sources of drinking water, and mandates that groundwater must meet maximum contaminant levels (MCLs).

CFR = Code of Federal Regulations

Table 2. Summary of the Present Value Costs of the Alternatives for the BAOU

Alternative BAOU-1
No Further Action
B Area Operable Unit
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
No Action					
Subtotal - Direct Capital Cost				$0	*
Mobilization/Demobilization	10%	of subtotal direct capital		$0	*
Site Preparation/Site Restoration	10%	of subtotal direct capital		$0	*
Total Direct Capital Cost		(sum of * items)		**$0**	
Indirect Capital Costs					
Engineering & Design	15%	of direct capital		$0	
Project/Construction Management	25%	of direct capital		$0	
Health & Safety	5%	of direct capital		$0	
Overhead	30%	of direct capital + indirect capital		$0	
Contingency	20%	of direct capital + indirect capital		$0	
Total Indirect Capital Cost				**$0**	
Total Estimated Capital Cost				**$0**	
Direct O&M Costs	2.7%	discount rate for costs > 30 years duration			
Annual Costs (Existing System during Post-ROD Design & Const)	100	year O&M period		*Years 2015 - 2115*	
Subtotal - Annual Costs				$0	
Present Worth Annual Costs				$0	
Five Year Costs	0				
Remedy Review	0	ea	$15,000	$0	
Subtotal - Five Year O&M Costs				$0	
Present Worth Five Year Costs				$0	
Total Present Worth Direct O&M Cost				**$0**	
Indirect O&M Costs					
Project/Admin Management	40%	of direct O&M		$0	
Health & Safety	10%	of direct O&M		$0	
Overhead	30%	of direct O&M + indirect O&M		$0	
Contingency	15%	of direct O&M + indirect O&M		$0	
Total Present Worth Indirect O&M Cost				**$0**	
Total Estimated Present Worth O&M Cost				**$0**	
TOTAL ESTIMATED COST				**$0**	

There are no O&M or 5-year review costs for the No Action alternative, as per EPA-540-R-98-031 guidance.

Table 2. Summary of the Present Value Costs of the Alternatives for the BAOU *(Continued)*

Alternative BAOU-2
Land Use Controls
B Area Operable Unit
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
None					
Covered as part of the NTCR Action for HWCTR.					
Subtotal - Direct Capital Cost				$0	*
Mobilization/Demobilization	15%	of subtotal direct capital		$0	*
Site Preparation/Site Restoration	15%	of subtotal direct capital		$0	*
Total Direct Capital Cost		(sum of * items)		**$0**	
Indirect Capital Costs					
Engineering & Design	14%	of direct capital		$0	
Project/Construction Management	25%	of direct capital		$0	
Health & Safety	6%	of direct capital		$0	
Overhead	30%	of direct capital + indirect capital		$0	
Contingency	20%	of direct capital + indirect capital		$0	
Total Indirect Capital Cost				**$0**	
Total Estimated Capital Cost				**$0**	
Direct O&M Costs	2.7%	discount rate for costs > 30 years duration[1]			
Annual Costs (Existing System during Post-ROD Design & Const)	0	years O&M		*Years 2014 - 2015*	
Access Controls	1	ea	$500	$500	
Subtotal - Annual Costs				$500	
Present Worth Annual Costs (0.9% Discount Rate)				$0	
Annual Costs (Institutional Controls)	100	years O&M		*Years 2015 - 2115*	
Access Controls	1	ea	$500	$500	
Annual Inspections / Maintenance	1	ea	$5,000	$5,000	
Subtotal - Annual Costs				$5,500	
Present Worth Annual Costs (2.7% Discount Rate)				$189,515	
Five Year Costs	20				
Remedy Review	1	ea	$15,000	$15,000	
Subtotal - Five Year O&M Costs				$15,000	
Present Worth Five Year Costs				$97,938	
Ten Year Costs	10				
Ten Year Major Repairs	1	ea	$15,000	$15,000	
Subtotal - Ten Year O&M Costs				$15,000	
Present Worth Ten Year Costs				$45,712	
Total Present Worth Direct O&M Cost				**$333,165**	
Indirect O&M Costs					
Project/Admin Management	234%	of direct O&M		$780,273	
Health & Safety	24%	of direct O&M		$79,960	
Overhead	30%	of direct O&M + indirect O&M		$358,019	
Contingency	15%	of direct O&M + indirect O&M		$232,713	
Total Present Worth Indirect O&M Cost				**$1,450,964**	
Total Estimated Present Worth O&M Cost				**$1,784,129**	
TOTAL ESTIMATED COST				**$1,784,129**	

1. Interest rate for costs with duration < 30 years (i.e., before 2043) based on SRNS's 25 August 2009 Technical Memorandum, ERTEC-2009-00004.

Table 2. Summary of the Present Value Costs of the Alternatives for the BAOU *(Continued/End)*

Alternative BAOU-3
Land Use Controls & Groundwater Monitoring
B Area Operable Unit
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
None				
Covered as part of the NTCR Action for HWCTR.				
Subtotal - Direct Capital Cost				$0 *
Mobilization/Demobilization	15%	of subtotal direct capital		$0 *
Site Preparation/Site Restoration	15%	of subtotal direct capital		$0 *
Total Direct Capital Cost		(sum of * items)		**$0**
Indirect Capital Costs				
Engineering & Design	14%	of direct capital		$0
Project/Construction Management	25%	of direct capital		$0
Health & Safety	6%	of direct capital		$0
Overhead	30%	of direct capital + indirect capital		$0
Contingency	20%	of direct capital + indirect capital		$0
Total Indirect Capital Cost				**$0**
Total Estimated Capital Cost				**$0**
Direct O&M Costs	2.7%	discount rate for costs > 30 years duration[1]		
Annual Costs (Existing System during Post-ROD Design & Const)	0	years O&M		*Years 2014 - 2015*
Access Controls	1	ea	$500	$500
Subtotal - Annual Costs				$500
Present Worth Annual Costs (0.9% Discount Rate)				$0
Annual Costs (Institutional Controls)	100	years O&M		*Years 2015 - 2115*
Access Controls	1	ea	$500	$500
Annual Inspections / Maintenance	1	ea	$5,000	$5,000
Subtotal - Annual Costs				$5,500
Present Worth Annual Costs (2.7% Discount Rate)				$189,515
Five Year Costs	20			
Groundwater Sampling & Analysis (4 Wells, Once Every 5 Years)	1	ea	$2,500	$2,500
Remedy Review	1	ea	$15,000	$15,000
Subtotal - Five Year O&M Costs				$17,500
Present Worth Five Year Costs				$114,261
Ten Year Costs	10			
Ten Year Major Repairs	1	ea	$15,000	$15,000
Subtotal - Ten Year O&M Costs				$15,000
Present Worth Ten Year Costs				$45,712
Total Present Worth Direct O&M Cost				**$349,488**
Indirect O&M Costs				
Project/Admin Management	223%	of direct O&M		$780,058
Health & Safety	23%	of direct O&M		$80,382
Overhead	30%	of direct O&M + indirect O&M		$362,978
Contingency	15%	of direct O&M + indirect O&M		$235,936
Total Present Worth Indirect O&M Cost				**$1,459,354**
Total Estimated Present Worth O&M Cost				**$1,808,843**
TOTAL ESTIMATED COST				**$1,808,843**

1. Interest rate for costs with duration < 30 years (i.e., before 2043) based on SRNS's 25 August 2009 Technical Memorandum, ERTEC-2009-00004.

Table 3. Description of CERCLA Evaluation Criteria

Threshold Criteria:
• *Overall Protectiveness of Human Health and the Environment* determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
• *Compliance with ARARs* evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site. ARARs may be waived under certain circumstances. ARARs are divided into chemical-specific, location-specific, and action-specific criteria.
Primary Balancing Criteria:
• *Long-Term Effectiveness and Permanence* considers the ability of an alternative to maintain protection of human health and the environment over time. It evaluates magnitude of residual risk and adequacy of reliability of controls.
• *Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment* evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
• *Short-Term Effectiveness* considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
• *Implementability* considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
• *Cost* includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
Modifying Criteria:
• *State Support/Agency Acceptance* considers whether USEPA and SCDHEC agree with the analyses and recommendations by the USDOE. Approval of the Record of Decision constitutes approval of the selected alternatives by the regulatory agencies.
• *Community Acceptance* considers whether the local community agrees with the Preferred Alternative. Comments received on the Statement of Basis/Proposed Plan during the public comment period are an important indicator of community acceptance. Comments from the public are considered in the final remedy selection in the ROD.

Table 4. Comparison of Alternatives against the CERCLA Evaluation Criteria

Criteria	Alternative BAOU-1 No Further Action	Alternative BAOU-2 Land Use Controls (only)	Alternative BAOU-3 Land Use Controls with Groundwater Monitoring
Overall protection of human health and the environment			
Protection of Human Health	Not protective.	Protective.	More protective with addition of groundwater monitoring.
Protection of the Environment	Not protective.	Protective.	Protective.
Compliance with ARARs			
Chemical-specific	Not applicable.	Not applicable.	Applicable. Provides additional assurance that groundwater classification and groundwater protection standards are maintained.
Action-specific	Not applicable.	Not applicable.	Not applicable.
Location-specific	Not applicable.	Not applicable.	Not applicable.
Long-term effectiveness and permanence			
Magnitude of Residual Risks	Not applicable. Risk remains unchanged.	Risks are reduced to acceptable levels by installation of a concrete cover and controlling exposure.	Risks are reduced to acceptable levels by installation of a concrete cover and control of exposure. Provides additional assurance that groundwater protection standards are maintained.
Adequacy of Controls	Not adequate.	Adequate.	Adequate.
Permanence	Not permanent.	Permanent as long as LUCs remain in place.	Permanent as long as LUCs remain in place.
Reduction of toxicity, mobility, or volume through treatment			
Treatment Process	No treatment.	No treatment.	No treatment.
Degree of Expected Reduction in Toxicity, Mobility, or Volume	None.	None.	None.
Short-term effectiveness			
Risk to Remedial Workers	Not applicable; no remedial action involved.	None.	None.
Risk to Community	Not applicable; no remedial action involved.	None.	None.
Risk to Environment	Not applicable; no remedial action involved.	None.	None.
Estimated Time Frame to Achieve RAOs or RGs	RAO is not achieved.	Immediate.	Immediate.

Table 4. Comparison of Alternatives against the CERCLA Evaluation Criteria *(Continued/End)*

Short-term effectiveness			
Risk to Remedial Workers	Not applicable; no remedial action involved.	None.	None.
Risk to Community	Not applicable; no remedial action involved.	None.	None.
Risk to Environment	Not applicable; no remedial action involved.	None.	None.
Estimated Time Frame to Achieve RAOs or RGs	RAO is not achieved.	Immediate.	Immediate.
Implementability			
Availability of materials, equipment, and skilled labor	No implementation.	Readily implemented.	Readily implemented.
Ability to construct and operate remedial technology	Not applicable.	Readily available. No specialized materials, equipment or labor required.	Readily available. No specialized materials, equipment or labor required.
Ability to obtain permits/approvals from Agencies	Not applicable.	Not applicable.	Readily implemented for groundwater wells.
Ease of undertaking additional actions	Not applicable.	Compatible.	Compatible.
Time to implement	Not applicable since no additional work is required.	Readily implementable.	Readily implementable.
Cost			
Total Present-Worth Costs	$0	$1,784,129	$1,808,843
State Support/Agency Acceptance	Not acceptable.	Not acceptable.	Both EPA and SCDHEC support the preferred remedy.
Community Acceptance	This criterion will be completed following public review.	This criterion will be completed following public review.	This criterion will be completed following public review.

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