Savannah River Site

HIGH-LEVEL WASTE TANK CLOSURE

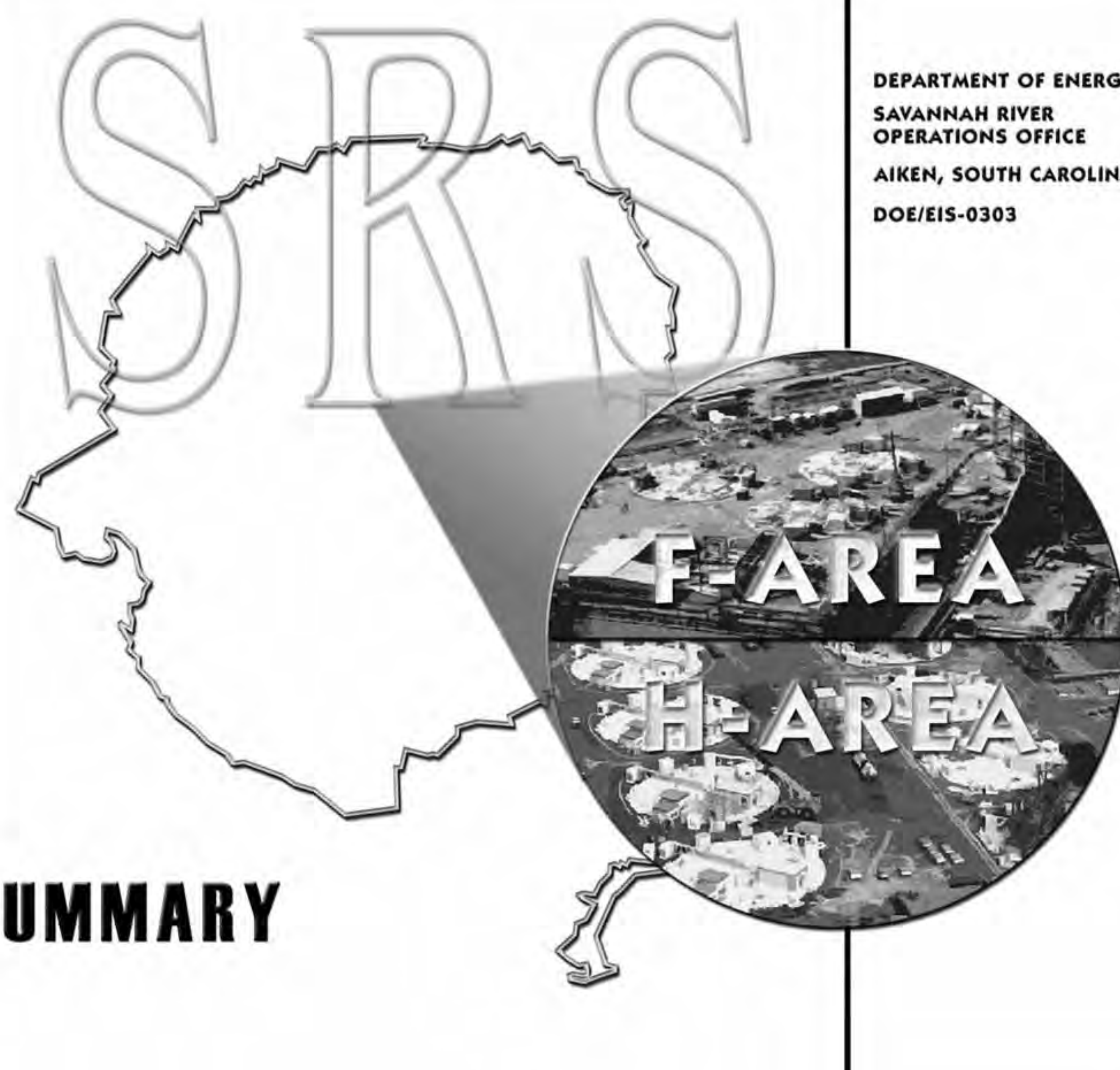
Final Environmental Impact Statement

DEPARTMENT OF ENERGY

SAVANNAH RIVER OPERATIONS OFFICE

AIKEN, SOUTH CAROLINA

DOE/EIS-0303



SUMMARY

May 2002

COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy (DOE)

TITLE: *Savannah River Site High-Level Waste Tank Closure Environmental Impact Statement* (DOE/EIS-0303), Aiken, South Carolina. EC

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ABSTRACT: DOE proposes to close the high-level waste (HLW) tanks at the Savannah River Site (SRS) in accordance with applicable laws and regulations, DOE Orders, and the *Industrial Wastewater Closure Plan for F- and H-Area High-Level Waste Tank Systems* (approved by the South Carolina Department of Health and Environmental Control), which specifies the management of residuals as waste incidental to reprocessing. The proposed action would begin after bulk waste removal has been completed. This EIS evaluates three alternatives regarding the HLW tanks at the SRS: the Stabilize Tanks Alternative (referred to as the Clean and Stabilize Tanks Alternative in the Draft EIS), the Clean and Remove Tanks Alternative, and the No Action Alternative. Under the Stabilize Tanks Alternative, the EIS considers three options for tank stabilization: Fill with Grout (Preferred Alternative), Fill with Sand, and Fill with Saltstone. TC TC

Under each alternative (except No Action), DOE would close 49 HLW tanks and associated waste handling equipment including evaporators, pumps, diversion boxes, and transfer lines. Impacts are assessed primarily in the areas of water resources, air resources, public and worker health, waste management, socioeconomic impacts, and cumulative impacts.

PUBLIC INVOLVEMENT: DOE issued the *High-Level Waste Tank Closure Draft Environmental Impact Statement* on November 24, 2000, and held a public comment period on the EIS through January 23, 2001. In preparing the Final EIS, DOE considered comments received via mail, fax, electronic mail, and transcribed comments made at public hearings held on Tuesday, January 9, 2001, in North Augusta, South Carolina, and on Thursday, January 11, 2001, in Columbia, South Carolina. Comments received and DOE's responses to those comments are found in Appendix D of this EIS. EC

OPERATIONAL SECURITY: Due to increased concerns about operational security after the events of September 11, 2001, Appendix E, which contains detailed information on the location, dimensions, and contents of the HLW tanks, is for Official Use Only. It will be made available on request to those who have a need to review this information. TC

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ABBREVIATIONS AND ACRONYMS, ABBREVIATIONS FOR MEASUREMENTS, USE OF SCIENTIFIC NOTATION, AND METRIC CONVERSION CHART

Abbreviations and Acronyms

EC

AEA	Atomic Energy Act of 1954
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DWPF	Defense Waste Processing Facility
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
FR	Federal Register
HLW	high-level waste
LLW	low-level waste
NEPA	National Environmental Policy Act
NRC	U.S. Nuclear Regulatory Commission
RCRA	Resource Conservation and Recovery Act
SCDHEC	South Carolina Department of Health and Environmental Control
SEIS	Supplemental Environmental Impact Statement
SRS	Savannah River Site

Abbreviations for Measurements

cfm	cubic feet per minute
cfs	cubic feet per second = 448.8 gallons per minute = 0.02832 cubic meter per second
cm	centimeter
gpm	gallons per minute
kg	kilogram
L	liter = 0.2642 gallon
lb	pound = 0.4536 kilogram
mg	milligram
µCi	microcurie
µg	microgram
pCi	picocurie
ºC	degrees Celsius = 5/9 (degrees Fahrenheit – 32)
ºF	degrees Fahrenheit = 32 + 9/5 (degrees Celsius)

Use of Scientific Notation

Very small and very large numbers are sometimes written using "scientific notation" or "E-notation" rather than as decimals or fractions. Both types of notation use exponents to indicate the power of 10 as a multiplier (i.e., 10^n, or the number 10 multiplied by itself "n" times; 10^{-n}, or the reciprocal of the number 10 multiplied by itself "n" times).

For example: $10^3 = 10 \times 10 \times 10 = 1{,}000$

$$10^{-3} = \frac{1}{10 \times 10 \times 10} = 0.001$$

In scientific notation, large numbers are written as a decimal between 1 and 10 multiplied by the appropriate power of 10:

4,900 is written $4.9 \times 10^3 = 4.9 \times 10 \times 10 \times 10 = 4.9 \times 1{,}000 = 4{,}900$
0.049 is written 4.9×10^{-2}
1,490,000 or 1.49 million is written 1.49×10^6

A positive exponent indicates a number larger than or equal to one; a negative exponent indicates a number less than one.

In some cases, a slightly different notation ("E-notation") is used, where "× 10" is replaced by "E" and the exponent is not superscripted. Using the above examples

$4{,}900 = 4.9 \times 10^3 = 4.9E{+}03$
$0.049 = 4.9 \times 10^{-2} = 4.9E{-}02$
$1{,}490{,}000 = 1.49 \times 10^6 = 1.49E{+}06$

Metric Conversion Chart

To convert into metric			To convert out of metric		
If you know	**Multiply by**	**To get**	**If you know**	**Multiply by**	**To get**
Length					
inches	2.54	centimeters	centimeters	0.3937	inches
feet	30.48	centimeters	centimeters	0.0328	feet
feet	0.3048	meters	meters	3.281	feet
yards	0.9144	meters	meters	1.0936	yards
miles	1.60934	kilometers	kilometers	0.6214	miles
Area					
sq. inches	6.4516	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.092903	sq. meters	sq. meters	10.7639	sq. feet
sq. yards	0.8361	sq. meters	sq. meters	1.196	sq. yards
acres	0.0040469	sq. kilometers	sq. kilometers	247.1	acres
sq. miles	2.58999	sq. kilometers	sq. kilometers	0.3861	sq. miles
Volume					
fluid ounces	29.574	milliliters	milliliters	0.0338	fluid ounces
gallons	3.7854	liters	liters	0.26417	gallons
cubic feet	0.028317	cubic meters	cubic meters	35.315	cubic feet
cubic yards	0.76455	cubic meters	cubic meters	1.308	cubic yards
Weight					
ounces	28.3495	grams	grams	0.03527	ounces
pounds	0.4536	kilograms	kilograms	2.2046	pounds
short tons	0.90718	metric tons	metric tons	1.1023	short tons
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths, then add 32	Fahrenheit

Metric Prefixes

Prefix	Symbol	Multiplication Factor
exa-	E	1 000 000 000 000 000 000 = 10^{18}
peta-	P	1 000 000 000 000 000 = 10^{15}
tera-	T	1 000 000 000 000 = 10^{12}
giga-	G	1 000 000 000 = 10^{9}
mega-	M	1 000 000 = 10^{6}
kilo-	k	1 000 = 10^{3}
centi-	c	0.01 = 10^{-2}
milli	m	0.001 = 10^{-3}
micro-	μ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}
femto-	f	0.000 000 000 000 001 = 10^{-15}
atto-	a	0.000 000 000 000 000 001 = 10^{-18}

Change Bars

Changes from the Draft EIS are indicated in this Final EIS by vertical change bars in the margins. The bars are marked TC for technical changes, EC for editorial changes or, if the change was made in response to a public comment, with an L for the designated comment number, as listed in Appendix D of the EIS.

TC

SUMMARY

S.1 Introduction

The U.S. Atomic Energy Commission, a U.S. Department of Energy (DOE) predecessor agency, established the Savannah River Site (SRS) near Aiken, South Carolina, in the early 1950s. The primary mission of SRS was to produce nuclear materials for national defense. With the end of the Cold War and the reduction in the size of the United States' stockpile of nuclear weapons, the SRS mission has changed. While national defense is still an important facet of the mission, SRS no longer produces nuclear materials and the mission is focused on material stabilization, environmental restoration, waste management, and decontamination and decommissioning of facilities that are no longer needed.

L-1-10 L-5-2 L-7-10 As a result of its nuclear materials production mission, SRS generated large quantities of high-level radioactive waste (HLW). The HLW resulted from dissolving spent reactor fuel and nuclear targets to recover the valuable radioactive isotopes. DOE had stored the HLW in 51 large underground storage tanks located in the F- and H-Area Tank Farms at SRS. DOE has emptied and closed two of those tanks. DOE is treating the HLW, using a process called vitrification. The highly radioactive portion of the waste is mixed with a glass like material and stored in stainless steel canisters at SRS, pending shipment to a geologic repository for disposal. This process is currently underway at SRS in the Defense Waste Processing Facility (DWPF).

The HLW tanks at SRS are of four different types, which provide varying degrees of protection to the environment due to different degrees of containment. The tanks are operated under the authority of the Atomic Energy Act of 1954 (AEA) and DOE Orders issued under the AEA. The tanks are permitted by the South TC Carolina Department of Health and Environmental Control (SCDHEC) under South Carolina wastewater regulations, which require permitted facilities to be closed after they are removed from service. DOE has entered into an agreement with the U.S. Environmental Protection Agency (EPA) and SCDHEC to close the HLW tanks after they have been removed from service. Closure of the HLW tanks would EC comply with DOE's responsibilities under the AEA and the South Carolina closure requirements and be carried out under a schedule agreed to by DOE, EPA, and SCDHEC.

There are several ways to close the HLW tanks. DOE has prepared this Environmental Impact Statement (EIS) to ensure that the public and EC DOE's decision makers have a thorough understanding of the potential environmental impacts of alternative means of closing the TC tanks. This Summary:

EC

- describes the HLW tanks and the closure process,
- describes the National Environmental Policy Act (NEPA) process that DOE is using to aid in decision making,
- summarizes the alternatives for closing the HLW tanks and identifies DOE's preferred alternative, and
- identifies the major conclusions regarding environmental impacts, areas of controversy, and issues that remain to be resolved as DOE proceeds with the HLW tank closure process.

S.2 High-Level Waste Storage and Tank Closure

S.2.1 HIGH-LEVEL WASTE

DOE Manual 435.1-1, which provides direction for implementing DOE Order 435.1, *Radioactive Waste Management*, defines HLW as "highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient

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S.2.2 HIGH-LEVEL WASTE MANAGEMENT AT THE SAVANNAH RIVER SITE

TC Currently, about 37 million gallons of HLW are stored in 49 underground tanks in two tank farms, the F-Area Tank Farm and the H-Area Tank Farm. Two additional tanks have been closed. The tank farms are in the central part of EC the SRS. Figure S-1 shows the locations of F and H Areas and the tank farms.

The HLW in the tanks is in three forms: sludge, salt, and liquid. The sludge is solid material that has precipitated and settled to the bottom of the tank. The salt is comprised of salt compounds[1] that have crystallized as a result of concentrating the liquid by evaporation. The liquid is a highly concentrated solution of salt compounds in water. Although some tanks contain all three forms, many tanks are considered primarily sludge tanks, while others are considered salt tanks, containing both salt and liquid. The sludge portion of the HLW is being transferred to the DWPF for vitrification in borosilicate TC glass. The glass is poured into stainless steel canisters at the DWPF and the filled and sealed canisters are stored nearby, pending shipment to a geologic repository. About 1,300 canisters have been filled and stored.

HLW management systems at SRS are designed to place the high-radioactivity fraction of the HLW in a form (borosilicate glass) that can be disposed of in a geologic repository, and to dispose of the low-radioactivity fraction that TC meets the Waste Incidental to Reprocessing requirements (see Section S.2.4) in vaults at the SRS. The proposed construction, operation and monitoring, and closure of a geologic repository at the Yucca Mountain site in Nevada is the L-4-13 subject of a separate EIS. As part of that process, DOE issued a Draft EIS for a geologic repository at Yucca Mountain, Nevada, in August 1999 (64 Federal Register [FR] 156), and a Supplement to the Draft EIS in May 2001 (66 FR 22540). The Final EIS was approved and DOE announced the electronic and reading room availability in February 2002 (67 FR 9048). The President has recommended to the Congress that the Yucca Mountain Site is suitable as a geologic repository. L-4-13 If the Yucca Mountain site is licensed by the Nuclear Regulatory Commission (NRC) for development as a geologic repository, current schedules indicate that the repository could begin receiving waste as early as 2010. DOE has not yet developed schedules for sending specific wastes, such as the glass-filled canisters, to the repository.

The salt and liquid portions of the HLW would be separated into high-radioactivity and low-radioactivity fractions as part of treatment. TC As described in the 1994 *Defense Waste Processing Facility Supplemental Environmental Impact Statement* (DOE/EIS-0082-S), an In-Tank EC Precipitation process would separate the salt and liquid portions of the HLW into high- and low-radioactivity fractions. The high-radioactivity fraction would be transferred to the DWPF for vitrification along with the sludge portion. The low-radioactivity fraction that meets the Waste Incidental to Reprocessing requirements (see TC Section S.2.4) would be transferred to the Saltstone Manufacturing and Disposal Facility in Z Area and mixed with grout to make a concrete-like material to be disposed of in vaults at SRS.

Since issuance of that Supplemental EIS, DOE has concluded that the In-Tank Precipitation process, as currently configured, cannot achieve production goals and meet safety requirements for processing the salt portion of HLW. Therefore, in February 1999, DOE issued a Notice of Intent (64 FR 8558; February 22, 1999) to prepare a second Supplemental EIS (SEIS), *High-Level Waste Salt Processing Alternatives at the Savannah River Site* L-4-14 (DOE/EIS-0082-S2). This SEIS analyzed the impacts of constructing and operating facilities for four alternative processing technologies. The Final Salt Processing Alternatives SEIS was

[1] A salt is a chemical compound formed when one or more hydrogen ions of an acid are replaced by metallic ions. Common salt, sodium chloride, is a well-known salt.

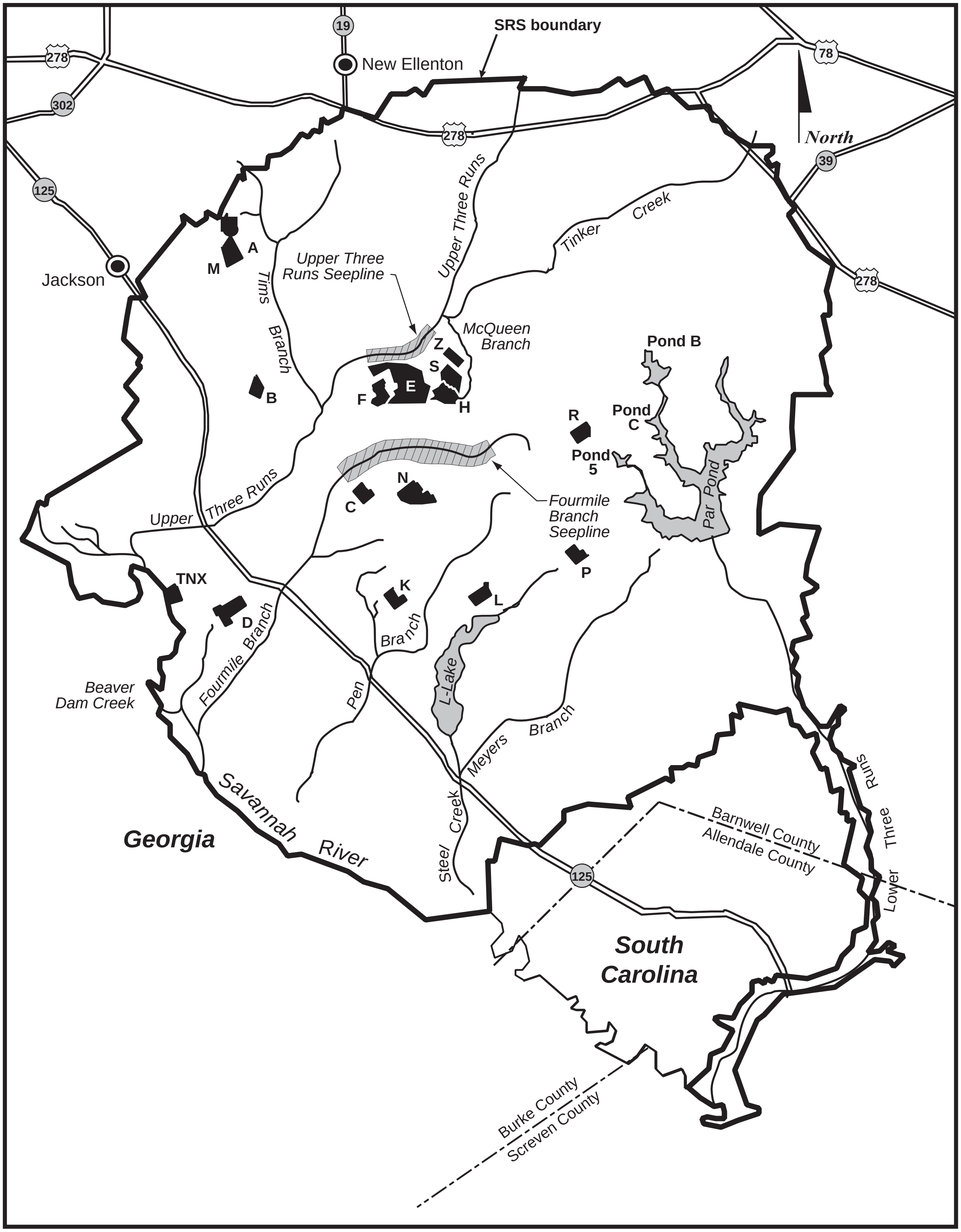

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Figure S-1. Savannah River Site map. F and H Areas are in the upper center.

issued in July 2001 (66 FR 37957; July 20, 2001) and the Record of Decision in October 2001 (66 FR 52752; October 17, 2001). DOE selected the Caustic Side Solvent Extraction Alternative for separation of radioactive cesium L-4-14 from SRS salt wastes. Selecting a salt processing technology was necessary in order to empty the tanks and allow tank closure to proceed. Figure S-2 shows the current configuration of the SRS HLW management system.

S.2.3 HIGH-LEVEL WASTE TANKS AND TANK FARMS

The F-Area Tank Farm is a 22-acre site that contains 20 active waste tanks, 2 closed waste tanks (Tanks 17 and 20), evaporator systems, transfer pipelines, diversion boxes, and pump pits. Figure S-3 shows the general layout of the EC F-Area Tank Farm. The H-Area Tank Farm is a 45-acre site with 29 active waste tanks, evaporator systems (including the new Replacement High-Level Waste Evaporator), the Extended Sludge Processing Facility, transfer pipelines, diversion boxes, and pump pits. Figure S-4 shows the general layout of the H-Area Tank Farm.

The HLW tanks are of four different designs, all constructed of carbon-steel inside reinforced concrete containment vaults. The major design features of each tank design are shown in Figure S-5.

EC There are 12 Type I tanks that were built in 1952 and 1953. These tanks have partial height secondary containment and active cooling. The tank tops are below grade, and the bottoms of EC Tanks 1 through 8 are above the seasonal high water table. The bottoms of Tanks 9 through 12 in H Area are in the water table. Tanks 1, 5, 6, and 9 through 12 are known to have leak sites where waste has leaked from the primary to the TC secondary containment. The leaked waste is kept dry by air circulation and there is no evidence that the waste has leaked from the secondary containment. The level of waste in TC these tanks has been lowered to below the leak sites. Four Type II tanks, Tanks 13 through 16, EC were built in 1956. These tanks have partial-height secondary containment and active cooling. These tanks are above the seasonal water table. All four tanks have known leak sites where waste has leaked from the primary to the secondary containment. In Tank 16, tens of gallons of waste overflowed the annulus pan (secondary containment) and migrated into the surrounding soil in 1962. Waste removal from the Tank 16 primary vessel was completed in 1980. DOE removed some waste from the annulus at that time, but some dry waste still remains in the annulus.

The SRS Citizen's Advisory Board recommendation (January 23, 2001) regarding annulus cleaning stated the Board's concern that SRS appears to be placing a low priority on annulus cleaning. DOE responded to this recommendation (February 8, 2001) stating, "the Savannah River Operations Office considers the issue of removal of waste from the tank annulus L-5-3 to be important to the long-term success of the HLW Tank Closure Program." The response further states, "However, the development of methods for removal of waste from the tank annulus as part of the longer term effort to close Tank 14 reflects a balanced and responsive approach to solving this important challenge." This conclusion is valid for closure of all tanks that have annuli.

Eight Type IV tanks, Tanks 17 through 24, were built between 1958 and 1962. These tanks have single steel walls and do not have active cooling. Tanks 17 through 20 are slightly above the water EC table. Tanks 19 and 20 have known cracks that are believed to have been caused by groundwater corrosion of the tank walls in the past. Interior photographic inspections have indicated that small amounts of groundwater L-7-12 have leaked into these tanks, but there is no evidence that waste ever leaked out. The level of the waste in Tank 19, which is the next tank TC scheduled to be closed, is below these cracks. Tanks 17 and 20 have been closed in the manner described in the Fill with Grout Option of the Stabilize Tanks Alternative evaluated in this EIS. Tanks 21 through 24 are above the EC groundwater table, but are in a perched water table, caused by the original construction of the tank area.

TC

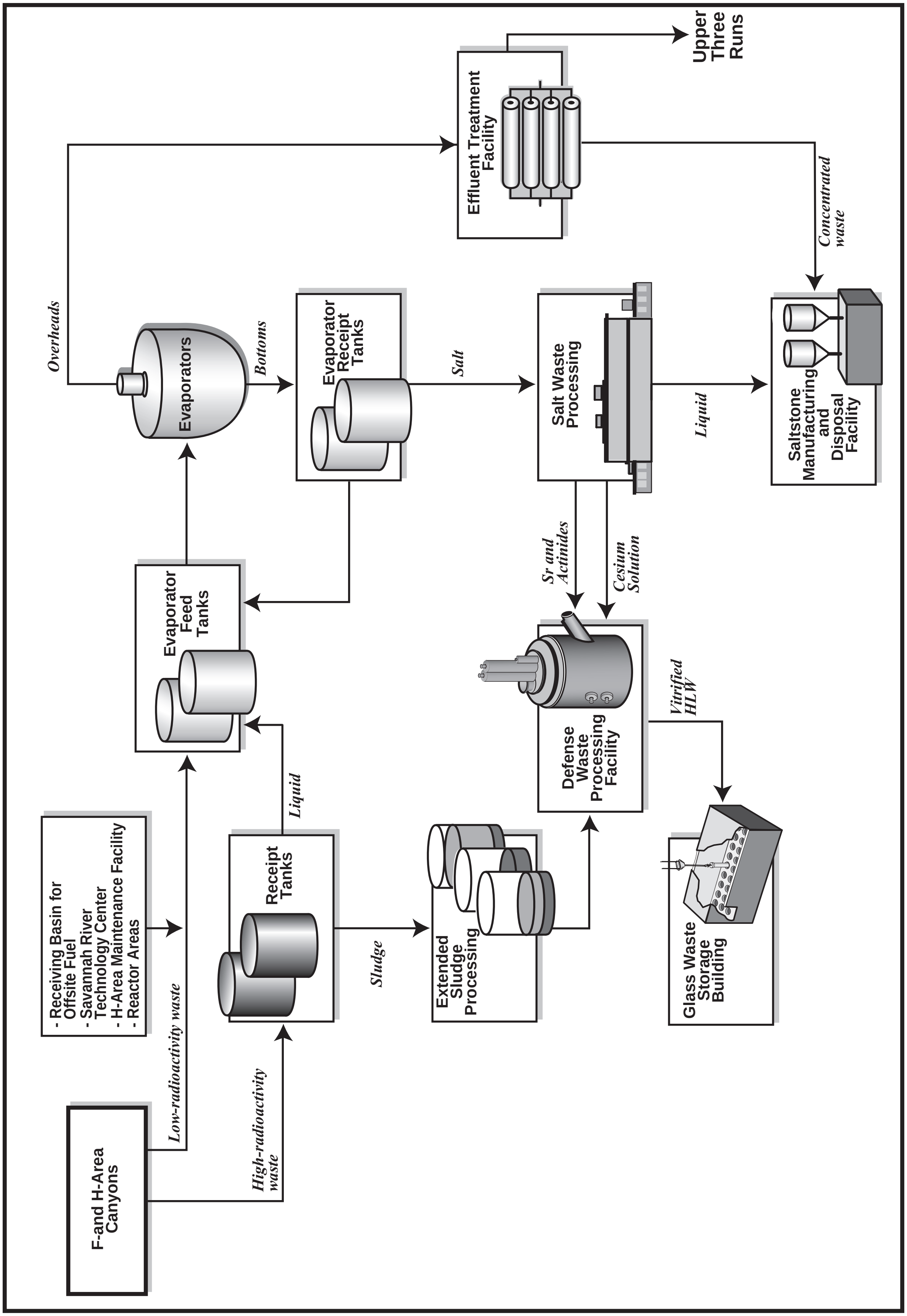
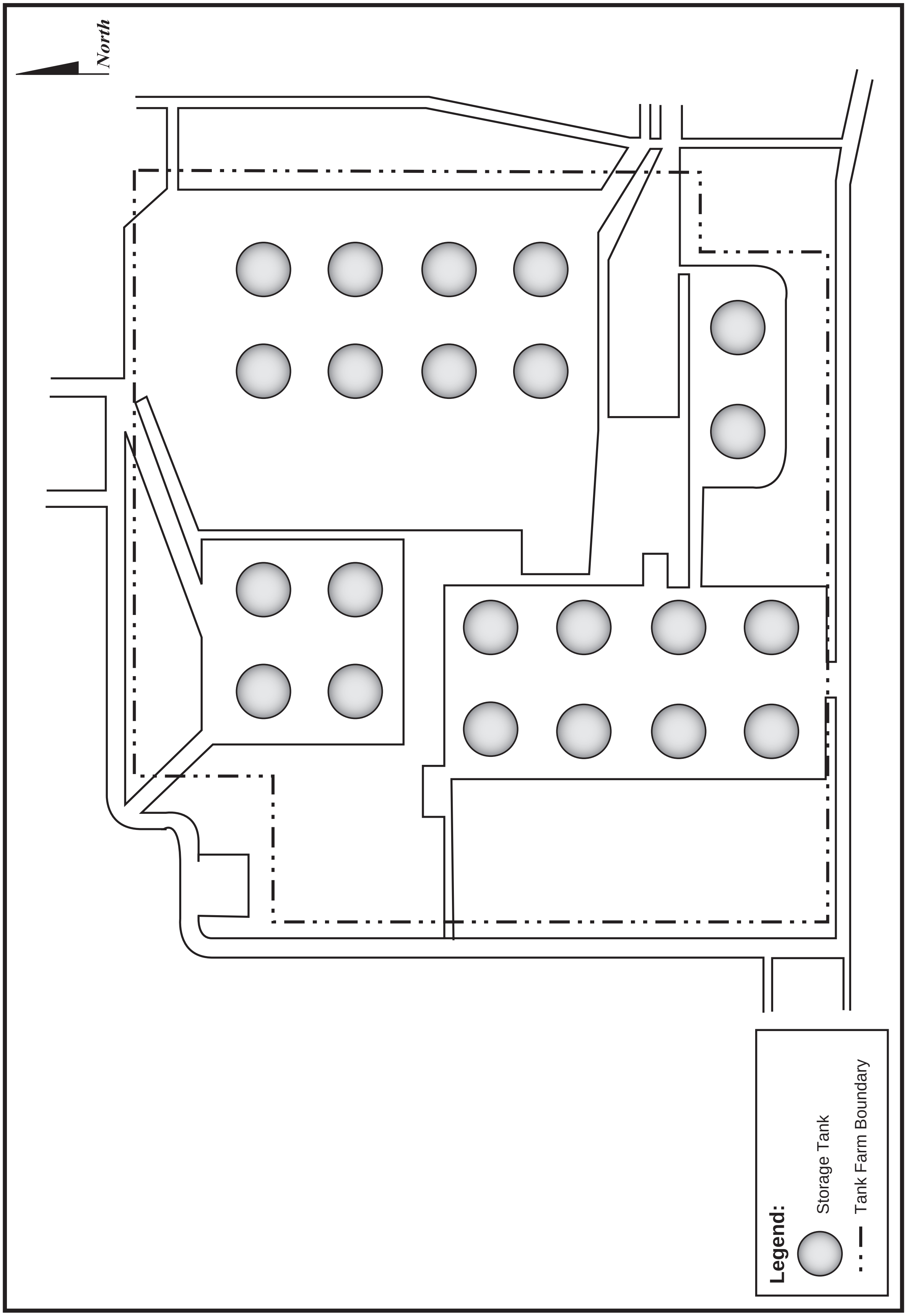


Figure S-2. Process flows for Savannah River Site high-level waste management system.

TC



NW TANK/Grfx/Sum/S-3 F_Tank.ai

Figure S-3. General layout of F-Area Tank Farm.

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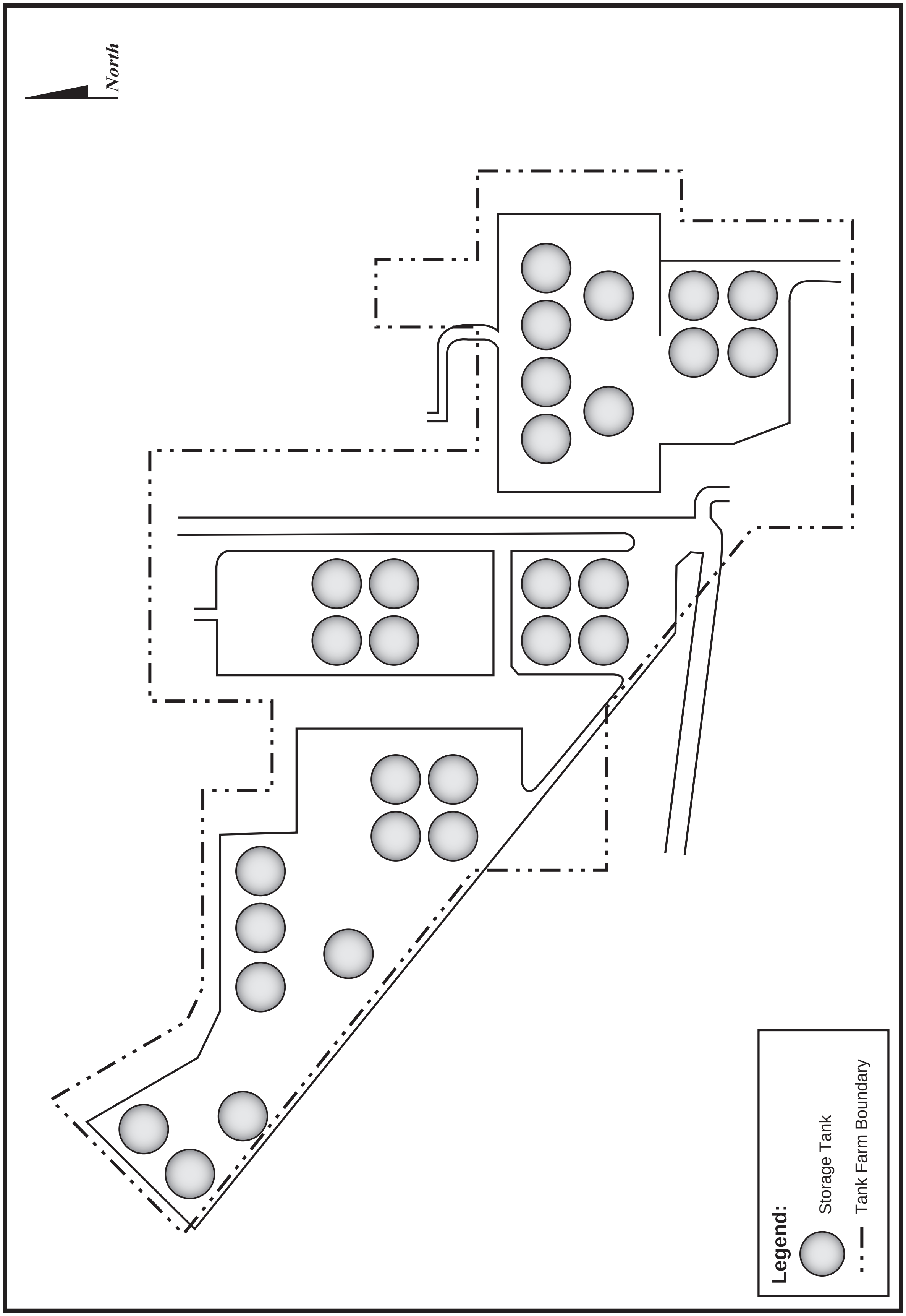

NW TANK/Grfx/Sum/S-4 H_Tank.ai

Figure S-4. General layout of H-Area Tank Farm.

TC

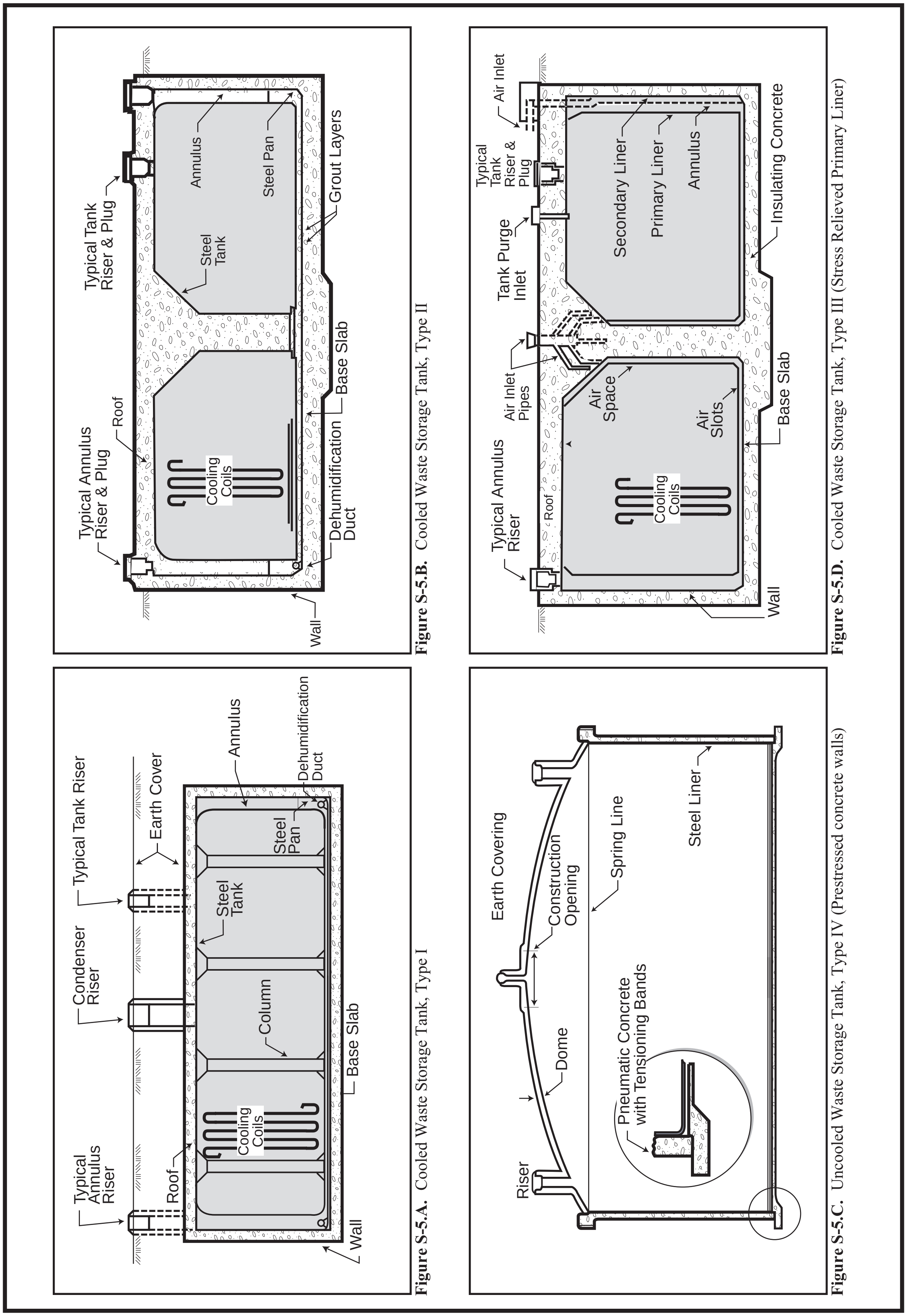

Figure S-5.A. Cooled Waste Storage Tank, Type I

Figure S-5.B. Cooled Waste Storage Tank, Type II

Figure S-5.C. Uncooled Waste Storage Tank, Type IV (Prestressed concrete walls)

Figure S-5.D. Cooled Waste Storage Tank, Type III (Stress Relieved Primary Liner)

NW TANK/Grfx/Sum/S-5 Tank config.ai

Figure S-5. Tank configurations.

The newest design, Type III tanks, have a full-height secondary tank and active cooling. L-7-13 During construction, the Type III tanks were stress relieved (heat treated to remove residual stresses in the metal introduced during the manufacturing process) to eliminate the high stresses that promote stress corrosion cracking. EC These 27 tanks were placed in service between 1969 and 1986. All Type III tanks are above the L-2-6 water table. No leaks have been observed in the Type III tanks.

S.2.4 HIGH-LEVEL WASTE TANK CLOSURE

Tank closure would begin when bulk waste has been removed from a HLW tank system (a tank and its associated piping and equipment) for treatment and disposal.

L-7-14 DOE has analyzed the environmental impacts of bulk waste removal from the HLW tanks in the *Waste Management Operations, Savannah River Plant EIS* (ERDA-1537) and the *Long-term Management for Defense High-Level Radioactive Wastes (Research and Development Program for Immobilization) Savannah River Plant EIS* (DOE/EIS-0023). In addition, the *SRS Waste Management EIS* (DOE/EIS-0217) discusses HLW management activities as part of the No Action Alternative (i.e., continuing the present course of action), and the *Defense Waste Processing Facility Savannah River Plant EIS* EC (DOE/EIS-0082), the *Defense Waste Processing Facility Final Supplemental Environmental Impact Statement* (DOE/EIS-0082-S), and the *Savannah River Site Salt Processing Alternatives Supplemental Environmental* EC *Impact Statement* (DOE/EIS-0082-S2) discuss management of HLW after it is removed from the tanks.

In accordance with the SRS Federal Facility Agreement between DOE, EPA, and SCDHEC, DOE intends to remove the tanks from service as their storage missions are completed. DOE is obligated to close 24 tanks that do not meet the EPA's secondary containment standards under the Resource Conservation and Recovery Act (RCRA) by 2022. The 24 Type I, II, and IV tanks have been or will be removed from service before the 27 Type III tanks. Type III tanks will remain in service until there is no further need for them, which DOE currently anticipates would occur before the year 2030.

The HLW tank systems at SRS are operated in accordance with a permit issued by SCDHEC under the authority of the South Carolina Pollution Control Act as industrial wastewater treatment facilities. DOE is required to close the tank systems in accordance with AEA requirements (i.e., DOE Orders) and South Carolina Regulation R.61-82, "Proper Closeout of Wastewater Treatment Facilities." This regulation requires that closures be carried out according to site-specific guidelines established by SCDHEC to prevent health hazards and to promote safety in and around the tank systems. DOE has adopted a general strategy for HLW tank system closure, set forth in DOE's 1996 *Industrial Wastewater Closure Plan for the F- and H-Area High-Level Waste Tank Systems*, known as the General Closure Plan. The General Closure Plan has been approved by SCDHEC.

The General Closure Plan identifies the resources (e.g., groundwater, air) potentially affected by contaminants remaining in the tanks after waste removal and closure, describes how the tank systems and residual wastes would be stabilized, and identifies Federal and State regulations and guidance that apply to the closures. The Plan describes the use of fate and transport models to calculate potential environmental exposure concentrations or radiological dose rates from the residual waste left in the tank systems. The General Closure Plan describes the method DOE will use to make sure the impacts of closure of individual tank systems do not exceed the environmental standards that apply to the entire F- and H-Area Tank Farms. Chapter 7 of this EIS gives more detail on the development of the General Closure Plan and the environmental standards that apply to closure of the HLW tanks.

Several issues related to the HLW tank closure program will be resolved after DOE selects an overall tank closure approach based on this EIS. L-4-12 These issues will be addressed during the tank-by-tank implementation of the closure decision, and include: (1) performance objectives for each tank that allow the cumulative closure to meet the overall performance standard; (2) the regulatory status of residual waste in each tank, through a determination whether it is "waste incidental to reprocessing;" (3) use of cleaning methods such as spray water washing or oxalic acid cleaning, if needed to meet a tank's performance objective; and (4) cleaning methods for tank secondary containment (annulus), if needed. These issues are discussed in greater L-4-12 detail below. (In addition, DOE is assessing the contributions to risk from non-tank sources in the H-Area Tank Farm. Although the long-term impacts presented in this EIS consider the contributions of non-tank sources, further characterization and modeling of contributions from other sources may result in the refinement of performance objectives. An issue to be addressed after tank closure is the long-term management of the area, which DOE will consider under the RCRA/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) processes as part of its environmental restoration program).

Performance Objective

Under the action alternatives, DOE will establish performance objectives for closure of each HLW tank. Each performance objective will correspond to an overall performance standard identified in the General Closure Plan and will ensure that the overall performance standard can be met. For example, if the performance standard for drinking water in the receiving TC stream is 4 millirem per year, the combined contribution from contaminants from all tanks will not exceed the 4-millirem-per-year limit. DOE will evaluate closure options for specific tanks to determine whether use of a specific EC closure option will allow DOE to meet the overall performance standard. Based on this analysis, DOE will develop a Closure Module (a tank-specific closure plan) for each HLW tank such that the performance objectives for the tank can be met. The Closure Module must be approved by SCDHEC before tank closure can begin.

Waste Incidental to Reprocessing

An important issue associated with tank closure and a subject of controversy, is the determination of the regulatory status of residual waste in the tanks. Before bulk waste removal, the content of the tanks is defined as HLW. The goal of the bulk waste removal and, if needed, subsequent cleaning of the tanks is to remove as much waste as can reasonably be removed. TC

Waste Incidental to Reprocessing Determination

The two processes for determining if waste can be considered incidental to reprocessing are "citation" and "evaluation." Waste incidental to reprocessing by "citation" includes spent nuclear fuel processing plant wastes that meet the description included in the U.S. Nuclear Regulatory Commission's Notice of Proposed Rulemaking (34 FR 8712; June 3, 1969) for promulgation of proposed Appendix D, 10 CFR Part 50, Paragraphs 6 and 7 that later came to be referred to as "waste incidental to reprocessing." These radioactive wastes are the result of processing plant operations such as, but not limited to, contaminated job wastes `such as laboratory items (i.e., clothing, tools, and equipment).

The DOE Radioactive Waste Manual (DOE M 435.1-1, Chapter II, B(2)) states:

"Determinations that any waste is incidental to reprocessing by the evaluation process shall be developed under good record-keeping practices, with an adequate quality assurance process, and shall be documented to support the determinations. Such wastes may include, but are not limited to, spent nuclear fuel reprocessing plant wastes that:

(a) Will be managed as low-level waste and meet the following criteria:
1. Have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical; and
2. Will be managed to meet safety requirements comparable to the performance objectives set out in 10 CFR Part 61; and
3. Are to be managed, pursuant to DOE's authority under the *Atomic Energy Act of 1954*, as amended, and in accordance with the provisions of Chapter IV of this Manual [DOE M 435.1-1], provided the waste will be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C low-level waste as set out in 10 CFR 61.55, Waste Classification; or will meet alternative requirements for waste classification and characterization as DOE may authorize. TC

(b) Will be managed as transuranic waste and meet the following criteria:
1. Have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical; and
2. Will be incorporated in a solid physical form and meet alternative requirements for waste classification and characteristics, as DOE may authorize; and
3. Are managed pursuant to DOE's authority under the *Atomic Energy Act of 1954*, as amended, in accordance with the provisions of Chapter III of this Manual [DOE M 435.1-1], as appropriate."

In July 1999, DOE issued Order 435.1, *Radioactive Waste Management*, and the associated *Manual* and *Implementation Guide*. DOE Manual 435.1-1 prescribes two processes, by citation or by evaluation (see text box), for determining that waste resulting from reprocessing spent nuclear fuel can be considered "waste incidental to reprocessing."

According to Order 435.1, waste resulting from reprocessing spent nuclear fuel that is determined to be incidental to reprocessing is not HLW, and shall be managed under DOE's regulatory authority in accordance with requirements for transuranic waste or low-level waste (LLW), and all other Federal or state regulations as appropriate.[2] Section 7.1.3 of this EIS discusses the waste incidental to reprocessing process in more detail.

<u>HLW Tank Cleaning</u>

Following bulk waste removal, DOE would clean the tanks, if necessary, to meet the performance objectives contained in the General Closure Plan and the tank-specific Closure Module. In accordance with the General Closure Plan, the need for and the extent of any tank cleaning would be determined based on the analysis presented in the tank-specific Closure Module. DOE estimates that bulk waste removal would result in removal of 97 percent of the total radioactivity in the tanks.

On a tank-by-tank basis, using performance and historical data, DOE would determine whether bulk waste removal, with water washing as appropriate, would meet Criterion 1 for removal of key radionuclides to the extent "technically and economically practical" (DOE Manual 435.1-1). If any criterion could not be met, cleaning methods, such as spray water washes or oxalic acid cleaning, could be employed. As part of each tank-specific closure module, DOE will evaluate the long-term human health impacts of further waste removal versus the additional economic costs.

Tank cleaning by spray water washing involves washing each tank, using hot water in rotary spray jets. The spray nozzles can remove waste near the edges of the tank that is not readily removed by slurry pumps. After spraying, the contents of the tank would be agitated with slurry pumps and the subsequent liquid pumped out of the tank. This process has been demonstrated on Tanks 16 (which has not been closed) and 17 (which has been closed). If modeling evaluations showed that performance objectives could not be met after an initial spray water washing, additional spray water washes would be used prior to employing other cleaning techniques.

If Criteria 2 and 3 could not be met using spray water washing, other cleaning techniques could be employed. These techniques could include mechanical methods, oxalic acid cleaning, or other chemical cleaning methods. If oxalic acid cleaning were chosen, hot oxalic acid would be sprayed through the spray nozzles that were used for spray water washing. Oxalic acid has been demonstrated in Tank 16 only, and shown to provide cleaning that is much more effective than spray water washing for removal of radioactivity (See Table S-1). However, oxalic acid cleaning costs far more than water washing, and there are important technical constraints on its use. Use of oxalic acid in an HLW tank would require successfully demonstrating that dissolution of HLW sludge solids by the acid would not create a potential for a nuclear criticality.

The potential for nuclear criticality is one significant technical constraint on the practicality of chemical cleaning (such as with oxalic acid). Concern about potential criticality would not preclude using chemical cleaning. However, a thorough, tank-specific evaluation

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[2] The Natural Resources Defense Council (NRDC) filed a Petition in the Idaho District Court on August 15, 2001, asking the Court to review DOE Order 435.1 and claiming that the Order is "arbitrary, capricious, and contrary to law." The U.S. Nuclear Regulatory Commission, in responding to a separate petition from the NRDC, has concluded that DOE's commitments to (1) clean up to the maximum extent technically and economically practical, and (2) meet performance objectives consistent with those required for disposal of low-level waste, if satisfied, should serve to provide adequate protection of public health and safety (65 FR 62377; October 18, 2000).

Table S-1. Tank 16 waste removal process and curies removed with each sequential step.

L-7-16

Sequential Waste Removal Step	Curies Removed	Percent of Curies Removed	Cumulative Curies Removed	Cumulative Percent Curies Removed
Bulk Waste Removal	2.74×10^6	97%	2.74×10^6	97%
Spray Water Washing	2.78×10^4	0.98%	2.77×10^6	97.98%
Oxalic Acid Wash & Rinse	5.82×10^4	2%	2.83×10^6	99.98%

TC for criticality would need to be done before using chemical cleaning in any tank and may result in the identification of additional tank-specific controls to ensure prevention of criticality.

TC Also, extensive chemical cleaning could affect downstream waste processing activities (DWPF and salt disposition). For example, the presence of oxalates in the waste feed to DWPF that would result from oxalic acid cleaning would adversely affect the quality of the glass, and special batches of the salt disposition process could be required to control the sodium oxalate concentration.

TC <u>**Cleaning of Secondary Containment**</u>

Nine HLW tanks have leaked measurable amounts of waste from primary containment to secondary containment, with only one leaking to the soil surrounding the tanks. For these tanks, the waste would be removed from the secondary containment using water and/or steam. Such cleaning has been attempted at SRS on only one tank (Tank 16), and the operation was only about 70 percent completed, because salts mixed with sand (from sandblasting of tank welds) made salt removal more difficult. Cleaning of the secondary containment is not a demonstrated technology and new techniques may need to be developed. The amount of waste that would
L-7-17 remain in secondary containment after bulk waste removal and cleaning is small, so the environmental risk of this waste is minimal com-
EC pared to the amount of residual waste that would be contained inside the tanks.

S.3 NEPA Process

NEPA provides Federal decision makers with a process to use when considering the potential environmental impacts of proposed actions and alternatives. This process also provides several ways the public can be informed about and influence the selection of an alternative.

In 1995, DOE began preparations for closure of the HLW tanks. DOE prepared the *Industrial Wastewater Closure Plan for F- and H-Area High-Level Waste Tank Systems*. At the same time, DOE prepared the *Environmental Assessment for the Closure of the High-Level Waste Tanks in F- and H-Areas at the Savannah River Site* (DOE/EA-1164). In a Finding of No Significant Impact signed on July 31, 1996, DOE concluded that closure of the HLW tanks in accordance with the General Closure Plan would not result in significant environmental impacts. Since that time DOE has closed Tanks 17 and 20.

DOE re-examined the 1996 Tank Closure Environmental Assessment and decided to prepare an EIS before any additional HLW tanks are closed at SRS. This decision was based on several factors, including a desire to more TC
thoroughly explore the environmental impacts from closure and to open a new round of information sharing and dialogue with stakeholders. In the December 29, 1998, Federal Register, DOE published a Notice of Intent (NOI) to prepare an EIS on closure of the HLW tanks (63 FR 71628). Publication of the EC
NOI began a 45-day public scoping period. DOE held public scoping meetings on January 14, 1999, in North Augusta, South Carolina, and on January 19, 1999, in Columbia, South Carolina. DOE considered comments received during the scoping period in preparing TC
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S.4 Purpose and Need

DOE needs to reduce human health and safety risks at and near the HLW tanks, and to reduce the eventual introduction of contaminants into the environment. If DOE does not take action after bulk waste removal, the tanks would fail and contaminants would be released to the environment. Failed tanks would present the L-2-9 risk of accidents to individuals and could lead to L-2-4 surface subsidence, which could open the tanks to intrusion by water or plants and animals. Release of contaminants to the environment would present human health risks, particularly to individuals who might use contaminated water, in addition to adverse impacts to the environment.

S.5 Decisions to be Based on This EIS

This EIS provides an evaluation of the environmental impacts of several alternatives for closure of the HLW tanks at SRS. The closure process will take place over a period of up to 30 years. The EIS provides the decision makers with an assessment of the environmental, health, and safety effects of each alternative. The selection of one or more tank closure TC alternatives, following completion of this EIS, will guide the selection and implementation of a closure method for each HLW tank at SRS. Within the framework of the selected alternative(s), and the environmental impact of TC closure described in the EIS, DOE will select and implement a specific closure method for each tank.

In addition to the closure methods and impacts described in this EIS, the tank closure program will operate under a number of laws, regulations, and regulatory agreements. In addition to the General Closure Plan (a document prepared by DOE and based on responsibilities under the AEA and other laws and regulations and approved by SCDHEC), the closure of individual tanks will be performed in accordance with a tank-specific Closure Module. Each Closure Module will incorporate a specific plan for tank closure and modeling of impacts based on that plan. Through the process of preparing and approving each Closure Module, DOE will select a closure method that is consistent with the alternative(s) selected after completion of this EIS. The aggregate environmental impacts TC of closing all the tanks would be equal to or less than those described in this EIS.

During the expected 30-year period of tank closure activities, new technologies for tank cleaning or other aspects of the closure process may become available. In a tank-specific Closure Module, DOE would evaluate the TC technical, regulatory, and performance implications of any new technology.

S.6 Proposed Action and Alternatives

DOE proposes to close the HLW tanks at SRS in accordance with applicable laws and regulations, DOE Orders, and the *Industrial Wastewater Closure Plan for F- and H-Area High-Level Waste Tank Systems* approved by SCDHEC, which specifies the management of residuals as waste incidental to reprocessing. The proposed action evaluated in this EIS would begin when bulk waste removal has been completed. Under each alternative except No Action, DOE would close 49 HLW tanks and associated waste handling equipment including evaporators, pumps, diversion boxes, and transfer lines.

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DOE is evaluating three alternatives in this EIS.

Tank Closure Alternatives

Implementation of each alternative would start following bulk waste removal and SCDHEC approval of a tank-specific Closure Module that is protective of human health and the environment.

- Fill the tanks with grout (Preferred Alternative). The use of sand or saltstone as fill material would also be considered.
- Clean and remove the tanks for disposal in the SRS waste management facilities.
- No Action. Leave the tank systems in place without cleaning or stabilizing, following bulk waste removal.

S.6.1 STABILIZE TANKS ALTERNATIVE

In the Draft EIS this Alternative was called the Clean and Stabilize Tanks Alternative. In order to provide flexibility for the closure process, DOE has changed the name to the Stabilize Tanks Alternative. If bulk waste removal is effective in removing waste from the tanks to the extent that performance objectives could be met and the Waste Incidental to Reprocessing process could be completed, DOE would not spray water wash the tanks, or use enhanced cleaning methods. A decision to forego cleaning would require the agreement of the SCDHEC in the form of an approved tank closure module.

Following bulk waste removal, DOE would clean the tanks, if necessary, to meet the performance objectives and fill the tanks with a material that would bind up remaining residual waste and prevent future collapse of the tanks. DOE considers three options for tank stabilization under this alternative:

- Fill with Grout (Preferred Alternative)
- Fill with Sand
- Fill with Saltstone

In the evaluation phase of tank closure, each tank system or group of tank systems would be evaluated to determine the inventory of radiological and nonradiological contaminants remaining after bulk waste removal. This information would be used to conduct a performance evaluation as part of the preparation of a Closure Module. In the evaluation DOE would consider: (1) the types of contamination in the tank and the configuration of the tank system, and (2) the hydrogeologic conditions at and near the tank location, such as distance from the water table and distance to nearby streams. The performance evaluation would include modeling the projected contamination pathways for selected closure methods, and comparing the modeling results with the performance objectives developed in the General Closure Plan. If the modeling shows that performance objectives would be met, the Closure Module would be submitted to SCDHEC for approval.

If the modeling shows that the performance objectives would not be met, cleaning steps (such as spray water washing or oxalic acid cleaning) would be taken until sufficient waste had been removed such that the performance objectives could be met.

Tank Stabilization

After DOE determines the nature and amount of residual waste, and demonstrates that the performance objectives would be met, SCDHEC would approve a Closure Module. The tank stabilization process would then begin. Each tank system (including the secondary containment, for those that have it) would be filled with a pumpable, self-leveling backfill material. DOE's preferred option is to use grout, a concrete-like material, as backfill. The grout would be trucked to an area near the tank farm, batched if necessary, and pumped to the tank. The fill material would be high enough in pH to be compatible with the carbon steel walls of the waste tank. The grout would be formulated with chemical properties that would retard the movement of radionuclides in the residual waste in the closed tank. Therefore, the closure configuration for each tank or group of tanks would be determined on a case-by-case basis through development of the Closure Module.

Using the preferred option of grout as fill material, the grout would be poured in three distinct layers as illustrated in Figure S-6. The bottom-most layer would be a specially formulated reducing grout to retard the migration of important contaminants and which provides some mixing and encapsulation of the residual material. The middle layer would be a low-strength material designed to fill most of the volume of the tank interior. The final layer would be a high-strength grout to deter inadvertent intrusion from drilling. DOE is also considering an all-in-one grout that would provide the same performance as the three separate layers of grout. If this all-in-one grout provides the same performance and protection at a lesser cost, DOE may choose to use the all-in-one grout.

If DOE were to choose another fill material (sand or saltstone) for a tank system, all other aspects of the closure process would remain the same, as described above.

Sand is readily available and inexpensive. Its emplacement is more difficult than grout because it does not flow readily into voids. Any equipment or piping left on or inside the tank that might require filling (to eliminate voids inside the device) might not be adequately filled. Over time, the sand would tend to settle in the tank, creating additional void spaces. The dome of the tank would then become unsupported and would sag and crack. The sand would tend to isolate the contamination from the environment to some extent, limit the amount of settling of the tank top after failure, and prevent wind from spreading the contaminants. Nevertheless, water would flow readily through the sand. Sand is relatively inert and could not be formulated to retard the migration of radionuclides. Thus, expected contamination levels in groundwater and surface water streams resulting from migration of residual contaminants would be higher than the levels for the preferred option.

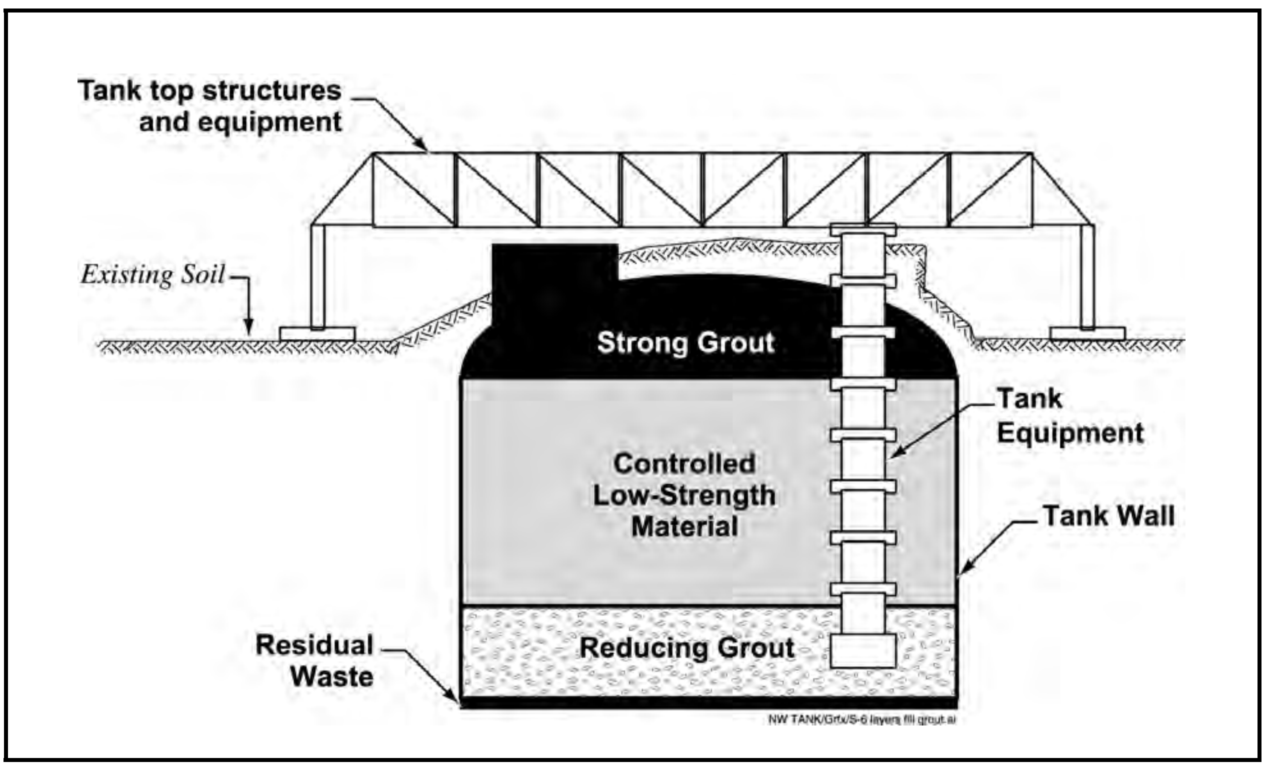

Figure S-6. Typical layers of the Fill with Grout Option.

Saltstone could also be used as fill material. Saltstone is the low-radioactivity fraction mixed with cement, flyash, and slag to form a concrete-like mixture. Saltstone is normally disposed of as LLW in the SRS Saltstone Disposal Facility. This alternative would have the advantage of reducing the amount of Saltstone Disposal Facility area that would be required and reducing the time and cost of transporting the material to the Saltstone Manufacturing Facility. Filling the tank with a grout mixture that is contaminated with radionuclides, like saltstone, would considerably complicate the project and increase worker radiation exposure, which would increase risk to workers and add to the cost of closure. In addition, the saltstone would contain large quantities of nitrate that would not be present in the tank residual. Because nitrates are very mobile in the environment, these large quantities of nitrate would adversely impact the groundwater near the tank farms over the long term (i.e., nitrate concentrations could exceed the SCDHEC Maximum Contaminant Level).

Following the use of any of the stabilization options described above, four tanks in F Area and four tanks in H Area would require backfill soil to be placed over the top of the tanks. The back-fill soil would bring the ground surface at these tanks up to the surrounding surface elevations to prevent water from collecting in the surface depressions. This action would prevent ponding conditions over the tanks that could facilitate degradation of the tank structure.

S.6.2 CLEAN AND REMOVE TANKS ALTERNATIVE

The Clean and Remove Tanks Alternative would include cleaning the tanks, cutting them up in situ, removing them from the ground, and transporting tank components for disposal in an engineered disposal facility at another location on SRS. This alternative has not been demonstrated on HLW tanks.

For the Clean and Remove Tanks Alternative, DOE would have to perform enhanced cleaning until tanks were clean enough to be safely removed and could meet waste acceptance criteria at SRS Low-Level Waste Disposal Facilities. Worker exposure would have to be As Low As Reasonably Achievable to ensure protection of the individuals required to perform the tank removal operations. This might require the use of cleaning technologies such as oxalic acid cleaning, mechanical cleaning, and additional steps as yet undefined on most of the tanks. DOE considers that these actions on so many tanks would not likely be “technically and economically practical” within the meaning of DOE Order 435.1 because of additional criticality safety concerns associated with acidic cleaning solutions, potential interference with downstream waste processing activities, large worker radiation exposures, and high cost.

Following bulk waste removal and cleaning, the steel components of the tank would be cut up, removed, placed in radioactive waste transport containers (approximately 3,900 SRS LLW disposal boxes per tank), and transported to SRS radioactive waste disposal facilities for disposal. During cutting and removal operations, steps would be taken and technologies employed to limit both emissions and exposure of workers to radiation. This alternative would require the construction of approximately 16 new low-activity waste vaults at SRS for disposal of the tank components. This alternative has the advantage of allowing disposal of the contaminated tank system in a waste management facility that is already approved for receiving LLW.

With removal of the tanks, backfilling of the excavations left after the removal would be required. The backfill material would consist of a soil type similar to the soils currently surrounding the tanks.

S.6.3 NO ACTION ALTERNATIVE

For HLW tanks, the No Action Alternative would involve leaving the tank systems in place after bulk waste removal has taken place. Even after bulk waste removal, each tank would contain residual waste and, in those tanks that reside in the water table, ballast water. The tanks would not be backfilled.

After some period of time (probably hundreds of years), the reinforcing bar in the roof of the tank would rust and the roof would fail, causing the structural integrity to degrade. Similarly, the floor and walls of the tank would degrade over time. Rainwater would pour into the exposed tank, flushing contaminants from the residual waste in the tanks and eventually carrying these contaminants into the groundwater. Contamination of the groundwater would occur much more quickly than it would if the tank were backfilled and the residual waste bound with the backfill material.

S.7 Alternatives Considered, But Not Analyzed

S.7.1 MANAGEMENT OF TANK RESIDUALS AS HIGH-LEVEL WASTE

The alternative of managing the tank residuals as HLW is not appropriate, in light of the provisions of DOE Order 435.1 and the State-approved General Closure Plan for a regulatory approach based on the determination that the residuals can be managed as other than HLW through the Waste Incidental to Reprocessing Process, as discussed in Section S.2.4.

The waste incidental to reprocessing designation does not create a new radioactive waste type. The terms "incidental waste" or "waste incidental to reprocessing" refer to a process for identifying waste streams that might otherwise be considered HLW due to their origin, but can be managed as LLW or transuranic waste, if the waste incidental to reprocessing requirements contained in DOE Manual 435.1-1 are met. The goal of the waste incidental to reprocessing determination process is to safely manage a limited number of reprocessing waste streams that do not warrant geologic repository disposal because of their low threat to human health or the environment. Although the technical alternatives of managing tank residuals under the General Closure Plan would likely be the same as those that would apply to managing residuals as HLW, the application of regulatory requirements would be different.

As described in the General Closure Plan, DOE will determine whether the residual waste meets the waste incidental to reprocessing requirements of DOE Manual 435.1-1, which entail a step for removing key radionuclides to the extent that is technically and economically practical, a step for incorporating the residues into a solid form, and a process for demonstrating that appropriate disposal performance objectives are met. The technical alternatives evaluated in the EIS represent a range of stabilization and tank cleaning techniques. The radionuclides in residual waste would be the same whether the material is classified as HLW, LLW, or transuranic waste; however, the regulatory regime would be different.

DOE must demonstrate its ability to meet certain performance objectives before SCDHEC will approve a Closure Module. Appendix C of the General Closure Plan describes the process DOE used to determine the performance objectives (dose limits and concentrations established to be protective of human health) incorporated in the General Closure Plan. As described in Chapter 7 of this EIS, DOE will establish performance objectives for the closure of each HLW tank. In the General Closure Plan, DOE considered dose limits and concentrations found in HLW management requirements (40 CFR 191 and 197, 10 CFR 60 and 63) in defining the overall performance standard. DOE considered the HLW management dose limits and concentrations as performance indicators of the ability to protect human health and the environment, even though the residual would not be considered HLW. That evaluation (described in Appendix C of the General Closure Plan) identified numerical performance standards (concentrations or dose limits for specific radiological or chemical constituents released to the environment) based on the requirements and guidance. Those numerical standards apply to all exposure pathways and to specific media (air, groundwater, and surface water) at different points of compliance and over various periods during and after closure.

If DOE determines through the waste incidental to reprocessing process, discussed in Section S.2.4, that the tank residues cannot be managed as expected, as LLW, or alternatively would rust and the roof would fail, causing the structural integrity to degrade. Similarly, the floor and walls of the tank would degrade over time. Rainwater would pour into the exposed tank, flushing contaminants from the residual waste in the tanks and eventually carrying these contaminants into the groundwater. Contamination of the groundwater would occur much more quickly than it would if the tank were backfilled and the residual waste bound with the backfill material.

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If DOE determines through the waste incidental to reprocessing process, discussed in Section S.2.4, that the tank residues cannot be managed as expected, as LLW, or alternatively as transuranic waste, the residues would be managed as HLW. The technical alternatives for managing the residues as HLW, however, would be the same as those for managing the residues under the LLW requirements. Thus, DOE expects that the potential environmental impacts that could result from managing the residues under the LLW requirements would be representative of the impacts if the HLW standards were applicable. For these reasons, this EIS does not present the management of tank residues as HLW as a separate alternative.

S.7.2 OTHER ALTERNATIVES CONSIDERED, BUT NOT ANALYZED

DOE considered the alternative of delaying closure of additional tanks, pending the results of research. For the period of delay, the impacts of this approach would be the same as the No Action Alternative. DOE continues to conduct research and development efforts aimed at improving closure techniques. DOE's evaluation of the No Action Alternative presents the impacts of delaying closure.

DOE considered an alternative that would represent grouting of certain tanks and removal of others. DOE has separately examined the impacts of both tank removal and grouting. Depending on the ability of cleaning to meet performance requirements for a given tank, the decision makers may elect to remove a tank if it is not possible to meet the performance requirements by using another method. This EIS captures the environmental and health and safety impacts of both options.

S.8 Comparison of Environmental Impacts Among Alternatives

Closure of the HLW tanks would affect the environment, as well as human health and safety, during the period of time when work is being done to close the tanks and after the tanks have been closed. For this EIS, DOE has defined the period of short-term impacts to be from the year 2000 through about 2030, or the period during which the HLW tanks would be closed. Long-term impacts would be those resulting from the eventual release of residual waste contaminants from the stabilized tanks to the environment. In this EIS, DOE has estimated these impacts over a period of 10,000 years.

S.8.1 SHORT-TERM IMPACTS

DOE evaluated short-term impacts of the tank closure alternatives on a number of environmental media. DOE also characterized the employment required for each alternative and estimated the cost to close a HLW tank using each alternative.

DOE compared impacts in the following areas:

- Geologic and Water Resources
- Nonradiological Air Quality
- Radiological Air Quality
- Ecological Resources
- Land Use
- Socioeconomics
- Cultural Resources
- Worker and Public Health Impacts
- Environmental Justice
- Transportation
- Waste Generation
- Utilities and Energy Consumption
- Accidents

In general, the No Action Alternative has the least impact on the environment over the short term, the Clean and Remove Tanks Alternative has the greatest, and the impacts of the Stabilize Tanks Alternative falls in between. Table S-2 shows those areas in which there are notable differences in impacts among the alternatives.

For the short term, No Action means continuing normal tank farm operations, including waste transfers, but not closing any tanks. The impacts, in terms of radiological and nonradiological air and water emissions and human health and safety, are the least of the three alternatives and in all cases are very small.

EC as transuranic waste, the residues would be managed as HLW. The technical alternatives for managing the residues as HLW, however, would be the same as those for managing the residues under the LLW requirements. Thus, DOE expects that the potential environmental impacts that could result from managing the residues under the LLW requirements would be representative of the impacts if the HLW standards were applicable. For these reasons, this EIS does not present the management of tank residues as HLW as a separate alternative.

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DOE considered the alternative of delaying closure of additional tanks, pending the results of research. For the period of delay, the impacts of this approach would be the same as the No Action Alternative. DOE continues to conduct research and development efforts aimed at improving closure techniques. TC DOE's evaluation of the No Action Alternative presents the impacts of delaying closure.

DOE considered an alternative that would represent grouting of certain tanks and removal TC of others. DOE has separately examined the impacts of both tank removal and grouting. Depending on the ability of cleaning to meet performance requirements for a given tank, the decision makers may elect to remove a tank if it is not possible to meet the performance requirements by using another method. This EIS captures the environmental and health and safety impacts of both options.

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S.8.1 SHORT-TERM IMPACTS

DOE evaluated short-term impacts of the tank closure alternatives on a number of TC environmental media. DOE also characterized the employment required for each alternative and estimated the cost to close a HLW tank TC using each alternative.

DOE compared impacts in the following areas:

- Geologic and Water Resources
- Nonradiological Air Quality
- Radiological Air Quality
- Ecological Resources
- Land Use
- Socioeconomics
- Cultural Resources
- Worker and Public Health Impacts
- Environmental Justice
- Transportation
- Waste Generation
- Utilities and Energy Consumption
- Accidents

In general, the No Action Alternative has the least impact on the environment over the short term, the Clean and Remove Tanks Alternative has the greatest, and the impacts of the Stabilize TC Tanks Alternative falls in between. Table S-2 shows those areas in which there are notable differences in impacts among the alternatives.

For the short term, No Action means continuing normal tank farm operations, including waste transfers, but not closing any tanks. The impacts, in terms of radiological and nonradiological air and water emissions and human health and safety, are the least of the three alternatives and in all cases are very small.

Table S-2. Summary comparison of short-term impacts by tank closure alternative.

Parameter	No Action Alternative	Stabilize Tanks Alternative: Fill with Grout Option	Stabilize Tanks Alternative: Fill with Sand Option	Stabilize Tanks Alternative: Fill with Saltstone Option	Clean and Remove Tanks Alternative	
						TC
Geologic Resources						EC
Soil backfill (m^3)	None	170,000	170,000	170,000	356,000	
Air Resources						EC
Nonradiological air emissions (tons/yr.):						
Particulate matter	None	4.5	3.1	1.7	None	L-4-7
Carbon monoxide	None	5.6	5.6	8.0	None	
Benzene	None	0.02	0.02	0.43	None	
Air pollutants at the SRS boundary (maximum concentrations-mg/m^3)[a]:						TC
Carbon monoxide – 1 hr.	None	1.2	1.2	3.4	None	
Volatile organic compounds – 1 hr.	None	0.5	0.5	2.0	None	
Annual radionuclide emissions (curies/year):	1.5×10^{-4}	1.5×10^{-4}	1.5×10^{-4}	0.46	1.5×10^{-4}	L-11-7
Socioeconomics (employment – full time equivalents)						EC
Annual employment	40	85	85	131	284	
Life of project employment	980	2,078	2,078	3,210	6,963	
Worker Health and Safety						EC
Radiological dose and health impacts to involved workers						
Closure collective dose (total person-rem)	29.4[b]	1,600	1,600	1,800	12,000	
Closure latent cancer fatalities	0.012	0.65	0.65	0.72	4.9	
Occupational Health and Safety:						
Recordable injuries–closure	110[c]	120	120	190	400	
Lost workday cases–closure	60[c]	62	62	96	210	

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Table S-2. (Continued).

Parameter	No Action Alternative	Stabilize Tanks Alternative: Fill with Grout Option	Stabilize Tanks Alternative: Fill with Sand Option	Stabilize Tanks Alternative: Fill with Saltstone Option	Clean and Remove Tanks Alternative	
						TC
Transportation						EC
Offsite round-trip truckloads (per tank)	0	654	653	19	5	
Waste Generation						EC
Maximum annual waste generation:						
Radioactive liquid high-level waste (gallons)	0	600,000	600,000	600,000	1,200,000	
Nonradioactive liquid waste (gallons)	0	20,000	20,000	20,000	0	
Low-level waste (m^3)	0	60	60	60	900	
Total estimated waste generation						
Radioactive liquid high-level waste (gallons)	0	12,840,000	12,840,000	12,840,000	25,680,000	TC
Nonradioactive liquid waste (gallons)	0	428,000	428,000	428,000	0	
Low-level waste (m^3)	0	1,284	1,284	1,284	19,260	
Mixed low-level waste (m^3)	0	257	257	257	428	
Utility and Energy Usage						EC
Water (total gallons)	7,120,000	48,930,000	12,840,000	12,840,000	25,680,000	
Steam (total pounds)	NA	8,560,000	8,560,000	8,560,000	17,120,000	
Fossil fuel (total gallons)	NA	214,000	214,000	214,000	428,000	
Utility cost (total)	NA	$4,280,000	$4,280,000	$4,280,000	$12,840,000	

a. No exceedances of air quality standards are expected.
b. Collective dose for the No Action Alternative is for the period of closure activities for the other alternatives. This dose would continue indefinitely at a rate of approximately 1.2 person-rem per year.
c. For the No Action Alternative, recordable injuries and lost workday cases are for the period of closure activities for the other alternatives. These values would continue indefinitely.
NA = Not available.

> The primary health effect of radiation is the increased incidence of cancer. Radiation impacts on workers and public health are expressed in terms of latent cancer fatalities. A radiation dose to a population is estimated to result in cancer fatalities at a certain rate, expressed as a dose-to-risk conversion factor. DOE uses dose-to-risk conversion factors of 0.0005 per person-rem for the general population and 0.0004 per person-rem for workers. The difference is due to the presence of children in the general population, who are believed to be more susceptible to radiation. EC
>
> DOE estimates the doses to the population and uses the conversion factor to estimate the number of cancer fatalities that might result from those doses. In most cases, the result is a small fraction of one. For these cases, DOE concludes that the action would very likely result in no additional cancer in the exposed population.

Over the short term, the Clean and Remove Tanks Alternative has significantly greater impacts than the other alternatives. This is particularly notable in worker exposure to radiation and the resultant cancer fatalities, and in the numbers of on-the-job injuries. DOE's analysis estimates that implementation of the Clean and Remove Tanks alternative would result in about five cancer fatalities in the worker population, while the estimate for the TC Stabilize Tanks Alternative is less than one, and the estimate for No Action is essentially zero. The Clean and Remove Tanks Alternative would result in the generation of twice as much liquid radioactive waste and about 15 times as much EC LLW as the Stabilize Tanks Alternative. The waste generation would be the result of the activities required to clean the tanks so they could be removed from the ground, and from EC disposal of the tanks as LLW at another location on the SRS.

As stewards of the Nation's financial resources, DOE decision makers must also consider cost of the alternatives. DOE has prepared rough estimates of cost for each of the alternatives.

L-4-15
L-2-12
L-6-2

These estimates, which are presented on a per tank basis, are as follows:

No Action Alternative:
<$100,000 (over the 30-year action period)

Stabilize Tanks Alternative:

- Fill with Grout Option:
  $3.8 - 4.6 million
- Fill with Sand Option:
  $3.8 - 4.6 million
- Fill with Saltstone Option:
  $6.3 million

Clean and Remove Tanks Alternative:
>$100 million

L-4-15
L-2-12
L-6-2

The labor and waste disposal requirements of the Clean and Remove Tanks Alternative would result in a cost of more than $100 million per tank, compared to about $6.3 million for the most costly option (Fill with Saltstone) of the Stabilize Tanks Alternative. TC While the Clean and Remove Tanks Alternative would effectively eliminate the future radiation dose at the seepline, under the Fill with Grout Option this seepline dose would be within the TC 4 millirem-per-year drinking water standard, which would equate to 0.000002 latent cancer fatality. Thus, DOE would spend $4.9 billion (for all 49 HLW tanks) to reduce a projected dose that already would be less than 4 millirem. The Clean and Remove Tanks Alternative would EC result in about 12,000 person-rem (4.9 latent cancer fatalities) within the population of SRS workers performing these activities. TC

There are some differences in impacts among the three options of the Stabilize Tanks TC Alternative in the short term, but none are significant. The Fill with Grout Option would TC use about four times as much water (from groundwater sources) as the other options. The Fill with Saltstone Option would employ the TC most workers and result in more occupational injuries and a very slightly increased risk of cancer fatalities for workers. It would also be the most costly of the three options.

DOE evaluated the impacts of potential accidents related to each alternative. The highest consequence accidents would be transfer errors (spills) and seismic events during TC cleaning. Both of these accidents could happen during cleaning under the Stabilize Tanks Alternative and the Clean and Remove Tanks

Alternative, and there is no difference in the consequences.

S.8.2 LONG-TERM IMPACTS

In the long term, the important impact to consider is the effect on the environment and human health of residual waste contaminants that will eventually find their way to the accessible environment. DOE estimated long-term impacts by completing a performance evaluation that includes fate and transport TC modeling for the No Action Alternative and Stabilize Tanks Alternative over a period of 10,000 years, to determine when certain impacts (e.g., radiation dose and the associated health TC effects) would reach their peak value. There are always uncertainties associated with the results of analyses, especially if the analyses attempt to predict impacts over a long period of time. These uncertainties could result from assumptions used, the complexity and variability of the process(es) being analyzed, the use of incomplete information, or lack of information. The uncertainties involved in estimating impacts over the 10,000-year period analyzed in this EIS are described in Chapter 4 and Appendix C of the EIS. Table S-3 shows those areas in which there are notable differences in impacts among the alternatives.

Any waste that migrates through the groundwater and outcrops at a stream location (called a "seepline" in the EIS) would result in radiological doses and possible consequent health effects to individuals exposed to water EC containing the contaminants. Because of the long travel time from the closed and stabilized tank to the groundwater outcrop, the impacts would be substantially reduced, compared to what they might have been if the contaminants came into the accessible environment more quickly. This can be seen clearly by comparing the long-term impacts of the No Action TC Alternative to the impacts of the Fill with Grout Option of the Stabilize Tanks Alternative. L-7-21 Figure S-7 graphically illustrates this point. The pattern of the peaks in the graph results from the simplified and conservative approach used in the modeling, such as the simplifying assumption that the tanks would release their entire inventories simultaneously and completely. L-7-21

If the Clean and Remove Tanks Alternative were chosen, residual waste would be removed from the tanks and the tank systems themselves would be removed and transported to SRS radioactive waste disposal facilities. Long-term impacts at TC these facilities are evaluated in the *Savannah River Site Waste Management EIS* (DOE/EIS-0217). That EIS analyzed the long-term impacts of the low-activity waste vaults at two locations: a hypothetical well 100 meters downgradient from the facility, and in the Savannah River. At the 100-meter well, the calculated radiation dose from the low-activity waste vaults is approximately one-one thousandth of the peak 100-meter well dose from HLW tank closure activities presented in this EIS

Under this alternative, some land in E Area would be permanently committed to disposal and would therefore be unavailable for other uses or for ecological habitat. After removal of the tanks and subsequent CERCLA actions, some land and habitats could become available for other uses.

L-4-20 L-4-21 L-4-22 The fate and transport modeling indicates that movement of residual radiological contaminants from closed HLW tanks to nearby surface waters via groundwater would also be limited by the three stabilization options under the Stabilize Tanks Alternative. Based on the modeling results, all three stabilization options under the Stabilize Tanks Alternative would be more effective than the No Action Alternative. The Fill with Grout Option would be the most effective of the three tank stabilization options, as far as minimizing long-term movement of residual radiological contaminants.

Conservative modeling, which exaggerates concentrations at wells close to the tank farms, estimates that doses from groundwater at wells 1 meter and 100 meters distant from the tank farms, and at the seepline in Fourmile Branch, TC would be very large under the No Action Alternative. Under the Stabilize Tanks Alternative, doses would be much smaller, but incremental TC doses at the 100-meter well for the Fill with

Table S-3. Summary comparison of long-term impacts by tank closure alternative.[a]

Parameter	No Action Alternative	Stabilize Tanks Alternative: Fill with Grout Option	Stabilize Tanks Alternative: Fill with Sand Option	Stabilize Tanks Alternative: Fill with Saltstone Option	
					TC
Surface Water					EC
Movement of contaminants	Limited movement of residual contaminants in closed tanks to downgradient surface waters	Almost no movement of residual contaminants in closed tanks to downgradient surface waters	Almost no movement of residual contaminants in closed tanks to downgradient surface waters	Almost no movement of residual contaminants in closed tanks to downgradient surface waters	
Maximum dose from beta-gamma emitting radionuclides in surface water (millirem/year)[b]					
Upper Three Runs	0.45	(c)	4.3×10^{-3}	9.6×10^{-3}	
Fourmile Branch	2.3	9.8×10^{-3}	0.019	0.130	
Groundwater					EC
Groundwater concentrations from contaminant transport – F-Area Tank Farm:					
Drinking water dose (mrem/yr.)					
1-meter well	35,000	130	420	790	
100-meter well	14,000	51	190	510	
Seepline, Fourmile Branch	430	1.9	3.5	25	EC
Groundwater concentrations from contaminant transport – H-Area Tank Farm:					
Drinking water dose (mrem/yr.)					
1-meter well	9.3×10^{6}	1×10^{5}	1.3×10^{5}	1×10^{5}	
100-meter well	9.0×10^{4}	300	920	870	
Seepline:					EC
North of Groundwater Divide	2,500	2.5	25	46	
South of Groundwater Divide	200	0.95	1.4	16	
Maximum Groundwater Concentrations of Nitrates[d]					EC
1-meter well	270	21	22	440,000	
100-meter well	69	4.7	4.9	180,000	
Seepline	3.4	0.1	0.2	3,300	

Table S-3. (Continued).

Parameter	No Action Alternative	Stabilize Tanks Alternative: Fill with Grout Option	Stabilize Tanks Alternative: Fill with Sand Option	Stabilize Tanks Alternative: Fill with Saltstone Option
Ecological Resources				
Maximum absorbed dose to aquatic and terrestrial organisms (in millirad per year):				
Sunfish dose	0.89	0.0038	0.0072	0.053
Shrew dose	24,450	24.8	244.5	460.5
Mink dose	2,560	3.3	25.6	265
Public Health				
Radiological contaminant transport from F-Area Tank Farm:				
Adult resident latent cancer fatality risk	2.2×10^{-4}	9.5×10^{-7}	1.8×10^{-6}	1.3×10^{-5}
Child resident latent cancer fatality risk	2.0×10^{-4}	8.5×10^{-7}	1.7×10^{-6}	1.2×10^{-5}
Seepline worker latent cancer fatality risk	2.2×10^{-7}	8.0×10^{-10}	1.6×10^{-9}	1.2×10^{-8}
Intruder latent cancer fatality risk	1.1×10^{-7}	4.0×10^{-10}	8.0×10^{-10}	8.0×10^{-9}
Adult resident maximum lifetime dose (millirem)[e]	430	1.9	3.6	26
Child resident maximum lifetime dose (millirem)[e]	400	1.7	3.3	24
Seepline worker maximum lifetime dose (millirem)[e]	0.54	0.002	0.004	0.03
Intruder maximum lifetime dose (millirem)[e]	0.27	0.001	0.002	0.02
Radiological contaminant transport from H-Area Tank Farm:				
Adult resident latent cancer fatality risk	8.5×10^{-5}	3.5×10^{-7}	5.5×10^{-7}	6.5×10^{-6}
Child resident latent cancer fatality risk	7.5×10^{-5}	3.3×10^{-7}	5.5×10^{-7}	6.5×10^{-7}
Seepline worker latent cancer fatality risk	8.4×10^{-8}	(f)	4.0×10^{-10}	6.8×10^{-9}
Intruder latent cancer fatality risk	4.4×10^{-8}	(f)	(f)	3.2×10^{-9}
Adult resident maximum lifetime dose (millirem)[e]	170	0.7	1.1	13
Child resident maximum lifetime dose (millirem)[e]	150	0.65	1.1	1.3
Seepline worker maximum lifetime dose (millirem)[e]	0.21	(c)	0.001	0.017
Intruder maximum lifetime dose (millirem)[e]	0.11	(c)	(c)	0.008

a. The Clean and Remove Tanks Alternative is not presented in this table because the residual waste (and tank components) would be removed from the tank farm areas and transported to SRS radioactive waste disposal facilities; impacts of this facility are evaluated in the *SRS Waste Management EI*S (DOE/EIS-0217).
b. For comparison, the average annual background radiation dose to a member of the public is approximately 360 millirem per year.
c. The radiation dose for this alternative is less than 1×10^{-3} millirem.
d. Given in percent of EPA Primary Drinking Water Maximum Contaminant Levels (MCL). A value of 100 is equivalent to the MCL concentration.
e. Calculated based on an assumed 70-year lifetime.
f. The risk for this alternative is less than 4.0×10^{-10}.

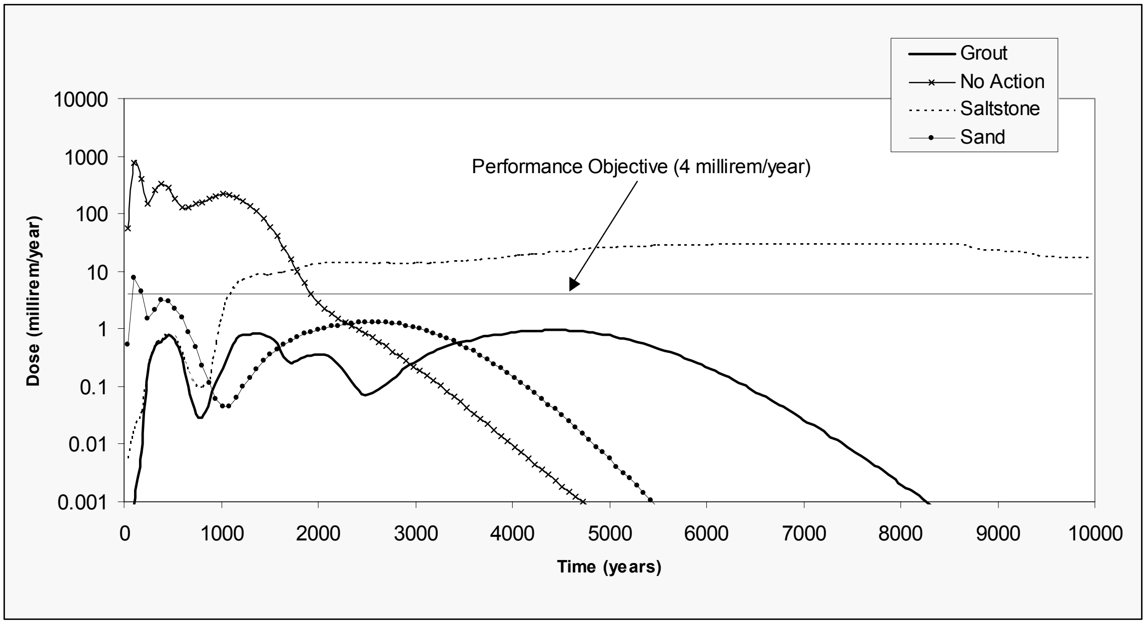

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Figure S-7. Predicted drinking water dose over time at the H-Area seepline north of the groundwater divide in the Barnwell-McBean and Water Table Aquifers. EC

Saltstone Option would still exceed the average annual dose a person receives from natural and man-made sources (about 360 millirem per year). The same is true for the Fill with Sand and Fill with Saltstone Options in the H-Area Tank Farm at the 100-meter well. The doses decrease substantially with distance from the tank farm.

The greatest long-term radiological impacts to groundwater and surface water occur under the No Action Alternative. For this alternative, the Maximum Contaminant Level for beta-gamma radionuclides is exceeded at all points of exposure. On the other hand, the Fill with Grout Option shows the lowest long-term impacts at all exposure points, and the Maximum Contaminant Level for beta-gamma radionuclides is met at the seepline for this alternative. Impacts for the Fill with Grout Option would occur later than under the No Action Alternative or the Fill with Sand Option. The Fill with Saltstone Option would delay the impacts at the seepline, but would result in a higher peak dose than either the Fill with Grout or Fill with Sand Options.

DOE does not envision relinquishing control of the area around the tank farms. However, DOE recognizes that there is uncertainty in projecting future land use and the effectiveness of institutional controls considered in this EIS. If, in the future, people were unaware of the presence of the closed waste tanks and chose to live in homes built over the tanks, they would have essentially no external radiation exposure under the Fill with Grout Option or the Fill with Sand Option. Residents could be exposed to external radiation under the Fill with Saltstone Option, due to the presence of radioactive saltstone near the ground surface. If it is conservatively assumed that all shielding material over the saltstone would be removed by erosion or excavation, a resident living on top of a closed tank, at 1,000 years after tank closure would be exposed to an effective dose equivalent of 390 millirem/year, resulting in an estimated 1 percent increase in risk of latent cancer fatality from a 70-year lifetime of exposure. For the No Action Alternative, external exposures to onsite residents would be expected to be unacceptably high, due to the potential for contact with residual waste.

The risk of incurring a fatal cancer as a result of radiation doses is also greater under the No Action Alternative than under any of the Options of the Stabilize Tanks Alternative. The preferred Option, Fill with Grout, would result in the least risk of a fatal cancer of all the options under the Stabilize Tanks Alternative.

Model results show some adverse impacts to aquatic and terrestrial organisms under the No Action Alternative, but much smaller exposures under the options of the Stabilize and Tanks Alternative.

To assist in addressing cumulative impacts, SRS prepared a report, referred to as the Composite Analysis, that calculated the potential cumulative impact to a hypothetical member of the public over a period of 1,000 years from releases to the environment from all sources of residual radioactive material expected to remain in the SRS General Separations Area, which contains all SRS waste disposal facilities, chemical separations facilities, HLW tank farms, and numerous other sources of radioactive material. The impact of primary concern was the increased probability of fatal cancers. The *Composite Analysis* also included contamination in the soil in and around the HLW tank farms resulting from previous surface spills, pipeline leaks, and Tank 16 leaks as sources of residual radioactive material. The Composite Analysis considered 114 potential sources of radioactive material containing 115 radionuclides.

From a land use perspective, the F- and H- Area Tank Farms are zoned Heavy Industrial and are within existing heavily industrialized areas. The alternatives evaluated in this EIS are limited to closure of the tanks and associated equipment. They do not address other potential sources of contamination co-located with the tank systems, such as soil or groundwater contamination from past releases or other facilities. Consequently, future land use of the tank farm areas is not solely determined by the alternatives for closure of the tank systems. For example, the Environmental Restoration program may determine that the tank farm areas should be capped to control the spread of contaminants through the groundwater. Such decisions would constrain future use of the tank farm areas. Any of these options under the Stabilize Tanks Alternative would render the tank farm areas least suitable for other uses, as the closed filled tanks would remain in the ground. The Clean and Remove Tanks Alternative would have somewhat less impact on future land use because the tank systems would be removed. However, DOE does not expect the General Separations Area, which surrounds the F- and H-Area Tank Farms, to be available for other uses.

S.9 Comments Received on Draft EIS

DOE summarized the comments received on the Draft EIS and grouped them in seven major categories, as discussed below.

__Alternatives__

Several comments questioned DOE's choice of alternatives for analysis or suggested additional alternatives that DOE should have considered. Specific topics included requests for clarification of the intent of the No Action Alternative, consideration of offsite disposal of tanks under the Clean and Remove Tanks Alternative, and a suggestion that DOE should cut up some of the tanks and place the components inside other intact tanks before grouting them. Several comments expressed concern or requested clarification about specific elements of the alternatives, including how transfer lines would be treated under the various alternatives and whether removed tank components would be disposed of in the SRS E-Area vaults under the Clean and Remove Tanks Alternative.

Response:

DOE finds that the suggested new and modified alternatives either are not reasonable or were effectively addressed by the analysis presented in the EIS. Therefore, DOE did not change the alternatives considered in the EIS (other than modifying the Clean and Stabilize Tanks Alternative). However, clarifying information was added to the EIS as a result of several of these comments, as described in the responses to individual comments in Appendix D.

TC of the Stabilize Tanks Alternative. The preferred Option, Fill with Grout, would result in the least risk of a fatal cancer of all the TC options under the Stabilize Tanks Alternative.

TC Model results show some adverse impacts to aquatic and terrestrial organisms under the No Action Alternative, but much smaller exposures under the options of the Stabilize and Tanks Alternative.

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Response:

DOE finds that the suggested new and modified alternatives either are not reasonable or were effectively addressed by the analysis presented in the EIS. Therefore, DOE did not change the alternatives considered in the EIS (other than modifying the Clean and Stabilize Tanks Alternative). However, clarifying information was added to the EIS as a result of several of these comments, as described in the responses to individual comments in Appendix D.

Use of Oxalic Acid

Several comments questioned the use of oxalic acid in cleaning tanks: whether other products could be used to remove residual material in the tanks and whether DOE expects to use oxalic acid in view of technical concerns, particularly about the potential for nuclear criticality. Comments pointed out apparent contradictions between statements that oxalic acid cleaning would be used in the Clean and Stabilize Tanks Alternative and other statements that oxalic acid cleaning would not be practical in the context of the Clean and Remove Tanks Alternative.

Response:

EC

DOE revised the EIS to clarify DOE's position regarding the use of oxalic acid. DOE recognizes that cleaning operations, such as oxalic acid cleaning, may be required to meet performance objectives for some of the tanks that contain first-cycle reprocessing wastes. A thorough, tank-specific evaluation for criticality would need to be done before using chemical cleaning, such as with oxalic acid, in any tank and may result in the identification of additional tank-specific controls to ensure prevention of criticality. As discussed in the EIS, DOE identified oxalic acid as the preferred chemical cleaning agent, after studying numerous other potential cleaning agents. Concerns about the effect of oxalic acid on the quality of the DWPF waste feed would be resolved by special handling of batches of waste feed that contained oxalates resulting from tank cleaning activities.

Cleaning of Tank Annulus

Several comments asked about the status of and plans for efforts to remove waste found in the annuli of some tanks, including the status of waste removal from the annulus of Tank 16.

Response:

In Chapter 2, a new paragraph was added on cleaning of the secondary containment, stating that waste would most likely be removed from the annulus using water and/or steam sprays, possibly combined with a chemical cleaning agent, such as oxalic acid. The Summary and Appendix A have been revised to clarify the status of waste removal from the Tank 16 annulus, specifically to state that some waste has been removed from the annulus, although some waste still remains.

Residual Waste

Several comments requested information on the residual waste inventories assumed for individual tanks or asked how DOE would measure or estimate the quantity and characteristics of residual waste remaining after tank cleaning is complete. Several comments requested additional discussion of the process by which the DOE determines that residual waste is "incidental to reprocessing."

Response:

In response to these comments, a table listing the assumed volume of residual waste if the tanks are cleaned that would remain in each closed HLW tank has been added to Appendix C. These volume estimates are based on previous experience with cleaning of Tanks 16, 17, and 20 and on judgments of the efficacy of the cleaning method. Also, additional information on the approach used to estimate residual waste characteristics has been provided in Appendix A. For modeling purposes, the EIS assumes that the physical and chemical composition of the residual waste would be approximately the same as the sludge currently in the tanks. Before each tank is closed, DOE would collect and analyze samples of the residual waste remaining after bulk waste removal and would conduct camera inspections to obtain visual evidence of the volume of residual waste in that tank. DOE has expanded the discussion of the three criteria for determining that waste is incidental to reprocessing and is to be managed as LLW, as specified in DOE Manual 435.1-1, *Radioactive Waste Management*. EC

Institutional Control and Future Land Use

Several questions addressed institutional controls and future land use. Commenters said that DOE should not assume that institutional controls would be retained for the entire duration of the modeling analysis or that the land around the tank farms would remain in commercial/industrial use. Some expressed concern about whether the selected alternative for HLW tank closure would restrict potential future land uses.

Response:

No changes were made to the EIS as a result of these comments. DOE's *Savannah River Site Future Use Plan* and the *Land Use Control Assurance Plan* call for the land around the F and H Areas (i.e., between Upper Three Runs and Fourmile Branch) to remain in industrial use indefinitely. This future use designation would not be affected by the choice of a tank closure alternative. Although DOE does not envision relinquishing control of the area, it does recognize that there is uncertainty in projecting future land use and effectiveness of institutional controls. Therefore, in this EIS, DOE assumes direct physical control in the General Separations Area, where F and H Areas are located, only for 100 years. In addition to reporting estimated human health impacts based at a regulatory point of compliance at the seepline, DOE has provided estimates of human health implications of doses that would be received by persons obtaining drinking water from a well directly adjacent to the boundaries of the tank farms.

EC

Regulatory Standard and Point of Compliance

Several comments questioned the regulatory point of compliance (i.e., the seepline) or the application of the EPA drinking water standard of 4 millirem/year at that location. One viewpoint was that the seepline should not be used as the point of compliance unless institutional controls prevent groundwater use at locations closer to the tank farms. Another viewpoint was that the seepline point of compliance is overly conservative because people would obtain water from the nearby stream rather than at the seepline. Several commenters stated that the 4 millirem/year limit is overly conservative and suggested adopting a less stringent standard. Another concern expressed was that a more stringent standard might be applied under a future RCRA/CERCLA regulatory process.

Response:

The performance objective of 4 millirem/year at the seepline was established by SCDHEC, after discussions with DOE and EPA Region 4 and following an evaluation of all applicable or relevant and appropriate requirements.

EC

EIS Summary

Several comments specifically addressed the EIS Summary, often requesting clarification on topics that were covered in the EIS text or appendices but not in the EIS Summary. Some commenters suggested that the Summary should be made an integral part of the EIS instead of being published as a separate volume.

Response:

In response to these comments, DOE incorporated additional information from the EIS into the EIS Summary. As allowed and encouraged in the Council on Environmental Quality NEPA implementing regulations (40 CFR 1500.4), DOE publishes the Summary separately as a service to readers.