United States Department of Energy

Savannah River Site

Early Action Record of Decision Remedial Alternative Selection for the D Area Operable Unit (DAOU) (U)

CERCLIS Number: 63

SRNS-RP-2010-00162

Revision 1.2

July 2011

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

Prepared for U.S. Department of Energy under Contract No. DE-AC09-08SR22470

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and
Savannah River Nuclear Solutions, LLC
Aiken, South Carolina

EARLY ACTION RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION (U)

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DECLARATION FOR THE EARLY ACTION RECORD OF DECISION

Unit Name and Location

D Area Operable Unit (DAOU)

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU- 63

Savannah River Site

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Identification Number: SC1 890 008 989

Aiken, South Carolina

United States Department of Energy

The D Area Operable Unit Operable Unit (DAOU) is listed as a Resource Conservation and Recovery Act (RCRA) 3004(u) Solid Waste Management Unit/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) unit in Appendix C of the Federal Facility Agreement (FFA) for the Savannah River Site (SRS).

The FFA is a legally binding agreement between regulatory agencies (United States Environmental Protection Agency [USEPA] and South Carolina Department of Health and Environmental Control [SCDHEC] and regulated entities (United States Department of Energy [USDOE]) that establishes the responsibilities and schedules for the comprehensive remediation of SRS. The media associated with this operable unit are surface and vadose zone soil, sediment, surface water, and concrete. Groundwater is not part of the DAOU. Groundwater is being addressed separately under the D Area Groundwater Operable Unit (OU).

Statement of Basis (SB) and Purpose

This decision document presents the selected early action (EA) remedy for the DAOU, which is located at the SRS near Aiken, South Carolina. The remedy was chosen in accordance with CERCLA, as amended by the Superfund Amendments Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan

(NCP). This decision is based on the information contained in the Administrative Record File for this site.

The USEPA, SCDHEC and USDOE concur with the selected EA remedy.

Assessment of the Site

The DAOU is comprised of multiple subunits and includes both deactivation and decommissioning (D&D) facilities and active facilities associated with the operation of the 484-D Powerhouse. There has been a release of metals, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and asbestos from one or more subunits at the DAOU into the environment.

The following subunits have been established for the DAOU:

- Bubble Tower Subunit (i.e., 717-D Maintenance Facility, D-Heavy Water Facility, Fire Fighting Training Facility)
- Moderator Processing Subunit (i.e., 420-D Concentrator Building, 420-2D Rework Handling Facility, 421-2D Moderating Handling and Storage Building, 421-D Finishing Building, 421-4D Drum Storage Building, 772-D Control Laboratory/Supervisor's Office)
- Powerhouse Subunit (489-D Coal Pile Runoff Basin (CPRB), 484-10D D Area Waste Oil Facility (WOF), 484-D Powerhouse, water treatment plant, 483-D Combined Spills)
- Miscellaneous Units (904-50G Outfall, D-Area Asbestos Pit [80-20G])
- D Area Inactive Process Sewer Lines (DIPSL)
- Electrical Transformers
- Miscellaneous Buildings

Table D1 provides a summary of administrative paths for areas and subunits in and around D Area.

Regulatory decisions (i.e., early removal actions) were previously made for the Bubble Tower Subunit, the Moderator Processing Subunit, the Powerhouse Subunit, and Miscellaneous Units and documented in their Action Memorandums. Cleanup goals established for the DAOU subunits (including goals identified for the early removal actions) are based on industrial land use. Therefore, hazardous substances will remain at the DAOU at levels that pose a threat to human health (HH) and prevent unrestricted land use. The response action selected in this EA record of decision (ROD) for a portion of DAOU is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

At the DAOU teleconference held on September 15, 2010, SCDHEC identified a problem with proceeding with a final ROD given than the 484-D Powerhouse would still be operational after approval of the ROD. Therefore, the Core Team agreed to pursue an EA ROD. Pursuing an EA ROD would allow the project to remain on track and achieve the targeted footprint reduction. The scope of the EA ROD would cover land use controls (LUCs) of completed subunits and areas and the final ROD would cover LUCs for all remaining subunits and areas. Since the D-006 Outfall (Petroleum Release Site) is connected to the wetlands of the Savannah River/Floodplain/Swamp (SRFS) Integrated Operable Unit (IOU), the D-006 Outfall (Petroleum Release Site) has been decoupled from the DAOU and added to the SRFS IOU. The removal action at the D-006 Outfall (Petroleum Release Site); however, will continue to be executed with the CPRB and WOF RSER/EE/CA.

Description of the Selected Remedy

The current land use for the DAOU is industrial with USDOE maintaining control of the land as long as necessary to keep the selected remedy fully protective of HH and the environment. The selected EA remedy under this EA ROD for the DAOU is LUCs to prevent unrestricted use for the Bubble Tower Subunit, Moderator Processing Subunit, northern 25% of the 489-D CPRB, 904-50G Outfall, D-Area Asbestos Pit, DIPSLs, electrical transformers, and miscellaneous buildings. There is also the potential for friable asbestos exposure (D Area Asbestos Pit) to human receptors should buried debris be brought to the surface. Therefore, LUCs will be

implemented to prevent land disturbance activities and to prevent exposure to subsurface soils that may include friable asbestos.

The following LUC objectives are necessary to ensure protectiveness of the selected EA remedy:

- Prevent contact, removal, or excavation of subsurface soil and buried asbestos-containing waste;
- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds;
- Maintain the integrity of any current or future remedial or monitoring systems, such as soil vapor extraction systems, soil covers, or groundwater monitoring wells; and
- Prevent construction of inhabitable buildings without an evaluation of indoor air quality to address vapor intrusion.

Following successful completion of the removal actions, residual hazardous substances will remain at the DAOU that pose a threat to HH. Therefore, LUCs are needed for the DAOU to prevent unrestricted land use. The early action LUC remedy is the final remedial action for the Bubble Tower Subunit, Moderator Processing Subunit, northern 25% of the 489-D CPRB, 904-50G Outfall, D-Area Asbestos Pit, DIPSLs, electrical transformers, and miscellaneous buildings. This remedy effectively balances short-term effectiveness, implementability, and cost criteria, while providing a high level of long term protection to hazardous contaminants that will remain at the site above levels that would allow for unrestricted use.

The RCRA permit will be revised to reflect selection of the final remedy using the procedures under 40 Code of Federal Regulations (CFR) Part 270, and South Carolina Hazardous Waste Management Regulations (SCHWMR) R.61-79.264.101; 270.

Statutory Determinations

Based on the unit RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan (WP) and RFI/RI Report with Baseline Risk Assessment (BRA) report, the DAOU poses a threat to HH and the environment. LUCs have been selected as the early action remedy for the DAOU to prevent unrestricted land use and to prevent exposure to buried asbestos containing material. The DAOU future land use will remain industrial in accordance with the SRS Future Use Project Report (USDOE 1996).

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is and will continue to be protective of human health and the environment.

The selected EA remedy is protective of HH and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The remedy in this OU does not satisfy the statutory preference for treatment as a principal element of the remedy because treatment is unnecessary to achieve the remedial action objectives (RAOs) and remedial goals (RGs).

In the long term, if the property, or any portion thereof, is ever transferred from DOE, the U.S. Government and/or DOE will take those actions necessary pursuant to Section 120(h)(1) of CERCLA. Those actions will include in any contract, deed, or other transfer document, notice of the type and quantity of any hazardous substances that were known to have been stored (for more than one year), released, or disposed of on the property. The notice will also include the time at which the storage, release, or disposal took place to the extent such information is available.

In addition, if the property, or any portion thereof, is ever transferred by deed, the U.S. Government will also satisfy the requirements of CERCLA 120(h)(3). The requirements include: a description of the remedial action taken, a covenant, and an access clause. These

requirements are also consistent with the intent of the RCRA deed notification requirements at final closure of a RCRA facility if contamination will remain at the unit.

LUCs will be implemented through the following:

- The contract, deed, or other transfer document shall also include restrictions precluding residential use of the property. However, the need for these restrictions may be reevaluated at the time of transfer in the event that exposure assumptions differ and/or the residual contamination no longer poses an unacceptable risk under residential use. Any reevaluation of the LUCs will be done through an amended ROD with USEPA and SCDHEC review and approval.

- In addition, if the site is ever transferred to nonfederal ownership, a survey plat of the OU will be prepared, certified by a professional land surveyor, and recorded with the appropriate county recording agency.

In the event of a property lease or interagency agreement, the equivalent restrictions will be implemented as required by CERCLA Section 120(h).

The selected EA remedy for the DAOU leaves hazardous substances in place that pose a potential future risk and will require land use restrictions for as long as necessary to keep the selected remedy fully protective of HH and the environment. As agreed on March 30, 2000, among the USDOE, USEPA, and SCDHEC, SRS is implementing a Land Use Control Assurance Plan (LUCAP) to ensure that the LUCs required by numerous remedial decisions at SRS are properly maintained and periodically verified. The unit-specific EA Land Use Control Implementation Plan (LUCIP) incorporated by reference into this EA ROD will provide details and specific measures required to implement and maintain the LUCs selected as part of this remedy. The USDOE is responsible for implementing, maintaining, monitoring, reporting upon, and enforcing the LUCs selected under this EA ROD. The EA LUCIP, developed as part of this action, will be submitted as required in the FFA for review and approval by USEPA and SCDHEC. Upon final approval, the EA LUCIP will be appended to the LUCAP and is

considered incorporated by reference into the EA ROD, establishing EA LUC implementation and maintenance requirements enforceable under CERCLA. The approved EA LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the unit. The EA LUCIP will remain in effect unless and until modifications are approved by the USEPA and SCDHEC as needed to be protective of HH and the environment. EA LUCIP modification will only occur through another CERCLA document.

Data Certification Checklist

This EA ROD provides the following information:

Constituents of concern (COCs) (Section V)

Baseline risk represented by the COCs (Section VII)

Cleanup levels established for the COCs and the basis for the levels (Section VIII)

Current and reasonably anticipated future land and groundwater use assumptions used in the BRA and EA ROD (Section VI)

Potential land and groundwater use that will be available at the site as a result of the selected remedy (Section VI)

Estimated capital, operation and maintenance, and total present worth cost; discount rate; and the number of years over which the remedy cost estimates are projected (Section IX)

Key decision factor(s) that led to selecting the remedy (Section X)

Table D1. Summary of Administrative Paths for Area and Subunits in and Around the DAOU

	ADMINISTRATIVE PATH				
SUBUNIT/AREA	**EAROD**	**Final ROD**	**IOU**	**GW OU**	**Other**
Bubble Tower Subunit	X				
Moderator Processing Subunit	X				
Powerhouse Subunit		X			
489-D CPRB - northern 25%	X				
489-D CPRB - southern 75%		X			
484-D Powerhouse building		X			
484-10D WOF Building		X			
484-10D WOF environmental media		X			
ash sluice lines		X			
D Area Coal Pile		X			
483-D Combined Spills		X			
Miscellaneous Units					
D-001 Outfall				X	
D-006 Outfall (Petroleum Release Site)			X		
904-50G Outfall	X				
D Area Asbestos Pit (80-20G)	X				
DIPSLs	X				
Electrical Transformers	X				
Miscellaneous Buildings	X				
D Area Rubble Pit (431-2D)					Closed; DEXOU ROD 2004
D Area Oil Seepage Basin					Closed; DAOSB ROD 1998
Ash Basin (488-D)					Closed; DEXOU ROD 2004
Ash Basin (488-1D)					Operational: to be closed via IWT
Ash Basin (488-2D)					Operational: to be closed via IWT
Ash Basin (488-4D)					Operational; to be closed via SW permit
D Area Groundwater				X	

Note that the 484-D Powerhouse building, its environmental media, and its ancillary facilities (e.g., 484-10D WOF) are considered part of the Powerhouse Subunit and will be closed as part of the final DAOU ROD. The soil at the WOF will be removed under the Recovery Act removal action, but the final WOF site conditions and requirements will be documented in the final ROD. All other structures within the DAOU have been deactivated and decommissioned to grade with concrete slabs remaining at some locations.

Aug 16, 2011 Karen Guevara
Date

Karen Guevara
Assistant Manager for Infrastructure and Environmental Stewardship
U.S. Department of Energy
Savannah River Operations Office

9/6/11
Date

Franklin E. Hill
Director
Superfund Division
U.S. Environmental Protection Agency - Region 4

9/15/11 Daphne G. Neel
Date

Daphne G. Neel
Bureau Chief
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control

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DECISION SUMMARY
REMEDIAL ALTERNATIVE SELECTION (U)

D Area Operable Unit (DAOU)

CERCLIS Number: 63

SRNS-RP-2010-00162
Rev. 1.2

July 2011

Savannah River Site
Aiken, South Carolina

Prepared By:

Savannah River Nuclear Solutions, LLC
for the
U. S. Department of Energy under Contract DE-AC09-96SR18500
Savannah River Operations Office
Aiken, South Carolina

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LIST OF ABBREVIATIONS AND ACRONYMS

ac	acre
ARAR	applicable or relevant and appropriate requirement
BRA	Baseline Risk Assessment
CA	Cost Analysis
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
cm	centimeter
CM	contaminant migration
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
COC	constituent of concern
CPRB	Coal Pile Runoff Basin
CSM	conceptual site model
DAOU	D Area Operable Unit
D&D	deactivation and decommissioning
DEXOU	D Area Expanded Operable Unit
DHWF	D Area Heavy Water Facility
DIPSL	D Area Inactive Process Sewer Line
EA	Early Action
EC	Engineering Control
EE	Engineering Evaluation
ERA	Ecological risk assessment
FFA	Federal Facility Agreement
FS	Feasibility Study
ft	feet
EE/CA	Engineering Evaluation/Cost Analysis
HH	human health
HHRA	human health risk assessment
IC	institutional control
in	inch
IOU	Integrated Operable Unit
km	kilometer
LLC	Limited Liability Company
LUC	Land Use Controls
LUCAP	Land Use Controls Assurance Plan
LUCIP	Land Use Controls Implementation Plan
m	meter
mi	mile
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit

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

PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
ppm	parts per million
PTSM	principal threat source material
RAIP	Remedial Action Implementation Plan
RAO	remedial action objective
RCOC	refined constituent of concern
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RG	remedial goal
RI	Remedial Investigation
ROD	Record of Decision
RSER	Removal Site Evaluation Report
SARA	Superfund Amendments Reauthorization Act
SB/PP	Statement of Basis/Proposed Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SCHWMR	South Carolina Hazardous Waste Management Regulations
SE	Site Evaluation
SRFS	Savannah River/Floodplain/Swamp
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
SVE	Soil Vapor Extraction
TSCA	Toxic Substances Control Act
USDOD	United States Department of Defense
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WOF	Waste Oil Facility
WP	Work Plan
WSRC	Washington Savannah River Company, LLC

I. SAVANNAH RIVER SITE AND OPERABLE UNIT NAME, LOCATION, AND DESCRIPTION

Unit Name, Location, and Brief Description

D-Area Operable Unit (DAOU)

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU- 63

Savannah River Site

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Identification Number: SC1 890 008 989

Aiken, South Carolina

United States Department of Energy (USDOE)

Savannah River Site (SRS) occupies approximately 802.9 km^2 (310 mi^2) of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina (Figure 1). SRS is located approximately 40.2 km (25 mi) southeast of Augusta, Georgia, and 32.1 km (20 mi) south of Aiken, South Carolina.

The USDOE owns SRS, which historically produced tritium, plutonium, and other special nuclear materials for national defense and the space program. Chemical and radioactive wastes are by-products of nuclear material production processes. Hazardous substances, as defined by the CERCLA, are currently present in the environment at SRS.

The Federal Facility Agreement (FFA) (FFA 1993) for SRS lists the DAOU as a Resource Conservation and Recovery Act (RCRA) Solid Waste Management Unit/CERCLA unit requiring further evaluation.

The DAOU was evaluated through an investigation process that integrates and combines the RCRA corrective action process with the CERCLA remedial process to determine the actual or potential impact to human health (HH) and the environment of releases of hazardous substances to the environment.

II. SITE AND OPERABLE UNIT COMPLIANCE HISTORY

SRS Operational and Compliance History

The primary mission of SRS has been to produce tritium, plutonium, and other special nuclear materials for our nation's defense programs. Production of nuclear materials for the defense program was discontinued in 1988. SRS has provided nuclear materials for the space program, as well as for medical, industrial, and research efforts up to the present. Chemical and radioactive wastes are by-products of nuclear material production processes. These wastes have been treated, stored, and in some cases, disposed at SRS. Past disposal practices have resulted in soil and groundwater contamination.

Hazardous waste materials handled at SRS are managed under RCRA, a comprehensive law requiring responsible management of hazardous waste. Certain SRS activities require South Carolina Department of Health and Environmental Control (SCDHEC) operating or post-closure permits under RCRA. SRS received a RCRA hazardous waste permit from the SCDHEC, which was most recently renewed on September 30, 2003. 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).

On December 21, 1989, SRS was included on the National Priorities List. 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 United States Code Section 9620, USDOE has negotiated a FFA (FFA 1993) with United States Environmental Protection Agency (USEPA) and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements. USDOE functions as the lead agency for remedial activities at SRS, with concurrence by the USEPA - Region 4 and the SCDHEC.

Operable Unit Operational and Compliance History

D Area is located in the southwest quadrant of the SRS, approximately 914 m (3,000 ft) east of the nearest site boundary, the Savannah River. The DAOU is approximately 85 ha (210 ac) and is composed of surface units and source areas in D Area that are potentially responsible for contaminating groundwater.

SRS produced special nuclear materials for the U.S. Department of Defense (USDOD) between 1952 and 1988. The reactors that were used to produce the special nuclear materials required heavy water (deuterium oxide) as a neutron moderator. Historically, heavy water was produced at D Area at the D Area Heavy Water Facility (DHWF) (i.e., Bubble Tower Subunit). D Area also contained the Heavy Water Rework Facility that purified the SRS inventory of used reactor moderator.

Figure 2 presents a layout of D Area and a delineation of the subunits. The DAOU subunits include both deactivation and decommissioning (D&D) facilities and the active facilities associated with the operation of the 484-D Powerhouse. The following subunits have been established based on their geographical proximity within D Area:

- Bubble Tower Subunit (i.e., 717-D Maintenance Facility, DHWF, Fire Fighting Training Facility)

- Moderator Processing Subunit (i.e. 420-D Concentrator Building, 420-2D Rework Handling Facility, 421-2D Moderating Handling and Storage Building, 421-D Finishing Building, 421-4D Drum Storage Building, 772-D Control Laboratory/Supervisor's Office)

- Powerhouse Subunit (489-D Coal Pile Runoff Basin, 484-10D D Area Waste Oil Facility(WOF), 484-D Powerhouse, 483-D Combined Spills]

- Miscellaneous Units (904-50G Outfall, D Area Asbestos Pit [80-20G])

- D Area Inactive Process Sewer Lines (DIPSLs)
- Electrical Transformers
- Miscellaneous Buildings

Table 1 provides a summary of administrative paths for subunits and areas in and around the DAOU.

A complete site history for each subunit is documented in the RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan (WP) and Baseline Risk Assessment (BRA) for the DAOU (SRNS 2009a).

A range of alternatives were evaluated for the seven subunits in the DAOU Corrective Measures Study/Feasibility Study (CMS/FS) (SRNS 2009b). Three of these subunits (i.e., Bubble Tower Subunit, Moderator Processing Subunit, and Powerhouse Subunit are currently being addressed by removal actions to achieve final cleanup goals based on industrial land use. The American Recovery and Reinvestment Act funded the removal actions for these subunits accelerated initiation of cleanup by 18 months and resulted in an overall schedule acceleration of 6 years. The selected remedies for the removal actions were made available for public notice and comment. After receiving no comments during the public comment period, the respective Action Memorandums were issued.

The EA ROD documents selection of the early action remedy for any residual hazardous substances that remain at the DAOU, as outlined in Table 1. Because some removal action reports will not be complete when this EA ROD is issued, this EA ROD will document that the selected remedy is dependent on successful completion of the removal actions to reach the remedial goals, as stated in each RSER/EE/CA.

Bubble Tower Subunit

The Bubble Tower Subunit is approximately 38 ha (95 ac) and consists of the DHWF, Firefighting Training Facility, and the 717-D Maintenance Facility. Heavy water (deuterium oxide) was produced at SRS through a chemical reaction called the "Girdler sulfide" process. Deuterium, a naturally occurring non-radioactive isotope of hydrogen, makes up about 0.015% of all hydrogen. The heavy water production process at SRS extracted naturally occurring deuterium oxide from Savannah River water using a series of cascade columns, or bubble towers, and hydrogen sulfide gas. The bubble towers were designed with a cold top section and a hot bottom section. The process worked by utilizing the difference in isotopic transfer of deuterium which migrates to the water at low temperatures and to hydrogen sulfide at high temperatures. Cold river water was fed into the top section of the first bubble tower and mixed with enriched hydrogen sulfide gas circulating from the bottom section. A series of perforated trays were used to promote mixing between the gas and the cold water. A portion of the cold-enriched water was then fed into the next cold tower where deuterium enrichment continued. This process continued using a series of successive bubble towers to enrich the deuterium content of the heavy water. The remaining wastewater was fed to a hot tower where the deuterium oxide migrated from the wastewater to remove the enriched hydrogen sulfide gas. Process wastewater from the heavy water production was passed through a stripper tower to remove any remaining dissolved hydrogen sulfide gas before it was discharged to the process sewer system.

SRS had six rows of bubble towers at the DHWF used in series to progressively enrich water to 20% to 30% deuterium oxide. To support heavy water production, hydrogen sulfide gas was produced onsite through reaction of sulfuric acid with iron sulfide. Operation of the bubble towers ceased in January 1982 with D&D concluding in 1994. Process lines were steam-purged and flushed with water (or purged with nitrogen), and other piping systems were drained.

The fire fighting training facility was an auxiliary structure that housed administrative support for the DHWF. The 717-D Maintenance Facility was used for general area maintenance, machine shop, and administrative support for D Area operations. The nature and extent of contamination evaluation determined that tetrachloroethylene (PCE) poses a contaminant migration (CM) problem at the 717-D Maintenance Facility. An evaluation of the soil at the DHWF and Firefighting Training Facility determined that there was no risk to future industrial workers or ecological receptors. Additionally, there is no CM migration threat or constituents that constitute principal threat source material (PTSM). Details of the nature and extent of the problem warranting action can be found in the RFI/RI WP and RFI/RI Report with BRA for the DAOU (SRNS 2009a).

The range of alternatives evaluated for the Bubble Tower Subunit included the following: No Action, Soil Vapor Extraction (SVE) with Land Use Controls (LUCs), Removal and Onsite Treatment with Low Temperature Thermal Desorption with LUCs, and Removal and Offsite Disposal and LUCs. Details of the alternatives development and evaluation can be found in the CMS/FS for the DAOU (SRNS 2009b). The problem warranting action associated with this subunit is being addressed as a removal action with the selected remedy being installation of an eleven MicroBlower™-equipped SVE system (USDOE 2009a). The MicroBlower™ system is anticipated to operate for approximately 4 years. This removal action has an approximate present worth cost of $897,038. Additional details of this selected alternative can be found in the Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis (RSER/EE/CA) for the volatile organic compound- (VOC-) contaminated soil at the Bubble Tower Subunit (SRNS 2009c). The MicroBlower™-equipped SVE system was installed successfully, and it is anticipated that the SVE system will be in operation for less than a decade to achieve the remedial goals (RGs) stated in the RSER/EE/CA. The passive nature of the SVE system will allow for an extended operation period should it be warranted. Once the removal action achieves RGs, no further action is warranted beyond LUCs to prevent land disturbance activities and unrestricted use. Petroleum product contamination was also

detected at the 717-D Maintenance Facility and will be addressed under the Underground Storage Tank (UST) Program under Permit Number 18936.

Moderator Processing Subunit

The Moderator Processing Subunit is composed of the 420-D Concentrator Building, 420-2D Rework Handling Facility, 421-D Finishing Building, 421-2D Moderator Handling and Storage Building, 421-4D Drum Storage Facility, and the 772-D Control Laboratory and Supervisor's Office. The Moderator Processing Subunit is approximately 6 ha (15 ac).

The heavy water produced by the bubble towers required further processing prior to use as a moderator in the SRS reactors. Additional enrichment was performed at the 420-D Concentrator Building using vacuum-assisted, fractional distillation. A series of reflux distillation columns was used to concentrate the heavy water (produced at the DHWF) to greater than 99% deuterium. As a final polishing step, the heavy water was refined at the 421-D Finishing Building using an electrolysis process to concentrate the heavy water to 99.8% pure deuterium oxide. Finished moderator was stored in stainless-steel drums in the 421-2D Moderator Handling and Storage Building.

The nature and extent of contamination evaluation determined that tritium in concrete and/or soil poses a CM threat at the 420-D, 420-2D, and 421-2D locations. Details of the nature and extent of the problem warranting action can be found in the RFI/RI WP and RFI/RI Report with BRA for the DAOU (SRNS 2009a). A range of alternatives were evaluated for the Moderator Processing Subunit which included: No Action, Removal and On-Unit Thermal Treatment with LUCs, and Removal and Off-SRS Disposal. Details of the alternatives development and evaluation can be found in the CMS/FS for the DAOU (SRNS 2009b). The problem warranting action associated with this subunit is being addressed as an early removal action with the selected remedy being on-unit thermal treatment with LUCs (USDOE 2009b). This remedy involves excavating contaminated media and applying heat to the stockpiled material to induce volatilization

of tritium using thermal treatment. The estimated ex situ excavation volume for the 420-D Concentrator Building is 700 m^3 (916 yd^3) of soil and concrete. This volume accounts for the approximately 5.4 m^3 (7 yd^3) of tritium-contaminated concrete and 53.5 m^3 (70 yd^3) of tritium-contaminated soil utilized in the treatability study (WSRC 2008). The estimated ex situ excavation volume for the 420-2D Rework Handling Facility is 144 m^3 (188 yd^3) of soil and concrete. The estimated ex situ volume excavation volume for the 421-2D Moderator Handling and Storage Building is 1,447 m^3 (1,893 yd^3) of soil. Excavations at each location will proceed to a depth of approximately 3.05 m (10 ft) below ground surface (bgs), or upon encountering groundwater, and will include the areas identified as requiring a removal action.

This removal action has an approximate present worth cost of $3,188,568. Further details regarding this removal action can be found in the RSER/EE/CA for the Tritium-Contaminated Soil and Concrete at the Moderator Processing Subunit at the DAOU (SRNS 2009d). Four thermal detritiation units have been constructed and are scheduled to operate through July 2011. Review of the confirmation results indicated that RGs will be successfully achieved. Once the removal action achieves RGs stated in the RSER/EE/CA, no further action is warranted beyond LUCs to prevent land disturbance activities and unrestricted use.

Powerhouse Subunit

The 484-D Powerhouse Subunit covers approximately 40.5 ha (100 ac), and includes the 484-D Powerhouse, the 484-10D D Area WOF, the 489-D Coal Pile Runoff Basin (CPRB), water treatment plant, and the 483-D Combined Spills. The coal-fired 484-D Powerhouse provided electricity and steam for the D Area facilities and other areas at SRS. The Powerhouse building was put in operation in 1952 and is still an active facility. The 484-D Powerhouse building is currently scheduled for closure in 2012 and must be in standby mode at least six months following startup of the replacement power plant.

The remedial decision for the 484-D Powerhouse building and ancillary facilities is not included in the DAOU EA ROD, and LUCs are not in place for these operating facilities. Any LUCs required for the 484-D Powerhouse building and associated facilities will be addressed by the appropriate remedial decision after operational closure of the Powerhouse building is complete.

A small water treatment plant (Figure 2) provides feedwater for the Powerhouse building boilers. The plant utilizes flocculation, filtration, and ion exchange to condition raw water for use in the boilers. Caustic and acid systems are used to regenerate the ion exchange columns. The water treatment plant will be closed under the administrative path for the 484-D Powerhouse building.

The 484-10D WOF stores used oil that was burned in the Powerhouse building boilers. The WOF is located outside of the Powerhouse on the south side of the building. The WOF consists of an aboveground storage tank on a diked concrete pad and associated aboveground piping used to deliver fuel to the Powerhouse building. The 484-10D will be closed under the administrative path for the 484-D Powerhouse building.

The 489-D CPRB is an active facility and currently receives runoff from the coal pile south of the 484-D Powerhouse building. Previous operation of the CPRB consisted of sufficient source material (coal fines) to produce a metals plume due to low pH infiltration from the basin. In a maintenance action performed in 2000, 7,646 m^3 (10,000 yd^3) of coal fines were excavated from the basin sediments, significantly reducing the quantity of source material. Based on the contamination migration evaluation, the current mass of coal in the basin is insufficient to leach metals to groundwater above maximum contaminant levels. The nature and extent of contamination evaluation indicated that the 489-D CPRB sediment poses an arsenic risk for HH (future industrial worker) and an arsenic and 2-methylnaphthalene (a polycyclic aromatic hydrocarbon [PAH]) risk for ecological receptors (sediment-dwelling organisms). In addition, metals and low pH present an ecological risk for aquatic

receptors in surface water. Additionally, there is an arsenic risk in surface soil for HH (future industrial worker) at the 484-10D WOF.

A range of alternatives were evaluated for the Powerhouse Subunit which included: No Action, Consolidation and Soil Cover with LUCs, and Removal and Off-SRS Disposal. Details of the alternatives development and evaluation can be found in the CMS/FS for the DAOU (SRNS 2009b). The problems associated with this subunit are being addressed by an early removal action, and the selected remedy is surface water management at the 489-D CPRB, consolidation of the contaminated sediment from the D-006 Outfall (Petroleum Release Site) and 484-10D WOF into the northern 25% of the 489-D CPRB, and application of a soil cover (USDOE 2009b, USDOE 2010, USDOE 2011a, USDOE 2011b). The Powerhouse building is on its own administrative path and will not be addressed by the remedial actions under this EA ROD. For this reason, execution of the remedial action for the 489-D CPRB will need to be segmented due to ongoing operations at the 484-D Powerhouse building and 489-D CPRB. The remedial action will be coordinated so that sections of the 489-D CPRB continue to receive runoff while other sections begin remedial construction activities (Figure 3). The CPRB will be segmented into a northern 25% and a southern 75% section so that the southern area can continue to receive runoff while the northern begins closure under the first phase of the removal action. Under the first phase, the existing coal pile will be reduced with a new berm, and a new swale will be installed inside the current footprint of the coal pile with a culvert directing the runoff to the southern section of the CPRB. The new swale will be "onsite" as it is an area immediately adjacent to the CPRB. The northern 25% of the CPRB will be dewatered by pumping runoff into the southern section. Contamination sediment from the D-006 Outfall (Petroleum Release Site) and 484-10D WOF will be consolidated into the northern section of the CPRB and a soil cover will be applied. The northern section of the CPRB will then be considered finalized and closed under the EA ROD. The DAOU final ROD will document closure of the southern section, which will take place after the shut down of the Powerhouse. The final action scope for the CPRB southern section will include coal pile cleanup, dewatering of the basin, closure of the

newly installed swale, placement of the backfill material to grade, soil cover placement, and LUCs. The total area of impacted sediment at the CPRB is approximately 5.7 ha (14 ac), to a depth of approximately 0.61 m (2 ft), for a total volume of approximately 34,405 m^3 (45,000 yd^3). The removal action has an approximate present worth cost of $5,050,430. Further details concerning this removal action can be found in the RSER/EE/CA for the 489-D CPRB, D-006 Outfall, and 484-10D WOF at the DAOU (SRNS 2009e). The consolidation and soil cover removal action is underway, and upon completion, it will achieve the human health and ecological RGs stated in the RSER/EE/CA. Once the removal action achieves RGs, no further action is warranted other than LUCs to prevent land disturbance activities and unrestricted use. The soil at the WOF will be removed under the Recovery Act removal action, but the final WOF site conditions and requirements will be documented in the final ROD.

An evaluation of the soil at the 483-D Combined Spills area determined that there is no threat to future industrial workers or ecological receptors. Additionally, there is no CM migration threat, and there are no constituents that constitute PTSM. Details of the nature and extent of the problem warranting action can be found in the RFI/RI WP and RFI/RI Report with BRA for the DAOU (SRNS 2009a).

Miscellaneous Units (904-50G Outfall and D Area Asbestos Pit)

There are two miscellaneous units identified in the DAOU and include the 904-50G Outfall and D Area Asbestos Pit..

The 904-50G Outfall received process discharges and river water during operation of the bubble towers. The outfall has not been operational since the bubble tower operations terminated in 1982. Three soil samples and a surface water sample were obtained. There are no refined constituents of concern (RCOCs) for surface water or surface soil associated with the 904-50G Outfall. Based on CM screening, no contaminants pose a CM risk. There are no contaminants that constitute principal threat source material (PTSM) in soil. There is no threat to future industrial workers or ecological receptors.

Therefore, there are no problems that would warrant a remedial action associated with the 904-50G Outfall.

The D Area Asbestos Pit (80-20G) operated between 1973 and 1975 as a disposal site for asbestos insulation and piping from the R Area steamlines. The pit also received asbestos, metal, scrap, and concrete from the bubble towers in 1974. The pit was estimated to contain 122 m^3 (4,300 ft^3) of buried waste and has been closed to disposal activities.

The SRS Site Evaluation (SE) Program conducted an investigation of the asbestos pit and determined that no threat to HH or the environment exists based on the results of over 200 soil samples and groundwater samples that were analyzed for the target analyte list (TAL)/target compound list (TCL) of possible contaminants. However, SRS recommended that the D Area Asbestos Pit beplaced in Appendix C, RCRA/CERCLA Units of the SRS FFA for further evaluation because of the presence of buried asbestos in the demolition debris from the Bubble Tower area. Soil, dust, and air samples were not taken for asbestos. However, there is a threat of release of and unacceptable exposure to asbestos if the cover is breached and asbestos containing material is brought to the surface. Therefore, USDOE is taking a response action as allowed in the USEPA "Framework for Investigating Asbestos-Contaminated Superfund Sites, OSWER Directive #9200.0-68" (USEPA 2008). USDOE is proceeding directly to a response because, if LUCs are not in place to prevent land disturbances, an exposure is possible.

D Area Inactive Process Sewer Lines

Process sewer lines were constructed in 1952 to carry wastewater from various heavy water processing facilities within the OU to a drainage ditch south of the 489-D CPRB (i.e., Beaver Dam Creek). Process sewer wastewater was principally contaminated with tritium and hydrogen sulfide. Groundwater and surface water runoff from the Powerhouse and support facilities drains to a ditch located east of the 488-D Ash Basin (i.e., D-006 Outfall [Petroleum Release Site]). The DIPSLs traverse approximately

4,328 m (14,200 ft) of the DAOU and are located in all three subunits. They are composed of vitrified clay pipe and reinforced-concrete pipe ranging in diameter from 15.2 cm (6 in) to 61 cm (24 in).

The DIPSL manholes were accessed for visual inspection and sampling. Most of the manholes were clean or contained just enough material to collect a sample. Samples were also obtained from various locations beneath the DIPSLs. No CM or PTSM were identified. The risk evaluation concluded that there are no complete exposure pathways for human or ecological exposure to surface or subsurface soils surrounding the DIPSLs. Under an excavation scenario (i.e., PTSM evaluation), there is a potentially complete pathway for an industrial worker, but no PTSM was identified. The manholes associated with the DIPSLs will be plugged and grouted as an engineering control (EC) to restrict access to impacted areas (i.e., residual contaminants in the DIPSLs) and for general safety.

Electrical Transformers

Electrical transformer substations are located throughout D Area and were often included with facilities during decommissioning activities. Polychlorinated biphenyls (PCBs) were used at SRS in dielectric fluids in electrical equipment such as transformers. After the PCB Disposal Regulations were promulgated in 1978, SRS conducted a comprehensive evaluation of PCB use. Detailed inventories of PCB-containing equipment were compiled. Historical records indicate that, where feasible, the transformers were switched from PCB oil to mineral oil in the 1980s. Equipment was subsequently tested to verify it contained less than 50 parts per million (ppm) PCBs. In 1986, USEPA performed a detailed assessment of SRS compliance with the Toxic Substances Control Act (TSCA) and found records of analysis, storage, and disposal of PCB materials to be in compliance (USEPA 1986). In 1996, SRS determined that all of the site's transformers and large capacitors that were regulated due to PCB content had been replaced or rendered non-PCB (WSRC 1996). There are no records indicating a spill or release from the transformers while they were operated with PCB oil; therefore,

no samples were collected during decommissioning. During pre-work plan characterization, visual inspections of the remaining concrete pads were performed with no evidence of spills on the pads. There are no problems warranting action.

Miscellaneous Buildings

In addition to the probable source facilities within each subunit, D Area contains miscellaneous buildings that were used for administrative purposes, general storage, etc. A complete list of DAOU miscellaneous buildings can be found in the RFI/RI WP and BRA for the DAOU (SRNS 2009a). The miscellaneous buildings have been classified through the Facility Decommissioning Evaluation process as Simple Model Decommissioning and have been deactivated and decommissioned with concurrence from USEPA and SCDHEC. Simple Model Decommissioning is performed for clean buildings with only normal safety risks associated with decommissioning per the WSRC 1C, Facility Disposition Manual (WSRC 2004). No sampling is required for facilities decommissioned under the Simple Model and there are no problems warranting action.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Both RCRA and CERCLA require the public to be given an opportunity to review and comment on the draft permit modification and proposed remedial alternative. Public participation requirements are listed in South Carolina Hazardous Waste Management Regulation (SCHWMR) R.61-79.124 and Sections 113 and 117 of CERCLA (42 United States Code Sections 9613 and 9617). These requirements include establishment of an Administrative Record File that documents the investigation and selection of the remedial alternative for addressing the DAOU soils. The Administrative Record File must be established at or near the facility at issue.

The SRS FFA Community Involvement Plan (WSRC 2006) is designed to facilitate public involvement in the decision-making process for permitting, closure, and the selection of remedial alternatives. The SRS FFA Community Involvement Plan

addresses the requirements of RCRA, CERCLA, and the National Environmental Policy Act, 1969. 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. The Statement of Basis/Proposed Plan (SB/PP) for the DAOU (SRNS 2009f), a part of the Administrative Record File, highlights key aspects of the investigation and identifies the preferred action for addressing the DAOU.

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

U.S. 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

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 was 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* newspaper. The public comment period was also announced on local radio stations.

The SB/PP 45-day public comment period began on July 26, 2010, and ended on September 8, 2010. Responses to the public comments on the SB/PP are provided in

Appendix A of the Revision 1 EA ROD. A Responsiveness Summary will also be available in the final RCRA permit.

IV. SCOPE AND ROLE OF THE OPERABLE UNIT

Due to the complexity and size of multiple waste units in different areas, the SRS 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. In addition, the SRS also identifies six Integrated Operable Units (IOUs) which are the surface water bodies and associated wetlands that correspond to the six respective watersheds. Waste units within a watershed may be evaluated and remediated individually or grouped with other waste units and evaluated as part of a larger Area OU. Upon disposition of all the waste units 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 DAOU is located within the Savannah River/Floodplain/Swamp (SRFS) IOU (Figure 1). Periodic reporting (five-year statutory reviews) will document progress of the remediation effort.

As previously discussed, successful completion of the removal actions will result in hazardous substances remaining at the DAOU above levels that allow for unrestricted land use. The final overall strategy for managing the residual contamination at the DAOU is to implement LUCs to prevent unrestricted land use and land disturbances and prevent HH exposure to buried, friable asbestos. As indicated in Section II, removal actions are being implemented at the Bubble Tower Subunit, Moderator Processing Subunit, and Powerhouse Subunit to facilitate cleanup. The operable unit strategy is depicted in Figure 3. Note that the ash sluice lines and D Area Coal Pile are on the same administrative path schedule as the 484-D Powerhouse and its ancillary buildings (e.g., 484-10D WOF) and are represented by the red dash line in Figure 3.

Groundwater is not part of the DAOU. The D-001 Outfall and groundwater are being addressed separately under the D Area Groundwater OU.

V. OPERABLE UNIT CHARACTERISTICS

Conceptual Site Model (CSM) for the DAOU

The CSM is an objective framework for assessing data pertinent to the investigation. The CSM identifies and evaluates suspected sources of contamination, contaminant release mechanisms, potentially affected media (secondary sources of contamination), potential exposure pathways, and potential human and ecological receptors.

Exposure pathways describe "the course a chemical or physical agent takes from the source to the exposed individual." The following five components comprise an exposure pathway:

- source (facility operations, landfill, spill, etc.)
- exposure media (concrete, soil, groundwater, etc.)
- exposure point (slab surface, drinking water well, etc.)
- exposure route (external radiation, incidental soil ingestion, inhalation, etc.)
- receptor (industrial worker, resident, wildlife, etc.)

If any of these components is missing, the pathway is incomplete and is not considered further in the risk assessment. A pathway is complete when all five components are present to permit potential exposure of a receptor to a source of contamination. Exposure analysis is conceptually important in terms of identifying all potential complete exposure routes, understanding the nature and extent (as well as fate and transport [F&T]) of contamination, and developing preliminary remedial alternatives. In a complete pathway, exposure occurs at exposure points that may represent only a small portion of the entire exposure route. If there is no exposure point, then there is not exposure, even if contaminants have been released into the environment.

The DAOU is located in an area of historically heavy industrial (primarily non-nuclear) land use, and future industrial land use is anticipated for the foreseeable future.

Therefore, the most appropriate receptor for evaluation from a human perspective is the future industrial worker. From an ecological risk perspective, the majority of the DAOU is industrial and is covered by concrete, asphalt, or gravel. In the centralized industrial areas, there is no natural cover, food, or water sources that would tend to attract wildlife receptors. Therefore, there are no potentially exposed ecological receptors in the industrial portions of the DAOU, and a quantitative risk assessment was not warranted. The subunits that are located on the periphery of the OU or that offer an aquatic habitat were evaluated in the ecological risk assessment (ERA).

In general, the primary sources of contamination at the DAOU are due to the facility operations at each of the areas. Spills, leaks, accidental releases, or simply the operation itself may have resulted in a release of hazardous and/or radioactive substances.

The following is a brief summary, by subunit, of the potentially complete exposure pathways evaluated in the BRA as part of this EA ROD. Detailed CSMs for each of the subunits are provided in the RFI/RI WP and RFI/RI Report with BRA for the DAOU (SRNS 2009a).

- Bubble Tower Subunit: At the Bubble Tower Subunit, a potentially complete exposure pathway exists for a future industrial worker for surface soil (0 to 0.6 m [0 to 2 ft]). The pathway was evaluated in the human health risk assessment (HHRA). All-depths soil offers a potential exposure pathway for a future industrial worker under an excavation scenario. This pathway was evaluated in the PTSM analysis. Leaching of contaminants from the contaminated media (e.g., concrete, pipeline, soil, or sediment) to groundwater constitutes a secondary contaminant release mechanism. The potential of contaminants to leach from soil to groundwater was evaluated in the CM analysis.

- Moderator Processing Subunit: At the Moderator Processing Subunit, a potentially complete exposure pathway exists for a future industrial worker for the surface of the concrete slabs (thickness of the concrete slabs ranges between 0.09 and 0.6 m

[0.3 and 2 ft]). In addition to the concrete slabs, surface soil (0 to 0.6 m [0 to 2 ft]) at the 421-2D Moderator Handling and Finishing Building offers a potentially complete exposure pathway for the future industrial worker. Subsurface concrete and building features (i.e., sumps, trenches, pipelines, etc.) and all-depths soil offer a potential exposure pathway for the future industrial worker under an excavation scenario. These pathways were evaluated in the PTSM analysis. Leaching of contaminants from the contaminated media (e.g., concrete, pipeline, soil, or sediment) to groundwater constitutes a secondary contaminant release mechanism. The potential for contaminants to leach from concrete and soil to groundwater was evaluated in the CM analysis.

- Powerhouse Subunit: The 489-D CPRB of the Powerhouse Subunit has a potentially complete exposure pathway in surface water for an aquatic ecological receptor. In addition, surface sediment (0 to 0.3 m [0 to 1 ft]) in the CPRB offers a potential exposure pathway for the future industrial worker and the aquatic ecological receptor. These pathways were evaluated in the HHRA and ERA. All-depths soil and sediment for the entire subunit, including the CPRB, offer a potentially complete exposure pathway for a future industrial worker under an excavation scenario. This pathway was evaluated in the PTSM analysis. Leaching of contaminants from the contaminated media (e.g., concrete, pipeline, soil, or sediment) to groundwater constitutes a secondary contaminant release mechanism. The potential for contaminants to leach from soil and sediment to groundwater was evaluated in the CM analysis.

- DIPSLs: Potential releases from the DIPSLs are at a depth greater than 1.2 m (4 ft); therefore, human or ecological exposure to surface and subsurface soil is unlikely, and no evaluation of surface and subsurface soil was conducted for the DIPSL Subunit. Contaminated sediment remaining in the DIPSLs offers a potentially complete exposure pathway for the future industrial worker under an excavation scenario. This pathway was evaluated in the PTSM analysis. Leaching of contaminants from the contaminated media (e.g., concrete, pipeline, soil, or sediment)

to groundwater constitutes a secondary contaminant release mechanism. The potential of contaminants from sediment in the manholes to leach to groundwater was evaluated in the CM analysis.

- Miscellaneous Units – 904-50G Outfall: At the 904-50G Outfall, a potentially complete exposure pathway exists for a future industrial worker for surface soil (0 to 0.3 m [0 to 1 ft]). This pathway was evaluated in the HHRA. In addition, surface (0 to 0.3 m [0 to 1 ft]) and subsurface soil (0.3 to 1.2 m [1 to 4 ft]) at Outfall 904-50G offer a potential exposure pathway for the terrestrial ecological receptor and was quantitatively evaluated as part of the ERA. All-depths soil offers a potential exposure pathway for the future industrial worker under an excavation scenario. This pathway was evaluated in the PTSM analysis. Leaching of contaminants from the contaminated media (e.g., concrete, pipeline, soil, or sediment) to groundwater constitutes a secondary contaminant release mechanism. The potential of contaminants to leach from soil to groundwater was evaluated in the CM analysis.

- Miscellaneous Units – D Area Asbestos Pit: The D Area Asbestos Pit received asbestos, metal, scrap, and concrete from the bubble towers in 1974, asbestos insulation and piping from the R Area Steamlines, and is currently closed. In the 1970s, a 6-inch compacted soil cover was installed to prevent exposure. The SRS Site Evaluation (SE) Program evaluated the asbestos pit for typical contaminants at SRS and determined that no threat to HH or the environment exists except for buried asbestos if the soil cover is disturbed.

- Electrical Transformers: There are no records indicating a spill or release from the transformers while they were operated with PCB oil; therefore, no samples were collected during decommissioning. During the pre-work plan characterization effort, visual inspections of the remaining concrete pads were performed with no evidence of spills on the pads; therefore, no complete exposure pathways were evaluated.

- Miscellaneous Buildings: D Area contains miscellaneous buildings that were used for administrative purposes, general storage, etc. The miscellaneous buildings have been classified through the Facility Decommissioning Evaluation process as Simple Models and have received concurrence from the USEPA and SCDHEC; thus, they did not require sampling.

Media Assessment

In summary, the DAOU was investigated to determine the nature and extent of contamination, the risks to an industrial worker and the environment, the presence of PTSM, and if there were any CM concerns. Information and data used to assess the DAOU were obtained from Site Evaluation Reports (SERs), the BRA for the D Area Expanded Operable Unit (DEXOU), and Decommissioning Project Final Reports generated under the D&D program. Additional information to assess the potential environmental impacts from current and former D Area buildings includes process knowledge, chemical use and storage, spills, and any potential discharges. Additional sampling was performed for the DAOU pre-work plan characterization with sampling biased to areas of potential or known contamination to assess the nature and extent of contamination and to identify problems warranting action. Investigation data assessed for the DAOU are provided in Appendices B and C of the RFI/RI Work Plan and RFI/RI Report with BRA for the DAOU (SRNS 2009a). The following sections summarize the sampling results for the DAOU subunits.

Bubble Tower Subunit

The 1998 – 2002 DEXOU soil gas survey, soil, and groundwater results were used to determine potential VOC contamination sources for the Bubble Tower Subunit. In 2003, D&D conducted historical records research and site reconnaissance to delineate potential areas for assessment. It was determined that no further action was required for the buildings/remnants in this area. In April 2007 under the DAOU characterization, soil gas survey and soil samples were collected.

The DHWF and Firefighting Training Facility pose no threat to future industrial workers or ecological receptors. Additionally, there is no CM migration threat, and no constituents constitute PTSM. Results from the DAOU assessment identified five contaminants as CM RCOCs in the vicinity of the 717-D Maintenance Facility from 0 to 3 m (0 to 10 ft) below surface. The scope of this problem warranting action is approximately 11,000 ft^2 and a volume of 4,033 yd^3 of contaminated soil. One CM RCOC was a VOC which was tetrachloroethylene (PCE), and there were four petroleum products which were cylohexane, ethylbenzene, methylcyclohexane, and xylenes. The PCE contamination is being addressed through an early removal action and is part of the remedial decision presented in this ROD (SRNS 2009c). The petroleum contamination is a result of an UST release reported in June 11, 2003, and is being assessed and remediated under the SCDHEC UST Program under Permit Number 18936.

Moderator Processing Subunit

From February 2003 to June 2006, D&D performed radiological screening of concrete slab surfaces, below-grade concrete structures, and surface soil in connection with deactivation of the buildings. From July 2007 to March 2008, under the DAOU characterization, the concrete was sampled to verify the D&D results and soil samples were collected beneath the slabs and adjacent process sewer lines.

Tritium was identified as a CM RCOC for concrete 15.2 cm (6 in) thick and soil 0 to 3 m (0 to 10 ft) bls at the 420-D Concentration Building and 420-2D Rework Handling Facility Building. Additionally, tritium was identified as a CM RCOC in soil 0 to 3 m (0 to 10 ft) bls at the 421-2D Moderator Handling and Storage Building. The total impacted media volume is approximately 2,294 m^3 (3,000 yd^3) of tritium contaminated soil and concrete.

Powerhouse Subunit

The Powerhouse Subunit was characterized under the 1991 to 1993 SE Program by soil gas and radiological surveys. Additionally, under the DEXOU characterization in 1998 through 2002, sediment, soil, and surface water samples were obtained and sampled. Under the DAOU characterization from February through October 2007, soil, sediment, and surface water samples were collected

Arsenic was identified as a HH RCOC in the 489-D CPRB sediment and 484-10D WOF surface soil. Ecological RCOCs for the 489-D CPRB include arsenic and 2-methylnaphthalene in sediment and aluminum, beryllium, cobalt, copper, iron, manganese, zinc, and pH in surface water. The HH and ecological RCOCs at the northern 25% of the CPRB are being addressed through an early removal action and is part of the remedial decision presented in this EA ROD (SRNS 2009e).

DIPSLs

The DIPSLs were evaluated between May and October 2007 as part of the DAOU investigation. The DIPSL manholes were visually inspected to determine if they contained waste/sludge from effluent discharges. Sediment samples were obtained from manholes, and soil samples were collected from beneath the process sewer lines.

No CM or PTSM RCOCs were identified for the sediment in the DIPSLs based on the evaluation of contaminant F&T and PTSM. Because the potential releases from the DIPSLs are at a depth greater than 12 m (4 ft), there are no HH or ecological concerns. The manholes associated with the DIPSLs will be plugged and grouted as an EC to restrict access to impacted areas (i.e., residual contaminants in the DIPSLs) and for general safety.

Miscellaneous Units

At the 904-50G Outfall, three sediment samples were analyzed for TAL/TCL. Based on the DAOU pre-work plan characterization data, there are no HH or ecological RCOCs, PTSM, or any other problems warranting action for surface water or sediment associated with the 904-50G Outfall.

The D Area Asbestos Pit (080-20G) was characterized under the SE Program between 1994 and 2001. The SE investigation consisted of soil and groundwater sampling and analyses for TAL, TCL, and radiological screening. Preliminary evaluation included radiological, ground penetrating radar, and soil gas surveys. Soil samples were collected from within the pit and at background locations.

For the D Area Asbestos Pit, no radiological contamination was identified; light hydrocarbons were detected, but were attributed to decaying plant material. The results of the SE Program investigation determined that the asbestos pit poses no threat to HH or the environment. However, should asbestos be brought to the surface, there would be potential for exposure.

Electrical Transformers

After the PCB Disposal Regulations were promulgated in 1978, SRS conducted a comprehensive evaluation of PCB use. Detailed inventories of PCB-containing equipment were compiled. Where feasible, transformers with high concentrations of PCBs were replaced with non-PCB models. Other pieces of equipment were rendered non-PCB via treatment or a drain-and-refill process. The equipment was subsequently tested to verify that it contained less than 50 ppm PCBs.

In 1986, the USEPA performed a detailed assessment of SRS compliance with the TSCA and found records of analysis, storage, and disposal of PCB materials to be in compliance. In 1995, SRS determined that all of the site's transformers and large

capacitors that were regulated due to PCB content have been replaced or rendered non-PCB. There are no records indicating a spill or release from the transformers while they were operated with PCB oil. During the pre-work plan characterization effort, visual inspections of the remaining concrete pads were performed with no evidence of spill on the pads. Therefore, there is no complete exposure pathway and no problem warranting action.

Miscellaneous Buildings

These are buildings in D Area that were used mainly for administrative, storage, basic support, training, etc. These buildings do not fit into the spill program, PCB program, permitted facilities, RCRA-regulated facilities, decommissioning managed under the National Environmental Policy Act, or the FFA. These facilities were mainly dispositioned under the Simple Model as buildings only possessing occupational hazards at time of operation. No sampling was performed for these buildings, and there are no RCOCs, HH, ecological concerns, or any other problems warranting action.

VI. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Land Uses

According to the SRS Future Use Project Report (USDOE 1996), residential uses of SRS land should be prohibited. The Land Use Control Assurance Plan (LUCAP) for the SRS (WSRC 1999) designates the DAOU as an industrial area (Figure 4). The future land use is reasonably anticipated to remain industrial.

The remedial decision for the 484-D Powerhouse building and ancillary facilities is not included in the DAOU EA ROD, and LUCs are not in place for these operating facilities. Any LUCs required for the 484-D Powerhouse building and associated facilities will be addressed by the appropriate remedial decision after operational closure of the Powerhouse building is complete. The DAOU removal and remedial actions and decisions will be safeguarded regardless of the Powerhouse use.

Groundwater Uses/Surface Water Uses

Groundwater is not part of the DAOU. Groundwater is being addressed separately under the D Area Groundwater OU.

VII. SUMMARY OF OPERABLE UNIT RISKS

Baseline Risk Assessment

As a component of the RFI/RI process, a BRA was performed to evaluate risks associated with the DAOU. The BRA estimates what risks the site poses if no action were taken. It provides the bases for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The BRA includes HH and ERAs. Risks associated with the potential for contaminant migration to groundwater and PTSM are also evaluated. This section of the EA ROD summarizes the results of the BRA.

DAOU areas that are addressed under this EA ROD are provided in Table 1. A complete DAOU risk assessment is documented in the RFI/RI WP and RFI/RI Report and BRA for the DAOU (SRNS 2009a).

Principal Threat Source Material

Source materials are those materials that include or contain hazardous substances, pollutants, or contaminants that act as a reservoir for migration to groundwater, surface water, or air, or that act as a source for direct exposure. PTSM is defined as those source materials that have a high toxicity or mobility and cannot be reliably contained or present a significant risk to HH or the environment (USEPA 1991). They include liquids and other highly mobile materials such as those released from surface soil due to volatilization or leaching, or materials having high concentrations of toxic compounds. No threshold level of toxicity/risk has been established to define “principal threat.” However, treatment or removal

alternatives should be considered for source materials when the cumulative risk for the future industrial worker exceeds 1.0E-03 for carcinogens or a hazard index of 10 for noncarcinogens.

There are no contaminants that constitute PTSM at the DAOU.

Human Health Risk Assessment

USEPA guidance indicates that when future residential land use is not reasonably anticipated, it is appropriate to focus the BRA on more likely future land-use scenarios, provided action is taken to ensure that risks for residential exposure are prevented. The LUCAP (WSRC 1999) designates the DAOU as being within the site industrial support area. Therefore, industrial land use is the most likely future land-use scenario. Because residual underground contamination will remain at the unit following completion of the removal actions and could result in an unacceptable risk to a future resident, land use restrictions are warranted.

HH risks were assessed for the future land-use scenario. The potentially exposed receptor under the future land-use scenario is the hypothetical industrial worker. Existing LUCs will ensure protection against unrestricted (i.e., residential) use.

Arsenic, at concentrations exceeding 1E-06 risk to a future industrial worker, was found at the 489-D CPRB (risk = 1.9E-05). The arsenic problem warranting action is being addressed via a removal action through an RSER/EE/CA. No RCOCs will remain at the northern 25% of the CPRB after completion of the removal action.

Due to presence of subsurface asbestos at the D Area Asbestos Pit, excavation in the area may expose humans to asbestos. Although the SRS SE Program determined there is no threat to HH or the environment from asbestos or other contaminants, should asbestos be brought up from the subsurface (>1 ft depth), an exposure risk would be present. Soil, dust, or air samples were not taken for

asbestos; however, the USDOE is implementing a remedial action because there is threat of release of asbestos as allowed in the USEPA "Framework for Investigating Asbestos-Contaminated Superfund Sites, OSWER Directive #9200.0-68" (USEPA 2008). Therefore, it is recommended that LUCs be implemented to prevent land disturbance activities.

Ecological Risk Assessment

The purpose of the ERA is to document the analysis of the potential for adverse effects associated with exposure to known contaminants at the unit.

For the 489-D CPRB, arsenic (HQ = 2.8) and 2-methylnaphthalene (HQ = 9.7) occur at concentrations exceeding an HQ of 1 and pose a risk to benthic organisms. In addition, low sediment pH in the CPRB would be toxic to benthic organisms. The concentrations of metals (seven total) and low pH in surface water also present a risk to aquatic ecological receptors. All of the ecological problems warranting action noted in this section are being addressed through a removal action. No ecological RCOCs will remain at the northern 25% of the CPRB after completion of the removal actions.

Contaminant Migration

At the Bubble Tower Subunit, PCE was identified as a CM RCOC in soil in the vicinity of the 717-D Maintenance Shop. Tritium was identified as a CM RCOC at several locations at the Moderator Processing Subunit. Specifically, for the 420-D and 420-2D locations, tritium was identified as a CM RCOC in concrete and soil for the 420-2D Facility. For the 421-2D soil, the tritium was identified as a CM RCOC. All of the CM problems warranting action noted in this section are being addressed through removal actions. There will be no CM RCOCs remaining after completion of the removal action.

Conclusion

No PTSM is identified for the DAOU. The HH, ecological, and CM RCOCs are being addressed through removal actions that will achieve RGs. A conceptual model identifies how the final action will eliminate the primary exposure pathways for the contaminants and media of concern for each DAOU subunit is presented in Figure 5.

Actual or threatened releases of hazardous substances from this waste unit, if not addressed by the selected alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

Should debris be brought up from the subsurface (i.e., D Area Asbestos Pit), an exposure risk would likely be present. It is recommended that LUCs be implemented following the removal actions to prevent land disturbance activities and to protect against unrestricted (i.e., residential) use for the DAOU.

VIII. REMEDIAL ACTION OBJECTIVES AND REMEDIAL GOALS

Remedial action objectives (RAOs) are media- or OU-specific objectives for protecting HH and the environment. RAOs usually specify potential receptors and exposure pathways, and are identified during scoping once the conceptual site model is understood. RAOs describe what the cleanup 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. The following RAOs are identified for the DAOU after completion of removal actions:

- Protect industrial workers from exposure to asbestos-containing waste in subsurface soil. This RAO applies to the D Area Asbestos Pit.

- Ensure protection against unrestricted (i.e., residential) land use. This RAO applies to areas indicated in Table 1 in the DAOU.

Remedial Goals

RGs can be qualitative statements or numerical values often expressed as concentration in soils and groundwater, or actions (installation of engineered barriers, placement of caps and covers, etc) that achieve the RAO. Final RGs will be monitored to determine when the remedial action is complete.

The RGs identified in Table 2 and the removal action decision documents will be met as the actions are completed. When provided, the SRS background level will be used as the RG instead of the HH, ecological, or contaminant migration RG. Specific RGs are not developed for the final action since the selected alternative (LUCs) will break the exposure pathway to any contamination left in place following the removal actions. Table 2 depicts the RGs for the DAOU.

As outlined in the risk assessment evaluation, there are no PTSM, HH, ecological, and CM RCOCs following completion of the removal actions under the industrial scenario. However, if the D Area Asbestos Pit is ever excavated, then potential exposure to friable asbestos would likely exist. It is recommended that LUCs be implemented at the DAOU to prevent unrestricted land use (i.e., residential scenario) and to prevent exposure to asbestos containing material and/or friable asbestos in the subsurface.

Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA, as amended by the Superfund Amendments Reauthorization Act (SARA), requires that remedial actions comply with requirements and standards set forth under federal and state environmental laws. Specifically, remedies must consider "any promulgated standard, requirement, criteria, or limitation under a state environmental or facility citing law that is more stringent than any federal standard, requirement, criteria or limitation" if the former is an applicable or relevant and

appropriate requirement (ARAR) for the site and associated remedial activities. SARA requires that the remedial action for a site meet all ARARs unless a waiver is invoked. In addition to ARARs, many federal and state environmental and public health programs include criteria, guidance, and proposed standards that are not legally binding but provide useful approaches or recommendations. Such information is required to-be-considered when RGs are developed.

ARARs include action-specific, location-specific, and chemical-specific requirements:

Chemical-specific ARARs are media-specific concentration limits promulgated under federal or state law. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requires the development of health-based, site-specific levels for chemicals where such limits do not exist and where there is a concern with their potential health or environmental effects.

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 characteristics of the unit.

As discussed below, No Action and LUCs are the alternatives evaluated for the DAOU following successful completion of the removal actions. Neither of these alternatives requires an ARAR evaluation. ARARs associated with the removal actions were previously identified in the respective RSER/EE/CA documents and are not repeated in this ROD with the exception of the ARARs associated with the 489-D CPRB. The ARARs for long-term maintenance of the 489-D CPRB cover system are depicted in Table 3.

IX. DESCRIPTION OF ALTERNATIVES

In accordance with the NCP, it is desirable, when practical, to offer a range of diverse alternatives to compare during the detailed analyses. The range of alternatives includes an option that involves no treatment yet provides protection to HH and the environment by preventing or controlling exposure through LUCs. Remedial alternatives were developed to address contamination in the subsurface. Due to the focused effort, under the EA ROD, two early action alternatives including No Action and LUCs were evaluated for the DAOU early action subunits and areas.

Alternative 1. No Action

The No Action alternative is required by the NCP to serve as a baseline for comparison to other alternatives. Under this alternative, no efforts would be made to control access, limit exposure, or reduce contaminant toxicity, mobility, or volume. This alternative would leave the DAOU in its current condition with no additional controls. This alternative is not effective in achieving the RAOs, and there are no capital construction or system operation and maintenance costs. The No Action alternative is insufficient in protecting HH and environment. This alternative does not include five-year remedy reviews.

Summary of Costs

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

Alternative 2. Land Use Controls

The second alternative is LUCs for the Bubble Tower Subunit, Moderator Processing Subunit, northern 25% of the 489-D CPRB, 904-50G Outfall, D Area Asbestos Pit, DIPSLs, electrical transformers, and miscellaneous buildings. ECs such as physical barriers (i.e., grouting manholes, installing signs) and institutional controls (ICs) (i.e.,

excavation permit restrictions and deed restrictions) will be used to restrict access to or activities that can be performed at the impacted areas. LUCs meet the threshold and balancing criteria requirements. Because this alternative results in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unrestricted use, five year remedy reviews would be performed to ensure that the remedy is and will continue to be protective of HH and the environment.

Summary of Costs	
Capital	$260,618
O&M Cost	$2,023,888
Total Present-Worth Cost	$2,284,505

X. COMPARATIVE ANALYSIS OF ALTERNATIVES

This section summarizes the evaluation of alternatives that apply to post-removal action conditions. Note that the removal actions occurring at the Bubble Tower, Moderator, and Powerhouse Subunits have been evaluated against the evaluation criteria and have been documented in their respective RSER/EE/CAs (SRNS 2009c, SRNS 2009d, SRNS 2009e).

The NCP (40 CFR 300.430(e)(9)) requires that potential remedial alternatives undergo detailed analysis using relevant evaluation criteria that will be used by decision makers to select a final remedy. The results of the detailed analysis are then examined to compare alternatives and identify key tradeoffs among alternatives.

The statutory requirements that guide the evaluation of remedial alternatives in a CERCLA FS state that a remedial action must:

- Be protective of HH and the environment
- Attain ARARs or define criteria for invoking a waiver
- Be cost effective

- Use permanent solutions to the maximum extent

USEPA has established nine evaluation criteria to address these statutory requirements under CERCLA. The criteria fall into the categories of threshold criteria, primary balancing criteria, and modifying 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. Evaluation criteria categories and the nine evaluation criteria are listed and explained in the following discussion.

Threshold Criteria

Threshold criteria are requirements that each alternative must achieve to be eligible for selections as a permanent remedy under CERCLA. The threshold criteria are:

1) Overall protection of HH and the environment

2) Compliance with ARARs

Primary Balancing Criteria

Primary balancing criteria are factors that identify key tradeoffs among alternatives. The primary balancing criteria are:

3) Long-term effectiveness and permanence

4) Reduction of mobility, toxicity, or volume through treatment

5) Short-term effectiveness

6) Implementability

7) Cost

Modifying Criteria

Modifying criteria (i.e., state or support agency acceptance; community acceptance) will be considered during remedy selection. The modifying criteria are:

8) State or support agency acceptance

9) Community Acceptance.

All of the alternatives have been evaluated against the seven CERCLA threshold evaluation criteria that provide the basis for evaluating the alternatives and selecting a remedy (Tables 3 and 4). The purpose of this section is to identify key advantages and disadvantages of each alternative relative to one another and in relation to the two threshold criteria and five primary balancing criteria. Emphasis is placed on the two threshold criteria: overall protection of HH and the environment and compliance with ARARs. However, key tradeoffs between alternatives are identified through a comparative evaluation against the five primary balancing criteria: long-term effectiveness and permanent reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. The five primary balancing criteria were assigned values based on technical judgments to support the comparative analyses. The final two modifying criteria – state or support agency acceptance and community acceptance – were evaluated following the comment period for the SB/PP.

Comparative Analysis of the DAOU Alternatives

A comparative analysis summary and ranking for the DAOU alternatives is shown in Table 4 and Table 5. The following two alternatives were developed for consideration:

- Alternative 1 – No Action; and
- Alternative 2 - LUCs

Overall Protection of Human Health and the Environment

The overall protection of HH and the environment is evaluated for each alternative on the basis of how the alternative reduces the risk of exposure to contaminants from potential exposure pathways through LUCs. Each alternative is examined as to whether it creates any unacceptable short-term risks to HH.

Alternative 1 (No Action) is not protective of HH and the environment since no controls are in place to prevent the potential exposure to contaminated media. Alternative 2 (LUCs) is protective of HH and the environment by preventing exposure to buried asbestos contamination and other residual contamination that will remain at the DAOU at the levels that do not allow for unrestricted land use. Alternative 2 (LUCs) will achieve RAOs.

Compliance with ARARs

Chemical-Specific ARARs. Alternative 1 (No Action) would not involve any remedial action; therefore, ARARs are not applicable. Alternative 2 (Land Use Controls) does not have chemical-specific ARARs.

Action-Specific ARARs. Alternative 1 (No Action) would not involve any remedial action; therefore, ARARs are not applicable. Alternative 2 (Land Use Controls) would be effective in complying with the action specific ARARs pertaining to the relevant and appropriate closure and monitoring of landfills (i.e., 489-D CPRB).

Location-Specific ARARs. Alternative 1 (No Action) would not involve any remedial action; therefore, ARARs are not applicable. Alternative 2 (Land Use Controls) does not have location-specific ARARs.

Long-Term Effectiveness and Permanence

The remedial alternatives are assessed on their ability to maintain reliable protection of HH and the environment after implementation. Alternative 1 (No Action) has no long-term effectiveness or permanence since no action is taken to mitigate the residual risk. Alternative 2 (LUCs) is protective and provides long-term effectiveness and permanence as long as LUCs criteria are met.

Reduction of Toxicity, Mobility, or Volume through Treatment

The statutory preference is to select a remedial action that employs treatment to reduce the toxicity, mobility, or volume of hazardous substances. The degree to which alternatives employ recycling or treatment is assessed, including how treatment is used to address the principal threats posed by the unit.

Neither Alternative 1 (No Action) nor Alternative 2 (LUCs) provides a reduction in the toxicity, mobility, or volume of contaminants through treatment. This criteria was addressed by the removal actions for the Bubble Tower, Moderator Processing, and Powerhouse Subunits as described in their respective RSER/EE/CAs (SRNS 2009c, SRNS 2009d, SRNS 2009e).

Short-Term Effectiveness

Evaluation of alternatives for short-term effectiveness takes into account protection of remedial workers, members of the community, and the environment during implementation of the remedial action and the time required to achieve RAOs/RGs. Schedule estimates are based on projected availability of materials and labor and may have to be updated at the time of remediation.

Short-term effectiveness is not applicable to Alternative 1 (No Action) since it does not involve any remedial activities and would not achieve RAOs. Alternative 2 (LUCs) achieves RAOs in a short period of time with essentially no risk to workers or the public.

Implementability

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

Alternative 1 (No Action) involves no implementation. Alternative 2 can be readily implemented.

Cost

Accuracy of present-worth costs is +50/-30 percent according to USEPA guidance. Detailed cost estimates are derived from current information, including vendor quotes, conventional cost-estimating guides (e.g., Means Site Work Cost Data), and costs associated with similar projects. The cost estimates are included for comparison only and are not intended to forecast actual budgetary expenditures. The actual costs of the project depend on labor and material costs, site conditions, competitive market conditions, final project scope, and implementation schedule at the time that the remedial activities are initiated. In estimating the present-worth costs, a discount rate of 2.7% is used and inflation is assumed to be 0%. Present-worth costs for review of the site remedy every five years are given for each alternative for which residuals remain at the site. Present-worth costs for these items are based on an estimated time frame of operation. Cost estimates are presented in Appendix B.

Alternative 1 (No Action) is less expensive ($0) than Alternative 2 (LUCs) ($2,284,505).

State or Support Agency Acceptance

State acceptance criteria were evaluated based on scoping meetings held between USDOE, USEPA, and SCDHEC and are based on comments received on the final SB/PP. Regulatory approval of the proposed action, Alternative 2 (LUCs), in the SB/PP constitutes acceptance of the selected remedy.

Community Acceptance

The community acceptance of the preferred alternative was assessed by giving the public an opportunity to comment on the remedy selection process. A public comment period was held between July 26, 2010 and September 8, 2010. Public comments concerning the proposed remedy were incorporated in the Responsiveness Summary in Appendix A of the Revision 1 EA ROD.

XI. THE SELECTED REMEDY

Detailed Description of the Selected Remedy

The selected early action alternative for the DAOU is Alternative 2 – LUCs. This alternative was selected because it effectively protects against unrestricted use (residential exposure). This alternative includes LUCs for the Bubble Tower Subunit, Moderator Processing Subunit, northern 25% portion of the CPRB, 904-50G Outfall, Asbestos Pit, DIPSLs, electrical transformer pads, and miscellaneous building pads. This alternative was selected because it effectively protects against residential exposure and provides the best balance of tradeoffs between no action and removal and offsite disposal. LUCs will be implemented for the completed areas at the DAOU.

Table 6 shows the types of controls, purposes of control, duration, implementation method, and affected areas. The DAOU LUCs will consist of the following:

- Controlled physical access into D Area. A single primary road leads into D Area with access to the area controlled (i.e., fence, guard house) and monitored by SRS security personnel. Only authorized personnel may enter.

- Signage and monuments will be located at the DAOU boundaries shown in Figure 4 to alert on-site workers to the presence of hazardous substances and to prevent unknowing entry and unrestricted use. The date and location for installation of the signs and monuments will be stated in the unit-specific EA LUCIP referenced in this EA ROD. Placement and content of the signage for the D Area Asbestos Pit will conform to the requirements in Table 3.

- Administrative controls as managed through the SRS Site Use/Site Clearance Program to require authorization before beginning any excavation activity at the DAOU. This authorization is usually in the form of an internal SRS permit.

- Maintenance of the existing soil cover for the D Area Asbestos Pit to ensure that there is no erosion damage and to prevent unauthorized excavation or construction activities. The EA LUCIP will specify the maintenance requirements necessary to ensure the integrity of the soil layer and vegetative cover as designed in accordance with the requirements in Table 3.

- Maintenance of newly installed soil cover at the northern section of the 489-D CPRB to ensure that there is no erosion damage and to prevent unauthorized excavation or construction activities. The EA LUCIP will specify the maintenance requirements necessary to ensure the integrity of the soil layer and vegetative cover as designed in accordance with the requirements in Table 3.

- Maintenance of the Bubble Tower soil cover to ensure that there is no erosion damage and to prevent unauthorized excavation or construction activities. The EA LUCIP will specify the maintenance requirements necessary to ensure the integrity of the soil

layer and vegetative cover as designed in accordance with the requirements in Table 3.

- Plugging and grouting of the manholes associated with the DIPSLs as an EC to restrict access to impacted areas and for general safety.

- Site maintenance (site inspections, general housekeeping, repair or erosion damage and other routine maintenance as needed). Additional erosion control and surface contouring in D Area, other than that associated with the Asbestos Pit, Bubble Tower Soil Cover, and CPRB remedial action, is not part of the DAOU EA LUCs.

These LUCs will be implemented by:

- Identifying access controls and use restrictions to on-site workers via the Site Use/Site Clearance Program, and by the locating of signage at the waste unit boundaries. Other administrative measures to ensure worker safety include work controls, worker training, and worker briefing of health and safety requirements. Providing access controls to prevent exposure to trespassers, as described in the 2000 RCRA Part B Permit Renewal Application, Volume I, 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.

In the long term, if the property, or any portion thereof, is ever transferred from DOE, the U.S. Government and/or DOE will take those actions necessary pursuant to Section 120(h)(1) of CERCLA. Those actions will include in any contract, deed, or other transfer document, notice of the type and quantity of any hazardous substances that were known to have been stored (for more than one year), released, or disposed of on the property. The notice will also include the time at which the storage, release, or disposal took place to the extent such information is available.

In addition, if the property, or any portion thereof, is ever transferred by deed, the U.S. Government will also satisfy the requirements of CERCLA 120(h)(3). The requirements include: a description of the remedial action taken, a covenant, and an access clause. These requirements are also consistent with the intent of the RCRA deed notification requirements at final closure of a RCRA facility if contamination will remain at the unit.

LUCs will be implemented through the following:

- The contract, deed, or other transfer document shall also include restrictions precluding residential use of the property. However, the need for these restrictions may be reevaluated at the time of transfer in the event that exposure assumptions differ and/or the residual contamination no longer poses an unacceptable risk under residential use. Any reevaluation of the LUCs will be done through an amended ROD with USEPA and SCDHEC review and approval.

- In addition, if the site is ever transferred to nonfederal ownership, a survey plat of the OU will be prepared, certified by a professional land surveyor, and recorded with the appropriate county recording agency.

In the event of a property lease or interagency agreement, the equivalent restrictions will be implemented as required by CERCLA Section 120(h).

The selected remedy for the DAOU leaves hazardous substances in place that pose a potential future risk and will require land use restrictions for as long as necessary to keep the selected remedy fully protective of HH and the environment. Five-year remedy reviews will be performed to ensure that the remedy is and will continue to be protective of HH and the environment.

As agreed on March 30, 2000, among the USDOE, USEPA, and SCDHEC, SRS is implementing a LUCAP to ensure that the LUCs required by numerous remedial decisions at SRS are properly maintained and periodically verified. The unit-specific EA Land Use Control Implementation Plan (LUCIP) referenced in this ROD will provide

details and specific measures required to implement and maintain the LUCs selected as part of this remedy. The USDOE is responsible for implementing, maintaining, monitoring, reporting upon, and enforcing the LUCs selected under this EA ROD. The EA LUCIP, developed as part of this action will be submitted as required in the FFA for review and approval by USEPA and SCDHEC. Upon final approval, the EA LUCIP will be appended to the LUCAP and is considered incorporated by reference into the EA ROD, establishing LUCs implementation and maintenance requirements enforceable under CERCLA and the *SRS Federal Facility Agreement*. The approved EA LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the unit. The EA LUCIP will remain in effect unless and until modifications are approved as needed to be protective of HH and the environment. The deed shall expressly prohibit activities inconsistent with the RGs and objectives in this EA ROD upon any and all transfers. The LUCs shall be maintained until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use. Approval by the USEPA and SCDHEC is required for any modification or termination of the LUCs.

USDOE has recommended that residential use of SRS land be controlled; therefore, future residential use and potential residential water usage will be restricted to ensure long-term protectiveness. LUCs will restrict the DAOU to future industrial use and will prohibit residential use of the area. Unauthorized excavation will also be prohibited and the DAOU will remain undisturbed. LUCs selected as part of this action will be maintained for as long as they are necessary and termination of any LUCs will be subject to CERCLA requirements for documenting changes in remedial actions.

The LUC objectives necessary to ensure the protectiveness of the selected remedy are:

- Prevent contact, removal, or excavation of subsurface soil and buried asbestos-containing waste

- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds.

- Maintain the integrity of any current or future remedial or monitoring systems, such as soil vapor extraction systems, soil covers, or groundwater monitoring wells; and

- Prevent construction of inhabitable buildings without an evaluation of indoor air quality to address vapor intrusion.

Cost Estimate for the Selected Remedy

The information in the cost estimate shown in Appendix B is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record File, an explanation of significant difference, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to –30 percent of the actual project cost.

Summary of Costs	
Capital Cost	$260,618
Operations and Maintenance Cost	$2,023,888
Total Estimated Cost	$2,284,505

Estimated Outcomes of Selected Remedy

LUCs will be maintained for protection of HH and the environment at the DAOU by restricting land disturbance activities and by restricting land use to industrial use only. Although groundwater is not included as part of this OU, the use of groundwater will continue to be restricted until the final ROD for the D Area Groundwater OU is completed.

Waste Disposal and Transport

Because LUCs is the selected remedy, there will be no waste streams generated during the remedial action.

XII. STATUTORY DETERMINATIONS

Based on the unit RFI/RI/BRA report, the DAOU poses a threat to HH and the environment. Therefore, Alternative 2 – LUCs, has been selected as the remedy for the DAOU. The future land use of the DAOU is assumed to be industrial land use.

This alternative was selected because it is protective of HH and the environment by preventing exposure to buried asbestos contamination and residual contamination that will remain at the DAOU at levels that do not allow for unrestricted land. It provides the best balance of tradeoffs between alternatives because it offers adequate protection at a minimal cost. The selected remedy is protective of HH and the environment, complies with federal and state requirements that are legally ARARs to the remedial action, and is cost-effective. The remedy does not satisfy the preference for treatment as a principal element of the remedy because there is no practicable remedial technology capable of reducing the toxicity, mobility, or volume of asbestos in the subsurface soils.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is and will continue to be, protective of HH and the environment.

XIII. EXPLANATION OF SIGNIFICANT CHANGES

At the DAOU teleconference held on September 15, 2010, SCDHEC identified a problem with proceeding with a final ROD given that the Powerhouse would still be operational after approval of the ROD. Therefore, DOE, EPA, and SCDHEC (the Core Team) agreed to pursue an EA ROD. An EA ROD allows the project to remain on track and

achieve the targeted footprint reduction, accelerate accomplishment of the FFA cleanup milestones at the DAOU while protecting HH and the environment. The scope of the EA ROD covers LUCs of completed subunits and areas. The final ROD is planned to cover LUCs for all remaining subunits and areas once the sources at those areas have been addressed. Since the D-006 Outfall (Petroleum Release Site) is connected to the wetlands, the D-006 Outfall (Petroleum Release Site) has been decoupled from the DAOU and added to the SRFS IOU. The removal action at the D-006 Outfall (Petroleum Release Site); however, will continue to be executed with the 489-D CPRB and 484-10D WOF RSER/EE/CA (SRNS 2009e) and as described in the Action Memorandum for those subunits of the DAOU (USDOE 2009c, USDOE 2010, USDOE 2011a, USDOE 2011b). After the SB/PP was issued for public comment, the three parties to the ROD recognized that 40 CFR 61.151, National Emissions Standards for Hazardous Air Pollutants (NESHAPs), is an ARAR for the D Area Asbestos Pit. Therefore, appropriate and relevant portions of NESHAPs (40 CFR 16.151) have been added to the ARAR table (Table 3). The selected remedy already meets the substantive requirements of the NESHAPs ARAR (6 inches of soil cover, signs, land use restrictions, and maintenance of the existing soil cover). No change to the remedy is needed to meet these substantive requirements.

XIV. RESPONSIVENESS SUMMARY

The Responsiveness Summary is included as Appendix A of this document. It will be completed at the end of the public comment period for the SB/PP.

XV. POST-ROD DOCUMENT SCHEDULE AND DESCRIPTION

A detailed schedule for the Post-EA ROD activities is shown in Figure 6. The early actions will constitute the remedial action. For the purposes of this remedy, the EA LUCIP will serve as the EA CMI/RAIP.

XVI. REFERENCES

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USDOE, 2009c. *Submittal of the Action Memorandum and Responsiveness Summary for the Non-Time Critical Removal Action for the 489-D Coal Pile Runoff Basin, D-006 Outfall, and 484-10D Waste Oil Facility at the D-Area Operable Unit,* CERCLIS Number: 63, ARF #16516, December 21, 2009, United States Department of Energy, Savannah River Operations Office, Aiken, SC

USDOE, 2010. *Submittal of the Action Memorandum and Responsiveness Summary for the Non-Time Critical Removal Action for the 489-D Coal Pile Runoff Basin, D-006 Outfall, and 484-10D Waste Oil Facility at the D-Area Operable Unit,* CERCLIS Number: 63, ARF #17084, August 26, 2010, United States Department of Energy, Savannah River Operations Office, Aiken, SC

USDOE, 2011a. *Submittal of the Revision 2 Action Memorandum and Responsiveness Summary for the Non-Time Critical Removal Action for the 489-D Coal Pile Runoff Basin, D-006 Outfall, and 484-10D Waste Oil Facility at the D-Area Operable Unit,*

CERCLIS Number: 63 and 69, ARF #17495, March 23, 2011, United States Department of Energy, Savannah River Operations Office, Aiken, SC

USDOE, 2011b. *Submittal of the Action Memorandum for Transfer of the D-006 Petroleum Release Site from the D-Area Operable Unit to the Savannah River and Floodplain Swamp Integrator Operable Unit,* CERCLIS Number: 69, ARF #17499, March 28, 2011, United States Department of Energy, Savannah River Operations Office, Aiken, SC

USEPA, 1986. TSCA Field Report by John B. Adcock, Jr. (USEPA), to R.L. Morgan, (USDOE) dated July 29, 1986

USEPA, 1991. *A Guide to Principle Threat and Low-Level Threat Wastes,* United States Department of Energy, Office of Emergency and Remedial Response, Superfund Publication 9380.3-06FS, Washington, DC

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WSRC, 1996. PCB Annual Document Log for Calendar Year 1996, Letter to A.B. Gould from J.V. Odum, ESH-FSS-97-00181, June 30, 1997

WSRC, 1999. *Land Use Control Assurance Plan for the Savannah River Site*. Revision 1.1, WSRC-RP-98-4125. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC (Updated January 2008)

WSRC, 2004*. *Facility Disposition Manual,* WSRC 1C, Revision 2, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2006. *Savannah River Site Federal Facility Agreement Community Involvement Plan (U),* Revision 5, WSRC-RP-96-120, Washington Savannah River Company, Savannah River Site, Aiken, SC

* WSRC procedures have been accepted by SRNS, but have not yet received an SRNS or SRS procedure number.

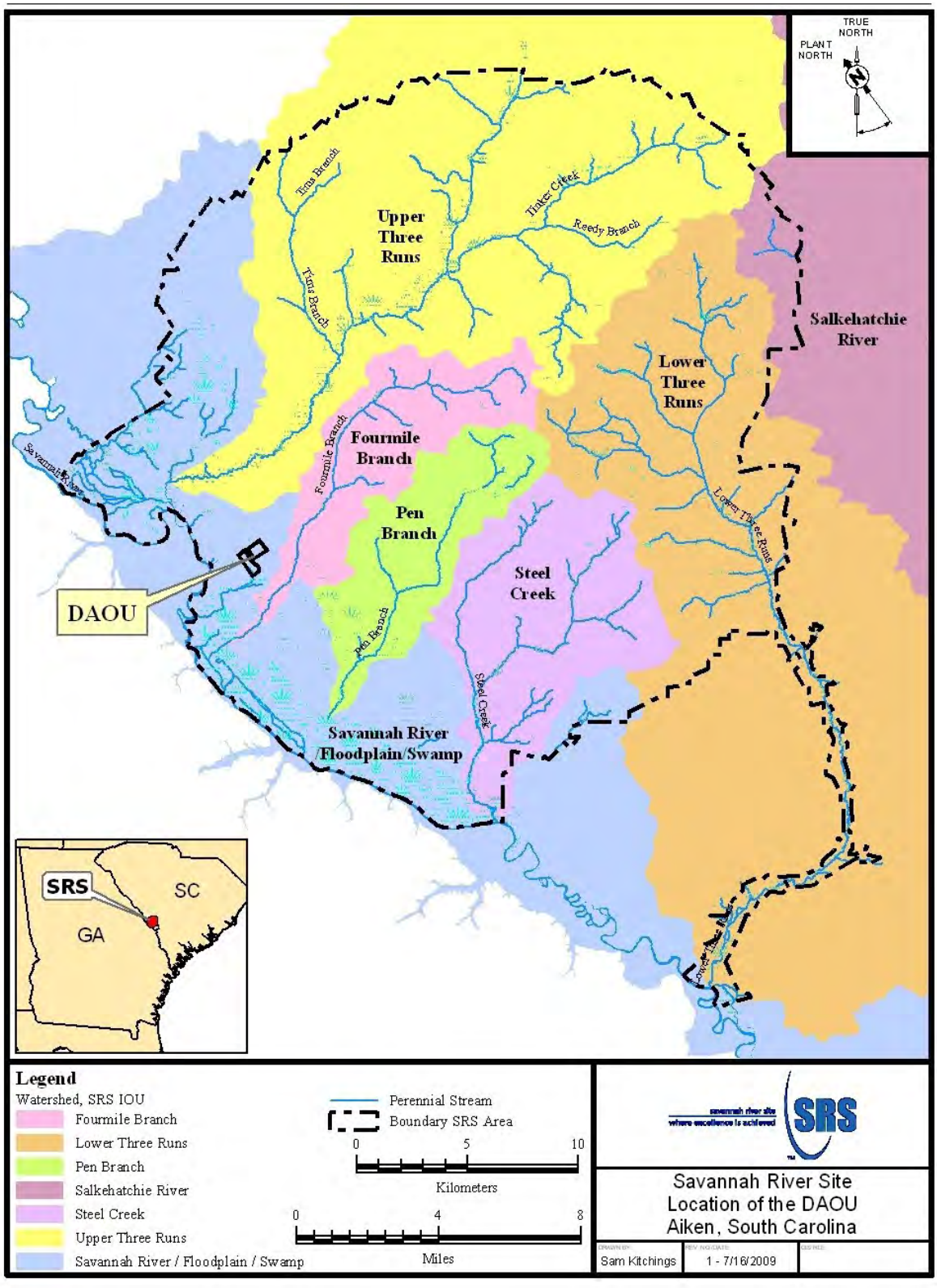

Figure 1. Location of the DAOU within the Savannah River Site

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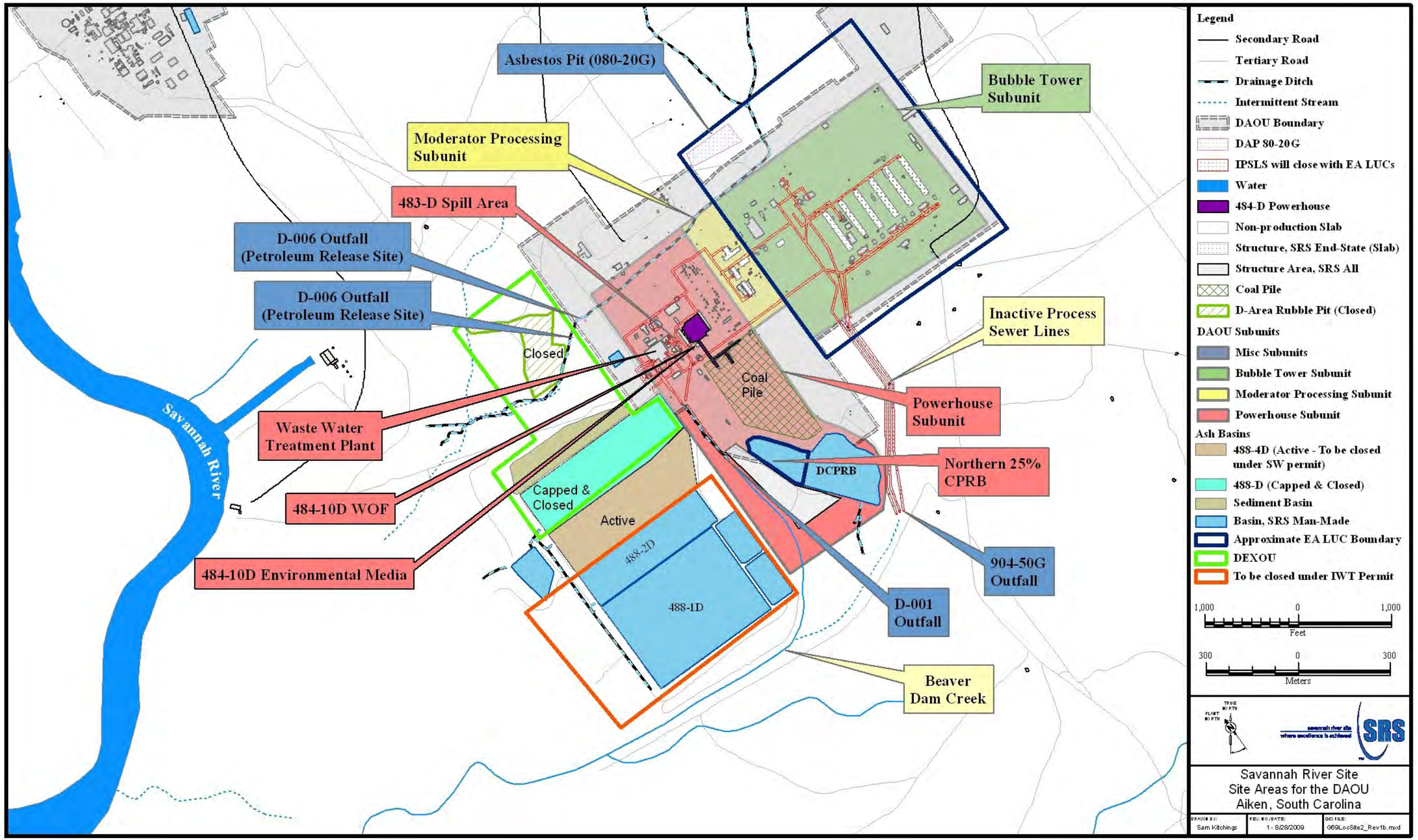

Figure 2. Site Areas and Subunits in and Around the DAOU

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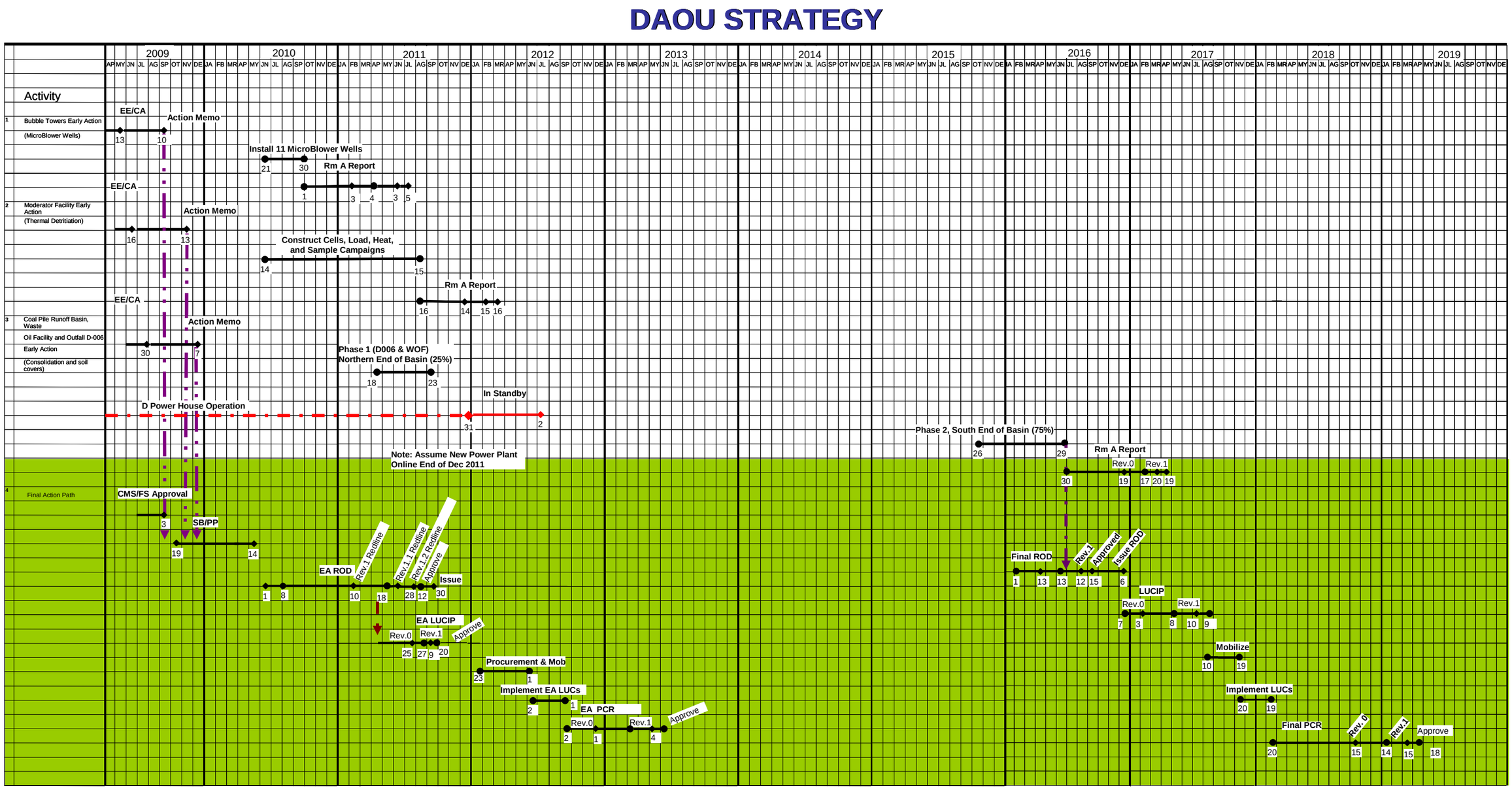

Figure 3. DAOU Integrated Schedule

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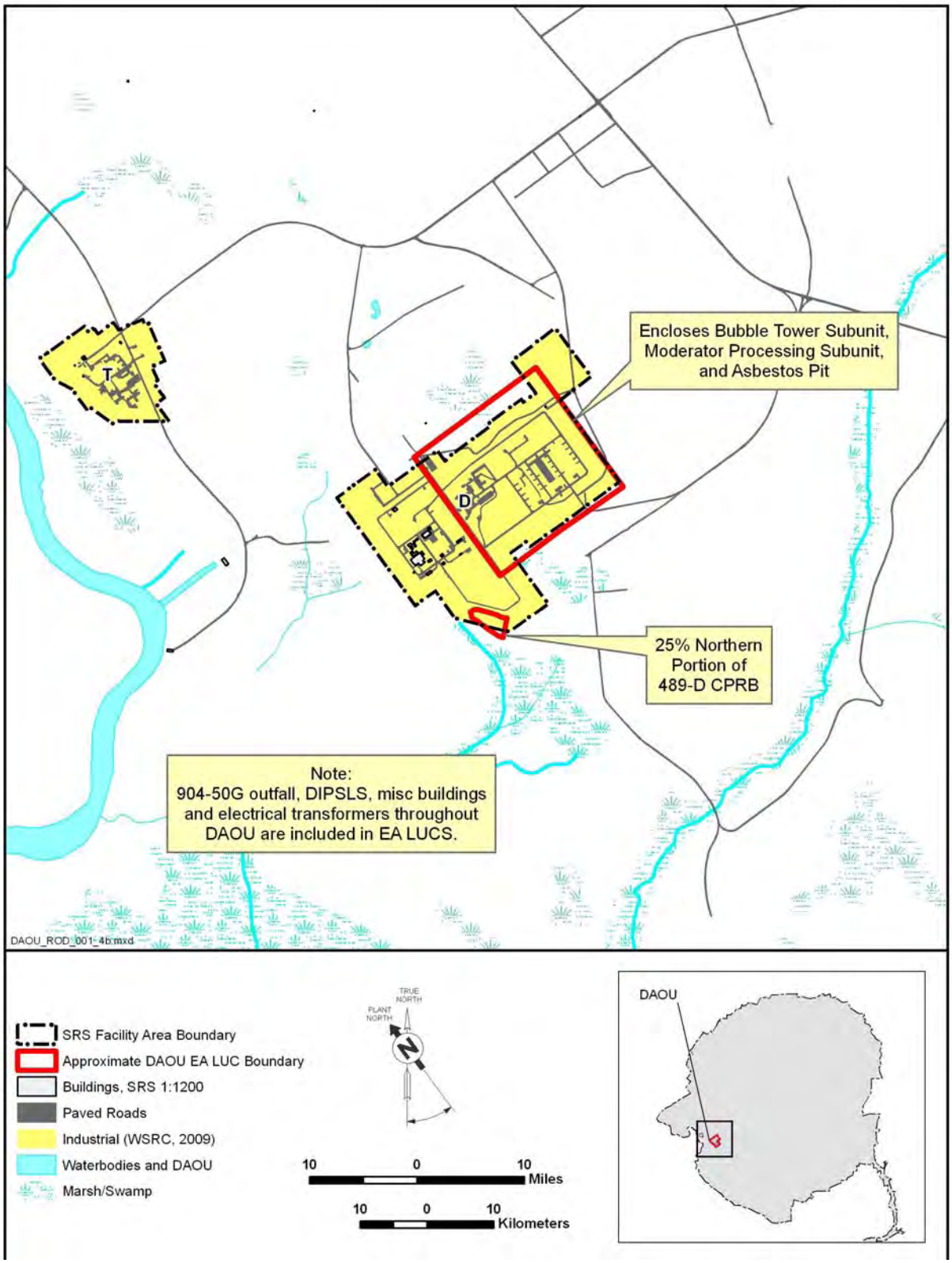

Figure 4. Early Action Land Use Map for DAOU

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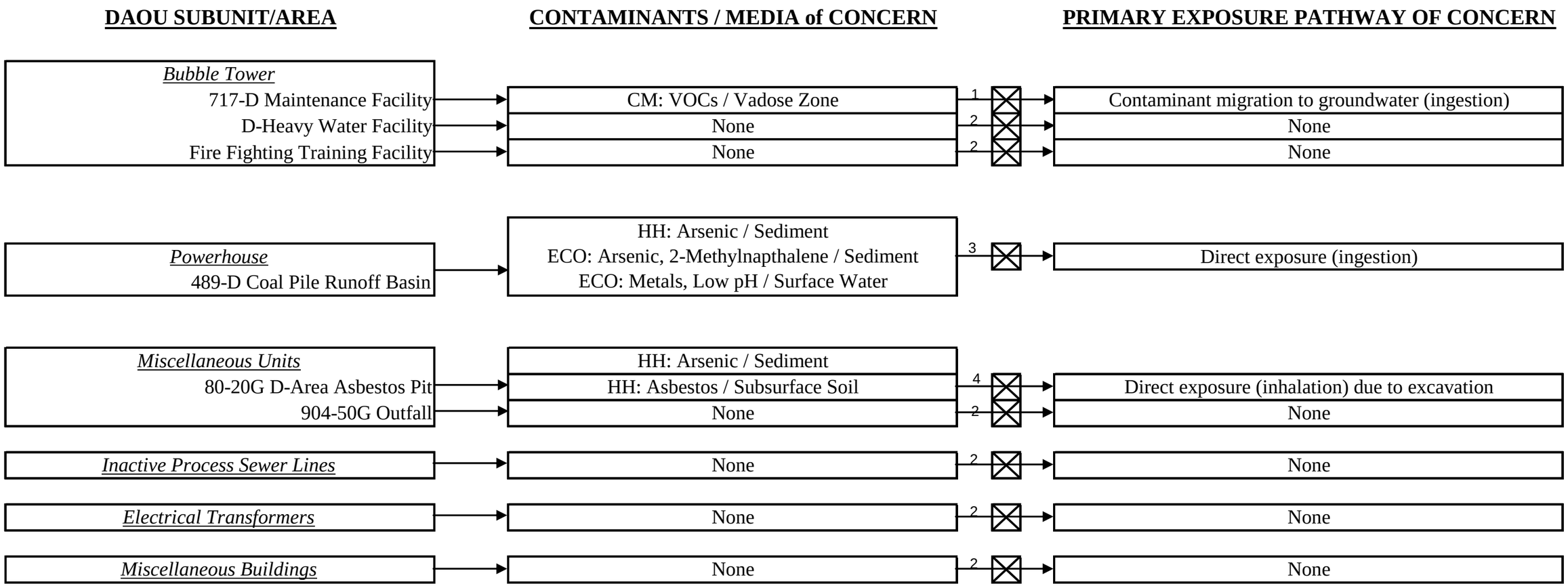

LEGEND

Complete exposure pathway

Incomplete exposure pathway due to final remedial action

CM = contaminant migration evaluation
HH = human health risk assessment
ECO = ecological risk assessment
1 - Soil Vapor Extraction per RSER/EE/CA (SRNS 2009c); DAOU Land Use Controls required after completion of early removal action to prevent land disturbance activities and unrestricted land use.
2 - No COCs based on an industrial land use scenario; DAOU Land Use Controls required to prevent unrestricted land use.
3 - Surface Water Management, Consolidation of Contaminated Soil and Sediment, Placement of Soil Cover per RSER/EE/CA (SRNS 2009e); DAOU Land Use Controls required after completion of early removal action to prevent land disturbance activities and unrestricted land use.
4 - Although not formally evaluated in the HHRA, asbestos waste present in subsurface is a problem warranting action under an excavation scenario; DAOU Land Use Controls required to prevent land disturbance activities and unrestricted land use.

Figure 5. DAOU Generic Conceptual Site Model After Completion of the Early Remedial Actions

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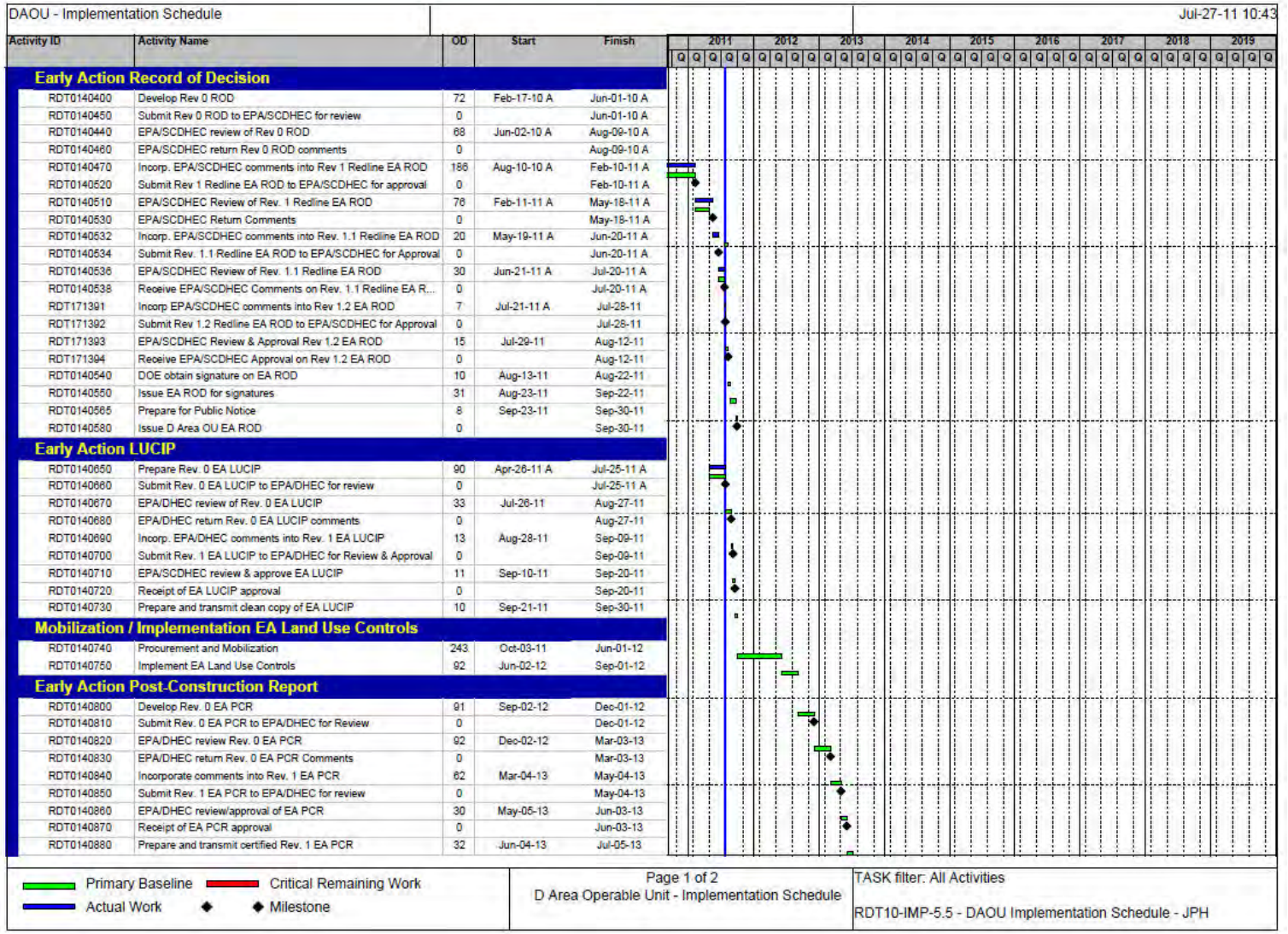

Activity ID	Activity Name	OD	Start	Finish
Early Action Record of Decision				
RDT0140400	Develop Rev 0 ROD	72	Feb-17-10 A	Jun-01-10 A
RDT0140450	Submit Rev 0 ROD to EPA/SCDHEC for review	0		Jun-01-10 A
RDT0140440	EPA/SCDHEC review of Rev 0 ROD	68	Jun-02-10 A	Aug-09-10 A
RDT0140460	EPA/SCDHEC return Rev 0 ROD comments	0		Aug-09-10 A
RDT0140470	Incorp. EPA/SCDHEC comments into Rev 1 Redline EA ROD	186	Aug-10-10 A	Feb-10-11 A
RDT0140520	Submit Rev 1 Redline EA ROD to EPA/SCDHEC for approval	0		Feb-10-11 A
RDT0140510	EPA/SCDHEC Review of Rev. 1 Redline EA ROD	76	Feb-11-11 A	May-18-11 A
RDT0140530	EPA/SCDHEC Return Comments	0		May-18-11 A
RDT0140532	Incorp. EPA/SCDHEC comments into Rev. 1.1 Redline EA ROD	20	May-19-11 A	Jun-20-11 A
RDT0140534	Submit Rev. 1.1 Redline EA ROD to EPA/SCDHEC for Approval	0		Jun-20-11 A
RDT0140536	EPA/SCDHEC Review of Rev. 1.1 Redline EA ROD	30	Jun-21-11 A	Jul-20-11 A
RDT0140538	Receive EPA/SCDHEC Comments on Rev. 1.1 Redline EA R...	0		Jul-20-11 A
RDT171391	Incorp EPA/SCDHEC comments into Rev 1.2 EA ROD	7	Jul-21-11 A	Jul-28-11
RDT171392	Submit Rev 1.2 Redline EA ROD to EPA/SCDHEC for Approval	0		Jul-28-11
RDT171393	EPA/SCDHEC Review & Approval Rev 1.2 EA ROD	15	Jul-29-11	Aug-12-11
RDT171394	Receive EPA/SCDHEC Approval on Rev 1.2 EA ROD	0		Aug-12-11
RDT0140540	DOE obtain signature on EA ROD	10	Aug-13-11	Aug-22-11
RDT0140550	Issue EA ROD for signatures	31	Aug-23-11	Sep-22-11
RDT0140565	Prepare for Public Notice	8	Sep-23-11	Sep-30-11
RDT0140580	Issue D Area OU EA ROD	0		Sep-30-11
Early Action LUCIP				
RDT0140650	Prepare Rev. 0 EA LUCIP	90	Apr-26-11 A	Jul-25-11 A
RDT0140660	Submit Rev. 0 EA LUCIP to EPA/DHEC for review	0		Jul-25-11 A
RDT0140670	EPA/DHEC review of Rev. 0 EA LUCIP	33	Jul-26-11	Aug-27-11
RDT0140680	EPA/DHEC return Rev. 0 EA LUCIP comments	0		Aug-27-11
RDT0140690	Incorp. EPA/DHEC comments into Rev. 1 EA LUCIP	13	Aug-28-11	Sep-09-11
RDT0140700	Submit Rev. 1 EA LUCIP to EPA/DHEC for Review & Approval	0		Sep-09-11
RDT0140710	EPA/SCDHEC review & approve EA LUCIP	11	Sep-10-11	Sep-20-11
RDT0140720	Receipt of EA LUCIP approval	0		Sep-20-11
RDT0140730	Prepare and transmit clean copy of EA LUCIP	10	Sep-21-11	Sep-30-11
Mobilization / Implementation EA Land Use Controls				
RDT0140740	Procurement and Mobilization	243	Oct-03-11	Jun-01-12
RDT0140750	Implement EA Land Use Controls	92	Jun-02-12	Sep-01-12
Early Action Post-Construction Report				
RDT0140800	Develop Rev. 0 EA PCR	91	Sep-02-12	Dec-01-12
RDT0140810	Submit Rev. 0 EA PCR to EPA/DHEC for Review	0		Dec-01-12
RDT0140820	EPA/DHEC review Rev. 0 EA PCR	92	Dec-02-12	Mar-03-13
RDT0140830	EPA/DHEC return Rev. 0 EA PCR Comments	0		Mar-03-13
RDT0140840	Incorporate comments into Rev. 1 EA PCR	62	Mar-04-13	May-04-13
RDT0140850	Submit Rev. 1 EA PCR to EPA/DHEC for review	0		May-04-13
RDT0140860	EPA/DHEC review/approval of EA PCR	30	May-05-13	Jun-03-13
RDT0140870	Receipt of EA PCR approval	0		Jun-03-13
RDT0140880	Prepare and transmit certified Rev. 1 EA PCR	32	Jun-04-13	Jul-05-13

Figure 6. Post-EA ROD Implementation Schedule

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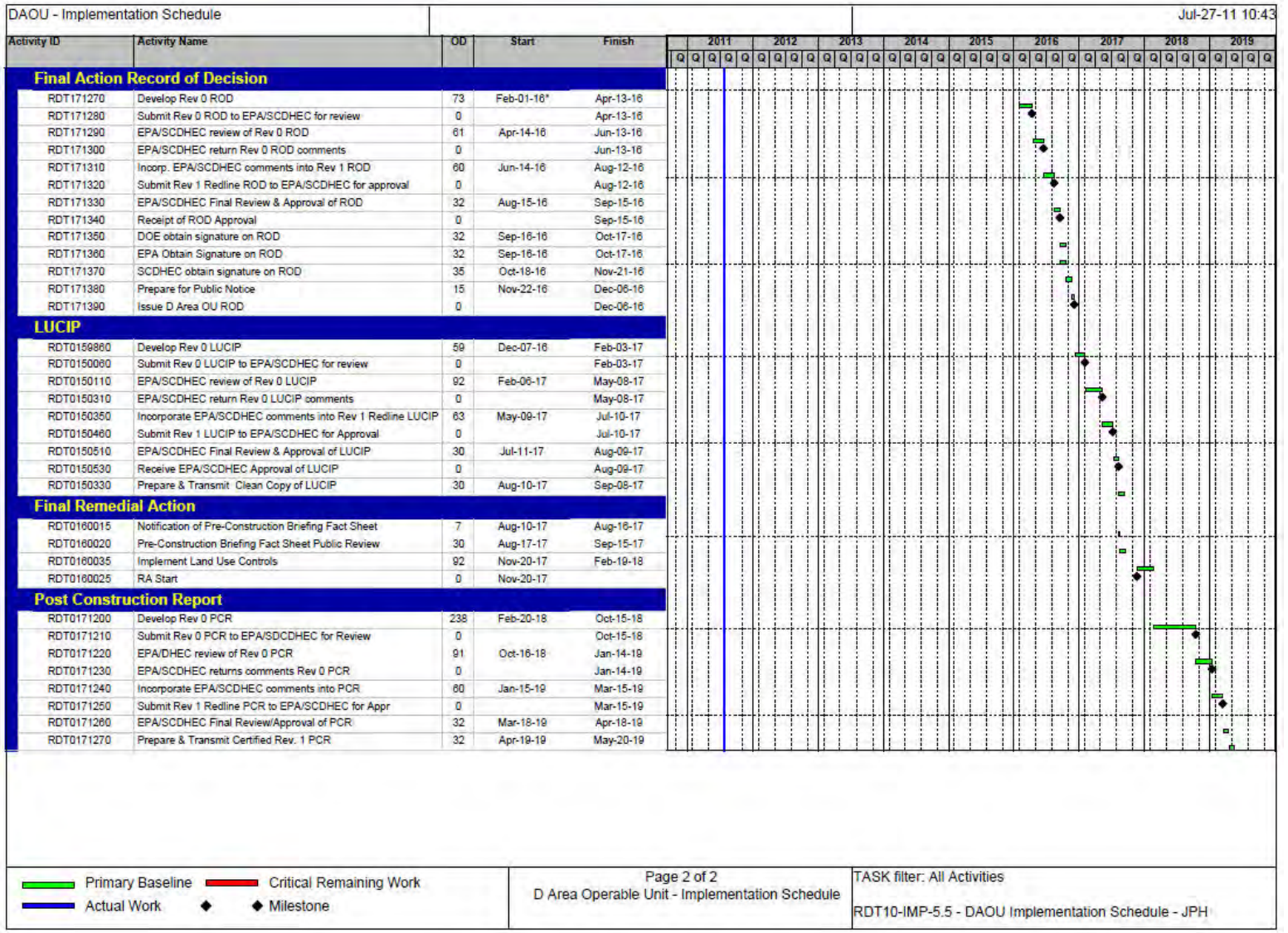

Activity ID	Activity Name	OD	Start	Finish
Final Action Record of Decision				
RDT171270	Develop Rev 0 ROD	73	Feb-01-16*	Apr-13-16
RDT171280	Submit Rev 0 ROD to EPA/SCDHEC for review	0		Apr-13-16
RDT171290	EPA/SCDHEC review of Rev 0 ROD	61	Apr-14-16	Jun-13-16
RDT171300	EPA/SCDHEC return Rev 0 ROD comments	0		Jun-13-16
RDT171310	Incorp. EPA/SCDHEC comments into Rev 1 ROD	60	Jun-14-16	Aug-12-16
RDT171320	Submit Rev 1 Redline ROD to EPA/SCDHEC for approval	0		Aug-12-16
RDT171330	EPA/SCDHEC Final Review & Approval of ROD	32	Aug-15-16	Sep-15-16
RDT171340	Receipt of ROD Approval	0		Sep-15-16
RDT171350	DOE obtain signature on ROD	32	Sep-16-16	Oct-17-16
RDT171360	EPA Obtain Signature on ROD	32	Sep-16-16	Oct-17-16
RDT171370	SCDHEC obtain signature on ROD	35	Oct-18-16	Nov-21-16
RDT171380	Prepare for Public Notice	15	Nov-22-16	Dec-06-16
RDT171390	Issue D Area OU ROD	0		Dec-06-16
LUCIP				
RDT0159860	Develop Rev 0 LUCIP	59	Dec-07-16	Feb-03-17
RDT0150060	Submit Rev 0 LUCIP to EPA/SCDHEC for review	0		Feb-03-17
RDT0150110	EPA/SCDHEC review of Rev 0 LUCIP	92	Feb-06-17	May-08-17
RDT0150310	EPA/SCDHEC return Rev 0 LUCIP comments	0		May-08-17
RDT0150350	Incorporate EPA/SCDHEC comments into Rev 1 Redline LUCIP	63	May-09-17	Jul-10-17
RDT0150460	Submit Rev 1 LUCIP to EPA/SCDHEC for Approval	0		Jul-10-17
RDT0150510	EPA/SCDHEC Final Review & Approval of LUCIP	30	Jul-11-17	Aug-09-17
RDT0150530	Receive EPA/SCDHEC Approval of LUCIP	0		Aug-09-17
RDT0150330	Prepare & Transmit Clean Copy of LUCIP	30	Aug-10-17	Sep-08-17
Final Remedial Action				
RDT0160015	Notification of Pre-Construction Briefing Fact Sheet	7	Aug-10-17	Aug-16-17
RDT0160020	Pre-Construction Briefing Fact Sheet Public Review	30	Aug-17-17	Sep-15-17
RDT0160035	Implement Land Use Controls	92	Nov-20-17	Feb-19-18
RDT0160025	RA Start	0	Nov-20-17	
Post Construction Report				
RDT0171200	Develop Rev 0 PCR	238	Feb-20-18	Oct-15-18
RDT0171210	Submit Rev 0 PCR to EPA/SDCDHEC for Review	0		Oct-15-18
RDT0171220	EPA/DHEC review of Rev 0 PCR	91	Oct-16-18	Jan-14-19
RDT0171230	EPA/SCDHEC returns comments Rev 0 PCR	0		Jan-14-19
RDT0171240	Incorporate EPA/SCDHEC comments into PCR	60	Jan-15-19	Mar-15-19
RDT0171250	Submit Rev 1 Redline PCR to EPA/SCDHEC for Appr	0		Mar-15-19
RDT0171260	EPA/SCDHEC Final Review/Approval of PCR	32	Mar-18-19	Apr-18-19
RDT0171270	Prepare & Transmit Certified Rev. 1 PCR	32	Apr-19-19	May-20-19

Figure 6. Post-EA ROD Implementation Schedule *(Continued/End)*

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Table 1. Summary of Administrative Paths for Area and Subunits in and Around the DAOU

	ADMINISTRATIVE PATH				
SUBUNIT/AREA	**EAROD**	**Final ROD**	**IOU**	**GW OU**	**Other**
Bubble Tower Subunit	X				
Moderator Processing Subunit	X				
Powerhouse Subunit		X			
489-D CPRB - northern 25%	X				
489-D CPRB - southern 75%		X			
484-D Powerhouse building		X			
484-10D WOF Building		X			
484-10D WOF environmental media		X			
ash sluice lines		X			
D Area Coal Pile		X			
483-D Combined Spills		X			
Miscellaneous Units					
D-001 Outfall				X	
D-006 Outfall (Petroleum Release Site)			X		
904-50G Outfall	X				
D Area Asbestos Pit (80-20G)	X				
DIPSLs	X				
Electrical Transformers	X				
Miscellaneous Buildings	X				
D Area Rubble Pit (431-2D)					Closed; DEXOU ROD 2004
D Area Oil Seepage Basin					Closed; DAOSB ROD 1998
Ash Basin (488-D)					Closed; DEXOU ROD 2004
Ash Basin (488-1D)					Operational: to be closed via IWT
Ash Basin (488-2D)					Operational: to be closed via IWT
Ash Basin (488-4D)					Operational; to be closed via SW permit
D Area Groundwater				X	

Note that the 484-D Powerhouse building, its environmental media, and its ancillary facilities (e.g., 484-10D WOF) are considered part of the Powerhouse Subunit and will be closed as part of the final DAOU ROD. The soil at the WOF will be removed under the Recovery Act removal action, but the final WOF site conditions and requirements will be documented in the final ROD. All other structures within the DAOU have been deactivated and decommissioned to grade with concrete slabs remaining at some locations.

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Table 2. Summary of DAOU Early Action RGs

	Subunit	Problem Warranting Action	Human Health RG	PTSM RG	Ecological RG	Contaminant Migration RG	SRS Background	Final Remedial Goals
Bubble Tower	► **717-D Maintenance Shop**	► Vadose zone soil is impacted by VOCs (primarily PCE) at concentrations (max. 8.6mg/kg) greater than CM thresholds (0.02 mg/kg).	NA	NA	NA	► PCE 20 µg/kg	NA	► PCE 20 ug/kg
Moderator Processing	► **420-D Concentrator Building Slab**	► The vadose zone and/or building concrete slabs/sumps are impacted with tritium at concentrations (max. concrete – 225,000 pCi/g and max. soil – 251,000 pCi/g) greater than CM thresholds (concrete – 68,000 pCi/g and soil – 120 pCi/g).	NA	NA	NA	► H3 Concrete 68,000 pCi/g ► H3 Soil 120 pCi/g	NA	► H3 Concrete 68,000 pCi/g ► H3 Soil 120 pCi/g
	► **420-2D Rework Handling Facility Building Slab**	► The vadose zone and/or building concrete slabs/sumps are impacted with tritium at concentrations (max. concrete – 99,600 pCi/g and max. soil – 4,720 pCi/g) greater than CM thresholds (concrete – 68,000 pCi/g and soil – 120 pCi/g).	NA	NA	NA	► H3 Concrete 68,000 pCi/g ► H3 Soil 120 pCi/g	NA	► H3 Concrete 68,000 pCi/g ► H3 Soil 120 pCi/g
	► **421-2D Moderator Handling and Storage Building Slab**	► The vadose zone is impacted with tritium at concentrations (max. 1,170pCi/g) greater than CM thresholds (120pCi/g).	NA	NA	NA	► H3 Soil 120 pCi/g	NA	► H3 Soil 120 pCi/g
Powerhouse	► **489-D Coal Pile Runoff Basin**	► Sediment is impacted with arsenic (max. 158mg/kg /PRG 1.59mg/kg) at concentrations exceeding 1E-06 that pose an exposure risk to a future industrial worker (risk = 1.9E-05). ► Sediment is impacted with arsenic (HQ = 2.8), 2-methylnaphthalene (HQ = 9.7) at concentrations exceeding an HQ of one that pose a risk to benthic organisms. ► Surface water is impacted with aluminum (HQ = 791), beryllium (HQ = 45), cobalt (HQ = 17), copper (HQ = 13), iron (HQ = 127), manganese (HQ = 41) and zinc (HQ = 5) at concentrations exceeding an HQ of 1 that pose a risk to aquatic organisms. In addition, the low pH conditions pose a risk to aquatic organisms, mammals, and birds.	► As 1.59 mg/kg	NA	**Sediments** ► As 8.2 mg/kg ► 2-Methylnapth. 0.07 mg/kg **Surface Water** ► Al 0.087 mg/L ► Be 0.00053 mg/L ► Co 0.023 mg/L ► Cu 0.00362 mg/L ► Fe 1.0 mg/L ► Mn 0.12 mg/L ► Zn 0.0327 mg/L ► pH 6.5-9.0	No longer a source due to dredging (2000). Groundwater contamination is present from previous source.	► *Arsenic 8.2 mg/kg	**Sediments** ► As 8.2 mg/kg ► 2-Methylnapth. 0.07 mg/kg **Surface Water** ► Al 0.087 mg/L ► Be 0.00053 mg/L ► Co 0.023 mg/L ► Cu 0.00362 mg/L ► Fe 1.0 mg/L ► Mn 0.12 mg/L ► Zn 0.0327 mg/L ► pH 6.5-9.0
Miscellaneous Units	► **D Area Asbestos Pit**	► Asbestos is present in the subsurface. It is important to prevent excavation that would expose humans to asbestos.	NA	NA	NA	NA	NA	NA

Notes:
LUCs will be implemented on the entire DAOU to prevent land disturbance activities and unrestricted land use.
When provided, SRS background concentrations will be used as the RG instead of the human health, ecological, or contaminant migration RG. See asterisked constituent/concentration in SRS Background column.

Acronyms/Symbols:

2-methylnaph. = 2-methylnaphthalene	Be = beryllium	Fe = Iron	max = maximum	Mn = manganese	pH = measure of acidity or basicity
Al = aluminum	Co = cobalt	H3 = tritium	mg/kg = miligram per kilogram	NA = not applicable	ug/kg = microgram per kilogram
As = arsenic	Cu = copper	HQ = hazard quotient	mg/L = miligram per liter	pCi/g = picocurie per gram	Zn = zinc

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Table 3. Summary of DAOU ARARs

Action	Requirements	Prerequisite	Citation(s)
Maintaining vegetative ground cover.	1. Closure. The termination of disposal operations at a Class Two landfill, whether the entire landfill site or a portion thereof, shall be in compliance with the following requirements.	Closure and long-term maintenance of the CPRB cover system – **relevant and appropriate**	SC. R. 61-107 Solid Waste Landfills and Structural Fill Closure and Post-Closure Care Subpart 19, Part IV (F)(1)
	a. Within one month following the last receipt of solid waste at a site or a part of the site, the application of final cover shall begin. A two foot thick final earth cover is required with at least a 3% but not greater than 5% surface slope, graded to promote positive drainage. The side slope cover shall not exceed three horizontal feet to one vertical foot, i.e., a 3:1 slope. Alternate final cover designs may be submitted for Department review and approval. Unless otherwise approved by the Department, the application of final cover shall be completed within six months of the last receipt of solid waste at the facility. The integrity of the final cover shall be maintained.		SC. R. 61-107 Subpart 19, Part IV (F)(1)(a)
	b. Testing for certification of cap closure by a South Carolina certified professional engineer shall be done at a rate of four thickness tests per acre as defined by best engineering and construction practices.		SC. R. 61-107 Subpart 19, Part IV (F)(1)(b)
	c. The storm water conveyance system for the landfill shall be designed to ensure that the system is capable of handling a 24-hour, 25-year storm event during the active life and post-closure period of the landfill.		SC. R. 61-107 Subpart 19, Part IV (F)(1)(c)
	d. The finished surface of the disposal area shall be seeded with native grasses or other suitable ground cover within 15 days of the completion of that portion of the landfill.		SC. R. 61-107 Subpart 19, Part IV (F)(1)(d)
Monitor groundwater	a. Groundwater detection monitoring is required at Class Two solid waste landfills. The detection monitoring program shall include at a minimum, monitoring for the constituents listed in Appendix III.	Groundwater Detection Monitoring Requirements – **relevant and appropriate**	SC. R. 61-107 Subpart 19, Part IV (F)(2)(a)

Table 3. Summary of DAOU ARARs *(Continued/End)*

Action	Requirements	Prerequisite	Citation(s)
Monitor groundwater	(1) The Department may require additional groundwater monitoring parameters for routine monitoring based on the chemical and physical nature of the waste stream received by the landfill.		SC. R. 61-107 Subpart 19, Part IV (F)(2)(a)(1)
	(2) The Department may delete specific monitoring parameters for a Class Two solid waste landfill if it can be shown that the constituent(s) are not reasonably expected to be contained in or derived from the waste contained in the unit. The deletion of specific constituents will be based on the permittee's knowledge of each waste stream disposed of in the facility and the operational controls of the facility.		SC. R. 61-107 Subpart 19, Part IV (F)(2)(a)(2)
Closure of an inactive asbestos waste disposal site for asbestos mills and manufacturing and fabricating operations	Cover the asbestos-containing waste with at least (6 in.) of compacted nonasbestos-containing material, and grow and maintain a cover of vegetation of the area adequate to prevent exposure of the asbestos containing waste	Disposal of asbestos-containing waste material – **Relevant**	40 CFR 61.151(a)(2)[1]
	Install and maintain warning signs as specified in 40 CFR 61.151(b); Alternative option under 40 CFR 61.151(c)		40 CFR 61.151(b) and 40 CFR 61.151(c)
Closure and post-closure care of landfills	Final cover must be designed and constructed to function with minimum maintenance; promote drainage and minimize erosion or abrasion of the cover; and accommodate settling and subsidence so that the cover's integrity is maintained.	Disposal of hazardous waste in landfill – **Relevant & Appropriate**	40 CFR 264.310(a)(2)-(4)
	Maintenance and monitoring throughout post-closure care period shall include maintaining the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events; and to prevent run-on and run-off from eroding or otherwise damaging the final cover.		40 CFR 264.310(b)(1) and (5)

[1] South Carolina DHEC Air Pollution Control Regulation 61-62.61 incorporates by reference the National Emissions Standards for Hazardous Air Pollutants (NESHAP) in 40 CFR Part 61, Subpart M, for asbestos.

Table 4. Comparison of DAOU Early Action Alternatives against the Seven Threshold Criteria

Criterion	Alternative 1 No Action	Alternative 2 Land Use Controls
Overall Protection of Human Health and the Environment		
Protection of Human Health	Not Protective	Protective
Protection of the Environment	Not Protective	Protective
Compliance with ARARs		
Chemical-Specific	Not Applicable	Not Applicable
Action-Specific	Not Applicable	Applicable to long-term maintenance of 489-D CPRB
Location-Specific	Not Applicable	Not Applicable
Long-Term Effectiveness and Permanence		
Magnitude of Residual Risks	Risks remain unchanged, not protective	Risks are reduced to acceptable levels by controlling exposure.
Adequacy of Controls	Not Adequate	Adequate
Permanence	Not Permanent	Permanent
Reduction of Toxicity, Mobility, or Volume Through Treatment		
Treatment Process	None	None
Degree of Expected Reduction in Toxicity, Mobility, or Volume	None	No reduction through treatment
Short-Term Effectiveness		
Risk to Remedial Workers	Not applicable; no remedial action involved.	None
Risk to Community	Not applicable; no remedial action involved.	None
Risks to Environment	Not applicable; no remedial action involved.	None
Estimated Time Frame to Achieve RAOs or concentration-based RGs	Does not achieve RAOs/RGs	1 month
Implementability		
Availability of Materials, Equipment, and Skilled Labor	Not Applicable	Straightforward; no specialized materials, equipment, and labor required
Ability to Construct and Operate the Remedial Technology	Not Applicable	Not Applicable
Ability to Obtain Permits/Approvals from Agencies	Not Applicable	Readily implemented
Ease of Undertaking Additional Actions	Compatible	Compatible
Time to Implement	Readily implementable	1 month
Cost		
Total Present-Worth Costs	$0	$2,284,505

Notes: Alternative 2 includes continuation of the Bubble Tower, Moderator Processing, and Powerhouse Subunits removal actions until RGs are met. At that time, LUCs will be implemented for the entire DAOU. LUC cost is calculated for a period of 200 years and is for the entire DAOU, including LUC costs at the removal action areas.

Table 5. Comparative Ranking of DAOU Early Action Alternatives

Alternative	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost
1 - No Action	No	No	Very Low	Very Low	Very Low	Very Low	$0
2 - Land Use Controls	Yes	Yes	Moderate	Very Low	Very Low	Very Low	$2,284,505
Note: Numeric range 1 - 5, where 1 = worst and 5 = best							

Table 6. Land Use Controls for the DAOU

Type of Control	Purpose of Control	Duration	Implementation	Affected Areas[a]
1. Property Record Notices[b]	Provide notice to anyone searching records about the existence and location of contaminated areas.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Notice recorded by USDOE in accordance with state laws at County Register of Deeds office if the property or any portion thereof is ever transferred to non-federal ownership.	At DAOU, where hazardous substances are left in place at levels requiring land use and/or groundwater restrictions.
2. Property record restrictions[c]: A. Land Use B. Groundwater	Restrict use of property by imposing limitations. Prohibit the use of groundwater.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Drafted and implemented by USDOE upon any transfer of affected areas. Recorded by USDOE in accordance with state law at County Register of Deeds office.	At DAOU, where hazardous substances are left in place at levels requiring land use and/or groundwater restrictions.
3. Other Notices[d]	Provide notice to city &/or county about the existence and location of waste disposal and residual contamination areas for zoning/planning purposes.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Notice recorded by USDOE in accordance with state laws at County Register of Deeds office if the property or any portion thereof is ever transferred to non-federal ownership.	At DAOU, where hazardous substances are left in place at levels requiring land use and/or groundwater restrictions.
4. Site Use Program[e]	Provide notice to worker/developer (i.e., permit requestor) on extent of contamination and prohibit or limit excavation/penetration activity.	As long as property remains under USDOE control	Implemented by USDOE and site contractors Initiated by permit request	At DAOU where levels requiring land use and/or groundwater restrictions.
5. Physical Access Controls[f] (e.g., fences, gates, portals)	Control and restrict access to workers and the public to prevent unauthorized access.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Controls maintained by USDOE.	Security is provided at site boundaries in accordance with SRS procedures.
6. Warning Signs[g]	Provide notice or warning to prevent unauthorized uses.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Signage maintained by USDOE.	Warning signs will be posted in accordance with applicable site procedures and will be placed in appropriate areas of the DAOU.
7. Security Surveillance Measures	Control and monitor access by workers/public.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Established and maintained by USDOE Necessity of patrols evaluated upon completion of remedial actions.	Security and surveillance measures are in place at the SRS boundary in accordance with RCRA permit requirements.

[a] Affected areas – Specific locations identified in the LUCIP or subsequent post-ROD documents.
[b] Property Record Notices – Refers to any non-enforceable, purely informational document recorded along with the original property acquisition records of USDOE and its predecessor agencies that alerts anyone searching property records to important information about residual contamination; waste disposal areas in the property.
[c] Property Record Restrictions – Includes conditions and/or covenants that restrict or prohibit certain uses of real property and are recorded along with original property acquisition records of USDOE and its predecessor agencies.
[d] Other Notices – Includes information on the location of waste disposal areas and residual contamination depicted on as survey plat, which is provided to a zoning authority (i.e., city planning commission) for consideration in appropriate zoning decisions for non-USDOE property.
[e] Site Use Program – Refers to the internal USDOE/USDOE contractor administrative program(s) that requires the permit requestor to obtain authorization, usually in the form of a permit, before beginning any excavation/penetration activity (e.g., well drilling) for the purpose of ensuring that the selected activity will not affect underground utilities/structures, or in the case of contaminated soil or groundwater, will not disturb the affected areas without the appropriate precautions and safeguards.
[f] Physical Access Controls – Physical barriers or restrictions to entry.
[g] Signs – Posted command, warning or direction.

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APPENDIX A

RESPONSIVENESS SUMMARY

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Responsiveness Summary

The 45-day public comment period for the Statement of Basis/Proposed Plan for the DAOU began on July 26, 2010 and ended on September 8, 2010.

Public Comments

The following comments were received from the public.

I am in the process of reviewing the SB/PP for D Area Operable Unit (DAOU) (U). The document is not understandable to the public. It is written poorly and uses codes only the governments can understand. There are so many abbreviation used in it that no member of the public can read it and respond to the decisions. The first thing I come to is five pages of referenced in small print. WHAT ARE THESE FOR? I get into the report in the Introduction and Background on page 1 and I am reading along getting interested and then it stops in mid sustenance. Page 2 is intentional left blank. The next few pages are associated with opportunities for the public to participate in earlier decisions, none were received by DOE, DHEC and I presume EPA. The process is broken. Figure 2 and Tables 1 are illegible. Now we finally get to the proposed action on page 14 and the text contains so many abbreviations that you lose interest. For example, the first paragraph on page 14 has the following abbreviations, LUC, DAOU, SB/PP, DAOU, SB/PP, and RG's, then references another illegible Figure that if I can make out some of it also has numerous abbreviations. If your public is not bored at this point, page 19 has more of the same. The text talks about the D-Ares Oil Seepage Basin as "not operable" with no further comment about what that means. Later I discovered that meant, it was not evaluated as part of this evaluation and will be considered later. If I go on further, that is not likely.

I finally got to something I was interested in on page 19; there is a short section on human risk assessment. It refers to the evaluated risk of 1E-06. This is using a series of codes developed by, I think EPA. I do not know how bad a risk of 1E-06 is. This analysis is unreasonable since it assumes a different future land use than DOE has repeatedly stated for all of the 300 square miles of land called Savannah River Site. As I understand it this assumes the land is in uncontrolled industrial usage. DOE has repeatedly stated they will maintain control of the land indefinitely and if transferred to

another owner will place land use restrictions on the land. The section on risk assessment is what the public is concerned about. I have not gotten beyond page 20 of this report. When I go on to the end, I will be surprised if my view of the document intent changes. I am particularly interested in D Area since I worked there in 1952.

Paul I would appreciate it if you would forward these comments to the appropriate people in DOE (both appropriate government people and the appropriate contractor people), DHEC and EPA. I think there is an appropriate lesson here, do not expect public comments on this quality document.

Lee Poe, Aiken Citizen

SRS Response

SRS developed the SB/PP in accordance with protocols agreed upon by the USEPA, SCDHEC, and USDOE. SRS is committed to improving public document quality so that the public can readily understand their content. To this end, from this point forward, SRS will be developing and issuing a fact sheet with each SB/PPs document to explain the waste units in layman terms. The fact sheets will summarize the investigation, risks analysis, feasibility evaluation, and preferred alternative such that the public may better grasp an understanding of the contents of the document.

APPENDIX B

DETAILED COST ESTIMATE

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Alternative 1
No Action
D Area OU
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		$0	
Contingency	20%	of direct 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)	30	year O&M period		*Years 2011 - 2041*	
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		$0	
Contingency	15%	of direct 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.

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Alternative 2
Early Action Land Use Controls
D Area OU
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
Plug Manhole Inverts and Grout Manholes	303	cy	$250	$75,750	
Institutional Controls					
Posting of Warning Signs	40	ea	$50	$2,000	
Early Action Land Use Control Implementation Plan	1	ea	$5,000	$5,000	
Deed Restrictions	1	ea	$5,000	$5,000	
Subtotal - Direct Capital Cost				$87,750	*
Mobilization/Demobilization	25%	of subtotal direct capital		$21,938	*
Site Preparation/Site Restoration	25%	of subtotal direct capital		$21,938	*
Total Direct Capital Cost		(sum of * items)		**$131,625**	
Indirect Capital Costs					
Engineering & Design	18%	of direct capital		$23,693	
Project/Construction Management	25%	of direct capital		$32,906	
Health & Safety	5%	of direct capital		$6,581	
Overhead	30%	of direct capital		$39,488	
Contingency	20%	of direct capital		$26,325	
Total Indirect Capital Cost				**$128,993**	
Total Estimated Capital Cost				**$260,618**	
Direct O&M Costs	2.7%	discount rate for costs > 30 years duration[1]			
Annual Costs (Existing System during Early Action ROD Design & Const)	1	years O&M		*Year 2011*	
Access Controls	1	ea	$500	$500	
Subtotal - Annual Costs				$500	
Present Worth Annual Costs (0.9% Discount Rate)				$496	
Annual Costs (Land Use Controls)	200	years O&M		*Years 2012 - 2212*	
Access Controls	1	ea	$500	$500	
Annual Inspections	1	ea	$5,000	$5,000	
Subtotal - Annual Costs				$5,500	
Present Worth Annual Costs (2.7% Discount Rate)				$197,386	
Five Year Costs	41				
Remedy Review	1	ea	$15,000	$15,000	
Subtotal - Five Year O&M Costs				$15,000	
Present Worth Five Year Costs				$104,824	
Total Present Worth Direct O&M Cost				**$302,705**	
Indirect O&M Costs					
Project/Admin Management	521%	of direct O&M		$1,577,095	
Health & Safety	3%	of direct O&M		$7,870	
Overhead	30%	of direct O&M		$90,812	
Contingency	15%	of direct O&M		$45,406	
Total Present Worth Indirect O&M Cost				**$1,721,182**	
Total Estimated Present Worth O&M Cost				**$2,023,888**	
TOTAL ESTIMATED COST				**$2,284,505**	

1. Interest rate for costs with duration < 30 years (i.e., before 2034) is based on SRNS's 25 August 2009 Technical Memorandum.

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