CHAPTER 1. BACKGROUND AND PURPOSE AND NEED FOR ACTION

1.1 Background

The Savannah River Site (SRS) occupies approximately 300 square miles adjacent to the Savannah River, primarily in Aiken and Barnwell Counties in South Carolina. It is approximately 25 miles southeast of Augusta, Georgia, and 20 miles south of Aiken, South Carolina. The U.S. Atomic Energy Commission, a U.S. Department of Energy (DOE) predecessor agency, established SRS in the early 1950s. Until the early 1990s, the primary SRS mission was the production of special radioactive isotopes to support national programs. More recently, the SRS mission has emphasized waste management, environmental restoration, and decontamination and decommissioning of facilities that are no longer needed for SRS's traditional defense activities.

L-1-10 L-5-2 L-7-22 As a result of its nuclear materials production mission, SRS generated large quantities of high-level radioactive waste (HLW). This waste resulted from dissolving spent reactor fuel and nuclear targets to recover the valuable isotopes.

1.1.1 HIGH-LEVEL WASTE DESCRIPTION

DOE Manual 435.1-1, which provides direction EC for implementing DOE Order 435.1, *Radioactive Waste Management*, (DOE 1999a) 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 concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation." DOE M 435.1-1 also defines two processes for determining that a specific waste resulting from reprocessing spent nuclear fuel can be considered waste incidental to reprocessing (see Section 7.1.3). Waste resulting from reprocessing spent nuclear fuel that is determined to be incidental to reprocessing does not need to be managed as HLW, and shall be managed under DOE's regulatory authority in accordance with the requirements for transuranic waste or low-level waste, as appropriate.

1.1.2 HLW MANAGEMENT AT SRS

At the present time, approximately 37 million TC gallons of HLW are stored in 49 underground tanks in two tank farms, the F-Area Tank Farm and the H-Area Tank Farm. These tank farms are in the central portion of SRS. The sites were chosen in the early 1950s because of their proximity to the F- and H-Area Separations Facilities, and the distance from the SRS EC boundaries. Figure 1-1 shows the setting of the F and H Areas and associated tank farms.

The HLW in the tanks consists primarily of three physical forms: sludge, salt, and liquid. The sludge is solid material that precipitates and settles to the bottom of a tank. The salt is comprised of salt compounds[1] that have crystallized as a result of concentrating the liquid by evaporation. The liquid is highly concentrated salt solution. Although some tanks contain all three forms, many tanks are considered primarily sludge tanks while others are considered salt tanks (containing both salt and salt solution).

The sludge portion of the HLW currently is being transferred to the Defense Waste Processing Facility (DWPF) for vitrification in borosilicate glass to immobilize the radioactive constituents as described in the *Defense Waste Processing Facility Supplemental Environmental Impact Statement* (DOE 1994). (The plan and schedule for managing tank space, mixing waste to create an appropriate feed for

[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.

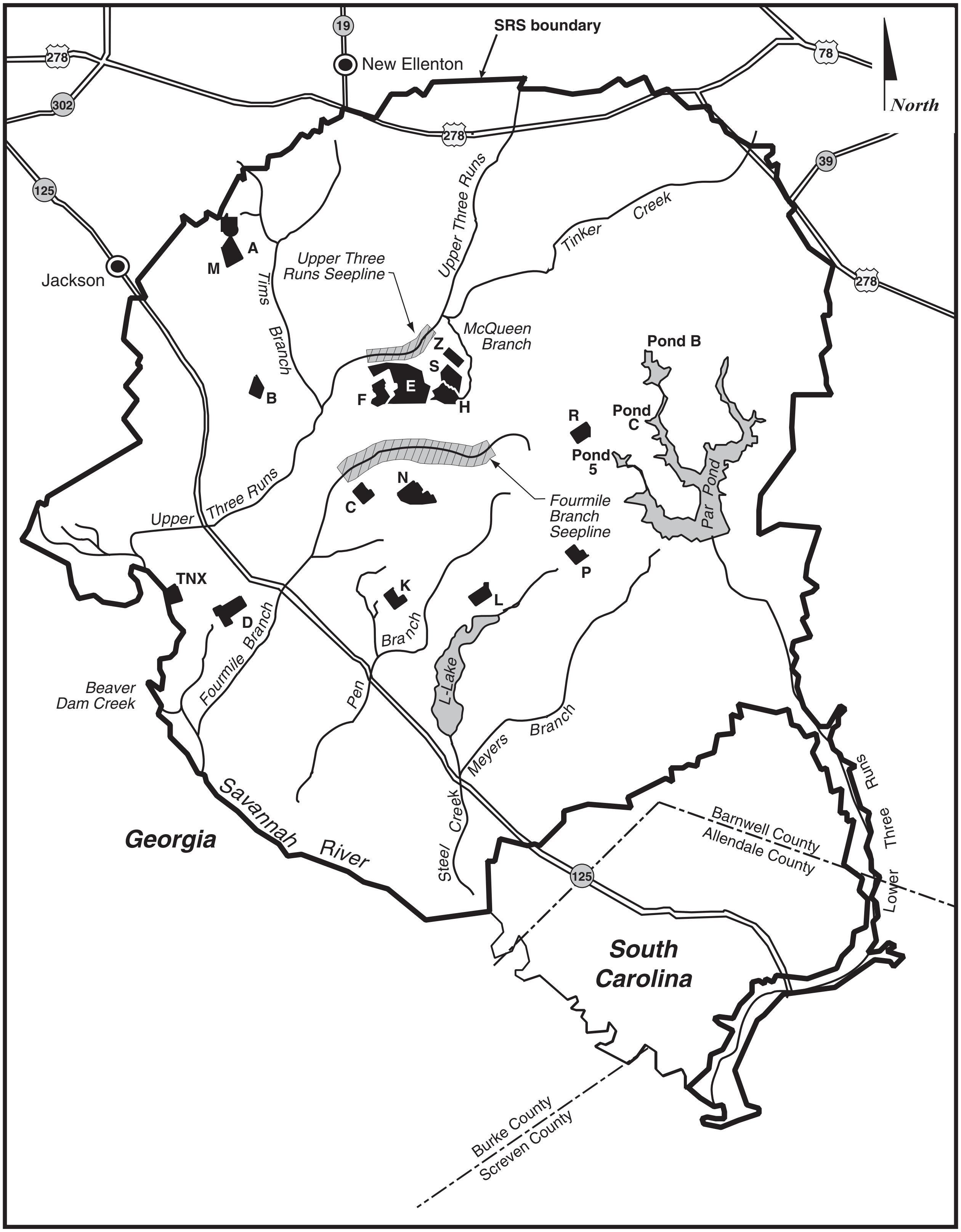

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Figure 1-1. Savannah River Site map. F and H Areas are in the upper center.

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the DWPF, and removing bulk waste is contained in the *High-Level Waste System Plan* [WSRC 1998 and subsequent revisions]). The borosilicate glass is poured into stainless steel canisters that are stored in the Glass Waste Storage Building pending shipment to a geologic repository for disposal. The proposed construction, operation and monitoring, and closure of a geologic repository at the Yucca Mountain site in Nevada is the subject of a separate environmental impact statement (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
L-4-13 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. 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 must be separated into high-radioactivity and low-
TC radioactivity fractions as part of treatment. As described in DOE (1994), the In-Tank Precipitation process would separate the HLW into high- and low-activity fractions. The high-radioactivity fraction would be transferred to the DWPF for vitrification. The low-radioactivity fraction that meets the Waste Incidental to
TC Reprocessing requirements (see Section 1.1.4.2) would be transferred to the Saltstone Manufacturing and Disposal Facility in Z Area
TC and mixed with grout to make a concrete-like material to be disposed of in vaults at SRS. Since issuance of that 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 (64 FR
L-4-14 8558, February 22, 1999). 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* (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 issued in July 2001 (66 FR 37957; July 20, 2001) and the Record of Decision in October 2001 (66 FR L-4-14
52752; October 17, 2001). DOE selected the Caustic Side Solvent Extraction Alternative for separation of radioactive cesium from SRS salt wastes. Selecting a salt processing technology was necessary in order to empty the tanks and allow tank closure to proceed. Figure 1-2 shows the SRS HLW management system as currently configured.

1.1.3 DESCRIPTION OF THE 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 1-3 shows the general layout of the F-Area Tank Farm. The H-Area Tank Farm is a 45-acre site that contains 29 active waste tanks, EC
evaporator systems (including the new Replacement High-level Waste Evaporator), the Extended Sludge Processing Facility, transfer pipelines, diversion boxes, and pump pits. Figure 1-4 shows the general layout of the H-Area Tank Farm.

The F- and H-Area Tank Farms were constructed to receive high-level radioactive waste generated by various SRS production, processing, and laboratory facilities. The use of the tank farms isolates these wastes from the environment, SRS workers, and the public. In addition, the tank farms enable radioactive decay by aging of the waste, clarification of waste by gravity settling, and removal of soluble salts from waste by evaporation. The tank farms also pretreat the accumulated sludge and salt solutions (supernate) to enable the management of these wastes at other SRS treatment facilities (i.e., DWPF and Z-Area Saltstone EC
Manufacturing and Disposal Facility). These

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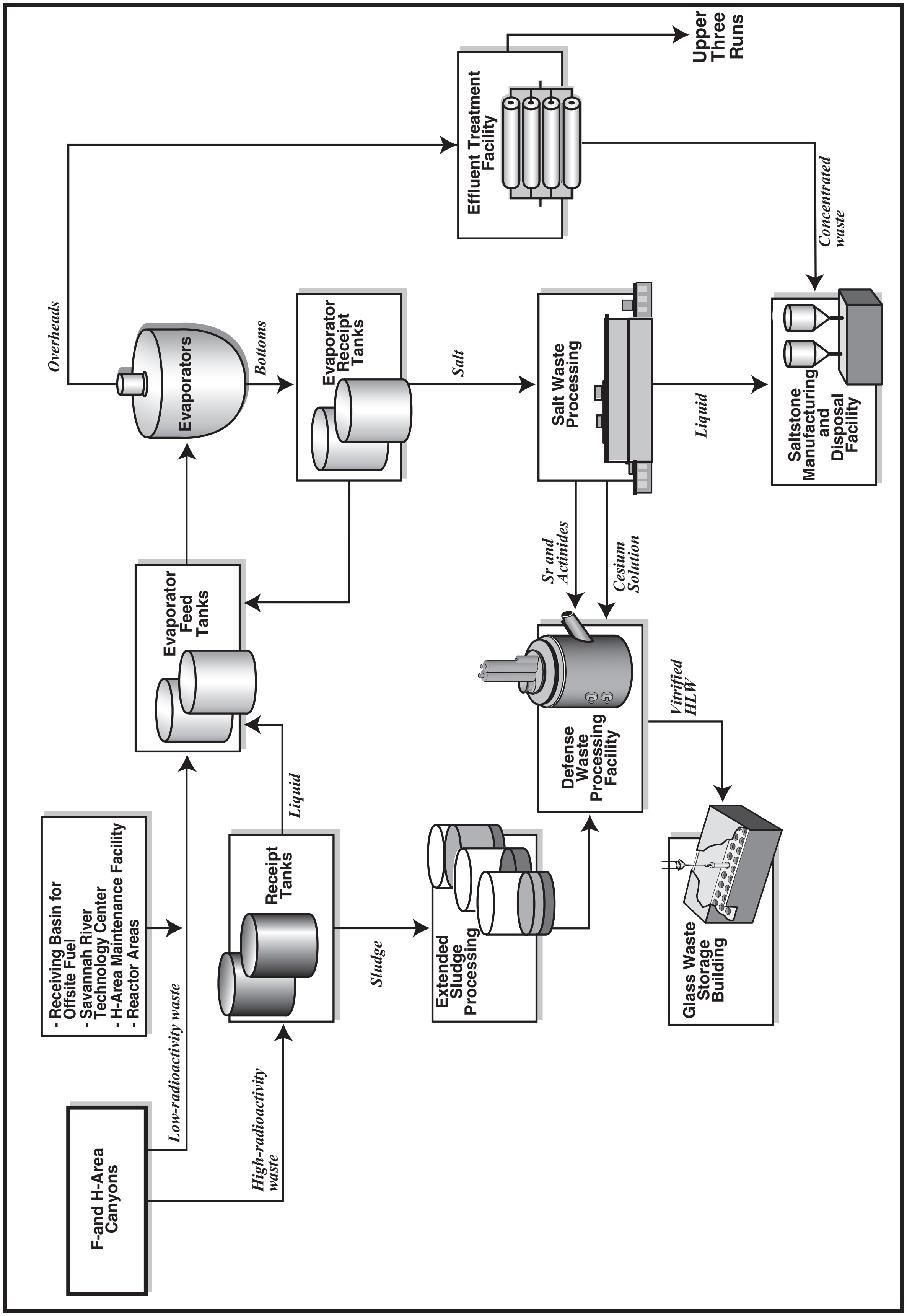

Figure 1-2. Process flows for Savannah River Site high-level waste management system.

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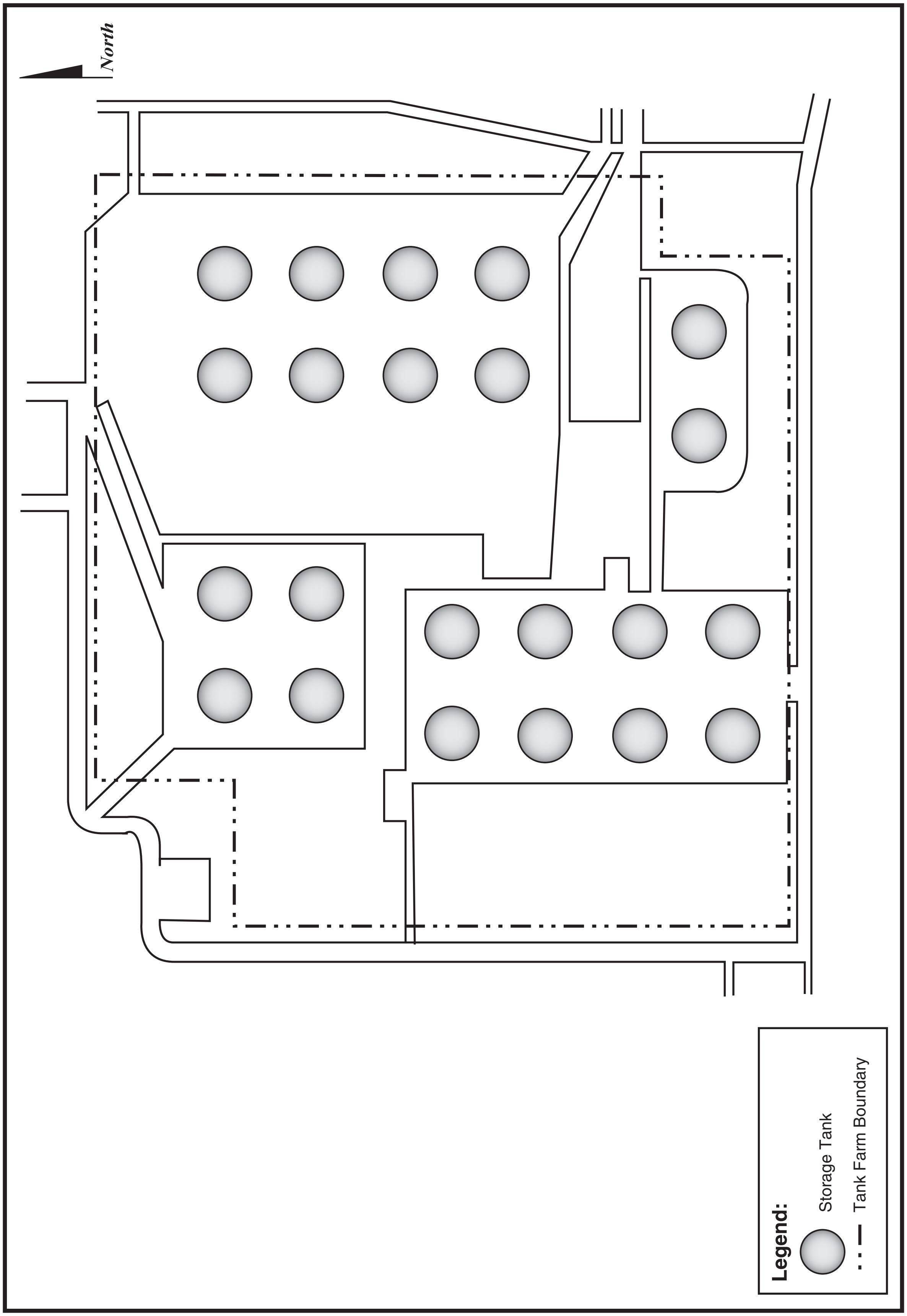

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Figure 1-3. General layout of F-Area Tank Farm.

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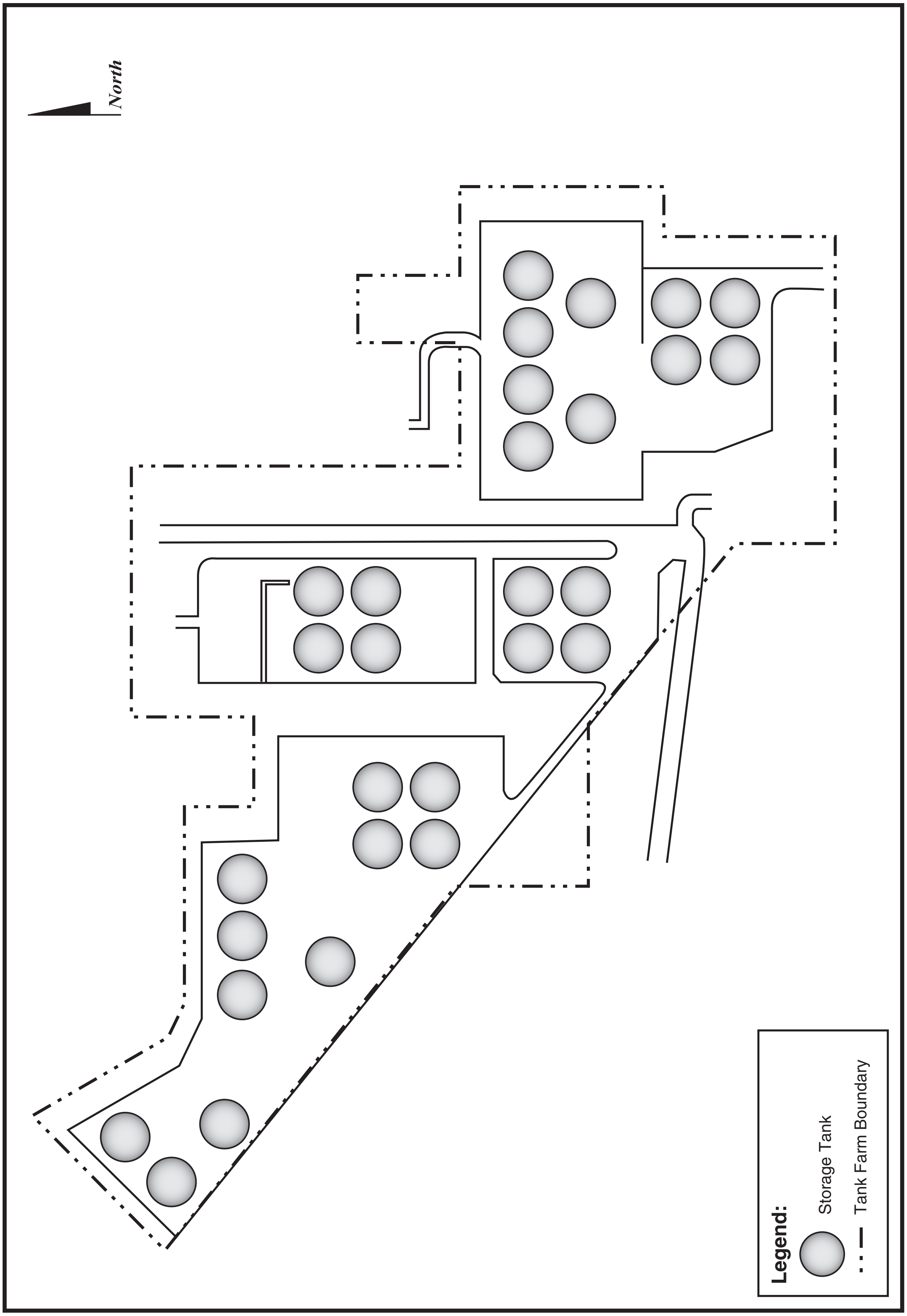

Figure 1-4. General layout of H-Area Tank Farm.

treatment facilities convert the sludge and supernate to more stable forms suitable for permanent disposal.

To accomplish the system operational objectives described above, the following units were assembled in the tank farms:

- Fifty-one large underground waste tanks to receive and age the waste, and allow it to settle
- Five existing evaporator systems to concentrate soluble salts and reduce the waste volume
- Transfer system (i.e., transfer lines, diversion boxes, and pump pits) to transfer supernate, sludge, and other waste (e.g., evaporator condensate) between tanks and treatment facilities
- Salt processing system to separate the salt solution into high- and low-activity fractions for immobilization at the DWPF Vitrification Facility and Z-Area Saltstone Manufacturing and Disposal Facility, respectively
- Sludge washing system (i.e., Extended Sludge Processing) to pre-treat the accumulated sludge prior to immobilization at the DWPF Vitrification Facility.

Tanks

The F- and H-Area tanks are of four different designs, all constructed of carbon-steel inside reinforced concrete containment vaults. Two designs (Types I and II) have secondary annulus pans and active cooling (Figure 1-5). (An annulus is the space between two walls of a double-walled tank.)

The 12 Type I Tanks (Tanks 1 through 12) were built in 1952 and 1953, 7 of these (Tanks 1, 5, 6, and 9 through 12) have known leak sites in which waste leaked from the primary containment to the 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 the waste in these tanks has been lowered to below these leak sites. The tank tops are below grade. The bottoms of Tanks 1 through 8, in F Area, are situated above the seasonal high water table. The bottoms of Tanks 9 through 12 in the H-Area Tank Farm are in the water table.

The four Type II tanks (Tanks 13 through 16) were built in 1956 in the H-Area Tank Farm (Figure 1-5). All four have known leak sites in which waste leaked from primary to secondary containment. In Tank 16, tens of gallons of waste overflowed the annulus pan (secondary containment) in 1962. Most of the waste was still contained in the concrete encasement that surrounds the tank, but surveys indicated that some waste leaked into the soil, presumably through a construction joint on the side of the encasement that is located near the top of the annulus pan, about 25 feet below grade. Based on soil borings around the tank, it is estimated that some tens of gallons of waste leaked into the soil. Much of the leaked waste was removed from the annulus during the period from 1976 to 1978; however, several thousand gallons of dry waste remain in the annulus. Waste removal from the Tank 16 primary vessel was completed in 1980. Assuming that the waste did leak from the construction joint, the leaked waste is in the vicinity of the seasonal water table and is at times below the water table.

The cracks in the Types I and II tanks were due to nitrate-induced stress corrosion cracking. The cracks generally occurred in the heat-affected zones adjacent to tank welds. These zones have high tensile stresses and are susceptible to the corrosive effects of the high concentrations of nitrates that occur in SRS wastes. Nitrate-induced stress corrosion cracking is inhibited by sodium hydroxide and sodium nitrite, but the initial wastes added to these tanks did not have sufficient inhibitors to prevent cracking. Since the time of the initial cracks, considerable research has been done to determine inhibitor levels that will prevent stress corrosion cracking and other types of corrosion that could affect the SRS tanks. (There are other types of corrosion, such as pitting that have not caused leaks, but are a potential threat.) SRS tanks are routinely

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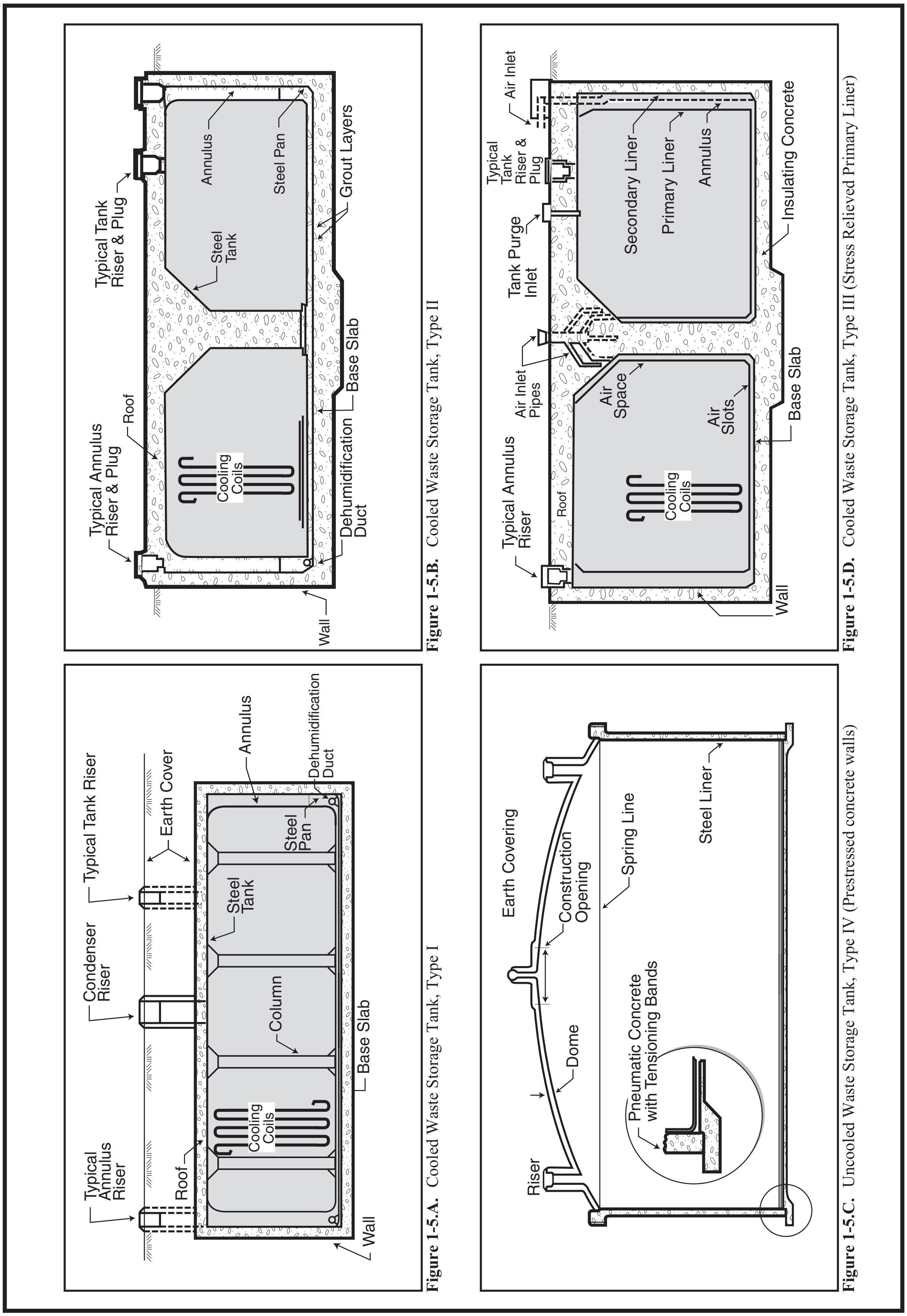

Figure 1-5.A. Cooled Waste Storage Tank, Type I

Figure 1-5.B. Cooled Waste Storage Tank, Type II

Figure 1-5.C. Uncooled Waste Storage Tank, Type IV (Prestressed concrete walls)

Figure 1-5.D. Cooled Waste Storage Tank, Type III (Stress Relieved Primary Liner)

NW TANK/Grfx/1-5 Tank config.ai

Figure 1-5. Tank configurations.

sampled to determine inhibitor levels, and additional inhibitors are added if concentrations are not sufficient to prevent corrosion. In addition, the newest tanks (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 cracking.

The eight Type IV tanks (Tanks 17 through 24) were built between 1958 and 1962. These tanks have a single steel wall and do not have active cooling (Figure 1-5). Tanks 17 through 20 are in the F-Area Tank Farm and Tanks 21 through 24 are in H Area. Tanks 19 and 20 have known cracks that are believed to have been caused by corrosion of the tank wall from occasional groundwater inundation from fluctuation in the water table. Interior photographic inspections have indicated that small amounts of groundwater have leaked into these tanks; there is no evidence that waste ever leaked out. The level of the waste in Tank 19, which is the next tank scheduled to be closed, is below these cracks. Tanks 17 through 20 are slightly above the water table. Tanks 21 through 24 are above the groundwater table; however, they are in a perched water table caused by the original construction of the tank area. Tanks 17 and 20 have already been closed in a manner described in the Fill with Grout option of the Stabilize Tanks Alternative evaluated in this EIS (see Section 2.1.1).

The newest design (Type III) has a full-height secondary tank and active cooling (Figure 1-5). All of the Type III tanks (25 through 51) are above the water table. These 27 tanks were placed in service between 1969 and 1986, with 10 in the F Area and 17 in the H Area Tank Farms. None of them has known leak sites.

By 2022, DOE is required to remove from service and close all the remaining tank systems that have experienced leaks or do not have full-height secondary containment. The 24 Types 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 the tanks, which DOE currently anticipates would occur before the year 2030.

Summary information on the F-and H-Area HLW tanks is presented in Table 1-1.

Evaporator Systems

The tank farms had five evaporators that concentrated waste following receipt from the canyons. At present, three evaporators are operational, one in F-Area Tank Farm and two in H-Area Tank Farm. Each operational evaporator is made of stainless steel and operates at near-atmospheric pressure under alkaline conditions. Because of the radioactivity emitted from the waste, the evaporator systems are either shielded (i.e., lead, steel, or concrete

Table 1-1. Summary of high-level waste tanks.

Tank type	Number of tanks	Area	Tank numbers	Year constructed	Year first used
I[a]	12	F	1 - 8	1952	1954-64
		H	9 - 12	1953	1955-56
II[a]	4	H	13 - 16	1956	1957-60
III	27	F	25 - 28	1978	1980
			33 - 34	1969, 1972	1969, 1972
			44 - 47	1980	1980-82
		H	29 - 32	1970	1971-74
			35 - 43	1976-79	1977-86
			48 - 51	1981	1983-86
IV[a]	8	F	17 - 20[b]	1958	1958-61
		H	21 - 24	1961-62	1961-65

a. Twenty-four Type I, II, and IV HLW tanks will be removed from service by 2022.
b. Two tanks (Tanks 17 and 20) have been closed.

vaults) or placed underground. The process equipment is designed to be operated and maintained remotely.

Waste supernate is transferred from the evaporator feed tanks and heated to the aqueous boiling point in the evaporator vessel. The evaporated liquids (overheads) are condensed and, if required, processed through an ion-exchange column for cesium removal. The overheads are transferred to the F/H Effluent Treatment Facility for final treatment before being discharged to Upper Three Runs. The overheads can be recycled back to a waste tank if evaporator process upsets occur. Supernate can be reduced to about 25 percent of its original volume and immobilized as crystallized salt by successive evaporations of liquid supernate.

Transfer System

A network of transfer lines is used to transfer wastes between the waste tanks, process units, and various SRS areas (i.e., F Area, H Area, S Area, and Z Area). These transfer lines have diversion boxes that contain removable pipe segments (called jumpers) to complete the desired transfer route. Jumpers of various sizes and shapes can be fabricated and installed to enable the transfer route to be changed. The use of diversion boxes and jumpers allows flexibility in the movement of wastes. The diversion boxes are usually underground, constructed of reinforced concrete, and either sealed with waterproofing compounds or lined with stainless steel.

Pump pits are intermediate pump stations in the F- and H-Area Tank Farm transfer systems. These pits contain pump tanks and hydraulic pumps or jet pumps. Many pump pits are associated with diversion boxes. The pits are constructed of reinforced concrete and have a stainless-steel liner.

1.1.4 HLW TANK CLOSURE

1.1.4.1 Closure Process

After the majority of the waste has been removed from the HLW tanks for treatment and disposal, the tank systems (including the tanks, evaporators, transfer lines, and other ancillary equipment) would become part of the HLW tank closure project, the potential environmental impacts of which are the subject of this EIS. In accordance with the SRS Federal Facility Agreement (EPA 1993), DOE intends to remove the tanks from service as their missions are completed. For 24 tanks that do not meet the U.S. Environmental Protection Agency's (EPA's) secondary containment standards under the Resource Conservation and Recovery Act (RCRA), DOE is obligated to close the tanks by | EC
2022. The proposed closure process specified by the Federal Facility Agreement is described in Appendix A beginning in Section A.4.

The process of preparing to close tanks began in 1995. DOE prepared the *Industrial Wastewater Closure Plan for F- and H-Area High-Level Waste Tank Systems* (DOE 1996a) that describes the general protocol for closing the tanks. This document (referred to as the General Closure Plan) was developed with extensive interaction with the State of South Carolina and EPA. Concurrent with the General Closure Plan, 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 1996b). In a Finding of No Significant Impact published 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.

Accordingly, DOE began to close Tank 20, from which the bulk waste had already been removed. In accordance with the General Closure Plan, DOE prepared a tank-specific closure plan (DOE 1997a) that outlined the specific steps for Tank 20 closure and presented the long-term environmental impacts of the closure. The State of South Carolina approved the Closure Module, and Tank 20 closure was completed on July 31, 1997. Later in 1997, following preparation and approval of a tank-specific Closure Module, Tank 17 was closed.

DOE decided to prepare this EIS before any | EC
additional HLW tanks are closed at SRS. This decision is based on several factors, including

the desire to further explore the environmental impacts from closure and to open a new round of information sharing and dialogue with stakeholders. SRS is committed in the Federal Facility Agreement to close another HLW tank by Fiscal Year 2003. DOE has reviewed bulk waste removal of waste 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 EC SRS Waste Management EIS discusses HLW management activities as part of the No Action Alternative (continuing the present course of action), and the *Defense Waste Processing Facility Savannah River Plant EIS* (DOE/EIS-0082) and the *Final Supplemental Environmental Impact Statement Defense Waste Processing Facility* (DOE/EIS-0082S) discuss EC management of HLW after it is removed from the tanks.

EC The National Research Council released a study (National Research Council, 1999) examining the technical options for HLW treatment and tank closure at the Idaho National Engineering and Environmental Laboratory (INEEL). The Council concluded that clean closure is impractical and some residual radioactivity will remain but, with rational judgment and prudent management, it is reasonable to expect that all options will result in very low risks. EC Recommendations made by the U.S. Nuclear Regulatory Commission (NRC) included: (1) establish closure criteria, (2) develop an innovative sampling plan based on risks, and (3) conduct testing to anticipate possible process failure. The SRS General Closure Plan had anticipated and includes points similar to those raised by the Council.

L-4-12 Several issues related to the HLW tank closure program will be resolved after DOE selects an overall tank closure approach based on this EIS. 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 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 L-4-12 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).

1.1.4.2 Waste Incidental to Reprocessing

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

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, and all other Federal or state regulations TC

> **Waste Incidental to Reprocessing Determination**
>
> The two processes for determining that 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 NRC'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 (clothing, tools, and equipment). EC
>
> 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, 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. EC
>
> (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, as appropriate."

as appropriate.[2] Section 7.1.3 of this EIS discusses the waste incidental to reprocessing process in more detail.

1.2 Purpose and Need for Action

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 risk of accidents to individuals and could lead to surface subsidence, which could open the tanks to intrusion by water or plants and animals. L-2-4 L-2-9 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.

1.3 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 the SRS. The TC closure process will take place over a period of up to 30 years. The EIS provides the decision makers with an assessment of the potential environmental, health, and safety effects of each alternative. The selection of one or more tank EC closure alternatives, following completion of this EIS, will guide the selection and implementation of a closure method for each HLW tank at the SRS. EC Within the framework of the selected alternative(s), and the

[2] The Natural Resources Defense Council (NRDC) has filed a Petition in the Idaho District Court on August 15, 2001, asking the Court to review DOE TC Order 435.1 and claiming the Order is "arbitrary, EC capricious, and contrary to law." NRC, in responding recently to a separate petition from the NRDC, has concluded that DOE's commitments to (1) clean up 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).

environmental impact of closure described in the EIS, DOE will select and implement a 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 described in Chapter 7 of this EIS. In addition to the General Closure Plan (a document prepared by DOE based on responsibilities under the Atomic Energy Act (AEA) and other laws and TC regulations and approved by the South Carolina Department of Health and Environmental Control (SCDHEC) and EPA Region-IV), 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. The module will also L-7-27 contain the measured inventory of residual material in the tank at the time of closure and an estimate of the volume of this material. Through the process of preparing and approving each Closure Module, DOE will select a closure method that is consistent with the closure EC alternative(s) selected after completion of this EIS. The selected closure method for each tank will result in the closure of all tanks with impacts on the environment equal to or less than those described in this EIS. If a tank closure that meets the performance objectives of the closure module cannot be accomplished using the selected alternative, DOE would evaluate the EC impacts of the technology against those presented in this EIS prior to implementing closure of the tank.

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 EC technical, regulatory, and performance implications of any proposal to use a new technology.

1.4 EIS Overview

1.4.1 SCOPE

This EIS analyzes the environmental impacts of cleaning, isolating, and stabilizing the HLW tanks and related systems such as evaporators, transfer piping, sumps, pump pits, diversion boxes, filtration systems, sludge washing equipment, valve boxes, and the condensate transfer system. Before tank closure can be accomplished, DOE must remove the waste stored in the tanks, a process called bulk waste removal. Bulk waste removal is discussed as part of the No Action Alternative (i.e., a continuation of the normal course of action) in the *Savannah River Site Waste Management EIS* EC (DOE/EIS-0217). If DOE proposes changes in the bulk waste removal program, DOE will determine the need to supplement the Waste Management EIS. Bulk waste removal means pumping out all the waste that is possible with existing equipment. Bulk waste removal leaves residual contamination on the tank walls and internal hardware such as cooling coils. A heel of liquid, salt, sludge, or other material remains in the bottom of the tank and cannot be removed without using special means. Removal of this residual material is part of the cleaning stage of the proposed action.

Upon completion of closure activities for a group of tanks (and their related piping and ancillary equipment) in a particular section of a EC tank farm, the tanks and associated equipment in the group would transition to the SRS environmental restoration program. The environmental restoration program would conduct soil assessments and remedial actions to address any contamination in the environment (including previously known leaks) and develop a post-closure strategy. Consideration of alternative remedial actions under the remediation program is outside the scope of this EIS and would be conducted under the EC CERCLA process. DOE, however, has established a formal process to ensure that tank closure activities are coordinated with the environmental restoration program. This process is described in the *High-Level Waste Tank Closure Program Plan* (DOE 1996c). This process requires that, once a group of tanks in a particular section of a tank farm is closed, the HLW operations organization and the environmental restoration organization would establish a Co-occupancy Plan to ensure safe and efficient soils assessment and remediation.

The HLW organization would be responsible for operational control and the environmental restoration organization would be responsible for environmental restoration activities. The primary purpose of the Co-occupancy Plan is to provide the two organizations with a formal process to plan, control, and coordinate the environmental restoration activities in the tank farm areas. The activities of the environmental restoration program would be governed by the CERCLA, RCRA corrective action, and the Federal Facility Agreement between DOE, SCDHEC, and EPA. As such, it is beyond the scope of this EIS.

1.4.2 ORGANIZATION

This EIS has seven chapters. The first chapter provides background information, describes the purpose and need for action, and describes the NEPA process. Chapter 2 describes the proposed action and alternatives for carrying it out. Chapter 3 discusses the SRS and describes the site and surrounding environment that the alternatives could impact. Chapter 4 presents the estimated impacts from tank closure. Chapter 5 discusses the cumulative impacts of this project, plus other existing or planned projects that affect the environment. Chapter 6 presents resource commitments. Chapter 7 discusses applicable laws, regulations, and permit requirements.

This EIS also contains five appendices. Appendix A describes HLW management at SRS with an emphasis on the tank farms and the closure alternatives. Appendix B provides information on accident scenarios. Appendix C describes long-term closure modeling, and Appendix D describes public input received on the Draft EIS and provides DOE responses. Appendix E, Description of the Savannah River Site High-Level Waste Tank Farms, which is for Official Use Only, contains detailed information about the location, physical dimensions, and content of the HLW tank systems. Due to increased concerns about operational security following the events of September 11, 2001, Appendix E will be made available upon request to those who have a need to review this information. Consistent with the direction of the Attorney General of the United States, this information is not releasable under the Freedom of Information Act.

1.4.3 STAKEHOLDER PARTICIPATION

On December 29, 1998, DOE announced in the *Federal Register* (63 FR 71628) its intent to prepare an EIS on the proposed closure of HLW tanks at SRS near Aiken, South Carolina. DOE proposes to close the tanks to protect human health and the environment and to promote safety. With the Notice, DOE established a public comment period that lasted through February 12, 1999.

DOE invited SRS stakeholders and other interested parties to submit comments for consideration in the preparation of the EIS.

DOE held scoping meetings on the EIS in North Augusta, South Carolina, on January 14, 1999, and in Columbia, South Carolina, on January 19, 1999. Each meeting included presentations on the NEPA process in relation to the proposed action, on the plan for closure of the tanks, and on the alternatives presented in this EIS. The meetings also offered opportunities for public comment and general questions and answers. DOE considered comments received during the scoping period in preparing this EIS.

The public and the State of South Carolina have been and continue to be involved in the closure of HLW facilities at the SRS. Additional public meetings were conducted in North Augusta, South Carolina (January 9, 2001) and Columbia, South Carolina (January 11, 2001) to present the Draft EIS for public comments. The public comment period ended on January 23, 2001. DOE received 18 letters on the Draft EIS. Court reporters documented comments and statements made during two public meetings, at which eight TC individuals asked questions, provided comments, or made statements. These comments have been addressed in the Final EIS and the comments, along with DOE's responses, are given in Appendix D of this EIS.

The Citizens Advisory Board (CAB) for SRS is very interested in the closure of HLW facilities. L-2-1 L-2-14 L-2-18 L-2-19 L-2-20 L-7-30 As such, the CAB has been briefed quarterly and the CAB Waste Management Committee is briefed bi-monthly on closure activities. The CAB has issued several recommendations related to HLW tank closure. DOE has carefully reviewed these recommendations in establishing and implementing the SRS HLW tank closure program, and will continue to do so in the future.

The SRS CAB 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 L-5-3 Office considers the issue of removal of waste from the tank annulus 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.

1.4.4 RELATED NEPA DOCUMENTS

This EIS makes use of information contained in other DOE NEPA documents related to HLW management and tank closure. It is also TC designed to be consistent with the recently completed EIS on HLW Salt Processing Alternatives, which is related to activities in the H-Area Tank Farm. The NEPA documents related to this HLW Tank Closure EIS are briefly described below.

Environmental Assessment for the Closure of the High-Level Waste Tanks in the F- and H-Areas at the Savannah River Site – DOE prepared an environmental assessment (DOE 1996b) to evaluate the impacts of closing HLW tanks at the SRS after removal of the bulk waste. The proposed action was to remove the residual waste from the tanks and fill them with a material to prevent future collapse and bind up residual waste, to decrease human health risks, and to increase safety in the area of the tank farms. After closure, the tank system would be turned over to the SRS environmental restoration program for environmental assessment and remedial actions as necessary. A Finding of No Significant Impact was determined based on the analyses in the environmental assessment, and DOE subsequently closed Tanks 17 and 20. DOE has now decided to prepare an EIS for the proposal to close the remaining HLW tanks.

Final Defense Waste Processing Facility Supplemental Environmental Impact Statement – DOE prepared a Supplemental EIS to examine the impacts of completing construction and operating the DWPF at the SRS. This document (DOE 1994) assisted DOE EC in deciding whether and how to proceed with the DWPF project, given the changes to processes and facilities that had occurred since 1982, when it issued the original *Defense Waste Processing Facility EIS*.

The Record of Decision (60 FR 18589) announced that DOE would complete the construction and startup testing of DWPF and would operate the facility, using the In-Tank Precipitation process, after the satisfactory completion of startup tests.

The alternatives evaluated in this EIS could generate radioactive waste that DOE would have to handle or treat at facilities described in the *Defense Waste Processing Facility Supplemental EIS* and the *SRS Waste Management EIS* (see next paragraph). The *Defense Waste Processing Facility Supplemental EIS* is also relevant to the assessment of cumulative impacts (see Chapter 5) that could occur at SRS.

Savannah River Site Waste Management Final Environmental Impact Statement – DOE issued the *SRS Waste Management EIS* (DOE 1995) to provide a basis for selection of a site-wide approach to managing present and future (through 2024) wastes generated at SRS. These wastes would come from ongoing operations and potential actions, new missions, environmental restoration, and decontamination and decommissioning programs.

The *SRS Waste Management EI*S includes the treatment of wastewater discharges in the Effluent Treatment Facility, F- and H-Area tank operations and waste removal, and construction and operation of a replacement HLW evaporator in the H-Area Tank Farm. In addition, it evaluates the Consolidated Incineration Facility for the treatment of mixed waste. The Record of Decision (60 FR 55249) stated that DOE will configure its waste management system according to the moderate treatment alternative described in the EIS. The *SRS Waste Management EIS* is relevant to this *HLW Tank Closure EIS* because it evaluates management alternatives for various types of waste that actions proposed in this EIS could generate. The *Waste Management EIS* is also relevant in the assessment of cumulative impacts that could occur at the SRS (see Chapter 5).

Final Waste Management Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste – DOE published this EIS as a complex-wide study of the environmental impacts of managing five types of waste generated by past and future nuclear defense and research activities, including HLW at four sites (DOE 1997c). This NEPA analysis was the first time DOE had examined in an integrated fashion the impacts of complex-wide waste management alternatives and the cumulative impacts from all waste management activities at a specific site.

The EIS evaluated four alternatives, including the No Action Alternative, for managing immobilized HLW until such time as a geologic repository is available to receive the waste. The TC
preferred alternative was for each site to store its immobilized waste onsite. The Record of Decision to proceed with DOE's preferred alternative of decentralized storage for immobilized HLW was issued August 26, 1999 (64 FR 46661).

Supplemental Environmental Impact Statement for High-Level Waste Salt Processing Alternatives at the Savannah River Site – On February 22, 1999, DOE published a Notice of Intent to prepare a Supplemental EIS for alternatives to the In-Tank Precipitation process at SRS (64 FR 8558). The In-Tank Precipitation process was intended to separate soluble, high-activity radionuclides from HLW before vitrifying the high-activity portion of the waste in the DWPF and disposing of the low-activity fraction as saltstone grout in vaults at SRS. However, the In-Tank Precipitation process, as presently configured, cannot achieve production goals and safety requirements for processing HLW. The Supplemental EIS evaluates the impacts of alternatives to the In-Tank Precipitation process for separating the high- and low-activity fractions of the HLW currently stored in tanks at SRS. Although the *Salt Disposition Alternatives Supplemental EIS* addresses subject matter and some equipment in common with this EIS, the actions proposed in each EIS are independent and are thus appropriately considered in separate EISs. The Final *Salt Processing Alternatives EIS* was issued in July 2001 (66 FR 37957; July 20, TC
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