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Implementation Plan for Liquid Low-Level Radioactive Waste Systems Under the FFA for Fiscal Years 1996 and 1997 at Oak Ridge National Laboratory, Oak Ridge, Tennessee

H&R Technical Associates, Inc.

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

DISCLAIMER

DOE/OR/01-1473&D2

Energy Systems Environmental Restoration Program

Implementation Plan for Liquid Low-Level Radioactive Waste Systems Under the FFA for Fiscal Years 1996 and 1997 at Oak Ridge National Laboratory, Oak Ridge, Tennessee

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Environmental Management Activities at
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831-6285
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the
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PREFACE

This document presents the annual revision to plans and schedules associated with the implementation of the Federal Facility Agreement (FFA) compliance program and summarizes progress toward achieving the goals of the FFA for the Liquid Low-Level Radioactive Waste Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee. The work is being performed under Work Breakdown Structure 1.3.6.4.14.5 (Activity Data Sheet 3206).

CONTENTS

EXHIBITS

FIGURES

TABLES

ABBREVIATIONS

BSR	Bulk Shielding Reactor
CAT	collection and transfer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWCH	central waste collection header
DOE	U.S. Department of Energy
DOE-OR	DOE Oak Ridge Operations Office
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ES&H	environmental, safety, and health
FFA	Federal Facility Agreement
GAAT	Gunite and Associated Tanks (OU)
GPP	general plant project
HEPA	high-efficiency particulate air filter
HFIR	High Flux Isotopes Reactor
HRLAL	High Radiation Level Analytical Laboratory
LIP	Line Item Project
LLLW	liquid low-level radioactive waste
MCS	monitoring and control station (LLLW)
MVST	Melton Valley Storage Tanks
NHF	New Hydrofracture Facility
OHF	Old Hydrofracture Facility
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Research Reactor
OU	operable unit
PWTP	Process Waste Treatment Plant
R&D	research and development
RCRA	Resource Conservation and Recovery Act
REDC	Radiochemical Engineering Development Center
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RPPP	Radiochemical Processing Pilot Plant
SIA	structural integrity assessment
TAG	Technical Advisory Group
TDEC	Tennessee Department of Environment and Conservation
TRU	transuranic
TWRF	Transported Waste Receiving Facility
WAG	waste area grouping
WMRAD	Waste Management and Remedial Action Division
WOCC	Waste Operations Control Center

GLOSSARY

Category A. A new or replacement tank system with secondary containment.

Category B. A tank system with secondary containment that existed on the date the FFA became effective.

Category C. An existing tank system without secondary containment.

Category D. A tank system that has been removed from service.

Hot cell. An enclosure and its associated ancillary equipment that provides shielding, containment, and remote handling capabilities for work involving radioactive sources and materials. Ancillary equipment includes radioactive off-gas filtration and drains to the LLLW system.

LLLW tank. A stationary device, designed to contain an accumulation of LLLW. It is constructed primarily of nonearthen materials (e.g., concrete or steel) to provide structural support and containment. This tank will function as a waste storage or neutralization tank. This definition does not include tanks in which processing other than neutralization occurs or in which the entire tank contents may be recycled to a process.

Leaking. The measured passage of a hazardous liquid through the primary or secondary containment structure at a rate greater than or equal to the criteria established in the *Leak Testing Plan for the Oak Ridge National Laboratory Liquid Low-Level Waste System* (ORNL/ER/Sub/92-SK263/1).

Raffinate. The part of a liquid remaining after its more soluble components have been extracted by a solvent.

Secondary containment tank system. For the purpose of the FFA, tank systems will be categorized as secondarily contained if the capability exists to contain regulated substances released from the primary tank system until such wastes are detected and removed. Some ORNL LLLW tank systems may require modification of ancillary equipment and the upgrade of secondary containment to meet FFA requirements.

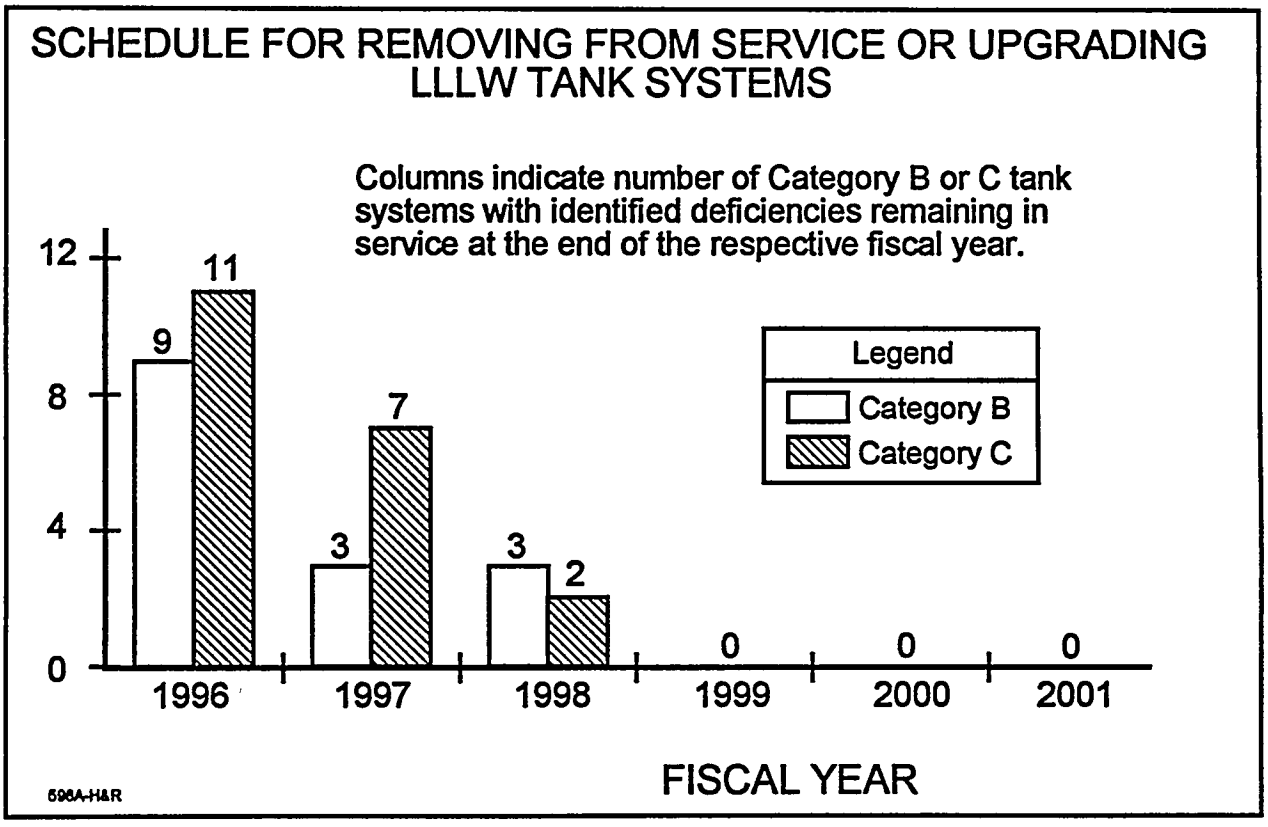
Tank system. A waste storage or waste treatment tank and its associated ancillary equipment and containment system. In the ORNL LLLW system, ancillary equipment includes sumps, piping, and valves to the waste tank(s) and piping and valves from the waste tank(s).

This document is the fourth annual revision of the plans and schedules for implementing the Federal Facility Agreement (FFA) compliance program, originally submitted in 1992 as ES/ER-17&D1, *Federal Facility Agreement Plans and Schedules for Liquid Low-Level Radioactive Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee.*

This document summarizes the progress that has been made to date or will be made as of the end of Fiscal Year (FY) 1996 in implementing the plans and schedules for meeting the FFA commitments for the Liquid Low-Level Waste (LLLW) System at Oak Ridge National Laboratory (ORNL). In addition, this document lists FFA activities planned for FY 1997. Information presented in this document provides a comprehensive summary to facilitate understanding of the FFA compliance program for LLLW tank systems and to present plans and schedules associated with remediation, through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, of LLLW tank systems that have been removed from service.

ORNL has a comprehensive program underway to upgrade the LLLW system as necessary to meet the FFA requirements. The tank systems that are removed from service are being investigated and remediated through the CERCLA process. Waste and risk characterizations have been submitted. Additional data will be prepared and submitted to EPA/TDEC as tanks are taken out of service and as required by the remedial investigation/feasibility study (RI/FS) process.

Chapter 1 provides general background information and philosophies that lead to the plans and schedules that appear in Chaps. 2 through 5. The following figure illustrates the schedule for removing from service or upgrading LLLW tank systems that have identified deficiencies.



Prior to the FFA effective date, 52 singly contained tanks were removed from service. Implementation activities from 1992 through 1996 are discussed in this document.

Milestones achieved since the FFA became effective include submittal to EPA/TDEC of the following:

- a schedule for conducting secondary containment design demonstrations for doubly contained tank systems (ORO-91-331-001);
- a schedule for removing singly contained tanks from service (ORO-91-331-002);
- a schedule for periodic review and revision of the structural integrity assessments of singly contained tanks that temporarily remain in service (ORO-91-331-003);
- a schedule for evaluating the structural integrity assessments of singly contained tanks that temporarily remain in service (ORO-91-331-004);
- a schedule for providing waste characterization information for tank systems that are removed from service (ORO-91-331-005);
- a schedule for providing risk characterization information for tank systems that are removed from service (ORO-91-331-006);
- a plan for characterizing the risk for tank systems that are removed from service;
- the *Waste Characterization Data Manual for the Inactive Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory*, DOE/OR/01-1159&D1 (supersedes ES/ER-80), June 1993;
- the *Risk Characterization Data Manual for the Inactive Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory*, DOE/OR/01-1168&D1, July 1993;
- the *Design Demonstrations Category-B Tank Systems*, DOE/OR/1047&D1, July 1992;
- the *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory*, LLLW Active Tanks DOE/OR/01-1129&D1, March 1993;
- the *Design Demonstration for the Remaining 19 Category B Tank Systems*, DOE/OR/03-1150&D1, June 1993;
- the *Remediation Schedule for Inactive Liquid Low-Level Waste Storage Tanks at ORNL*, DOE/OR/01-1138&D1, March 1993;
- the *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Pipelines*, DOE/OR/01-1167&D1, September 1993;
- the *Design Demonstrations for Category B Tank System Piping at Oak Ridge National Laboratory*, Oak Ridge, Tennessee, DOE/OR/03-1195&D1, February 1994;

- the *Design Assessment for Melton Valley Liquid Low-Level Waste Collection and Transfer System at Oak Ridge National Laboratory*, DOE/OR/03-1258&D1, Enserch Environmental Corp., May 1994;

- the *Annual Status Report on Federal Facility Agreement Compliance for the Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory*, DOE/OR/01-1291&D1, September 1994;

- the *Gunite and Associated Tanks Treatability Study Work Plan*, DOE/OR/02-1300&D1, September 1994;

- the *Remedial Investigation/Baseline Risk Assessment for the Gunite and Associated Tanks Operable Unit at WAG 1 at ORNL*, DOE/OR/02-1275&D1, June 1994; and

- the *Structural Integrity Assessments for the Category C Liquid Low-Level Waste Tank Systems at the Oak Ridge National Laboratory*, DOE/OR/01-1385&D1, September 1995.

Other submittals to EPA/TDEC include the following:

- the *Leak Testing Plan for the Oak Ridge National Laboratory Liquid Low-Level Waste System* (Active Tanks), ORNL/ER/Sub/92-SK263/1, June 1992;

- The *Risk Characterization Data Manual for the Inactive Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory*, DOE/OR/01-1168&D2, September 1993;

- the Design Assessment for FFA Compliance Work, Building 3019A Liquid Low-Level Waste Tank Systems at ORNL, DOE/OR/03109D1, January 1994;

- the Design Assessment for FFA Compliance Work, Building 3019A Liquid Low-Level Waste Tank Systems at ORNL, DOE/OR/031097D2, June 1994;

- the *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Pipelines*, DOE/OR/01-1167&D2, August 1994;

- the *Design/Installation and Structural Integrity Assessment Under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory*, DOE/OR/01-1311&D1, October 1994;

- the *Remedial Investigation/Baseline Risk Assessment for the Gunite and Associated Tanks Operable Unit at WAG 1 at ORNL*, DOE/OR/02-1275&D2, October 1994;

- the *Design Assessment for Melton Valley Liquid Low-Level Waste Collection and Transfer System at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/03-1258&D2, October 1994;

- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 2649 (Transported Waste Receiving Facility) at ORNL*, DOE/OR/01-1312&D1, October 1994;

- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 3092 (Central Off-Gas Scrubber Facility) at ORNL*, DOE/OR/01-1313&D1, October 1994;

- the *Risk Evaluation of Embedded, Single-Walled Liquid Low-Level Waste Piping at ORNL*, DOE/OR/01-1314&D1, October 1994;

- the *Design Demonstrations Category-B Tank Systems at ORNL*, DOE/OR/1047&D2, November 1994;

- the *Design/Installation and Structural Integrity Assessment Under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory*, DOE/OR/01-1311&D2, November 1994;

- the *Action Memorandum for the WAG 1 Tank WC-14 Removal at ORNL*, DOE/OR/02-1322&D2, November 1995, and associated revision letter from Nelson Lingle, April 1995;

- the *Leak Testing Plan for the Oak Ridge National Laboratory Liquid Low-Level Waste System* (Active Tanks), ORNL/ER/Sub/92-SK263/1 (Rev. 2), December 1994;

- the *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory, LLLW Active Tanks*, DOE/OR/01-1129&D2, December 1994;

- the *Design Demonstration for the Remaining 19 Category B Tank Systems*, DOE/OR/03-1150&D2, December 1994;

- the *Design Demonstrations for Category B Tank System Piping at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/03-1195&D2, January 1995;

- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 2649 (Transported Waste Receiving Facility) at ORNL*, DOE/OR/01-1312&D2, January 1995;

- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 3092 (Central Off-Gas Scrubber Facility) at ORNL*, DOE/OR/01-1313&D2, January 1995;

- the *Annual Status Report of Fiscal Year 1995 for the Liquid Low-Level Waste Tank Systems at the Oak Ridge National Laboratory Under the Federal Facility Agreement, Oak Ridge, Tennessee*, DOE/OR/01-1438&D0, October 1995;

- the *Design Assessment for the Melton Valley Storage Tanks Capacity Increase at Oak Ridge National Laboratory Under the Federal Facility Agreement, Oak Ridge, Tennessee*, DOE/OR/01-1424&D1, November 1995;

- the *Structural Integrity Assessments for the Category C Liquid Low-Level Waste Tank Systems at the Oak Ridge National Laboratory*, DOE/OR/01-1385&D2, April 1996; and

- the *Design Assessment for the Bethel Valley FFA Upgrades at Oak Ridge National Laboratory Under the Federal Facility Agreement*, Oak Ridge, Tennessee, DOE/OR/03-1418&D1, September 1995.

In addition to the submittal of these documents, the following actions have been accomplished or will have been accomplished by the end of FY 1996:

- installed two new LLLW tanks (F-1401 and F-1701) serving Building 2026 and the transported waste receiving facility;
- reclassified tank LA-104 from Category B to Category D;
- initiated leak testing for all active, singly contained tanks and piping;
- eliminated three sources of nonprogrammatic inflow into tank WC-10;
- completed an ORNL-wide survey to identify inputs to the LLLW system that could be isolated or diverted to the process waste system. The results of this survey led to initiation of projects to eliminate inputs to the LLLW system from the cell ventilation system and the hot off gas system, specifically, isolation of drains from the cell ventilation ducts and fans at the 3039 central off-gas stack, and the off-gas condensate pots in the isotopes area;
- installed double wall pipe to bypass a leaking flange on the tank W-12 discharge line;
- completed activities requiring temporary use of tank W-12 and returned W-12 to inactive status (Category D);
- repaired leaking discharge line on tank WC-10;
- installed double-walled pipe to bypass leaking pump in WC-9 pump pit;
- enclosed filter pit at the Radiochemical Engineering Development Center (REDC);
- replaced 11 valves in Bldg. 2533; valve pit 3026; and tank systems WC-3, WC-7, WC-9, WC-19, W-16, and L-11 to support pipeline leak testing;
- reconditioned valves in valve boxes VB-1 and VB-2 and modified piping in valve pit 3026 to support pipeline leak testing;
- repaired steam supply valve in LA-104 pit;
- repaired steam ejector piping in WC-19 pit;
- installed valve in Bldg. 3517 to support leak testing of S-223 discharge pipeline;
- removed tanks 3001-B, 3004-B, and LA-104;
- isolated and/or remediated tanks 3013, WC-7, 4501-P, 7562, H-209, and T-30;
- placed tank F-1401 in service;
- repaired leaking discharge line from the WC-3/WC-17/W-16 system;

- reclassified tanks WC-7, 2026A, F-201, and WC-19 from Category C to Category D (as of the end of FY 1996);
- upgraded Incinerator Drive/Old Hydrofracture Facility (OHF) valve box to meet FFA requirements;
- constructed ion exchange system to eliminate generation of High Flux Isotopes Reactor (HFIR) LLLW;
- installed liner in W-6 valve box;
- completed construction of double-walled Melton Valley transfer line;
- completed construction of REDC tank systems upgrades (awaiting system test and checkout and operational training and readiness review);
- prepared feasibility study for Gunite and Associated Tanks (GAAT) W-3, W-4, and TH-4;
- issued the *Addendum to the Remedial Investigation/Baseline Risk Assessment for the Gunite and Associated Tanks Operable Unit at Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.* DOE/OR/02-1275&D2/A1, April 1996;
- issued *Engineering Evaluation/Cost Analysis for the Old Hydrofracture Tanks, Oak Ridge, Tennessee.* DOE/OR/02-1450&D2, May 1996;
- upgraded the 3019A LLLW discharge system to meet FFA requirements; and
- completed construction of an ion exchange system at the Bulk Shielding Reactor/Oak Ridge Research Reactor that eliminated LLLW discharges to tank WC-19.

The following actions are planned for FY 1997:

- isolate and remediate tanks WC-19, WC-4, WC-5, WC-6, WC-8, and 2026A;
- remediate tanks W-1, W-2, W-11, W-12, W-13, W-14, W-15, W-19, W-20, and W-1A (if funding becomes available);
- eliminate nonprogrammatic waste generation at Bldgs. 7830 and 7860;
- upgrade tank systems B-2-T, B-3-T, C-6-T, F-111, and F-126;
- upgrade East Evaporator Valve Pit;
- install new Melton Valley Storage Tanks W-32 through W-37;
- install replacement transfer piping for Bldg. 3092;
- begin installation of replacement piping for Bldg. 3025;
- begin operation of tanks F-1701 and F-1800;

- complete GAAT Treatability Study;
- complete feasibility studies/proposed plans for the GAAT Groups 2 and 3 tanks;
- determine CERCLA action for tank WC-1;
- evaluate treatment, storage, and disposal options for tank WC-14 waste; and
- perform cold tests for OHF tanks content sluicing.

The tank systems at ORNL to which the FFA applies are listed in Fig. 1.2 of this report and in Appendix F of the FFA. Periodic changes occur in tank categories as tank systems are tested, upgraded or removed from service or for other reasons as agreed upon by the FFA signatories. Because of the time required to revise the FFA or this report, the lists in these documents may not reflect the latest approved status of some tanks. Any approved change in tank status that deviates from that shown in FFA Appendix F or this report will be supported by documentation on file in the Environmental Restoration Document Control Center and the Waste Management and Remedial Action Division Document Management Center. The FFA requirements applicable to each tank system are those for the latest approved category of that system.

1. BACKGROUND

1.1 INTRODUCTION

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires a Federal Facility Agreement (FFA) for federal facilities placed on the National Priorities List. The Oak Ridge Reservation was placed on that list on December 21, 1989, and the agreement was signed in November 1991 by the Department of Energy Oak Ridge Operations Office (DOE-ORO), the U.S. Environmental Protection Agency (EPA)–Region IV, and the Tennessee Department of Environment and Conservation (TDEC). The effective date of the FFA was January 1, 1992. Section IX and Appendix F of the agreement impose design and operating requirements on the Oak Ridge National Laboratory (ORNL) liquid low-level radioactive waste (LLLW) tank systems and identify several plans, schedules, and assessments that must be submitted to EPA/TDEC for review or approval. The issue of ES/ER-17&D1 *Federal Facility Agreement Plans and Schedules for Liquid Low-Level Radioactive Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee* in March 1992 transmitted to EPA/TDEC those plans and schedules that were required within 60 to 90 days of the FFA effective date. This document updates the plans, schedules, and strategy for achieving compliance with the FFA as presented in ES/ER-17&D1 and summarizes the progress that has been made to date. This document supersedes all updates of ES/ER-17&D1.

Chapter 1 describes the history and operation of the ORNL LLLW System and the objectives of the FFA. Chaps. 2 through 5 contain the updated plans and schedules for meeting FFA requirements. This document will continue to be periodically reassessed and refined to reflect newly developed information and progress.

1.2 LLLW SYSTEM BACKGROUND

ORNL is a multidisciplinary research facility that began operation in 1943 as part of the Manhattan Project. The original mission of the laboratory was to develop a prototype graphite reactor and reprocess the reactor fuel for plutonium recovery. Subsequent to World War II, the primary functions of ORNL were fuel reprocessing research; radioisotopes production and applications development; and development, testing, and operation of nuclear reactor concepts. More recently, the laboratory has increased its role in biological, environmental, energy, and materials research. As a consequence of these multidisciplinary research activities, heterogeneous wastes, including solid and liquid radioactive, hazardous, and mixed wastes, have been generated in varying amounts over time.

Since its establishment, ORNL has operated numerous facilities that generate LLLW. LLLW originates from radioactive liquid discarded into sinks and drains in research and development (R&D) laboratories and from facilities such as the Radiochemical Processing Pilot Plant (RPPP, Bldg. 3019), nuclear reactors, radioisotope production facilities, and the Process Waste Treatment Plant (PWTP).

The LLLW system is a complex system with multiple facilities, users, and operators. The system is used for collection, neutralization, transfer, and concentration of aqueous radioactive waste solutions from generator facilities, followed by storage of the LLLW concentrate. Figure 1.1 is a block flow diagram depicting the movement of waste through the system. Waste solutions are typically accumulated at source buildings, often in collection tanks located inside the buildings, and discharged to below-grade collection tanks that receive wastes from several different source buildings. However, in many instances, LLLW is transferred from laboratory and

hot-cell drains directly to underground collection tanks or the central waste collection header (CWCH) through unvalved piping.

A network of below-grade piping interconnects the various system components. Because their initial pH may be low, LLLW solutions often must be neutralized with sodium hydroxide (NaOH). The solutions are periodically transferred via the CWCH to the LLLW evaporator service tanks. From there, the solutions are sent to the LLLW evaporator facility where they are concentrated by a factor of approximately 30:1. The evaporator concentrate is then transferred via pipeline to the Melton Valley Storage Tanks (MVST). LLLW collection tanks are equipped with liquid-level instrumentation with high-level and low-level alarms to alert the Waste Operations Control Center (WOCC) of unusual conditions. The tanks are vented to the atmosphere through a central off-gas collection and filtration system operating at a negative pressure or through an individual tank filter system.

Most of the LLLW System was installed more than 30 years ago. The initial system and its subsequent modifications were designed to minimize radiation exposure to LLLW System users and operators. The system includes features such as unvalved, gravity-drained transfer lines to prevent waste backup into generator areas; shielded lines and tanks; and provisions for remote operations to minimize personnel exposure. As-built drawings for some of the older tank systems do not exist. Over the years, tank systems were abandoned as their integrity was breached or as programs were terminated. Some of the tanks were abandoned in place with liquid wastes and sludge left in them. As new tank systems were installed during the past 10 to 15 years, secondary containment and improved leak detection features were provided. The LLLW System is a mix of singly and doubly contained tank systems. The portions of the system that have been removed from service consist almost exclusively of tanks without secondary containment.

1.3 FFA OBJECTIVES

The objectives of the FFA are to ensure (1) that active tank systems slated to remain in service comply with the design and containment requirements specified in FFA Appendix F, Subsects. B and C; (2) that singly contained tank systems operated in the interim do not leak; and (3) that tank systems that are removed from service are evaluated and remediated through the CERCLA process. A breakdown of the LLLW tank systems by FFA category is provided in Fig. 1.2. Figures 1.3 and 1.4 are maps showing the relative locations of FFA LLLW tanks in Bethel Valley and Melton Valley, respectively.

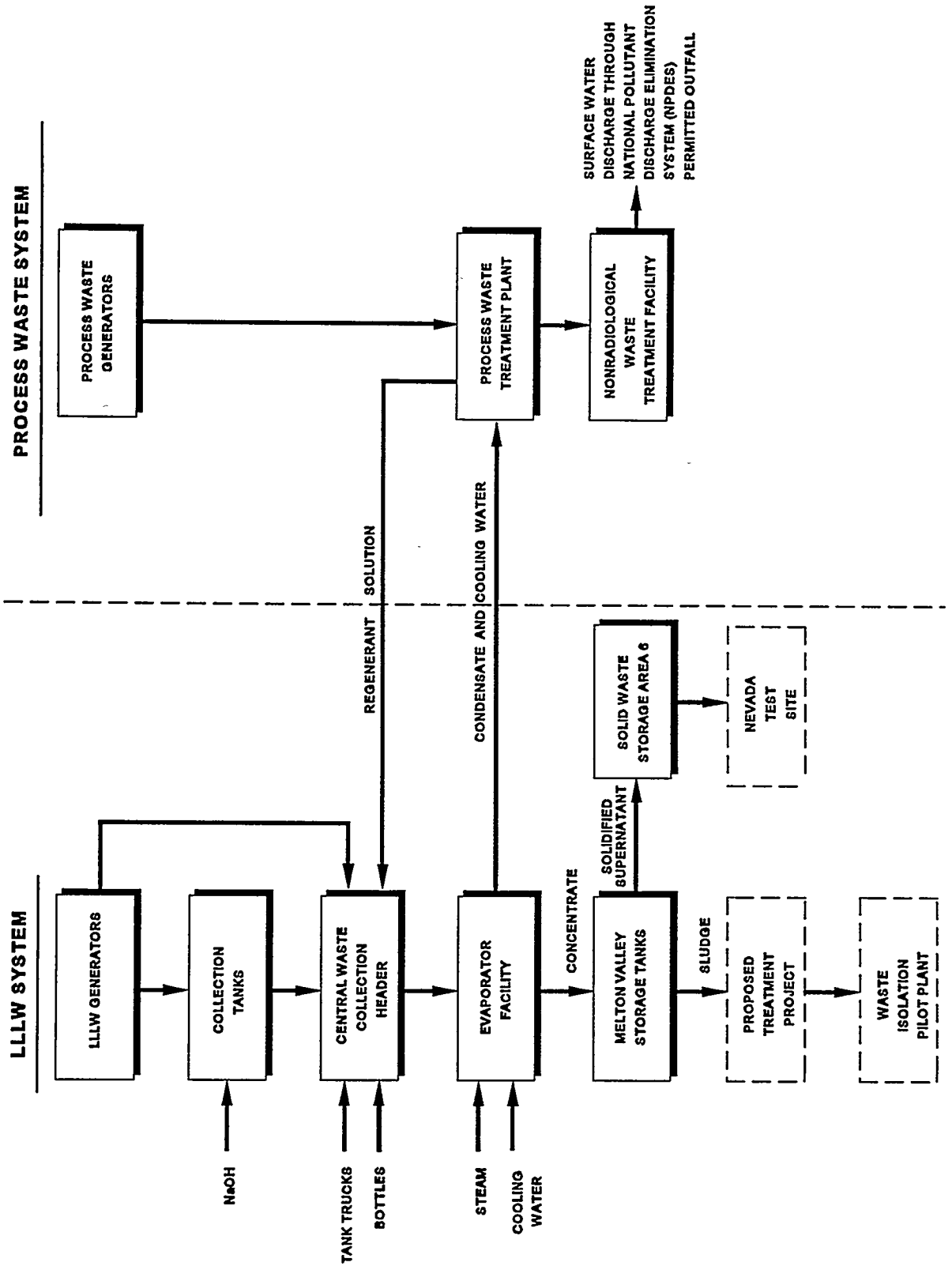


Fig. 1.1. Block flow diagram for the ORNL LLLW system.

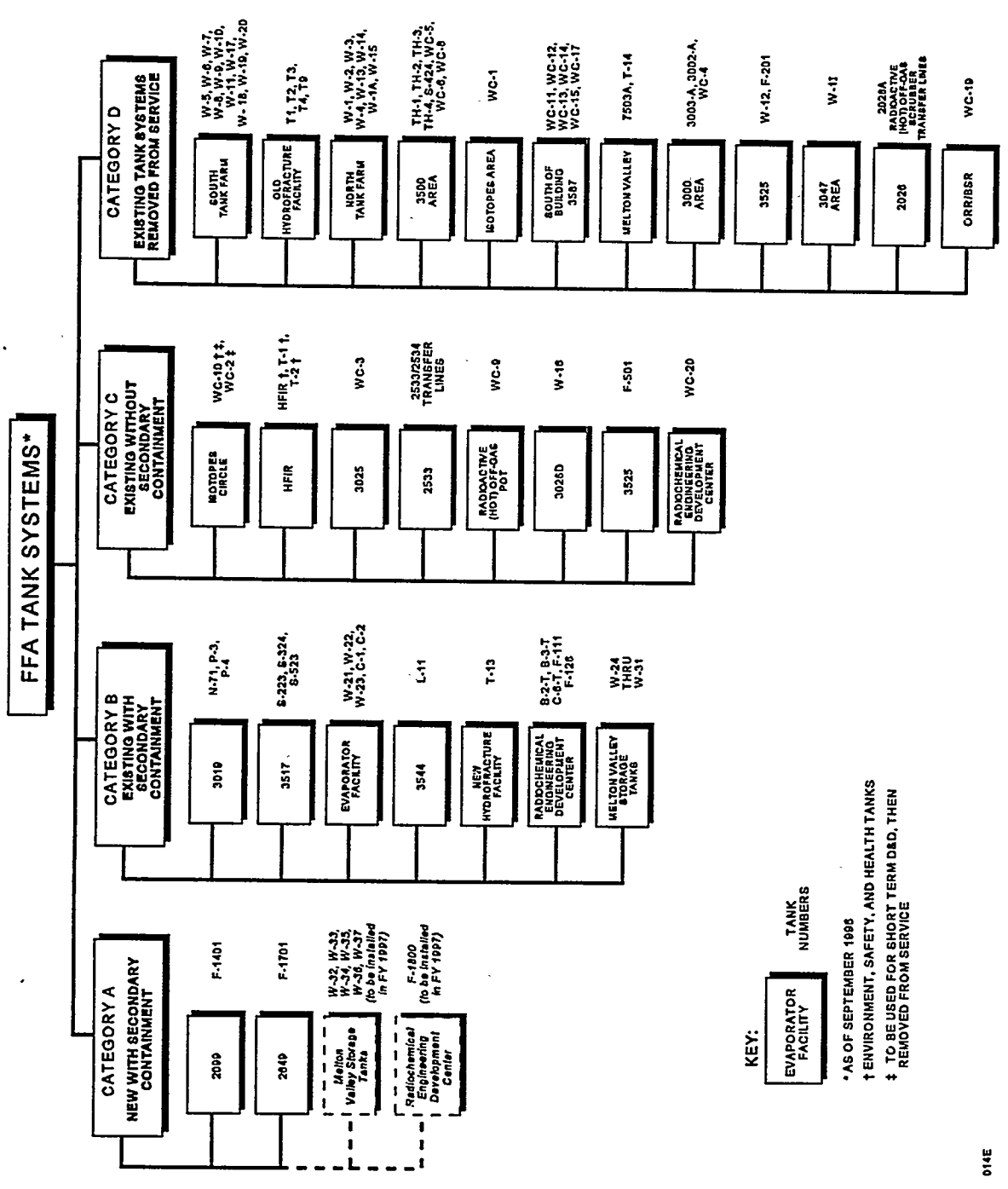


Fig. 1.2. ORNL LLLW tank systems by FFA category.

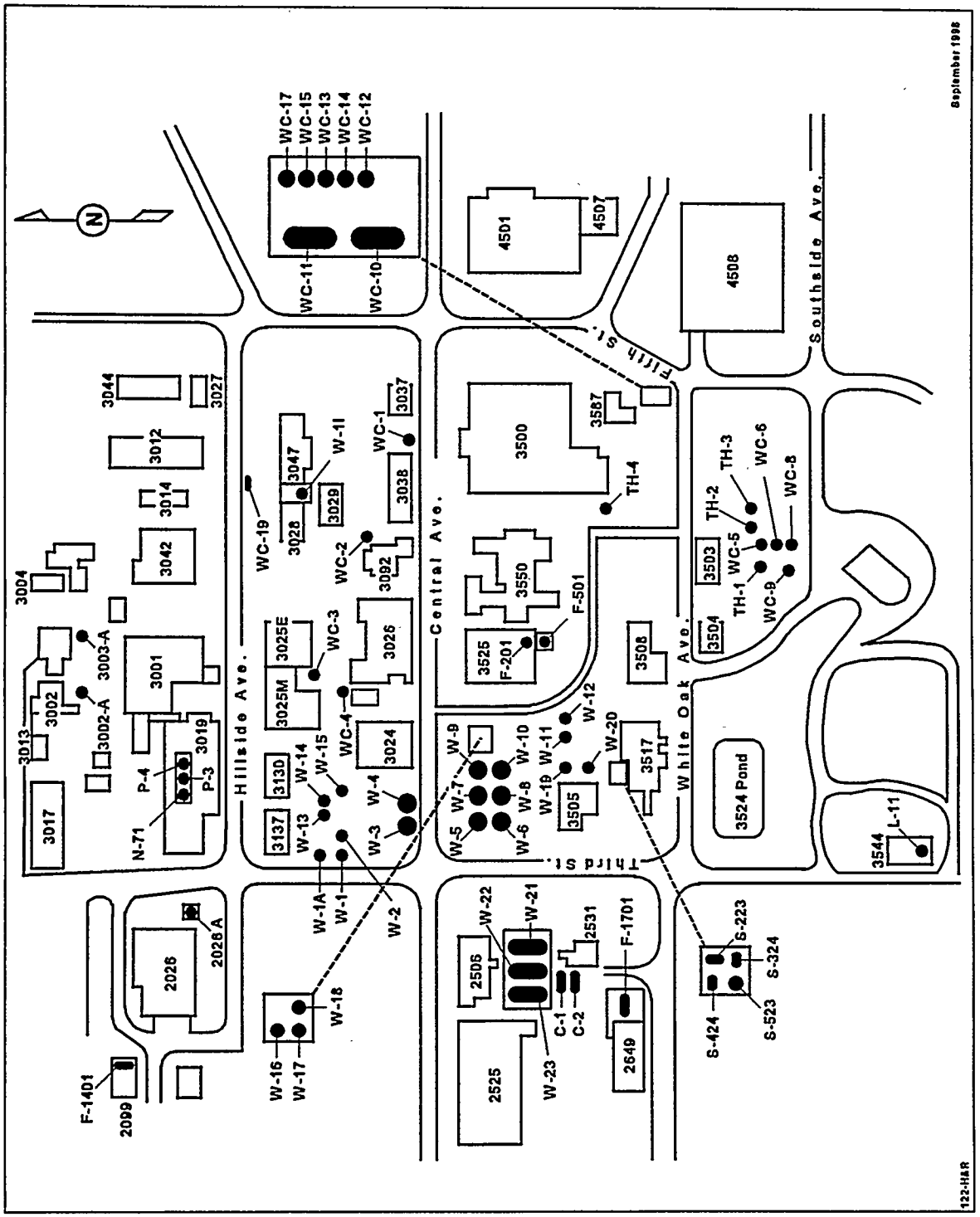


Fig.1.3. Bethel Valley LLLW tank systems.

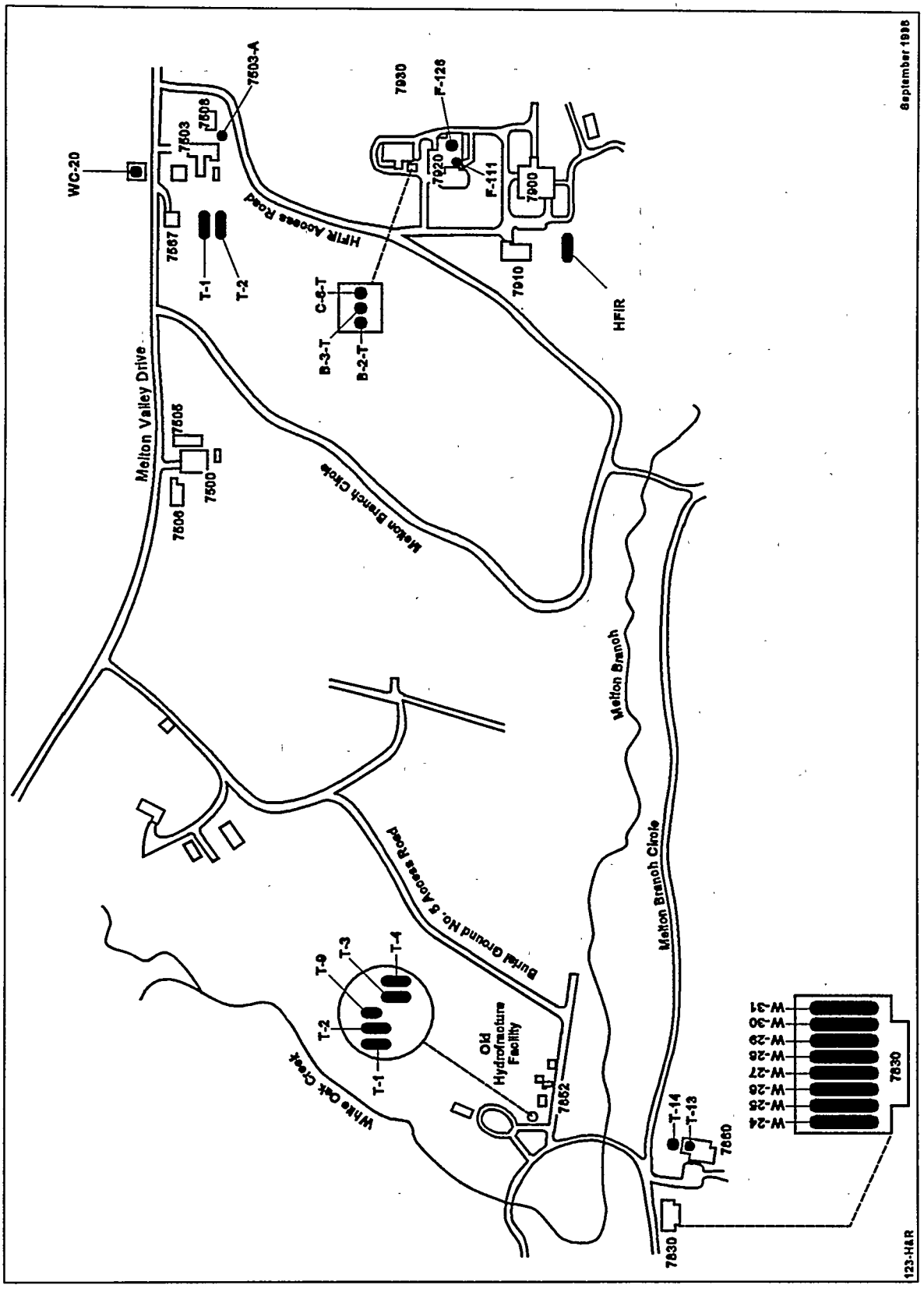


Fig. 1.4. Melton Valley LLLW tank systems.

1.4 TECHNICAL ADVISORY GROUP

The Technical Advisory Group (TAG) was a group of independent experts assembled to provide technical consultation on the suitability of planned and ongoing activities to meet FFA requirements and ORNL objectives. The TAG provided valuable guidance that was instrumental in developing the approach taken in administering the FFA program. The program has progressed to a more mature phase and the management of FFA activities has become more routine. The TAG was therefore disbanded in FY 1996.

2. CATEGORY A TANK SYSTEMS

2.1 FFA DELIVERABLE

The FFA requires DOE to prepare design assessments demonstrating that new or replacement tank systems meet the standards for design, containment, and release detection specified in FFA Appendix F, Sects. B and C. This chapter contains the schedules by which these assessments are being conducted and indicates the dates for submittal of information to EPA/TDEC. Design assessments will be submitted to EPA and TDEC for approval at least 90 days prior to start of construction. An installation assessment will be performed at the end of the project to document changes to the system, and the installation assessment will be kept on file.

2.2 STATUS

Design assessments are being prepared for projects that install, upgrade, and/or replace deficient LLLW systems at ORNL. The following design assessments have been submitted to and approved by EPA/TDEC:

- the *Design Assessment for FFA Compliance Work, Building 3019A Liquid Low-Level Waste Tank Systems at ORNL*, DOE/OR/03-1097&D2, June 1994;
- the *Design Assessment for Melton Valley Liquid Low-Level Waste Collection and Transfer System at Oak Ridge National Laboratory*, DOE/OR/03-1258&D2, October 1994;
- the *Design/Installation and Structural Integrity Assessment Under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System Upgrade fore Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory*, DOE/OR/01-1311&D2, November 1994;
- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 2649 (Transported Waste Receiving Facility) at ORNL*, DOE/OR/01-1312&D2, January 1995;
- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 3092 (Central Off-Gas Scrubber Facility) at ORNL*, DOE/OR/01-1313&D2, January 1995;
- the *Design Assessment for the Melton Valley Storage Tanks Capacity Increase at Oak Ridge National Laboratory Under the Federal Facility Agreement, Oak Ridge, Tennessee*, DOE/OR/01-1385&D1, September 1995; and
- the *Design Assessment for the Bethel Valley FFA Upgrades at Oak Ridge National Laboratory Under the Federal Facility Agreement, Oak Ridge, Tennessee*, DOE/OR/03-1418&D1, September 1995.

Future design assessments will be submitted at least 90 days prior to the start of project construction. The schedule for installing category A systems is shown in Table 2.1.

Table 2.1. Projects that will install Category A tank systems

Year of funding (FY)	Projected completion date (FY)	Project title	Project scope	Tank system	Design assessments	Type of funding
1992	1996	Melton Valley LLLW-CAT System Upgrade	Deletes, replaces or upgrades tank systems for REDC and HFIR	Installs MCS with local collection tank	5/94	line-item project
1988	1997	Bethel Valley LLLW-CAT System Upgrade Phase II	Deletes, replaces or upgrades LLLW-CAT systems for Bldgs. 3092, and 3544	Installs replacement transfer piping	11/94	line-item project
1994	1998	Bethel Valley FFA Upgrades	Deletes, replaces or upgrades tank systems for Bldg. 3503, 3025 and 2533.	Installs replacement transfer piping	9/95	line-item project
1994	1998	Melton Valley Storage Tank Capacity Increase	Provides additional storage capacity for LLLW concentrates	Installs additional concentrate storage tanks	11/95	line-item project

Note: Based on FY 1997 Activity Data Sheets (ADS), target funding levels.

3. CATEGORY B TANK SYSTEMS

3.1 FFA DELIVERABLE

The FFA requires that DOE demonstrate that the secondary containments for Category B tank systems meet the design and operating conditions specified in FFA Appendix F, Sect. C.

3.2 STATUS

Design demonstrations have been submitted for all Category B tanks[1,2] and pipelines.[3] The objective of each assessment is to demonstrate that the design of the secondary containment system meets the requirements of the FFA, Appendix F, Sect. C. Seventeen tank systems (C-1, C-2, N-71, P-3, P-4, T-13, W-21, W-22, W-23, W-24, W-25, W-26, W-27, W-28, W-29, W-30, and W-31) meet the requirements of the FFA. Nine tank systems (L-11, B-2-T, B-3-T, C-6-T, F-111, F-126, S-223, S-324, and S-523) have minor deficiencies in the tank secondary containment design for which there are one or more mitigating design features. Some of the piping associated with these tank systems is singly contained—notably, buried transfer piping connecting the tanks to the central waste collection system. Projects planned or initiated to correct these noted deficiencies are summarized in Table 3.1; the schedule for these upgrades is shown in Table 3.2. Until the projects correcting these pipeline deficiencies are completed, the pipelines will be periodically leak tested.[4]

Additionally, three tank systems originally considered as Category B (WC-20, F-201, and F-501) do not fully meet the secondary containment requirements and will not be upgraded. These systems were transferred to Category C. Tank F-201 was transferred to Category D in FY 1996. Tanks WC-20 and F-501 will be subject to the FFA requirements for Category C tank systems until they are removed from service.

Table 3.1. Projects for upgrading/replacing Category B LLLW tank systems

Year of funding (FY)	Projected completion date (FY)	Project title	Project scope	Tank system	Type of funding
1994	1997	NHF Cell Plugs Enclosures	Eliminates nonprogrammatic waste generation at 7830 and 7860	T-13	GPP
1994	1996	Incinerator Drive/OHF Valve Box Upgrade (completed)	Upgrades valve boxes to meet FFA requirements	Melton Valley Facilities	GPP
1992	1996	FFA Compliance Work, Bldg. 3019A (completed)	Doubly contains piping for 3019	N-71, P-3, P-4	GPP
1995	1996	W-6 Valve Box Upgrade (completed)	Upgrades valve box to meet FFA requirements		GPP
1995	1997[a]	East Evaporator Valve Pit Upgrade	Upgrades valve pit to meet FFA requirements		GPP
1992	1996[b]	Melton Valley LLLW-CAT System Upgrade	Deletes, replaces or upgrades tank systems for REDC and HFIR	B-2-T, B-3-T, C-6-T F-111, F-126, HFIR[c] T-1[c] T-2[c]	line item project

Note: Based on FY 1997 Activity Data Sheets (ADS), target funding levels.

[a]This project was delayed due to discovery of unexpectedly high levels of valve pit contamination. The upgrade will be redesigned.

[b]Construction activities for this project will be completed by the end of FY 1996. Operational readiness activities will be completed in FY 1997.

[c]Category C tanks that are included in the line-item project. These tanks will be removed from service within 1 year after project completion.

Table 3.2. Schedule for upgrade or removal from service of Category B tank systems

Fiscal year	Tank systems upgraded	Tank systems removed from service
1996	P-3, P-4, N-71 (Completed)	
1997	B-2-T, B-3-T, C-6-T, F-111, F-126, L-11[a]	
1999		S-223, S-523, S-324

[a]The tank L-11 discharge piping will be removed from service and a trucking station will be installed.

REFERENCES FOR CHAPTER 3

1. *Design Demonstrations for Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR-1047&D2, Foster Wheeler, Oak Ridge, Tennessee, November 1994.

2. *Design Demonstration for the Remaining 19 Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/03-1150&D2, Foster Wheeler, Oak Ridge, Tennessee, December 1994.

3. *Design Demonstrations for Category B Tank System Piping at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/03-1195&D2, Foster Wheeler, Oak Ridge, Tennessee, January 1995.

4. *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Pipelines*, DOE/OR/01-1167&D2, Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee, August 1994.

4. CATEGORY C TANK SYSTEMS

4.1 BACKGROUND

The FFA allows tank systems that do not meet secondary containment standards to remain in service until the system can be upgraded or replaced, as long as the tank systems are not leaking and no adverse change occurs in the tank systems' baseline structural integrity data. If a tank system leaks, all programmatic inputs will be stopped, provided that complete shutdown of the tank system would not pose unacceptable environmental, health, or safety risk (e.g., reactor cooling-water treatment systems). Such systems will be repaired or replaced as soon as practicable.

4.2 FFA DELIVERABLE

4.2.1 Removal from Service

The FFA requires DOE to remove from service any tanks that do not meet the secondary containment standards in FFA Appendix F, Subsect. C. The plan and schedule for removing Category C tank systems from service is shown in Table 4.1.

4.2.1.1 Status

General plant projects (GPPs) and line-item projects are being planned and implemented to upgrade or replace the LLLW tank systems that do not meet secondary containment and leak detection standards (Category C). The schedule for line-item projects that will replace singly contained LLLW systems is shown in Table 2.1.

As scheduled in the FY 1995 Implementation Plan, Tanks 2026A and WC-19 were removed from service in FY 1996. Tank F-201 was removed from service in FY 1996, 2 years ahead of schedule.

Table 4.1. Projects for modifying FFA singly contained LLLW tank systems

Tank location	Tank system	Project title	Project scope	Funding (FY and type)	Projected completion date (FY)	Removal from service date (FY)
Isotopes Circle Facilities	WC-10	Isotope Facility Deactivation	Removes WC-10 from service	Expense	1998	1998
	WC-2	Isotope Facility Deactivation	Removes WC-2 from service	Expense	1998	1998
HFIR	HFIR T-1 T-2 WC-20	Melton Valley LLLW-CAT System Upgrade	Provides an ion exchange treatment system to convert LLLW to solid waste and installs an MCS to eliminate the need for the tanks	FY 92-LIP	1996	1997
3025	WC-3	Bethel Valley FFA Upgrades	Removes WC-3 from service	FY 94-LIP	1998	1999
		Bethel Valley FFA Upgrades	Doubly contains LLLW piping for 2533/2534 transfer line	FY 94-LIP	1997 (piping)	
Radioactive (hot) Off-gas	WC-9	Bethel Valley FFA Upgrades	Eliminates need for WC-9 tank system	FY 94-LIP	1998	1999
3026D	W-16	Isotope Facilities Deactivation	Removes W-16 from service	Expense	1998	1998
3525	F-501[a]					1998

[a]The scope of the Bethel Valley LLLW-CAT Systems Upgrades no longer includes upgrades for tank F-501 as indicated in previous revisions of this document. The schedule for removing tank F-501 from service has not changed.

The schedules presented in this section will continue to be subject to annual negotiation to adjust for updated information based on duration of activities or for changes in priorities and funding.

4.2.2 Structural Integrity Assessment

The FFA requires DOE to provide information concerning the structural integrity of tank systems not meeting the secondary containment standards (Category C).

4.2.2.1 Status

The information submitted follows the requirements of FFA Appendix F, Subsect. A., titled "Standards for Integrity Assessment for Tank System(s)." The structural integrity assessments (SIAs) include tank system design data, generic descriptions of the hazardous or radioactive contents, a description of the system's corrosion protection measures, the age of the tank system, and the results of leak tests on the tank system.

The first annual issue of the structural integrity assessments for the tank systems not meeting secondary containment standards was submitted to EPA/TDEC in September 1995.

The schedules presented in this section will be subject to annual renegotiation to adjust for updated information based on duration of activities or for changes in priorities and funding.

4.2.3 Leak Detection Tests

The FFA requires DOE to provide the schedule for periodic review and revision of the SIAs and to provide leak detection test results for Category C tank systems. Leak detection tests are being performed in support of the SIAs.

4.2.3.1 Status

All Category C tank systems are being leak tested. Leak testing of the WC-20 tank system was initiated in 1995. The Category B tanks that demonstrated secondary containment in accordance with FFA requirements have been removed from the Leak Testing Program. The pipelines for several Category B Tank Systems were included in the Leak Testing Program on the basis of results from the Secondary Containment Design Demonstration documents.[1,2,3] The test schedule for tanks is contained in the detailed leak detection test plan and schedule for active tanks.[4] The test schedule for pipelines is contained in the detailed leak detection test plan and schedule for active pipelines.[5]

4.3 WASTE MINIMIZATION

Treatment activities have been initiated to minimize waste. These activities are independent of tank systems' upgrades and replacement projects. The schedule for the treatment activities is shown in Table 4.2. These activities are listed in this document for information only.

Table 4.2. Treatment activities for newly generated LLLW

Funding Year	Title	Scope	Locations of interim upgrades[a]
1990	4501 Source Treatment	Installs source treatment to reduce radioactivity of LLLW to meet bottling requirements	4501
1990–97	HFIR Source Treatment	Installs source treatment to discontinue the generation of LLLW and produce solid LLW in its place	HFIR
1991–97	REDC Source Treatment	Installs source treatment to reduce the volume and radioactivity of LLLW. Provides capability to remove TRU and fission product constituents from process liquids prior to discharge of the liquids to the LLLW system; converts TRU and fission products to solid waste forms. Installs temporary trucking station for decontaminated LLLW.	REDC
1991–95	3517 Source Treatment	Upgrades filter pit sump to reduce nonprogrammatic waste inputs and to meet leak-testing requirements. Curbs were installed and shield plugs sealed to prevent infiltration of stormwater runoff. Installs parallel sump pumps in filter pit. Also installs valve on the discharge of the 3517 LLLW collection tanks to allow pressure-testing of transfer pipeline.	3517
1993–95	3025 Source Treatment	Installs source treatment to remove ^{60}Co from LLLW and allow trucking of liquids to the LLLW system. Converts ^{60}Co to solid LLW for disposal	3025
1994	Pretreatment REDC LLLW-GPP	Provides support systems necessary for removal of TRU and fission product constituents from process liquids before discharge to the LLLW system	REDC

Note: Based on FY 1997 Activity Data Sheets (ADS), target funding level.
[a]See Fig. 1.2 for LLLW tank systems associated with a given facility.

REFERENCES FOR CHAPTER 4

1. *Design Demonstrations for Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee* DOE/OR-1047&D2, Foster Wheeler, Oak Ridge, Tennessee, November 1994.

2. *Design Demonstration for the Remaining 19 Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee* DOE/OR/03-1150&D2, Foster Wheeler, Oak Ridge, Tennessee, December 1994.

3. *Design Demonstrations for Category B Tank System Piping at Oak Ridge National Laboratory, Oak Ridge, Tennessee* DOE/OR/03-1195&D2, Foster Wheeler, Oak Ridge, Tennessee, January 1995.

4. *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Tanks*, DOE/OR/01-1129&D1 ORNL/ER/Sub/92-SK263/2&D1 (revision 2), Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee, December 1994.

5. *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Pipelines,* DOE/OR/01-1167&D2, Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee, August 1994.

5. CATEGORY D TANK SYSTEMS

The FFA definition of and deliverables for Category D tank systems and the status of these deliverables are described in this section. In addition, the current strategy for the remediation of these ORNL inactive LLLW tank systems is described.

5.1 BACKGROUND

As of December 1994, FFA Appendix F identified a total of 55 tanks that have been removed from service. These tanks are defined in Section IX (A)(d) of the FFA as Category D tanks because they are "existing tank systems without secondary containment that are removed from service." As such, some of these tank shells have been removed or remediated in place or are currently being evaluated to determine the appropriate remediation method. In the following sections, the status of these tanks with respect to this evaluation and remediation decision process is discussed and the associated FFA requirements are noted.

5.2 FFA DELIVERABLES

According to the FFA, within 90 days of the date on which a tank is declared inactive DOE must provide EPA and TDEC with a plan and schedule for characterizing tank contents and the risks associated with the tank system. The characterization information is provided in the *Waste Characterization Data Manual for the Inactive LLLW Tank Systems at ORNL*[1] and the *Risk Characterization Data Manual for Category D Inactive LLLW Tank Systems at ORNL*.[2] These data manuals are controlled documents that are updated as new information becomes available (i.e., as tanks are taken out of service).

On the basis of the results of waste and risk characterization, DOE must then provide EPA and TDEC with a plan and schedule for remediation of inactive tank systems. The initial plan and schedule provided by DOE to meet the FFA requirements is presented in the *Remediation Schedule for Inactive LLLW Storage Tanks at ORNL*.[3] For tanks or tank groupings that are actively in the CERCLA process, current remediation schedules are negotiated annually and published in Appendix E of the FFA. Two projects currently have Appendix E milestones: the Gunite and Associated Tanks (GAAT) remediation project and the Old Hydrofracutre Facility (OHF) tanks removal action. Some tanks pose no significant risks by CERCLA definition but still require remediation under the FFA because they are listed in Appendix F of the FFA. Remediation of such a tank shell and contents is considered a maintenance action. Tank remediation activities that have not yet been initiated are prioritized semiannually with remediation activities from the entire ER program. This prioritization determines when the activity will be funded and thus also determines when the activity will begin. The status of the ongoing activities is discussed in Sect. 5.4.

5.3 INACTIVE TANK REMEDIATION PROGRAM

The inactive tank program comprises several projects that work together and in parallel to accomplish remediation of all inactive LLLW tank systems at ORNL. The ER program's approach for remediating tanks within the inactive LLLW tank systems was documented in a January 1995 strategy document,[4] and enhancements of this strategy are described in this section. In the following subsections, two of ER's largest inactive LLLW tank remediation projects (GAAT and OHF tanks) and the integrated team activities associated with tank maintenance actions for these projects are described.

5.3.1 GAAT Project

The GAAT project is an ongoing project that involves CERCLA activities associated with tanks located in the center of the ORNL Main Plant (tanks W-1 through W-11, W-13, W-14, W-15, W-1A, and TH-4). The remedial investigation (RI)/baseline risk assessment has been issued and approved by EPA/TDEC, and the treatability study and feasibility study (FS)/proposed plan have been (or are currently being) prepared and reviewed by DOE, LMES, TDEC, EPA, and Jacobs Engineering. The current GAAT strategy is summarized as follows.

- Group 1 Tanks: W-1, W-1A, W-2, W-11, W-13, W-14, and W-15 contain no sludge
  - close in place FY 1997 following agreement with TDEC and EPA
  - tank W-1A may require further investigation as a result of ORNL Groundwater Program findings

- Group 2 Tanks: W-3, W-4, and TH-4 contain 0.5% of GAAT OU sludge contaminant inventory
  - conduct treatability study testing in FY 1997
  - mix the waste in tank TH-4 in place with grout and close by filling with structural material in FY 1998
  - remove waste from tanks W-3 and W-4 and transfer it to the Melton Valley Storage Tanks, close tanks by filling with structural material in early FY 1998.

- Group 3 Tanks: W-5, W-6, W-7, W-8, W-9, and W-10 contain 99.5% of GAAT OU sludge contaminant inventory
  - remove and treat waste as appropriate according to the results of the treatability study and second feasibility study/proposed plan in FY 1999–2000
  - mix the residual waste in place with grout and close by filling with structural material in FY 1999–2001

These proposed actions will be negotiated and finalized in the Group 2 and 3 proposed plan and record of decision. Detailed information on the GAAT project can be found in CERCLA documents (listed in the Executive Summary) that are available at the ER Information Resource Center.

5.3.2 OHF Tanks Project

An engineering evaluation/cost analysis (EE/CA) was prepared for the OHF Tanks project. The baseline risk assessment for the OHF tanks was presented in the WAG 5 RI Report, which was approved by DOE, EPA, and TDEC in September 1995. The EE/CA developed, evaluated, and recommended a preferred alternative for the non-time-critical removal action to reduce the risk of a release of

radioactively contaminated liquid and sludge wastes stored in the OHF tanks. Alternatives considered were in situ treatment, encapsulation, and waste removal. After the alternatives were screened, waste removal was chosen because it met the objective and was achievable without interfering with future actions. On the basis of a technology screening, a conventional sluicing and pumping operation will be used to remove tank contents; these contents will then be transferred to the Melton Valley Storage Tanks. Waste removal activities are expected to be implemented in the beginning of FY 1998.

5.3.3 Other Tanks

Other inactive LLLW tanks that are not included in the GAAT or OHF projects must also be remediated as part of the FFA agreement. An overview of the risk assessment strategy that supports the remediation decision process, the current remediation strategy, the integrated isolation/remediation approach, and those activities planned for FY 1997 are presented in the following subsections.

5.3.3.1 Risk Assessment Strategy

The ORNL Inactive LLLW Tank Program risk assessment strategy is based on an incremental approach in which quantitative decision rules are used to help ensure a conservative method with a minimum of modeling.[5] The conservative risk assessment model assumes that the tank fails, the tank waste leaches into the unsaturated-saturated zone interface, and an on-site resident consumes 2 L per day of the contaminated groundwater. If this risk exceeds or is within the EPA range of concern, more realistic assumptions are made (i.e., groundwater modeling is performed to include dilution of contaminants at the nearest surface water source) and an enhanced risk assessment is performed to determine if the tank should be addressed through a more rigorous CERCLA risk assessment/remediation process. If the risk is below the EPA range of concern, the tank shells are candidates for remediation as a maintenance action.

5.3.3.2 Remediation Strategy

The overall objective of the Inactive LLLW Tank Program is to remediate all LLLW tanks that have been removed from service to the extent practicable in accordance with FFA requirements. As stated in Section IX.G.4 of the FFA, "to the extent practicable, the DOE shall remove or decontaminate, or otherwise remediate all residues, contamined containment system components (liners, etc.), contaminated soils and structures and equipment associated with the tank system(s)." The primary task of the Inactive LLLW Tank Program is to remediate the tank residues and tank shell. Other contaminated equipment and soil associated with the tank system will be remediated in conjunction with similar remediation activities for adjacent areas so that consistent and cost-effective remediation of the area can be achieved. The proposed Bethel Valley ROD will address the remediation of these other components by the year 2000. In addition, the operable unit strategy document[7], approved in 1992 as part of the ORNL WAG 1 site characterization activities, outlines a similar approach to remediation of these units. The following paragraphs will discuss the current remediation strategy for the ORNL inactive LLLW tanks.

In addition to risk and risk reduction discussed above, other factors are also considered when making remediation decisions. These other factors include:

- tank accessibility (e.g., located in a vault or buried);

- contamination adjacent to the site (soil and groundwater),
- future landuse in the area,
- future activities associated with adjacent facilities (i.e., D&D),
- waste acceptance criteria for disposal facility to receive tank shell, and
- other factors specific for the area.

Figure 5.1 illustrates conceptually how these factors are evaluated in the remediation decision process. This information is provided to EPA and TDEC prior to remediation to gain consensus on the remediation decision (e.g., removal versus in-place remediation) prior to implementation.

The remediation strategy also considers integration of tank isolation activities planned by WMRAD with ER remediation activities. This integration results in remediation of LLLW tanks more cost effectively by combining technical forces to make necessary remediation decisions prior to isolation activities. Historically, WMRAD would stop nonprogrammatic inputs to the tank, empty the tank, characterize residual waste liquids and sludges (if any), and isolate the tank from the LLLW system. The tank would then be transferred to ER, where, in most cases, the tank would be resampled to support the screening-level risk assessment; new plans would be written to support field activities associated with these sampling activities; and the actual implementation of the selected remedial action, which would involve new subcontractors and new contracts, would take place.

The integration of ER/WMRAD activities eliminates redundant activities and blends the isolation and remediation programs to reduce the costs and shorten the schedule associated with inactive LLLW tank isolation and remediation. Some of the efficiencies achieved through this integrated ER/WMRAD strategy are as follows.

- The tank is sampled once by following existing waste management standard operating procedures. Separate ER documents, such as a sampling analysis plan, quality assurance project plan, etc., are unnecessary.

- The decision to remove or close the tank in place is made on the basis of a screening-level risk assessment, cost effectiveness, future activities in the vicinity of the tank site, etc., prior to mobilizing the WMRAD subcontractor who will carry out the isolation and remedial activities. Thus, only one set of implementation plans (site safety and health plan, engineering specifications, etc.) is prepared to support field activities and subcontractor personnel are mobilized only once.

- For those tanks for which maintenance actions require only in-place closure or isolation (e.g., filling the tank with grout), the costs of excavating soil to expose pipelines and then disposing of that soil, as well as the costs of actually cutting and capping lines, will not be incurred because placement of the grout serves as a pipeline isolation technique.

The revised strategy for remediating tanks can and should be viewed as a dynamic, flexible, customized process that must be adapted in response to the specific circumstances of individual tank

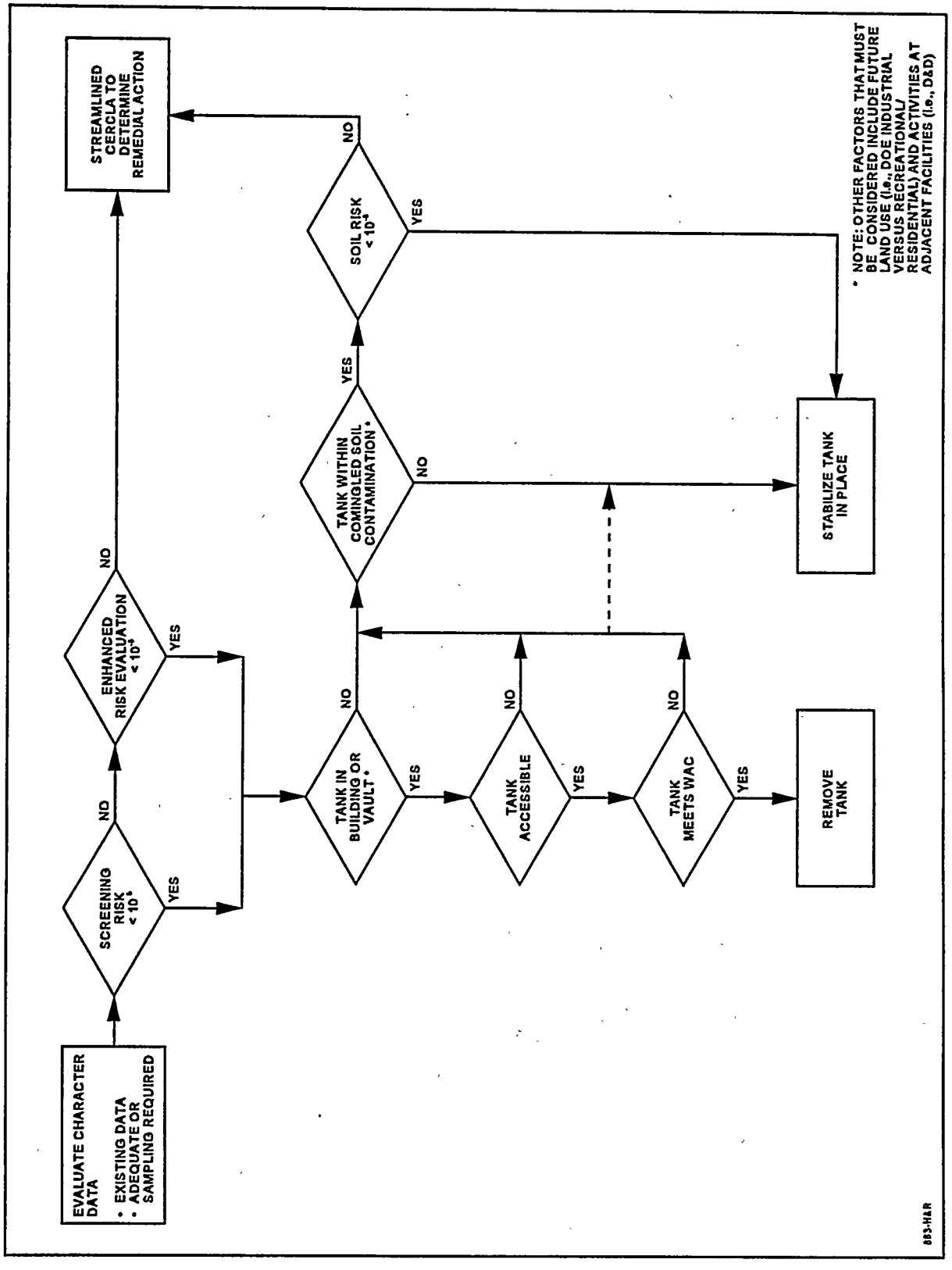


Fig. 5.1. Conceptual LLLW Tank Remediation Decision Process.

systems and site conditions. Thus, the strategy will be tailored to accommodate feedback from lessons learned from previous maintenance/remediation activities and will not require a rigid step-by-step process that must be identical for every tank system.

5.4 STATUS

The current status of ORNL's Category D tanks is presented in Appendix C. Additional information on these tanks, such as physical characteristics, past use, and waste characteristics, is provided in Appendix B. Activities completed in FY 1995 and 1996 are described in the following subsections.

5.4.1 Fiscal Year 1995 Activities

At the Regulatory Working Group meeting held on February 7, 1995, the remediation strategy, issues, preliminary risk assessment results, and site conceptual model were presented for tanks 3001-B, 3004-B, 3013, and T-30. The consensus among DOE, EPA, and TDEC participants at this meeting was that, because the risk associated with these tanks was below the EPA range of concern and the required remedial design was minimal, the remediation activities would be addressed as maintenance actions.

Implementation of these maintenance actions involved the efforts of a team that included individuals from the ORNL ER Division, WMRAD, Central Engineering Services, Risk Analysis Section, Chemical Technology Division, and Solid Waste Operations, as well as subcontractors. The technical objectives of these maintenance actions were (1) to isolate the inactive tanks from their associated piping systems; (2) to remediate tanks 3001-B, 3004-B, 3013, and T-30; and (3) to obtain knowledge and experience that could be applied to future tank removal actions.

The activities completed by the maintenance action team in FY 1995 are summarized in Table 5.1.

Table 5.1. ORNL inactive LLLW tank systems FY 1995 activities

Tank	Maintenance/remediation activities
3001-B	• Removed tank from vault. • Restored waste discharge line from 3001 canal demineralizer to tank WC-19. • Filled vault with grout.
3004-B	• Cut and capped piping connected to tank. • Removed tank from vault. • Filled vault and adjacent valve pit with grout.
3013	• Cut and capped piping connected to tank. • Filled tank with grout.
T-30	• Isolated tank from LLLW system by cutting and capping piping connected to tank.

Note: These activities are described in detail in the completion report for these tanks.[6]

5.4.2 Fiscal Year 1996 Activities

In FY 1996, the maintenance action team pursued the closing of additional tanks as maintenance actions. The activities that have been completed or that are planned for completion by the end of FY 1996 are summarized in Table 5.2.

Table 5.2. ORNL inactive LLLW tank systems FY 1996 activities

Tank	Maintenance/remediation activities
LA-104	• Cut and capped piping connected to tank. • Removed tank from vault.
WC-7	• Cut and capped critical piping connected to tank. • Filled tank with grout.
4501-P	• Cut and capped critical piping connected to tank. • Filled tank with grout.
T-30	• Removed lead bricks from vault. • Filled tank and vault with grout. • Removed and disposed of containment tent, miscellaneous equipment, and minimal contaminated surface soil. • Placed concrete cap over tank vault and reseeded area.
7562	• Cut and capped critical piping connected to tank.
H-209	• Install blind flanges in critical piping connected to tank. • Filled tank with grout.
GAAT	• Completed site preparation in NTF • Completed riser & platform installation on tanks W-3 & W-4 • Initiated cold testing of treatability study
OHF Tanks	• Completed site preparation and tank riser installation

5.4.3 Fiscal Year 1997 Planned Activities

The current funding for the ORNL inactive LLLW tanks includes only the CERCLA activities associated with the GAAT and OHF tanks projects and the isolation activities (e.g., cutting and capping pipelines) associated with WMRAD tanks WC-5, WC-6, WC-8, WC-19, and 2026A. These funded activities and other activities that could be accomplished if funding becomes available are shown in Table 5.3.

Table 5.3. ORNL inactive LLLW tank systems FY 1997 planned activities

Tank	Planned maintenance/remediation activities (subject to funding availability)[1]
WC-1	• Evaluate future CERCLA action.
WC-5	• Cut and cap critical piping connected to tank. • Remediate tank shell and contents.
WC-6	• Cut and cap critical piping connected to tank. • Remediate tank shell and contents.
WC-8	• Cut and cap critical piping connected to tank. • Remediate tank shell and contents.
WC-14	• Evaluate waste treatment, storage, and disposal options in EE/CA.
WC-19	• Cut and cap critical piping connected to tank. • Remediate tank shell and contents.
3002-A	• Cut and cap critical piping connected to tank. • Remediate tank shell and contents.
OHF Tanks: T-1 T-4 T-2 T-9 T-3	• Collect and sample tank contents. • Build and test pumping and sluicing mock up • Initiate design of full-scale pumping and sluicing equipment • Perform valve box modification for transfer to MVST.
GAAT: W-1 W-13 W-2 W-14 W-11 W-15 W-1A	• Coordinate closure of no-risk GAAT tanks with tanks W-12, W-19, and W-20, which are empty. • Cut and cap critical piping connected to tanks. • Remediate tank shell and contents.
W-12	• Remediate shell and tank contents parallel with the GAAT project.
W-19	• Remediate shell and tank contents parallel with the GAAT project.
W-20	• Remediate shell and tank contents parallel with the GAAT project.

[1]*Note*: Tank isolation activities have been funded. Remediation activities associated with tanks W-1, W-2, W-11, W-13, W-14, W-15, and W-1A are funded through the GAAT project. Removal action activities associated with tanks T-1, T-2, T-3, T-4, and T-9 are funded through the OHF tanks project. All other listed tank remediation efforts have not yet been funded. More detailed descriptions of remediation activities will be provided once the existing information for these tanks has been more thoroughly evaluated.

REFERENCES FOR CHAPTER 5

1. *Waste Characterization Data Manual for the Inactive Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee,* DOE/OR/01-1159&D1, Bechtel National, Inc. et al., Oak Ridge, Tennessee, June 1993.

2. *Risk Characterization Data Manual for Category D Inactive Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee,* DOE/OR/01-1168&D1, Lockheed Martin Energy Systems, Risk Analysis Section, Oak Ridge, Tennessee, July 1993.

3. *Remediation Schedule for Inactive Liquid Low-Level Waste Storage Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee,* DOE/OR/01-1138&D1, H&R Technical Associates, Inc., Oak Ridge, Tennessee, March 1993.

4. *Inactive Tanks Remediation Program Strategy and Plans for Oak Ridge National Laboratory, Oak Ridge, Tennessee,* ORNL/ER-297, H&R Technical Associates, Inc., Oak Ridge, Tennessee, June 1995.

5. *Technology Information Exchange Quarterly,* Vol. 4, No.3, "Screening Strategy for ORNL Inactive Tanks Remediation Program," U. S. Department of Energy Environmental Restoration Office of Program Integration (EM-43), Germantown, Maryland, fall 1995.

6. *Completion Report for the Inactive Liquid-Low Level Waste Tank Remediation Project at Oak Ridge National Laboratory, Oak Ridge, Tennessee,* ORNL/ER-343, H&R Technical Associates, Inc., Oak Ridge, Tennessee, February 1996.

7. *Operable Unit Strategy Document for WAG 1 at ORNL,* Oak Ridge, TN, ORNL/ER-133, Bechtel National, Inc., Oak Ridge, TN, July 1992.

Appendix A

DATA SUMMARIES FOR CATEGORY A, B, AND C TANK SYSTEMS

Exhibit A.1. Data summary for the MCS at Bldg. 2026.

A. Facility: 2026 (Radioactive Materials Analytical Laboratory)

B. Tank Location: ORNL Bethel Valley Area, West of Bldg. 2026

C. Tank User Divisions: Analytical Chemistry, Waste Management and Remedial Action Division (WMRAD)

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
F-1401	1993	IGV	1900	SS	A

Legend: **AGV**—above-ground vault **SS**—stainless steel **BT**—buried tank
IGV—in-ground vault **CS**—carbon steel **G**—gunite
NA—not applicable

E. Original or Past Tank Usage:

The 2026 facility generates LLLW from analysis of samples at ORNL. The primary activities conducted within the facility include analysis of LLLW waste tank contents, reactor fuel analysis, and work for others. The facility is key to environmental characterization of materials considered by the FFA and other environmental compliance programs.

F. Current or Future Tank Usage:

This tank was installed in 1993 as part of the Bethel Valley LLW-CAT line item project. This tank was placed in operation in FY 1996 following the removal of tank 2026A from service.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: ~900 ft
Percent Doubly Contained Buried Pipe: 100%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.2. Data summary for the TWRF storage tank.

A. Facility: 2649 [Transported Waste Receiving Facility (TWRF)]

B. Tank Location: ORNL Bethel Valley, in Bldg. 2649

C. Tank User Division: WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
F-1701	1993	AGV	1900	SS	A

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

F-1701 is the central receiving point for all transported LLLW at ORNL.

F. Current or Future Tank Usage:

This tank is part of the newly constructed central station for receipt of bottled or trucked LLLW. Initial operation of the facility is planned for FY 1997.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 900 ft
Percent Doubly Contained Buried Pipe: 100%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.3. Data summary for the REDC tank system.

A. Facility: Radiochemical Engineering Development Center (REDC)

B. Tank Location: ORNL Melton Valley, HFIR Area

C. Tank User Division: Chemical Technology, WMRAD

D. Tank Data:

Tank No.	Date of Install	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
F-1800	1997	IGV	10,000	SS	A

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Tank Usage:

Tank F-1800 will be installed in FY 1996 and will be operational in FY 1997. Tank F-1800 will replace tank WC-20.

LLLW was produced from radiochemical operations designed to recover isotopes produced from irradiation of HFIR targets and other sources. LLLW produced at REDC was primarily generated from disposal of spent off-gas scrubber solutions. Other sources included routine and nonroutine washdown of hot cells and other contaminated equipment.

F. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: TBD.
Percent Doubly Contained Buried Pipe: 100%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.4. Data summary for the Melton Valley Storage Tank systems.

A. Facility: Melton Valley Storage Tanks (MVST)

B. Tank Location: Melton Valley, Hydrofracture area

C. Tank User Division: WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
W-32	1997	IGV	100,000	SS	A
W-33	1997	IGV	100,000	SS	A
W-34	1997	IGV	100,000	SS	A
W-35	1997	IGV	100,000	SS	A
W-36	1997	IGV	100,000	SS	A
W-37	1997	IGV	100,000	SS	A

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Tank Usage:

These tanks will be installed in FY 1997 and will be operational in FY 1998.

The evaporator bottoms from the LLLW evaporators in Bethel Valley will be stored in these tanks. This material, which includes transuranic waste, must be stored at ORNL until a DOE facility that can accept it becomes operational.

F. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: TBD.
Percent Doubly Contained Buried Pipe: 100%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.5. Data summary for the LLLW tank systems at Bldg. 3019.

A. Facility: 3019 [Radiochemical Processing Pilot Plant (RPPP)]

B. Tank Location: Bethel Valley, Cells 6 and 7 of Bldg. 3019

C. Tank User Divisions: Chemical Technology

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
N-71	Unknown	AGV	240	304SS	B
P-3	Unknown	AGV	197	347SS	B
P-4	Unknown	AGV	197	347SS	B

Legend: **AGV**—above-ground vault; **IGV**—in-ground vault; **NA**—not applicable; **SS**—stainless steel; **CS**—carbon steel; **BT**—buried tank; **G**—gunite

E. Original or Past Tank Usage:

These tanks were used for collection of a variety of production waste process streams such as raffinates from extraction processes, overheads from evaporation processes, and others. In addition, laboratory wastes, such as liquids left after analyses and bench scale experimental processes, were collected in the tanks. Also, any spills that might occur in the cells are jetted to these tanks.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: ~700 ft
Percent Doubly Contained Buried Pipe: 100%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.6. Data summary for the LLLW tank systems at Bldg. 3517.

A. Facility: 3517 [Fission Products Development Laboratory (FPDL)]

B. Tank Location: Bethel Valley, Cells 23 and 24 of Bldg. 3517

C. Tank User Division: Chemical Technology

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
S-223	1955	IGV	2500	304L-SS	B
S-324	1955	IGV	1000	304L-SS	B
S-523	1955	IGV	1000	304L-SS	B

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

These tanks were used to collect production process wastes from a variety of operations. Wastes included supernatant from cesium and strontium precipitation operations, raffinate from a ^{144}Ce extraction process, and general decontamination solutions that contained ^{60}Co, ^{90}Sr, ^{192}Ir, ^{147}Pm, and $^{137}Cs/^{134}Cs$.

F. Current or Future Tank Usage:

These tanks are scheduled to be removed from service in 1999.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 360 ft
Percent Doubly Contained Buried Pipe: 98%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.7. Data summary for the Evaporator Facility LLLW tank systems.

A. Facility: 2531 (Evaporator Facility)

B. Tank Location: C-1,C-2, W-21, W-22, and W-23 are located in Bethel Valley, north of Bldg. 2531.

C. Tank User Division: WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
C-1	1964	IGV	50,000	SS	B
C-2	1964	IGV	50,000	SS	B
W-21	1979	IGV	50,000	SS	B
W-22	1979	IGV	50,000	SS	B
W-23	1979	IGV	50,000	SS	B

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

Tanks C-1, C-2, and W-21 through W-23 are used as feed or concentrate storage tanks for the LLLW evaporator located in Bldg. 2531.

F. Current or Future Tank Usage:

Current and future use remains unchanged for the tanks in the evaporator complex.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: ~400 ft
Percent Doubly Contained Buried Pipe: 100%
Cathodic Protection for Buried Pipe: All piping has cathodic protection.
System Operation at Negative Pressure: Yes

Exhibit A.8. Data summary for the LLLW tank systems at Bldg. 3544.

A. Facility: 3544 [Process Waste Treatment Plant (PWTP)]

B. Tank Location: Bethel Valley, in Bldg. 3544

C. Tank User Division: WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
L-11	1975	IF	400	SS	B

Legend: **AGV**—above-ground vault; **IGV**—in-ground vault; **NA**—not applicable; **SS**—stainless steel; **CS**—carbon steel; **IF**—inside facility; **BT**—buried tank; **G**—gunite

E. Original or Past Tank Usage:

L-11 is used as a collection tank for the evaporator bottoms from the PWTP Plant.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 900 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.9. Data summary for the New Hydrofracture Facility LLLW tank system.

A. Facility: New Hydrofracture Facility (NHF)

B. Tank Location: Melton Valley NHF area

C. Tank User Division: WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
T-13	1979	IGV	4000	SS	B

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

Served as a waste tank for the NHF, which was used to solidify concentrated LLLW for disposal.

F. Current or Future Tank Usage:

Potential uses include pilot plant operations to develop new LLLW treatment processes and decontamination activities.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 0 ft
Percent Doubly Contained Buried Pipe: NA
Cathodic Protection for Buried Pipe: NA
System Operation at Negative Pressure: Yes

Exhibit A.10. Data summary for the Radiochemical Engineering Development Center LLLW tank systems.

A. Facility: Radiochemical Engineering Development Center (REDC)

B. Tank Location: ORNL Melton Valley, High Flux Isotopes Reactor (HFIR) Area

C. Tank User Division: Chemical Technology, WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
F-111	1962	IGV	125	SS	B
F-126	1962	IGV	1200	SS	B
C-6-T	1965	IGV	700	SS	B
B-2-T	1965	IGV	1870	SS	B
B-3-T	1965	IGV	1870	SS	B

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

LLLW was produced from radiochemical operations designed to recover isotopes produced from irradiated HFIR targets and other sources. LLLW at REDC was primarily generated from disposal of spent off-gas scrubber solutions. Other sources included routine and nonroutine washdown of hot cells and other contaminated equipment. REDC is the major contributor of transuranic radionuclides in the LLLW system.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 55%
Length of Buried Piping: 4300 ft
Percent Doubly Contained Buried Pipe: 11%
Cathodic Protection for Buried Pipe: All underground lines cathodically protected except three LLLW lines from Bldg. 7930 to the 7930 tank vault. The transfer line from Melton Valley to Bethel Valley is also protected. Approximately 90% of the system is protected.
System Operation at Negative Pressure: Yes

Exhibit A.11. Data summary for the Melton Valley Storage Tank systems.

A. Facility: Melton Valley Storage Tanks (MVST)

B. Tank Location: Melton Valley, Hydrofracture area

C. Tank User Division: WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
W-24	1980	IGV	50,000	SS	B
W-25	1980	IGV	50,000	SS	B
W-26	1980	IGV	50,000	SS	B
W-27	1980	IGV	50,000	SS	B
W-28	1980	IGV	50,000	SS	B
W-29	1980	IGV	50,000	SS	B
W-30	1980	IGV	50,000	SS	B
W-31	1980	IGV	50,000	SS	B

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Tank Usage:

The evaporator bottoms from the LLLW evaporators in Bethel Valley are stored in these tanks. This material, which includes transuranic waste, must be stored at ORNL until a DOE facility that can accept it becomes operational.

F. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 6,300 ft
Percent Doubly Contained Buried Pipe: 100%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.12. Data summary for the LLLW tank systems at Bldg. 3525.

A. Facility: 3525 (High Radiation Level Examination Laboratory)

B. Tank Location: ORNL Bethel Valley, South of Bldg. 3525

C. Tank User Division: Chemical Technology, Metals and Ceramics

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
F-501	1962	IGV	200	SS	C

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

Bldg. 3525 provides for the postirradiation mechanical disassembly of reactor components so that physical and metallurgical examinations can be conducted. LLLW is produced from the decontamination and cleanup of the hot cells used in the disassembly and examination process.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 50%
Length of Buried Piping: 290 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: None
System Operation at Negative Pressure: Yes

Exhibit A.13. Data summary for the Isotopes Circle Facilities LLLW tank systems.

A. Facility: Isotopes Circle

B. Tank Location: ORNL Bethel Valley, Isotopes Area

C. Tank User Division: Chemical Technology, WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
WC-10	1951	BT	2000	SS	C
WC-2	1951	BT	1000	SS	C

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

Multigram quantities of radioisotopes were separated, purified, stored, and distributed in facilities served by the LLLW system. A wide range of radionuclides were produced. Isotopes were produced for use in medical, research, and industrial applications. Most waste was generated as a result of hot-cell and equipment decontamination. Waste includes residual solutions used for isotope separation, isotopes, and other contaminated liquids. The waste from the Hot Off-Gas Scrubber Treatment Facility was transferred via a pipe that intersects the WC-2 tank discharge line.

F. Current or Future Tank Usage:

Significant isotopes production in the facilities served by the LLLW system was terminated in FY 1990. However, the LLLW system continues to collect waste from routine cleanup and washdown of hot cells and other components. The LLLW system will be used during formal cleanup and shutdown stabilization of the facility through FY 1998. Research and medical production activities will continue in a limited portion of these facilities for the foreseeable future. The Hot Off-Gas Scrubber waste will continue to be collected.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 3900 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: No
System Operation at Negative Pressure: Yes

Exhibit A.14. Data summary for the HFIR LLLW tank systems.

A. Facility: High Flux Isotopes Reactor (HFIR)

B. Tank Location: ORNL Melton Valley Area, HFIR Area

C. Tank User Division: Research Reactors, WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
HFIR	1961	BT	13,000	SS	C
T-1	1963	BT	15,000	SS	C
T-2	1963	BT	15,000	SS	C

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

These LLLW systems serve a major research reactor facility. LLLW from the HFIR primarily results from (1) regeneration and backwashing of primary and pool demineralizer systems, (2) sampling operations, (3) gaseous waste filter pit inleakage and condensation, and (4) stack drainage. Other waste is generated by routine maintenance and decontamination of contaminated equipment. When in operation, the HFIR is the primary source of ^{60}Co in the LLLW system.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 3000 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: Transfer piping from T-1 and T-2 only.
System Operation at Negative Pressure: Yes

Exhibit A.15. Data summary for the LLLW tank system at Bldg. 3025.

A. Facility: 3025 (Irradiated Materials Examination and Testing Facility)

B. Tank Location: Bethel Valley, South of Bldg. 3025

C. Tank User Divisions: WMRAD, Metals and Ceramics

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
WC-3	1951	BT	1000	347SS	C

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

WC-3 was used primarily to collect residuals from metallurgical sampling and analysis. The waste solutions came from etching, dissolution, and decontamination of particulate residue from physical property analysis (such as tensile and shear testing) of irradiated metals.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 250 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: No
System Operation at Negative Pressure: Yes

Exhibit A.16. Data summary for the Radioactive (Hot) Off-Gas LLLW tank system.

A. Facility Name: Radioactive (Hot) Off-Gas also referred to as Hot Off-Gas Collection (HOG)

B. Tank Location: Bethel Valley, South of Bldg. 3503

C. Tank User Division: Chemical Technology

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
WC-9	1952	BT	2150	SS	C

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

Tank WC-9 received LLLW from Bldg. 3503. Building 3503 originally was a high-level radiation engineering laboratory. LLLW was generated by pilot plant studies. The tank also received waste from the Hot Off-Gas System, which collects condensate from the hot off-gas and cell ventilation gaseous waste collection systems.

F. Current or Future Tank Usage:

WC-9 currently receives condensate from the Hot Off-Gas Pot.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 0%
Length of Buried Piping: 125 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: No
System Operation at Negative Pressure: No

Exhibit A.17. Data summary for the LLLW tank system at Bldg. 3026D.

A. Facility Name: 3026D (Segmenting Hot Cell Facility)

B. Tank Location: Melton Valley South Tank Farm

C. Tank User Divisions: WMRAD, Metals and Ceramics

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
W-16	1951	BT	1000	347SS	C

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

Tank W-16 serves Bldg. 3026D in the Isotopes Complex. Multigram quantities of radioisotopes were separated, purified, stored, and distributed in facilities serviced by the LLLW system. A wide range of radionuclides was produced. Isotopes were produced for use in medical, research, and industrial applications. Most waste was generated as a result of routine and nonroutine hot-cell and equipment decontamination. Waste includes residual solutions used for isotope separation, trace quantities of isotopes, and other contaminated liquids.

F. Current or Future Tank Usage:

Potential use for decontamination of Bldg. 3026D.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 550 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: No
System Operation at Negative Pressure: Yes

Exhibit A.18. Data summary for the WC-20 tank system.

A. Facility: Radiochemical Engineering Development Center (REDC)

B. Tank Location: ORNL Melton Valley, HFIR Area

C. Tank User Division: Chemical Technology, WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
WC-20	1976	IGV	10,000	SS	C

Legend: AGV—above-ground vault; IGV—in-ground vault; NA—not applicable; SS—stainless steel; CS—carbon steel; BT—buried tank; G—gunite

E. Original or Past Tank Usage:

LLLW was produced from radiochemical operations designed to recover isotopes produced from irradiation of HFIR targets and other sources. LLLW produced at REDC was primarily generated from disposal of spent off-gas scrubber solutions. Other sources included routine and nonroutine washdown of hot cells and other contaminated equipment.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 3521 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Appendix B

DATA SUMMARIES FOR CATEGORY D TANK SYSTEMS

Exhibit B.1. Data summary for South Tank Farm Category D LLLW tank systems.

A. Tank Location: Bethel Valley, South Tank Farm (W-5, W-6, W-7, W-8, W-9, W-10, W-11, W-17, and W-18); south of the South Tank Farm (W-19, and W-20).

B. Responsible Division: Environmental Restoration (ER)

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
W-5	1943	BT	170,000	G	no	NA
W-6	1943	BT	170,000	G	no	NA
W-7	1943	BT	170,000	G	no	NA
W-8	1943	BT	170,000	G	no	NA
W-9	1943	BT	170,000	G	no	NA
W-10	1943	BT	170,000	G	no	NA
W-11	1943	BT	1,500	G	no	NA
W-17	1951	BT	1,000	SS	no	no
W-18	1951	BT	1,000	SS	no	no
W-19	1955	BT	2,250	SS	no	no
W-20	1955	BT	2,250	SS	no	no

Legend: AGV—above ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite

D. Original or Past Tank Usage:

Tanks W-5 through W-10 were constructed in 1943 for long-term storage of LLLW. Because of the expanding needs of ORNL, the capacity of the tanks proved inadequate. The waste was directed to an evaporator between 1949 and 1954 and from 1959 until the tanks were taken out of service in 1980. Between 1953 and 1959 the waste was sent to open waste pits.

Tank W-11 was constructed in 1943 to serve as a waste collection and monitoring tank for research laboratories in Bldg. 3550. The tank was removed from service in 1948 because of leaks.

Tanks W-17 and W-18 served as waste tanks for isotope production in Bldg. 3026.

Tanks W-19 and W-20 were used to collect waste produced from recovery and reprocessing of uranium and other nuclear material from the Metal Recovery Facility in Bldg. 3505. The tanks were removed from service in 1960.

E. Waste Characterization:

The results of a previous sampling campaign revealed that Tanks W-5 through W-10 contain sludge with transuranics and toxic metals. In addition, most of these tanks contain organics. Tank W-11 contains primarily low-level waste in aqueous form.

The results of a previous sampling campaign revealed that tanks W-19 and W-20 are empty.

The results of the 1992-1993 sampling campaign showed that contaminant levels in tanks W-17 and W-18 are very low.

Exhibit B.2. Data summary for Old Hydrofracture Facility Category D LLLW tank systems.

A. Tank Location: Melton Valley Hydrofracture Area

B. Responsible Division: ER

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
T1	1963	BT	15,000	CS	no	yes *
T2	1963	BT	15,000	CS	no	yes *
T3	1963	BT	25,000	CS/RL	no	yes *
T4	1963	BT	25,000	CS/RL	no	yes *
T9	1963	BT	13,000	CS	no	yes *

Legend: AGV—above ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite; RL-rubber lining

* The cathodic protection system is not operational.

D. Original or Past Tank Usage:

Tanks T1 through T4 and T9 were used during the Old Hydrofracture Facility (OHF) operation to store liquid waste until it was ready to be blended with grout, before waste injection by hydrofracture. OHF operations were discontinued in 1980.

E. Waste Characterization:

The results of a previous sampling campaign indicate that OHF tanks (T-1 through T-4 and T-9) contain soft sludge containing high concentrations of transuranics and toxic metals.

Exhibit B.3. Data summary for the North Tank Farm Category D LLLW tank systems.

A. Tank Location: Bethel Valley, North Tank Farm Area

B. Responsible Division: ER

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
W-1	1943	BT	4,800	G	no	NA
W-2	1943	BT	4,800	G	no	NA
W-3	1943	BT	42,500	G	no	NA
W-4	1943	BT	42,500	G	no	NA
W-13	1945	BT	2,000	SS	no	no
W-14	1945	BT	2,000	SS	no	no
W-1A	1951	BT	4,000	SS	no	no
W-15	1945	BT	2,000	SS	no	no

Legend: AGV—above-ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite

D. Original or Past Tank Usage:

Tanks W-1 through W-4 and W-1A received waste from Bldg. 3019, a radiochemical processing facility. The principal radionuclides in the waste were cesium, strontium, and transuranics. Tanks W-1 through W-4 were taken out of service in the early 1960s, and tank W-1A was taken out of service in 1986 because of leaks. The tanks were emptied when removed from service.

Tanks W-13, W-14, and W-15 were connected to the metal waste drains from the Radiochemical Processing Facility, Bldg. 3019, but also collected chemical waste from recovery of fission products. The tanks were taken out of service in 1958.

E. Waste Characterization:

The results of a previous sampling campaign revealed that the North Tank Farm varies from tanks with only liquids (W-1, W-1A, W-2, W-13, W-14, and W-15) to tanks that contain a liquid phase and a sludge with transuranic and toxic metals (W-3 and W-4).

Exhibit B.4. Data summary for the 3500 Area Category D LLLW tank systems.

A. Tank Location: Bethel Valley, 3500 Area

B. Responsible Division: ER

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
TH-1	1948	BT	2500	SS	no	no
TH-2	1952	BT	2400	SS	no	no
TH-3	1952	BT	3300	SS	no	no
TH-4	1952	BT	14000	G	no	NA
S-424	1955	IGV	500	SS/GL	yes	no
WC-5	1952	BT	1000	SS	no	no
WC-6	1952	BT	500	SS	no	no
WC-8	1952	BT	1000	SS	no	no

Legend: AGV—above ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite; GL—glass lined

D. Original or Past Tank Usage:

Tanks TH-1, TH-2, and TH-3, received waste from the irradiated thorium and uranium pilot development plant development projects in Bldg. 3503. TH-4 received waste from thorium and uranium projects in Bldg. 3550. The tanks were taken out of service in 1970.

S-424 was used to collect highly corrosive chloride-bearing supernate from a precipitation operation.

Tanks WC-5, WC-6, and WC-8 received waste from development projects in Bldgs. 3503, 3508, 3541, and 3592.

E. Waste Characterization:

Tanks TH-1, TH-2, and TH-3 contain little or no sludge. The liquid phase contains low levels of radioactivity.

Tank TH-4 contains large quantities of sludge but is not known to leak.

Tanks WC-5, WC-6, and WC-8 were sampled in FY 92 and early FY 93. Tank S-424 contains no liquids and will be further characterized as part of the remedial investigation/feasibility study process. Tanks WC-5, WC-6, and WC-8 contain no sludge, and their liquids have very low levels of chemical and radiological contaminants.

Note: Tank H-209 is scheduled to be removed from service in FY 1996.

Exhibit B.5. Data summary for the Isotopes Circle Category D LLLW tank systems.

A. Tank Location: Bethel Valley, Isotopes Circle.

B. Responsible Division: ER

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
WC-1	1950	BT	2150	SS	no	no

Legend: **AGV**—above ground vault; **IGV**—in-ground vault; **BT**—buried tank; **NA**—not applicable; **SS**—stainless steel; **CS**—carbon steel; **G**—gunite

D. Original or Past Tank Usage:

WC-1 was used to collect and monitor process liquid waste from isotopes production and development laboratories in Bldgs. 3038, 3028, 3029, 3030, 3031, 3032, 3033, 3047, the filter in Bldg. 3110, the 3039 stack, and the scrubber in 3092. The tank was taken out of service in 1968 because of a leaking discharge line.

E. Waste Characterization:

Tank WC-1 contains approximately 3 in. of sludge at the sample point. The liquid contents have been removed. Tank W-1I has no liquids, and its sludge contains high levels of alpha contamination.

Exhibit B.6. Data summary for the 3587 Area Category D LLLW tank systems.

A. Tank Location: South of Bldg. 3587

B. Responsible Divisions: ER, WMRAD

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
WC-11	1951	BT	4000	SS	no	no
WC-12	1947	BT	1000	SS	no	no
WC-13	1951	BT	1000	SS	no	no
WC-14	1951	BT	1000	SS	no	no
WC-15	1951	BT	1000	SS	no	no
WC-17	1951	BT	1000	SS	no	no

Legend: AGV—above ground vault; IGV—in-ground vault; BT—buried tank; NA-not applicable; SS—stainless steel; CS—carbon steel; G—gunite; GL—glass lined

D. Original or Past Tank Usage:

Tanks WC-11, WC-12, WC-13 and WC-14 were used as waste tanks for the 4500 complex.

Tanks WC-15 and WC-17 were used to collect LLLW from research laboratories in Bldg. 4500. Tanks WC-15 and WC-17 were taken out of service in the 1960s because of leaks.

E. Waste Characterization:

Tanks WC-11, WC-12, WC-13, and WC-14 were sampled in FY 92 and early FY 93. Tanks WC-11 and WC-13 contain a thin, floating organic layer. The liquid is radioactive. Tanks WC-11, WC-12, WC-13, and WC-14 contain liquid contaminated primarily with ^{137}Cs. Tank WC-14 contains TRU sludge contaminated with PCBs.

Tanks WC-15, and WC-17 contain little or no sludge. The liquid phase contains low levels of radioactivity with an organic layer within the liquid phase.

Exhibit B.7. Data summary for Melton Valley Area Category D LLLW tank systems.

A. Tank Location: Melton Valley Area

B. Responsible Division: ER

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
T-14	1979	BT	48,500	C	no	no
7503-A	1962	IGV	11,000	SS	yes	NA

Legend: **AGV**—above ground vault; **IGV**—in-ground vault; **BT**—buried tank; **NA**—not applicable; **SS**—stainless steel; **CS**—carbon steel; **C**—concrete; **RL**—rubber lining

D. Original or Past Tank Usage:

Tank T-14 was used as an overflow emergency waste tank for the NHF.

Tank 7503-A was a waste holding tank for the Molten Salt Reactor Experiment.

E. Waste Characterization:

Tank 7503-A was sampled in FY 93 and was found to be empty except for a very thin layer of dry sludge. Tank T-14 contains low levels of chemicals and radiological contaminants.

Note: Tanks 7560 and 7562 are scheduled to be remediated by the end of FY 1996.

Exhibit B.8. Data summary for the 3000 Area Category D LLLW tank systems.

A. Tank Location: Bethel Valley, 3000 Area

B. Responsible Divisions: ER, WMRAD

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
3003-A	1943	BT	16,000	C	no	NA
3002-A	1943	IGV	1,600	SS	no	no
WC-4	1944	BT	1,700	SS	no	no

Legend: AGV—above ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; C—concrete; GL—glass lined

D. Original or Past Tank Usage:

Tank 3003-A received LLLW from three cells and a stack in Bldg. 3003. Building 3003 was the air-handling building for the graphite reactor (Bldg. 3001). Because it was in contact with the air handling system, condensate from this equipment is expected to be contaminated with low levels of fission products. The tank was taken out of service in 1965.

Tank 3002-A was used to collect liquid condensate from Bldg. 3002. Building 3002 was the filter house for the Old Graphite Reactor.

Tank WC-4 was used as a waste tank for Bldg. 3026. Wastes were primarily generated from the Roll Up Process, which involved dissolving uranium targets and extracting isotopes. The tank was taken out of service in the 1950s.

E. Waste Characterization:

Tank 3003-A contains liquid and sludge with chemical and radiological contaminants. Tank 3002-A contains liquid and a thin sludge layer with very low levels of chemical and radiological contaminants. Tank WC-4 contains liquids with low levels of radiological and chemical contaminants.

Exhibit B.9. Data summary for the 3525 Area Category D LLLW tank systems.

A. Tank Location: Bethel Valley, Southwest of Bldg. 3525

B. Responsible Division: WMRAD

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
W-12	1947	BT	700	SS	no	no

Legend: AGV-above ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite; GL—glass lined

D. Original or Past Tank Usage:

Tank W-12 is designed to receive waste from the examination of reactor components in Bldg. 3525 from tanks F-501. The tank system was repaired and returned to service in June 1994 and remained in service until October 1995.

Exhibit B.10. Data summary for the Bldg. 3047 Area Category D LLLW tank systems.

A. Tank Location: ORNL Bethel Valley, Isotopes Area, Bldg. 3047.

B. Responsible Division: ER

C Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
W-1[illegible]	1959	BT	500	SS	No	No

Legend: AGV—above-ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite

D. Original or Past Tank Usage:

Multigram quantities of radioisotopes were separated, purified, stored, and distributed in facilities served by the LLLW system. A wide range of radionuclides were produced. Isotopes were produced for use in medical, research, and industrial applications. Most waste was generated as a result of hot-cell and equipment decontamination. Waste includes residual solutions used for isotope separation, isotopes, and other contaminated liquids.

Tank W1I was used to collect waste liquids from isotope recovery operations in Bldg. 3028. Although the actual data is uncertain, the tank was not used after 1987.

E. Waste Characterization:

[NOTE: This summary was revised and moved from Appendix A.]

Exhibit B.11. Data summary for the ORR/BSR LLLW Category D tank system.

A. Tank Location: Bethel Valley, North of Bldg. 3047

B. Responsible Division: ER

C. Tank Data Table:

Tank No.	Date of Install	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
WC-19	1955	BT	2250	SS	no	no

Legend: AGV-above ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

D. Original or Past Tank Usage:

LLLW was produced from the regeneration of reactor pool and canal demineralizers at Bldgs. 3019, 3001, 3042, 3004, and 3010. Also, the tanks received condensate from off-gas High Efficiency Particulate Air (HEPA) filter pits associated with these reactors.

Tank WC-19 will be removed from service by the end of FY 1996.

E. Waste Characterization:

The schedule for submittal of WC-19 waste characterization data will be submitted to EPA and TDEC within 90 days of removal from service.

[NOTE: This summary was revised and moved from Appendix A.]

Exhibit B.12. Data summary for the Bldg. 2026 Category D LLLW tank system.

A. Tank Location: ORNL Bethel Valley Area, East of Bldg. 2026

B. Responsible Division: ER

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
2026A	1962	IGV	500	SS	no	no

Legend: AGV-above ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

The 2026 facility provided analytical sample analysis for various programs at ORNL. LLLW was generated upon disposal of various samples once analysis was completed and from routine washdown and decontamination of hot cells and other contaminated equipment.

F. Waste Characterization:

Tank 2026A was removed from service in 1996.

[NOTE: This summary was revised and moved from Appendix A.]

Exhibit B.13. Data summary for the LLLW tank systems at Bldg. 3525.

A. Tank Location: ORNL Bethel Valley, South of Bldg. 3525

B. Responsible Division: Environmental Restoration

C. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
F-201	1962	IGV	40	SS	no	no

Legend: **AGV**—above-ground vault; **IGV**—in-ground vault; **NA**—not applicable; **SS**—stainless steel; **CS**—carbon steel; **BT**—buried tank; **G**—gunite

E. Original or Past Tank Usage:

Bldg. 3525 provides for the postirradiation mechanical disassembly of reactor components so that physical and metallurgical examinations can be conducted. LLLW is produced from the decontamination and cleanup of the hot cells used in the disassembly and examination process.

F. Waste Characterization:

Tank F-201 will be removed from service by the end of FY 1996. The schedule for submittal of waste characterization will be submitted to EPA and TDEC within 90 days of removal from service.

Appendix C

STATUS OF CATEGORY D LLLW TANK SYSTEMS

Table C.1.1 Status of Category D LLLW tank systems

Tank Number	Tank Construction Material	Capacity (gal)	Current Content Volume (gal)	Curie Content		Inleakage/Outleakage	Status*
				Alpha	Beta		
2026A	Stainless steel	500	Empty March 1996	TBD	TBD	No	Remediation FY98
3001-B	—	—	—	—	—	—	Removed FY1995
3001-S	—	—	—	—	—	—	Non-existent
3002-A	Stainless steel	1,600	Varies	Varies	Varies	Nonprogrammatic waste input (filter house)	Remediation FY97
3003-A	Concrete	16,000	4,000 (est.)	Negligible	0.25	Unknown	Tank evaluation
3004-B	—	—	—	—	—	—	Removed FY 1995
3013	—	—	—	—	—	—	In place closure FY 1995
4501-C	—	—	—	—	—	—	Remediated prior to FFA
4501-D	—	—	—	—	—	—	Remediated prior to FFA
4501-P	Stainless steel	100	Empty September 1992	Negligible	Negligible	No	In place closure FY 1996
7503-A	Stainless steel	11,000	Empty	Negligible	Negligible	No evidence of leaks	Tank evaluation
7560	Stainless steel	1,000	Empty December 1992	Negligible	Negligible	No evidence of leaks	Tank evaluation
7562	Stainless steel	12,000	4,400	Negligible	3.0	No	Remediation FY 1996/97
F-201	Stainless steel	40	Unknown volume	—	—	No	Remediation FY 99

Tank Number	Tank Construction Material	Capacity (gal)	Current Content Volume (gal)	Curie Content		Inleakage/Outleakage	Status*
				Alpha	Beta		
H-209	Carbon steel	2,500 (est.)	Empty	Negligible	Negligible	No evidence of leaks	In place closure FY 1996
LA-104	—	—	—	—	—	—	Removed FY 1996
S-424	Stainless steel/glass lined	500	Empty September 1992	Negligible	Negligible	No	Remediation FY 2000
T-1	Mild steel	15,000	8,479	79.24	7292.0	No	OHF EE/CA
T-2	Mild steel	15,000	10,544	46.24	3860.0	No	OHF EE/CA
T-3	Mild steel/rubber lined	25,000	2,918	62.0	7859.0	No	OHF EE/CA
T-4	Mild steel/rubber lined	25,000	14,668	75.05	7600.0	No	OHF EE/CA
T-9	Mild steel	13,000	4,981	11.09	1245.0	No	OHF EE/CA
T-14	Concrete	48,500	Empty September 1992	Negligible	Negligible	No	Remediation FY 97
T-30	Stainless steel	825	400	0.0004	0.001	No	In place closure FY 1996
TH-1	Stainless steel	2,500	Empty September 1992	Negligible	Negligible	No evidence of leaks	Tank evaluation
TH-2	Stainless steel	2,400	Empty September 1992	Negligible	Negligible	No evidence of leaks	Tank evaluation
TH-3	Stainless steel	3,300	Empty September 1992	Negligible	Negligible	No evidence of leaks	Tank evaluation
TH-4	Gunite	17,900	8,000	3.08	10.5	No evidence of leaks	GAAT OU
W-1	Gunite	4,800	3,100	Negligible	0.11	Inleakage	GAAT OU
W-1A	Stainless steel	4,000	Varies	Varies	Varies	Inleakage	GAAT OU

Tank Number	Tank Construction Material	Capacity (gal)	Current Content Volume (gal)	Curie Content		Inleakage/Outleakage	Status*
				Alpha	Beta		
W-1I	Stainless steel	500	Empty September 1992	Probably high	Probably high	No	Remediation FY 2001
W-2	Gunite	4,800	2,000	Negligible	0.05	Inleakage	GAAT OU
W-3	Gunite	42,500	16,000	2.96	523.9	Inleakage	GAAT OU
W-4	Gunite	42,500	29,000	4.0	194.5	Inleakage	GAAT OU
W-5	Gunite	170,000	29,300	1.0	144.4	Inleakage	GAAT OU
W-6	Gunite	170,000	42,000	6.32	940.0	Inleakage	GAAT OU
W-7	Gunite	170,000	3,500	11.14	2800.0	Probably not	GAAT OU
W-8	Gunite	170,000	66,000	11.58	3410.0	Inleakage	GAAT OU
W-9	Gunite	170,000	47,000	43.08	2094.0	Very slight leakage	GAAT OU
W-10	Gunite	170,000	105,400	83.2	13,400.0	Very slight leakage	GAAT OU
W-11	Gunite	1,500	450	Negligible	Negligible	Inleakage during heavy rain	GAAT OU
W-12	Stainless steel	700	Varies	Varies	Varies	Slight inleakage	Remediation FY 97
W-13	Stainless steel	2,000	Empt September 1992	0.40	65.0	No evidence of leaks	GAAT OU
W-14	Stainless steel	2,000	Empty September 1992	0.22	26.0	No evidnece of leaks	GAAT OU
W-15	Stainless steel	2,000	Empty September 1992	Negligible	Negligible	No	GAAT OU
W-17	Stainless steel	2,250	Varies	—	—	Inleakage	Remediation in FY 99
W-18	Stainless steel	2,250	Varies	—	—	Inleakage	Remedication in FY 99

Tank Number	Tank Construction Material	Capacity (gal)	Current Content Volume (gal)	Curie Content		Inleakage/Outleakage	Status*
				Alpha	Beta		
W-19	Stainless steel	2,250	Empty 1988	Negligible	Negligible	Dry when last inspected	Remediation FY 97
W-20	Stainless steel	2,250	Empty 1988	Negligible	Negligible	Dry when last inspected	Remedication FY 97
WC-1	Stainless steel	2,150	Empty September 1992	Negligible	Negligible	No (since March)	Tank evaluation
WC-4	Stainless steel	1,700	Varies	Varies	Varies	Very slight inleakage	Remediation FY 97
WC-5	Stainless steel	1,000	Varies	Varies	Varies	Nonprogrammatic waste input	Remediation FY 1997
WC-6	Stainless steel	500	Varies	Varies	Varies	No	Remedication FY 1997
WC-7	Stainless steel	1,100	Empty	Negligible	Negligible	No	In place closure FY 1996
WC-8	Stainless steel	1,000	Varies	Varies	Varies	Nonprogrammatic waste input (pump prime water)	Remediation FY 1997
WC-11	Stainless steel	4,000	Varies	Varies	Varies	Nonprogrammatic waste input (filter pit, cell ventilation pump)	Remediation FY 2001
WC-12	Stainless steel	1,000	Varies	Varies	Varies	Nonprogrammatic waste input (sump)	Remedication FY 2001
WC-13	Stainless steel	1,000	Varies	Varies	Varies	Nonprogrammatic waste input (floor sump)	Remediation FY 2001
WC-14	Stainless steel	1,000	Varies	Varies	Varies	Nonprogrammatic waste input	Remediation FY 2001
WC-15	Stainless steel	1,000	1,000	0.0001	0.002	No	Tank evaluation
WC-17	Stainless steel	1,000	400	Negligible	Negligible	Inleaks groundwater	Tank evaluation

Tank Number	Tank Construction Material	Capacity (gal)	Current Content Volume (gal)	Curie Content		Inleakage/Outleakage	Status*
				Alpha	Beta		
WC-19	Stainless steel	2,250	Varies	Varies	Varies	Suspected inleakage	Remediation FY 97

The old hydrofracture tanks (T-1, T-2, T-3, T-4, T-9) are scheduled to be emptied in late FY 1997.

Legend:

CERCLA—Comprehensive Environmental Response, Compensation, and Liability Act
EE/CA—engineering evaluation/cost analysis
FY—Fiscal Year
GAAT—Gunite and Associated Tanks
OHF—Old Hydrofracture Facility
OU—Operable Unit

Source: Adapted from *Remediation Schedule for Inactive LLLW Storage Tanks at Oak Ridge National Laboratory, Oak Ridge, Tennessee,* DOE/OR/01-1138&D1, Table A.1. (p. 19).