FTF-WDIP-001
Revision 0

GENERAL INFORMATION INPUT PACKAGE

for the

Section 3116 Draft Basis Document for F-Tank Farm at the Savannah River Site

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ACRONYMS / ABBREVIATIONS

CFR	Code of Federal Regulations
CTS	Concentrate Transfer System
DB	Diversion Box
DOE	United States Department of Energy
FDB	F-Area Diversion Box
FTF	F-Tank Farm
HTF	H-Tank Farm
HRR	Highly Radioactive Radionuclide
LDB	Leak Detection Box
MEP	Maximum Extent Practical
MLDB	Modified Leak Detection Box
NDAA	Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005
NRC	United States Nuclear Regulatory Commission
PA	Performance Assessment
PP	Pump Pit
SNF	Spent Nuclear Fuel
SRS	Savannah River Site

1.0 GENERAL INFORMATION

To proceed with closure of the F-Tank Farm (FTF) at the Savannah River Site (SRS), the Department of Energy (DOE) plans to determine, in consultation with the Nuclear Regulatory Commission (NRC) whether the stabilized residuals resulting from, in part, prior reprocessing of spent nuclear fuel (SNF) within the waste tanks and ancillary structures, the waste tanks, and the ancillary structures (including integral equipment) located at FTF at the time of closure, meet the criteria in Section 3116(a) of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (NDAA), and thus are not high-level waste. The NDAA Section 3116(a) specifies in relevant part that the term "high-level radioactive waste" does not include radioactive waste that results from the reprocessing of SNF if the Secretary of Energy determines, in consultation with the NRC, that: 1) the waste does not require isolation in a deep geologic repository for spent fuel or high-level radioactive waste (3116(a)(1)); 2) the waste has had highly radioactive radionuclides (HRRs) removed to the maximum extent practical (MEP) (3116 (a)(2)); and 3) the waste either A) does not exceed concentration limits for Class C low-level waste and will be disposed of in compliance with performance objectives in Title 10 Code of Federal Regulations (CFR) Part 61, Subpart C, and pursuant to a State-approved closure plan or State-issued permit, based on authority conferred on the State outside of NDAA Section 3116 (3116(a)(3)(A)), or B) exceeds concentration limits for Class C low-level waste in 10 CFR 61.55, but will be disposed of in compliance with performance objectives in 10 CFR 61, Subpart C, pursuant to a State-approved closure plan or a State-issued permit, based on authority conferred on the State outside of NDAA Section 3116, and pursuant to plans developed by the Secretary in consultation with the NRC (3116(a)(3)(B)).

To determine whether the stabilized residuals within the waste tanks and ancillary structures, the waste tanks, and the ancillary structures (including integral equipment) located at FTF at the completion of closure activities meet the criteria in Section 3116(a) and thus are not "high-level radioactive waste", DOE is preparing a basis document which will support a Section 3116 Determination by the Secretary of Energy. To facilitate the consultation process, DOE will provide the NRC with a Draft FTF 3116 Basis Document, which will be finalized after DOE has completed consultation with the NRC. Although not required by NDAA Section 3116, DOE will also issue the Draft FTF 3116 Basis Document for public review and comment.

The purpose of developing input packages and utilizing a scoping process parallel to development of the Draft FTF 3116 Basis Document is to expedite the identification of issues and assess the reasonability of DOE's approach in addressing the NDAA Section 3116 criteria, thereby allowing for more informed and efficient consultation with the NRC and a more informed draft for public comment.

2.0 BASIS DOCUMENT SCOPING MEETING APPROACH

To gain early consensus and understanding of the content to be included in the Draft FTF 3116 Basis Document, it is prudent to develop input packages and conduct a scoping meeting with NRC representatives concurrent with document development. This process is intended to expedite the identification of issues and NRC's views on the reasonability of the approach to demonstrate compliance with NDAA Section 3116(a) criteria, thereby allowing for more

informed and efficient consultation with the NRC and a more informed draft for public comment. Public comments and additional NRC comments may be made during the public comment period and NRC consultation process, respectively, for the Draft FTF 3116 Basis Document. [NDAA_3116]

The Draft FTF 3116 Basis Document scoping process will facilitate technical discussion on the approach to demonstrating compliance with certain criteria of NDAA Section 3116(a). To accomplish this, a scoping meeting(s) to discuss individual input packages will be held with NRC representatives. [NDAA_3116]

2.1 Proposed FTF 3116 Basis Document Input Packages

Seven input packages will be submitted to the NRC approximately four weeks before the scoping meeting(s). The following summarizes these packages.

- **General Information Input Package (FTF-WDIP-001)**

  The FTF-WDIP-001 input package describes the scoping process and the associated input packages. In addition, this input package describes the overall approach DOE is considering for the Draft FTF 3116 Basis Document and identifies the background information for the SRS and FTF, which is useful and common to other specific Draft FTF 3116 Basis Document input packages.

- **Highly Radioactive Radionuclides (HRRs) Input Package (FTF-WDIP-002)**

  The FTF-WDIP-002 input package provides a methodology to determine HRRs and identifies potential HRRs for FTF. This input package presents information that is anticipated to be in Section 5.1, *Highly Radioactive Radionuclides,* of the Draft FTF 3116 Basis Document. FTF-WDIP-002 includes:

  - Identification of potential HRRs for FTF.
  - A description of a HRR determination process.

- **Removal to the Maximum Extent Practical (MEP) Input Package (FTF-WDIP-003)**

  The FTF-WDIP-003 input package provides a methodology to demonstrate removal of HRRs to the MEP. FTF-WDIP-003 presents information that is anticipated to be in Section 5.2, *Removal to the Maximum Extent Practical,* of the Draft FTF 3116 Basis Document.

- **Radionuclide Concentrations of Stabilized Residuals, Tanks and Ancillary Structures Input Package (FTF-WDIP-004)**

  The FTF-WDIP-004 input package provides a methodology to determine waste classification relevant to 10 CFR 61.55. FTF-WDIP-004 presents information that is anticipated to be in Section 6.0, *Radionuclide Concentration of Stabilized Residuals, Tanks and Ancillary Structures,* of the Draft FTF 3116 Basis Document. FTF-WDIP-004 will include:

  - A description of a calculation methodology for comparison to the 10 CFR 61.55 tables.
  - A sample calculation utilizing the methodology described.

- **Waste will be Disposed of in Accordance with the Performance Objectives 10 CFR 61.41 & 10 CFR 61.42 Input Package (FTF-WDIP-005)**

  The FTF-WDIP-005 input package provides a methodology to demonstrate compliance with 10 CFR 61.41 and 10 CFR 61.42. FTF-WDIP-005 presents information that is anticipated to be in Section 7.0, *Waste will be Disposed of in Accordance with the Performance Objectives in 10 CFR 61 Subpart C,* of the Draft FTF 3116 Basis Document.

- **Waste will be Disposed of in Accordance with the Performance Objectives 10 CFR 61.43 Input Package (FTF-WDIP-006)**

  The FTF-WDIP-006 input package provides a methodology to demonstrate compliance with 10 CFR 61.43. FTF-WDIP-006 presents information that is anticipated to be in Section 7.0, *Waste will be Disposed of in Accordance with the Performance Objectives in 10 CFR 61 Subpart C,* of the Draft FTF 3116 Basis Document.

- **Waste will be Disposed of in Accordance with the Performance Objectives 10 CFR 61.44 Input Package (FTF-WDIP-007)**

  The FTF-WDIP-007 input package provides a methodology to demonstrate compliance with 10 CFR 61.44. FTF-WDIP-007 presents information that is anticipated to be in Section 7.0, *Waste will be Disposed of in Accordance with the Performance Objectives in 10 CFR 61 Subpart C,* of the Draft FTF 3116 Basis Document.

2.2 Overall Approach for the Draft FTF 3116 Basis Document

Based on the overall approach that DOE is considering, the Draft FTF 3116 Basis Document will identify the criteria and basis for each element of the Secretary of Energy's Section 3116 Determination that the stabilized residuals within the waste tanks and ancillary structures, the waste tanks, and the ancillary structures (including integral equipment) located at FTF at the completion of closure activities meet the criteria in Section 3116(a) and thus are not "high-level radioactive waste". However, because actual closure of the FTF is anticipated to occur over a number of years, and to facilitate full disclosure, DOE is considering including, for information purposes, an Appendix to the Draft FTF 3116 Basis Document that contains a description of the process DOE will follow to implement all aspects of the Section 3116 Determination prior to the closure of each waste tank or ancillary structure. Additionally, for each element depicted in input packages FTF-WDIP-003, FTF-WDIP-004 and FTF-WDIP-005, DOE is considering identifying within the Draft FTF 3116 Basis Document the type of information that will be used to document implementation of those specific elements.

3.0 SITE CHARACTERISTICS

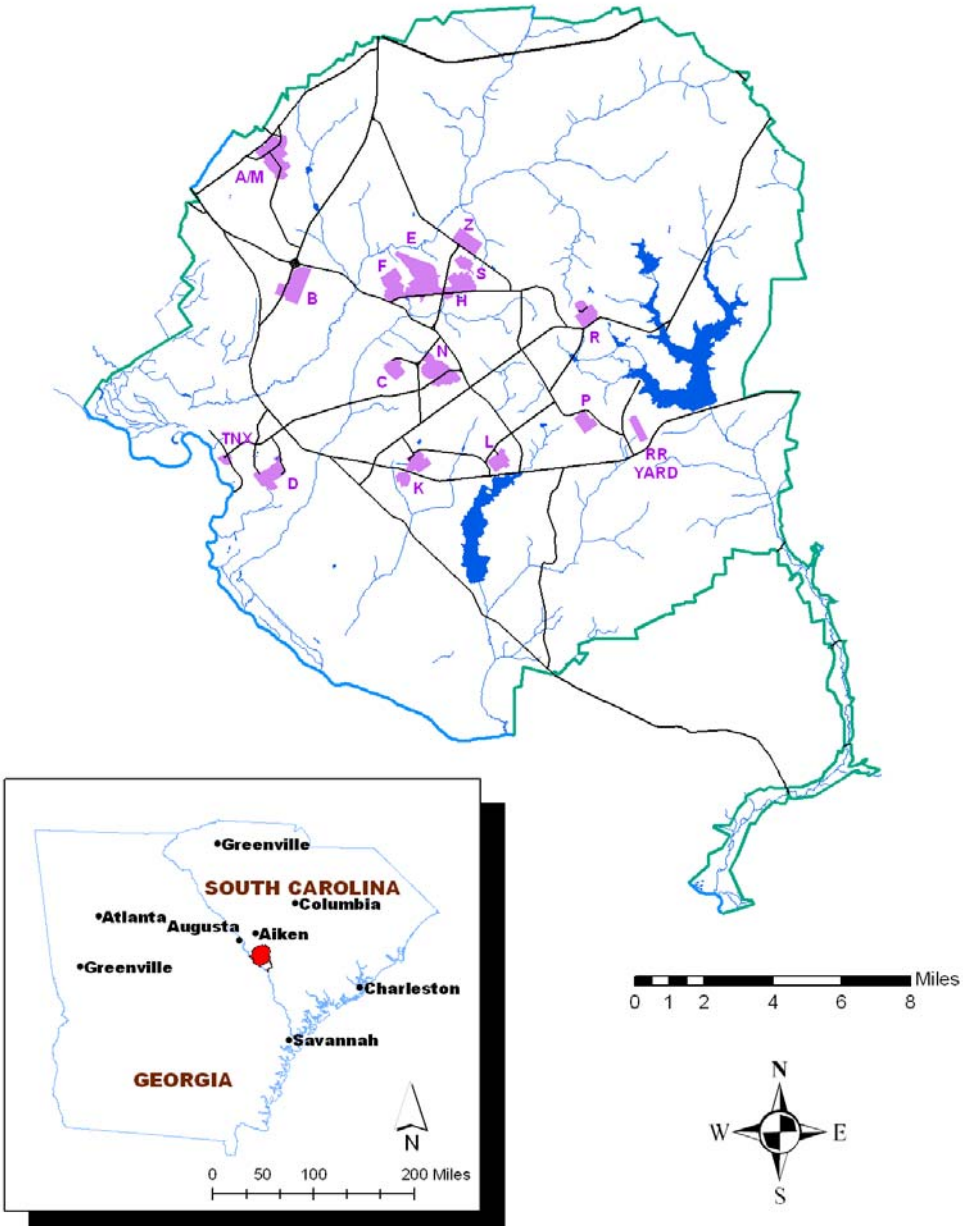
The SRS is located in south-central South Carolina, approximately 100 miles from the Atlantic Coast. The major physical feature at SRS is the Savannah River, approximately 20 miles of which serves as the southwestern boundary of the site and the South Carolina-Georgia border. The SRS encompasses portions of Aiken, Barnwell, and Allendale counties in South Carolina. The SRS occupies approximately 310 square miles, or more than 198,000 acres, and contains production, service, and research and development areas. The developed areas occupy less than

10% of the SRS footprint while the remainder of the site is undeveloped forest or wetlands. [SRS-REG-2007-00002]

3.1 F-Area Tank Farm Facility Description

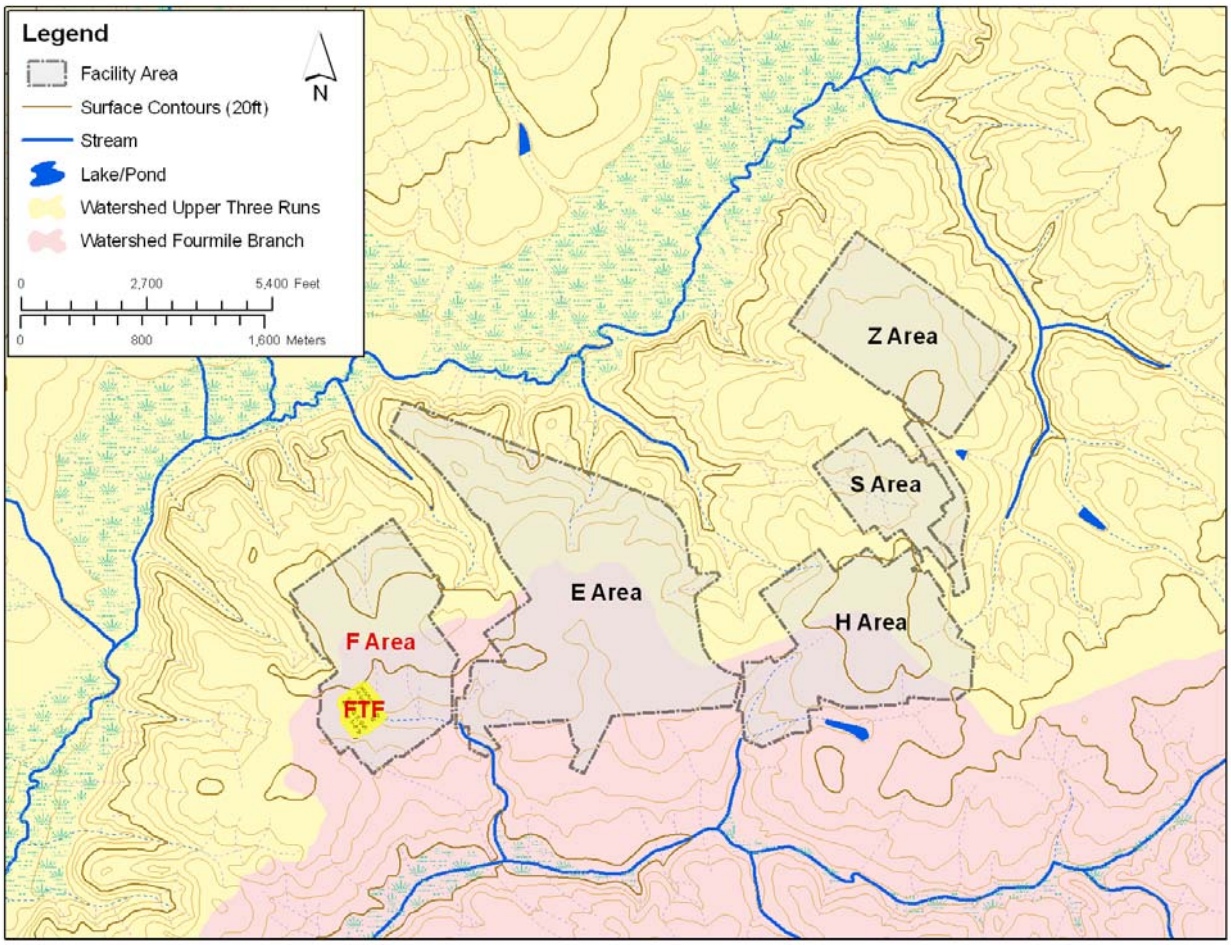
A legacy of the SRS mission was the generation of liquid waste from chemical separations processes in both F- and H-Areas. Since the beginning of SRS operations, an integrated waste management system has evolved, which consists of several facilities designed for the overall processing of liquid waste. Two of the major components of this system are the FTF and H-Tank Farm (HTF) located in F-Area and H-Area, respectively, near the center of the site (Figure 3.1-1). In F-Area, plutonium, uranium, and other radionuclides were separated from irradiated fuel and target assemblies using chemical separations processes. The tank farms, which store and process waste from the chemical separations process, include tanks, evaporators, transfer line systems, and other ancillary structures.

Figure 3.1-1: SRS Operational Area Location Map



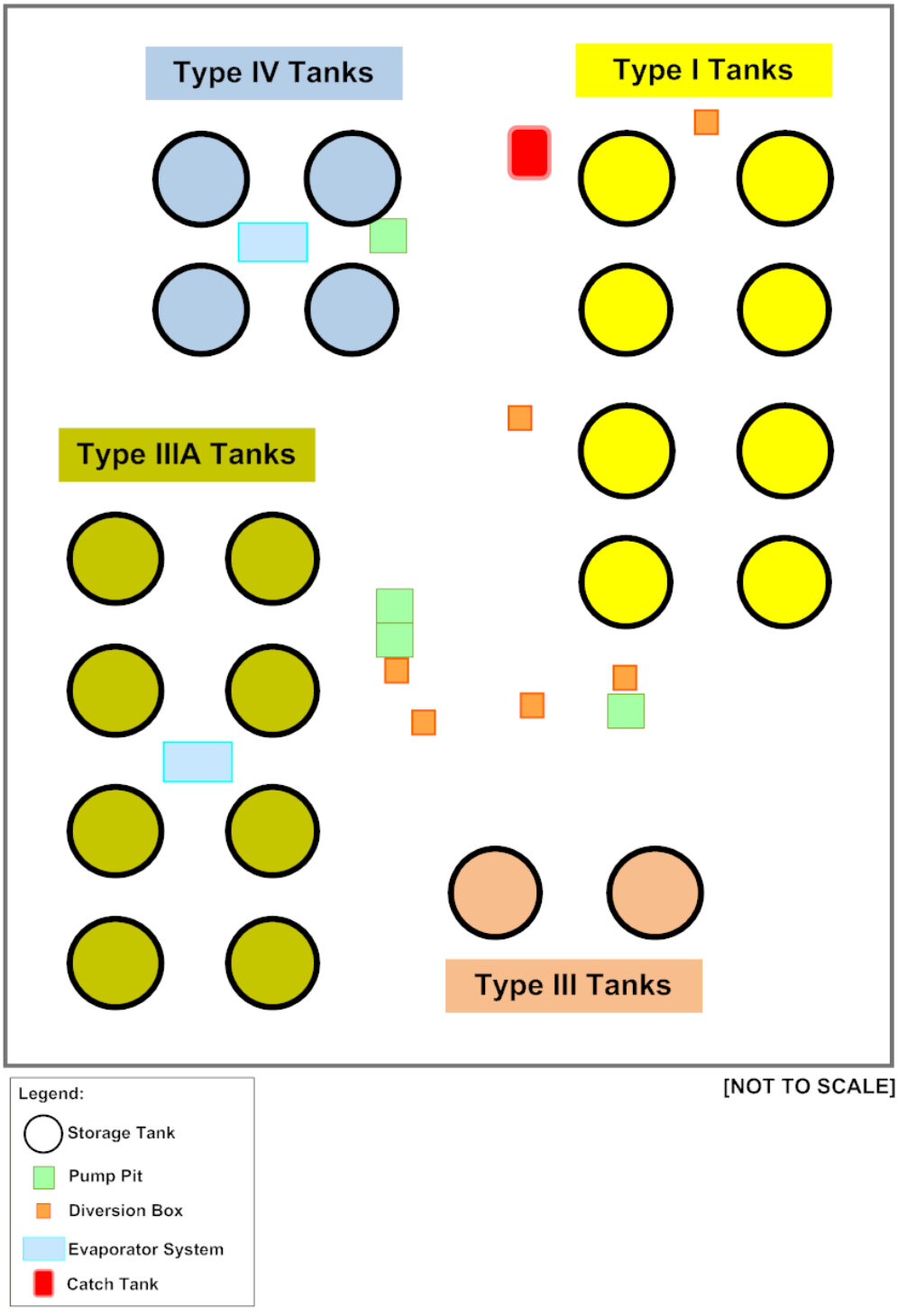
The FTF site was chosen because of its favorable terrain, proximity to the F Canyon Separations Facility (the major waste generation source), and isolation distance from the SRS boundaries. Figure 3.1-2 shows the setting of F-Area and FTF within the General Separations Area.

Figure 3.1-2: Layout of the General Separations Area



The FTF is a 22 acre site, which consists of 22 liquid waste storage tanks and supporting ancillary structures. The major FTF ancillary structures are two evaporator systems, transfer lines, six diversion boxes (DBs), one catch tank, a concentrate transfer system (CTS) tank, and three pump pits (PPs). There are three major waste tank types in FTF with nominal operating capacities ranging from 750,000 gallons (Type I tanks) to 1.3 million gallons (Type III, IIIA, and Type IV tanks). Figure 3.1-3 shows the general layout of FTF. The tanks have varying degrees of secondary containment and in-tank structural features such as cooling coils and columns. All FTF tank types are constructed of carbon steel. The FTF was constructed to receive waste generated by various SRS production, processing, and laboratory facilities. The use of FTF isolated these wastes from the environment, SRS workers, and the public. Extensive descriptions of the FTF and waste processing facilities are provided in the FTF Performance Assessment (PA). [SRS-REG-2007-00002]

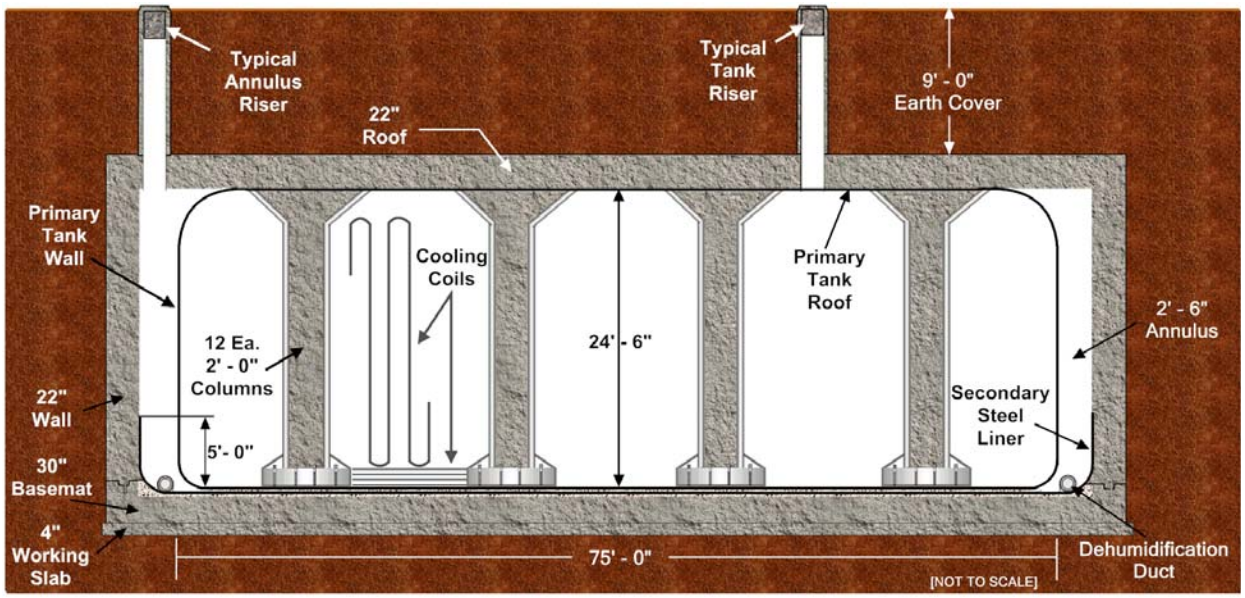
Figure 3.1-3: General Layout of F-Tank Farm



3.2 Type I Tanks

There are eight Type I tanks in FTF (Tanks 1 through 8). The Type I tanks were constructed in the early 1950s and first received waste from F Canyon in 1954. A typical Type I tank is shown in Figure 3.2-1. These waste tanks are 75 feet in diameter and 24.5 feet in height with a nominal operating capacity of 750,000 gallons. The tank tops are approximately 9 feet below grade. All Type I tanks are provided partial secondary containment by a five foot high, 80 foot diameter secondary steel liner (creating a 2.5 foot wide annulus). All Type I tanks have similarly configured vertical and horizontal cooling coils throughout the tank. Additional details of the Type I tanks are provided in Section 3.0 of the FTF PA. [SRS-REG-2007-00002]

Figure 3.2-1: Sketch of Typical Type I Tank (Cross-sectional View)



3.3 Type III/IIIA Tanks

There are two Type III and eight Type IIIA tanks in FTF. Construction of the FTF Type III tanks was completed in 1969 (Tank 33) and 1972 (Tank 34), and the FTF Type IIIA tanks were completed in 1978 (Tanks 25 through 28) and 1980 (Tanks 44 through 47). Typical Type III and IIIA tanks are shown in Figures 3.3-1 and 3.3-2, respectively. These waste tanks are 85 feet in diameter and 33 feet in height with a nominal operating capacity of 1,300,000 gallons. All Type III and IIIA tanks are provided full secondary containment by a secondary steel liner with the same height as the primary tank and a diameter of 90 feet (creating a 2.5 foot wide annulus). In the Type III tanks, cooling coil piping consists of deployable coolers that were inserted through the waste tank risers. Type IIIA tanks have vertical cooling coils throughout the tank that were installed at the time of tank construction. Both types of cooling coils are permanently installed in the tanks. Additional details of the Type III and IIIA tanks are provided in Section 3.0 of the FTF PA. [SRS-REG-2007-00002]

Figure 3.3-1: Sketch of Typical Type III Tank (Cross-sectional View)

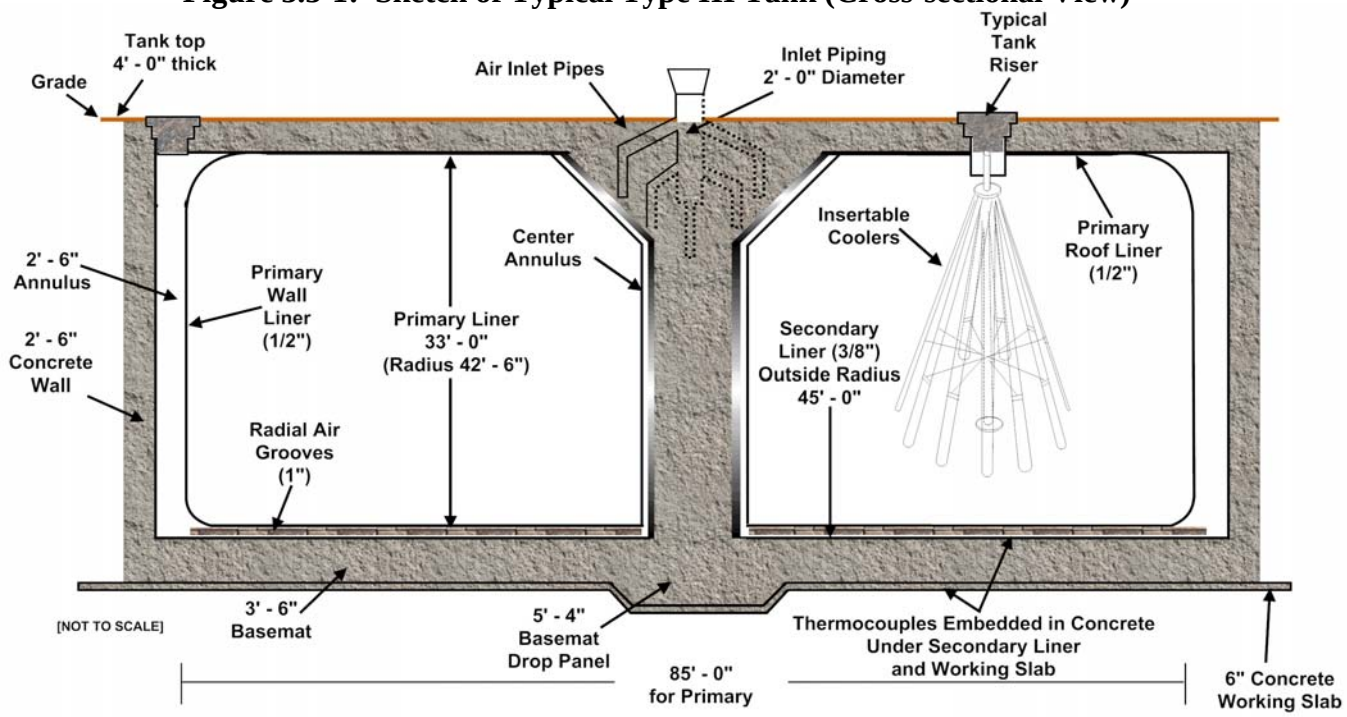
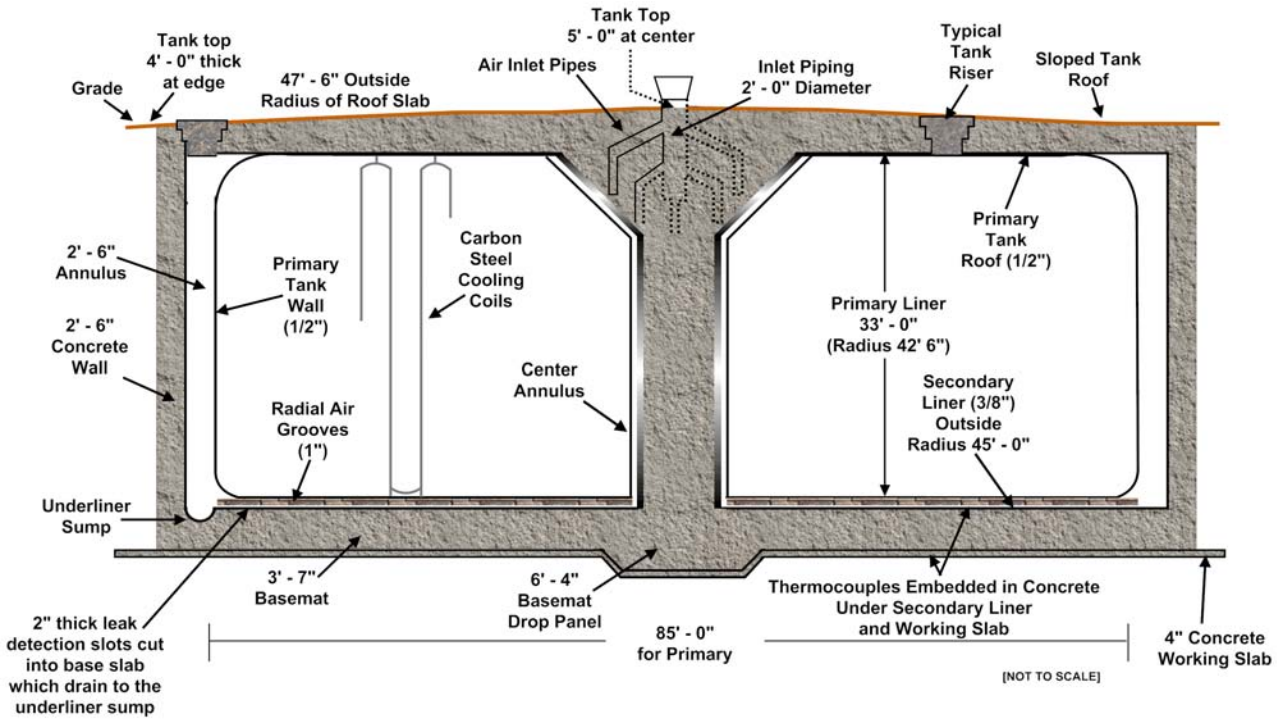


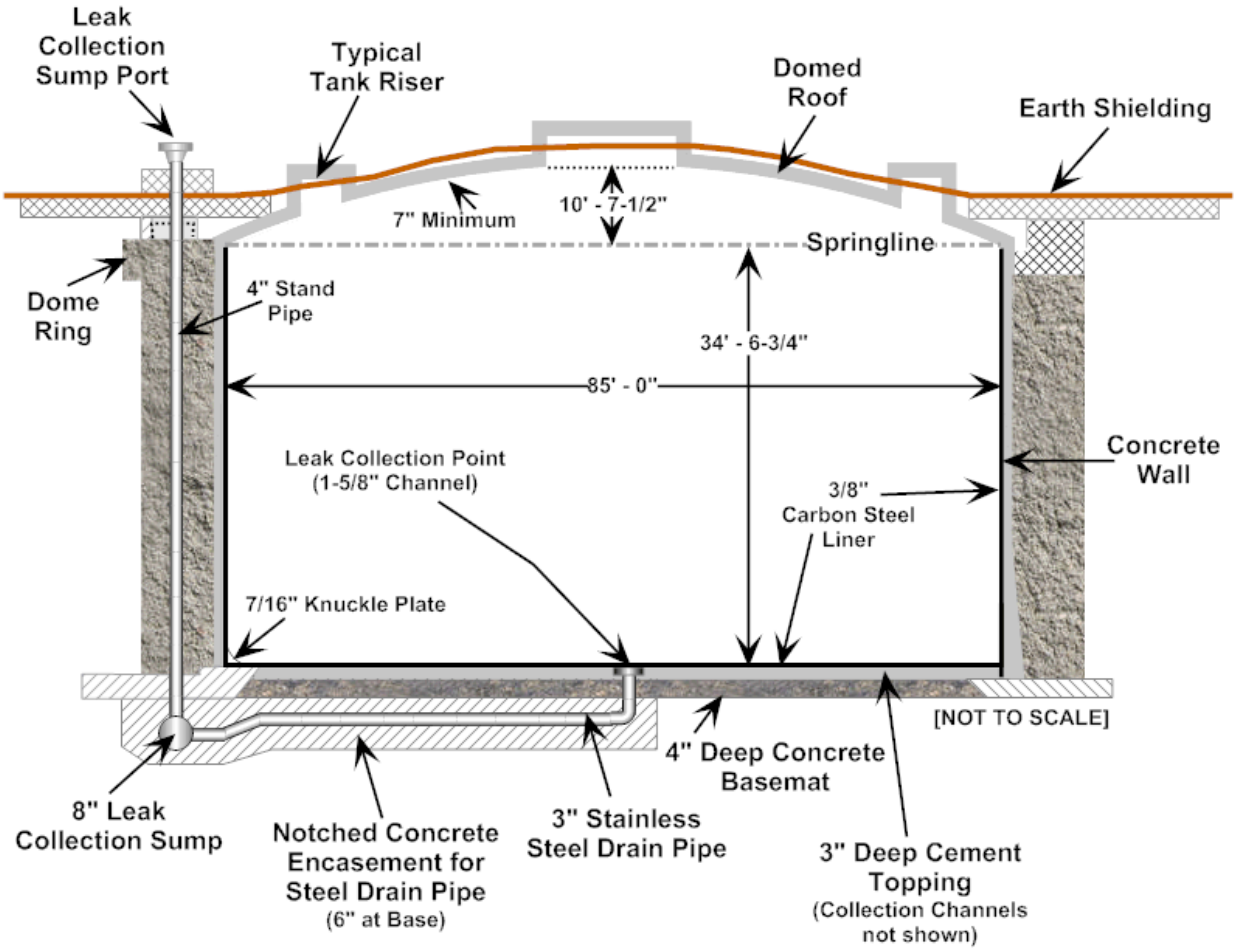
Figure 3.3-2: Sketch of Typical Type IIIA Tank (Cross-sectional View)



3.4 Type IV Tanks

There are four Type IV tanks in FTF (Tanks 17 through 20). The FTF Type IV tanks were constructed in the late 1950s. A typical Type IV tank is shown in Figure 3.4-1. These waste tanks have a single carbon steel liner with a reinforced concrete domed roof which is self-supporting. Type IV tanks are 85 feet in diameter and approximately 34 feet in height at the side wall with a nominal operating capacity of 1,300,000 gallons. Type IV tanks do not have secondary containment and do not have cooling coils. Tanks 17 and 20 were removed from service and filled with grout 1997 under the South Carolina Department of Health and Environmental Control approved Closure Modules. [PIT-MISC-0002, PIT-MISC-0004] Additional details of the Type IV tanks are provided in Section 3.0 of the FTF PA. [SRS-REG-2007-00002]

Figure 3.4-1: Sketch of Typical Type IV Tank (Cross-sectional View)

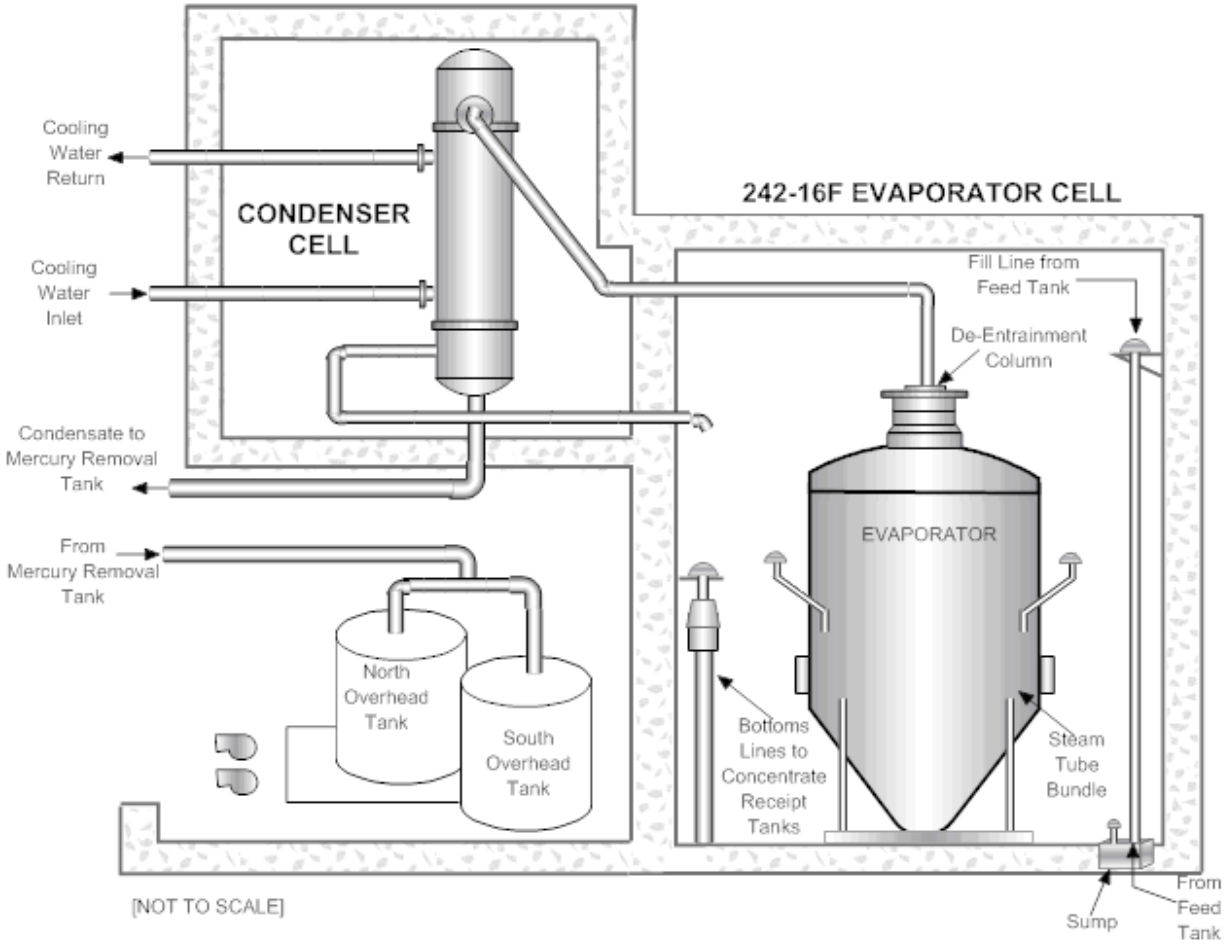


3.5 Ancillary Structures

3.5.1 Evaporator Systems

There are two evaporator systems in the FTF, the 242-F Evaporator System and the 242-16F Evaporator System. Both of these evaporator systems have processed waste resulting from the reprocessing of SNF and are being addressed by the Draft FTF 3116 Basis Document. The evaporators are used to reduce the volume of liquid radioactive waste within FTF by driving off a portion of the water in the waste. The evaporator systems are principally comprised of the Evaporator, Overheads System, and Condenser. The 242-16F Evaporator System is shown in Figure 3.5-1. The 242-F Evaporator Facility, which is similar to the 242-16F Evaporator, was constructed and placed into service in 1960 and removed from service in 1988. The 242-F Evaporator System also included the 242-3F CTS, which was used to distribute evaporator bottoms to tanks throughout FTF. The 242-16F Evaporator Facility was constructed in 1980 and continues to operate. Additional details of the evaporator systems are provided in Section 3.0 of the FTF PA. [SRS-REG-2007-00002]

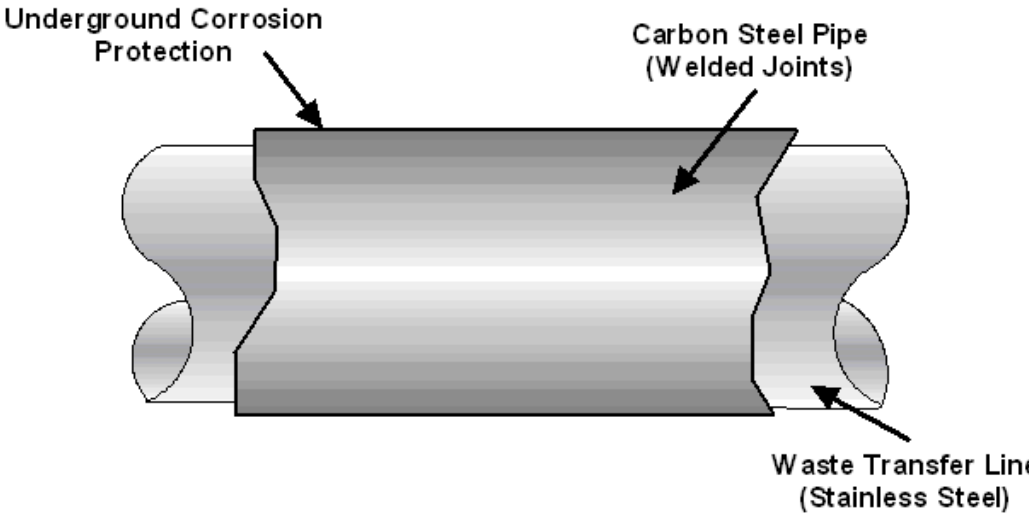
Figure 3.5-1: 242-16F Evaporator System Schematic



3.5.2 Transfer Line System

There are over 45,000 linear feet of transfer line piping in FTF, in which line segment lengths range from a few feet to over 4,000 feet. The FTF waste transfer lines are typically constructed of a stainless steel primary core pipe and are normally located below ground. Most primary transfer lines have secondary containments of some type. Approximately 93% (by length) of primary transfer lines are surrounded by another pipe (jacket) constructed of carbon steel, stainless steel, or cement-asbestos. These jackets typically drain to Leak Detection Boxes (LDB), Modified Leak Detection Boxes (MLDB), or to another primary or secondary containment (e.g., a waste tank). Approximately 7% (by length) of primary transfer lines are located inside a covered, concrete encasement. A typical transfer line is shown in Figure 3.5-2. Additional details of the transfer line system are provided in Section 3.0 of the FTF PA. [SRS-REG-2007-00002]

Figure 3.5-2: Typical Transfer Line Design



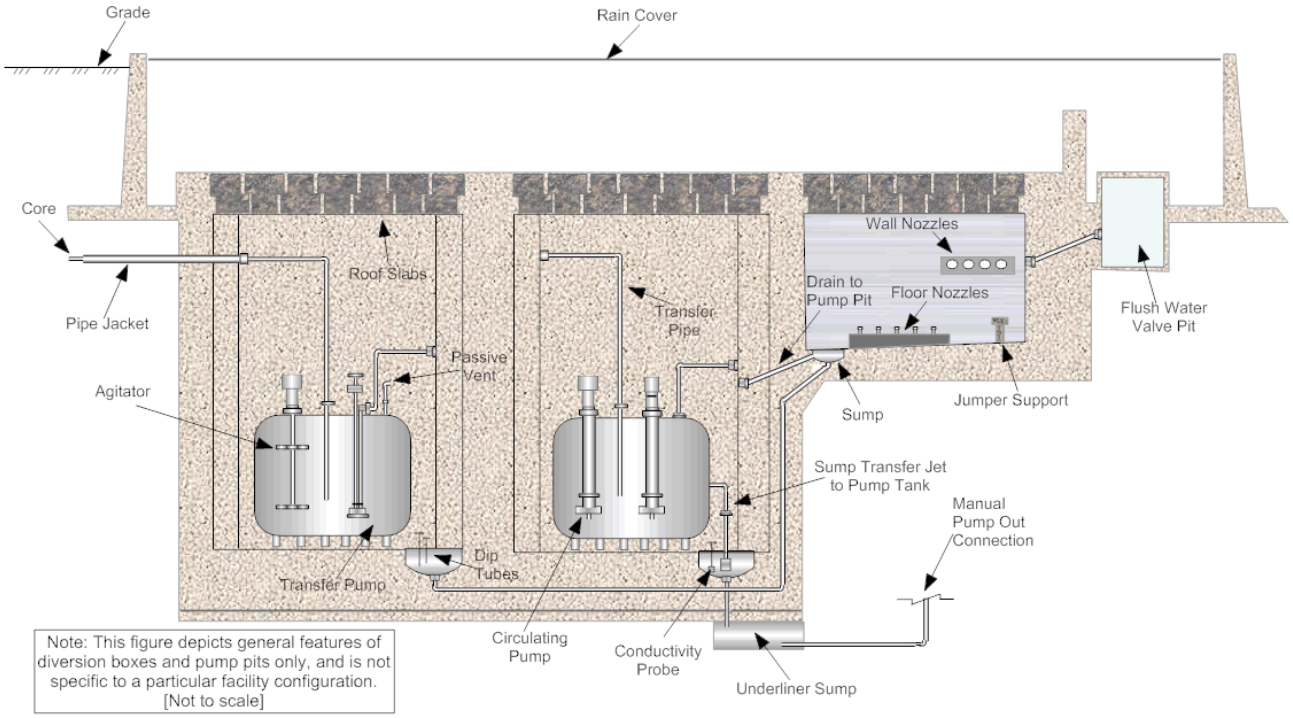
3.5.3 Pump Pits and Pump Tanks

The PPs are shielded, reinforced, concrete structures located below grade at the low points of transfer lines and are usually lined with stainless steel (Figure 3.5-3). The PP walls are approximately 2 to 3 feet thick (2 feet – 1 inch minimum), sloped floors are approximately 3 feet thick (2 feet – 9 inch minimum), and cell covers are concrete slabs approximately 2 to 3 feet thick. All PPs house a pump tank with the PPs providing secondary containment. Pump tanks are primarily used to temporarily stage material that is being transferred between waste tanks and to allow for venting, draining, and flushing of transfer lines at the completion of a transfer. See Figure 3.1-3 for locations of the PPs relative to other FTF components. Additional details of the PPs and pump tanks are provided in Section 3.0 of the FTF PA. [SRS-REG-2007-00002]

3.5.4 Diversion Boxes and Valve Boxes

The DBs are shielded, reinforced, concrete structures containing transfer line nozzles to which jumpers are connected in order to direct waste transfers to the desired location. The DBs are often constructed in conjunction with a PP (Figure 3.5-3). Transfer line valve boxes facilitate specific waste transfers that are conducted frequently. The valves are generally manual ball valves in removable jumpers with flush water connections on the transfer lines. Leakage collects in the valve box and drains back to the associated waste tank, DB, LDB, or LDB Drain Cell. Valve boxes are generally located adjacent to the tanks they serve and are designated accordingly. Additional details of the DBs and valve boxes are provided in Section 3.0 of the FTF PA. [SRS-REG-2007-00002]

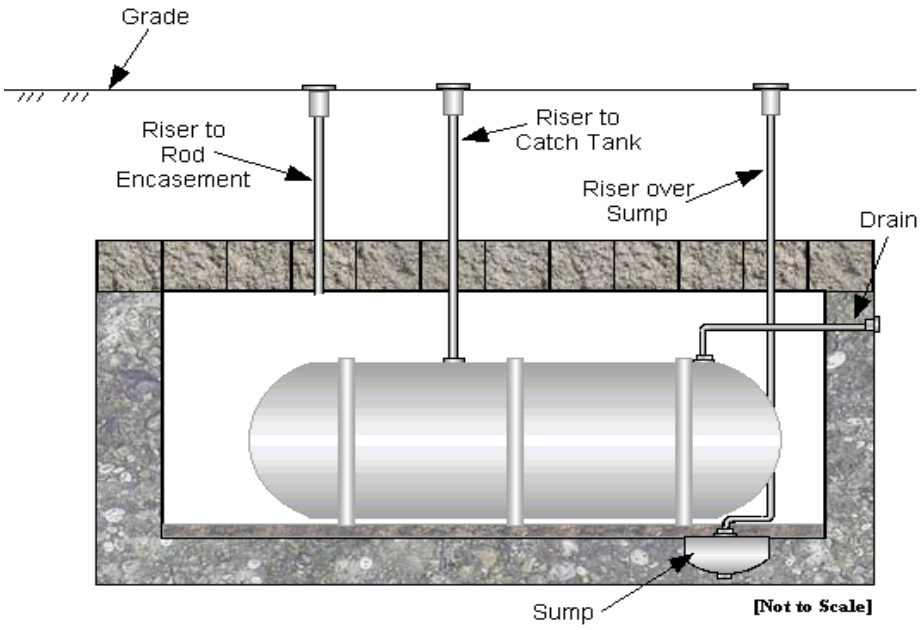
Figure 3.5-3: Typical Diversion Box and Pump Pit Design



3.5.5 Catch Tank

There is a single catch tank in FTF (Figure 3.5-4) designed to collect drainage from F-Area Diversion Box-1 (FDB-1) and the Type I tank transfer line encasement. The stainless steel catch tank is approximately 11,700 gallons and is in an underground reinforced concrete cell. The catch tank encasement is built on a 4 inch thick concrete pad with walls more than 3 feet thick. Additional details of the catch tank are provided in Section 3.0 of the FTF PA. [SRS-REG-2007-00002]

Figure 3.5-4: Catch Tank Cross Section



3.5.6 Other Ancillary Structures

The LDBs provide for the collection and detection of leakage from the transfer line. Drain piping can be run from a transfer line jacket to an LDB. The LDBs have conductivity probe leak detection, and drain and overflow plugs. Drain piping for the LDBs is provided so that leaks are diverted to the evaporator cell sump, or to a DB, PP, or drain cell.

The MLDBs serve the same purpose as the LDBs but are larger and are installed at low points that cannot be gravity drained to a collection point. In addition to a conductivity probe, MLDBs also include a vent line to a DB or PP, an above ground pressure gage to monitor for potential over-pressurization, and a smear/cleanout pipe for measuring level and manual pump-out of leakage into the box. Additional descriptions of the FTF ancillary structures are presented in Section 3.0 of the FTF PA. [SRS-REG-2007-00002]

4.0 REFERENCES

10 CFR 61, *Licensing Requirements for Land Disposal of Radioactive Waste*, U.S. Nuclear Regulatory Commission, Washington DC, January 1, 2010.

NDAA_3116, *Public Law 108-375, Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005, Section 3116, Defense Site Acceleration Completion*, October 28, 2004.

PIT-MISC-0002, *Industrial Wastewater Closure Module for the High-Level Waste Tank 20 System*, Savannah River Site, Aiken, SC, Rev. 1, January 8, 1997.

PIT-MISC-0004, *Industrial Wastewater Closure Module for the High-Level Waste Tank 17 System*, Savannah River Site, Aiken, SC, Rev. 2, August 26, 1997.

SRS-REG-2007-00002, *Performance Assessment for the F-Tank Farm at the Savannah River Site*, Savannah River Site, Rev. 1, March 31, 2010.