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ORNL/ER-388

**ENVIRONMENTAL
RESTORATION
PROGRAM**

**Completion Report for the Isolation
and Remediation of Inactive Liquid
Low-Level Radioactive Waste Tanks
LA-104, WC-7, and 4501-P
at Oak Ridge National Laboratory,
Oak Ridge, Tennessee**

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DEPARTMENT OF ENERGY

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Energy Systems Environmental Restoration Program

**Completion Report for the Isolation
and Remediation of Inactive Liquid
Low-Level Radioactive Waste Tanks
LA-104, WC-7, and 4501-P
at Oak Ridge National Laboratory,
Oak Ridge, Tennessee**

Date Issued—December 1996

Prepared by
Advanced Sciences, Inc.
under subcontract 96B-99311C

Prepared for
the U.S. Department of Energy
Office of Environmental Management
under budget and reporting code EW 20

Environmental Management Activities at the
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
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U.S. DEPARTMENT OF ENERGY
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PREFACE

This report provides documentation of the maintenance action completion for remediation of tanks LA-104, WC-7, and 4501-P at Oak Ridge National Laboratory. This report will serve as the remediation completion documentation for the request to remove these tanks from the Federal Facility Agreement Appendix F listing. This work was performed under Work Breakdown Structure 1.4.12.6.1.01.21, Activity Data Sheet 3301, "ORNL WAG 1 ER."

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EXECUTIVE SUMMARY

The Federal Facility Agreement (FFA) among the U.S. Environmental Protection Agency (EPA), the Tennessee Department of Environment and Conservation (TDEC), and the U.S. Department of Energy (DOE) requires that all liquid low-level waste (LLLW) tanks at Oak Ridge National Laboratory (ORNL) that have been removed from service, designated in the FFA as Category D, to be remediated in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements.

A human health risk analysis was conducted on inactive tanks LA-104, WC-7, and 4501-P to determine the method for remediating the tanks. Risk analysis results indicated that the health risk associated with these tanks were within or below the EPA range of concern of 1×10^{-4} to 1×10^{-6} . On the basis of these results and with regulators approval, it was determined that either no action or in-place stabilization of the tanks would satisfy risk-based remediation goals. Therefore, a decision was made and approved by DOE to remediate these tanks as a maintenance action rather than an action under the CERCLA process. Letters documenting these decisions were approved by DOE and submitted to TDEC and EPA.

It was the responsibility of the ORNL Waste Management and Remedial Action Division (WMRAD) to empty, characterize, and isolate the tanks when they were removed from service. The tanks were then transferred to the ORNL Environmental Restoration (ER) Program under which tanks are remediated either as a maintenance action or by following the complete CERCLA process, depending on the level of risk.

While WMRAD was in the final stages of characterizing and isolating tanks LA-104, WC-7, and 4501-P, it was determined that cost and schedule savings could be realized by having WMRAD remediate the tanks for ER as part of the integrated WMRAD and ER LLLW inactive tank activities. Cost and time savings were realized by maintaining job continuity, using the existing containment and isolation equipment, using a trained and experienced work force, and eliminating the requirement for redundant project documentation. Approvals were provided by DOE-ER program for all maintenance actions.

Tank LA-104 was isolated, removed from its vault and transferred to a waste containment box for storage or disposal. Tank WC-7 and 4501-P were isolated and grouted in-place.

All objectives of the maintenance actions for these tanks were met. Completion of these maintenance actions has met the intent of the FFA for remediation of inactive tanks LA-104, WC-7, and 4501-P. DOE, EPA, and TDEC will be requested to approve a change to the FFA document removing these tanks from the Appendix F list of inactive tanks and transferring the remaining associated piping systems to Appendix C for future remedial consideration.

1. INTRODUCTION AND SITE DESCRIPTION

1.1 BACKGROUND

The Federal Facility Agreement (FFA) among the U.S. Environmental Protection Agency (EPA), the Tennessee Department of Environment and Conservation (TDEC), and the U.S. Department of Energy (DOE) requires that all liquid low-level waste (LLLW) tanks at Oak Ridge National Laboratory (ORNL) that have been removed from service, designated in the FFA as Category D, to be remediated in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements.

A human health risk analysis was conducted on inactive tanks LA-104, WC-7, and 4501-P to determine the method of remediation necessary to safely take the tanks permanently out of service. Risk analysis results indicated that the health risk associated with these tanks were within or below the EPA range of concern of 1×10^{-4} to 1×10^{-6} . On the basis of these results and with regulators approval, it was determined that either no action or in-place stabilization of the tanks would satisfy risk-based remediation goals. Therefore, a decision was made and approved by DOE to remediate these tanks as a maintenance action rather than an action under the CERCLA process. Letters documenting these decisions were approved by DOE and submitted to TDEC and EPA.

It was the responsibility of the ORNL Waste Management and Remedial Action Division (WMRAD) to empty, characterize, and isolate the tanks when they were removed from service. The tanks were then transferred to the ORNL Environmental Restoration (ER) Program under which tanks are remediated either as a streamlined maintenance action or by following the complete CERCLA process, depending on the level of risk.

While WMRAD was in the final stages of characterizing and isolating tanks LA-104, WC-7, and 4501-P, it was determined that cost and schedule savings could be realized by having WMRAD remediate the tanks for ER as part of the integrated WMRAD and ER LLLW inactive tank activities. Cost and time savings were realized by maintaining job continuity, using the existing containment and isolation equipment, using a trained and experienced work force, and eliminating the requirement for redundant project control documentation.

1.2 SITE DESCRIPTION

The following subsections describe the tank sites as they were prior to maintenance action activities.

1.2.1 Tank LA-104

Tank LA-104 was a 296-gal, type 304L, stainless steel tank situated in the Isotopes Circle area of ORNL. The tank was installed in 1960 as a surge tank to prevent liquid carryover to the vacuum pump in the Radioisotope Development Laboratory (Bldg. 3047) vacuum system. The tank was located in a reinforced, below-grade, concrete vault beneath the south side of the building. The vault also contains additional tanks, piping, and equipment for other building systems. Operation of the vacuum system was discontinued in 1985.

1.2.2 Tank WC-7

Tank system WC-7 is situated just west of Bldg. 3504 in the Main Plant area of ORNL. Tank WC-7 was used to collect liquid waste solutions generated from health physics research on contaminated animals, and to transfer the waste to the LLLW Evaporator Facility. The tank is constructed of 347 stainless steel with an outside diameter of 5 ft. - 6 in., an overall height of 6 ft. - 9 in., and a nominal capacity of 1,100 gal. Tank WC-7 is buried vertically with its top approximately 4½ ft. below grade. Tank system piping is stainless steel. The influent piping is routed underground from Bldg. 3504 to tank WC-7. The discharge piping from tank WC-7 is routed through the tank jet pit to Valve Box No. 1 on the central waste collection header and to process manhole 229. LLLW from the Evaporator Complex Bldg. 2533 sump is transferred to the central LLLW system by means of a connection to the WC-7 discharge line near tank W-6 in the South Tank Farm. The connection of the 2533 sump discharge line to the WC-7 discharge line contains no local isolation valves.

1.2.3 Tank 4501-P

Tank 4501-P, a stainless steel tank with a nominal capacity of 140 gal, is located in an old elevator pit under the basement in the southwestern portion of Building 4501 at ORNL. This tank was used to store waste from the plutonium recovery loop experiment in the LLLW system. The piping to tank 4501-P penetrates the basement floor around a building structural column. The insulation on the steam and process chilled water piping contains asbestos containing materials.

2. MAINTENANCE ACTION OBJECTIVES

The main objective of the maintenance actions were to safely and permanently remove tanks LA-104, WC-7, and 4501-P from service to eliminate the need for continued surveillance and maintenance (S&M) of the tank systems. Meeting this objective involved removal of any existing liquids from each tank, isolation of each tank to prevent future leakage or introduction of programmatic wastes, removal of tank LA-104 for disposal, and securing tanks WC-7 and 4501-P in-place by filling each tank with a controlled low-strength grout material. The grout consisted of a mixture of Type II cement, sand, F-Type fly ash, and water which has a compressive strength of approximately 300 psi and a permeability of 2×10^{-5} cm/s. Closing the tanks with low permeability material will prevent the movement of free liquids in the tanks.

3. MAINTENANCE ACTION METHOD OF ACCOMPLISHMENT

The initial purpose of this maintenance action was to isolate each tank from its associated piping system by cutting piping attached to the tank and welding on caps to isolate the remaining piping and the tank. As part of the isolation activities, samples were taken to allow characterization of each tank in accordance with FFA requirements. LMES prepared the Title I and II isolation designs. Fieldwork to isolate each tank was begun by MK-Ferguson in accordance with a construction specification prepared by LMES. MK-Ferguson completed all necessary fieldwork. When the decision was made

to integrate tank remediation into the isolation activities, LMES engineering notified MK-Ferguson of the change in work scope for each tank. Tank LA-104 was subsequently removed and tanks WC-7 and 4501-P were grouted in-place.

LMES, as integrating contractor for DOE, performed the sampling and analysis, off-site waste transport, waste management, and oversight for field activities.

4. MAINTENANCE ACTION FIELD ACTIVITIES

Before maintenance action field activities began, Waste Operations removed the residual liquid from each tank and rinsed the interior surfaces, as necessary.

All objectives of the maintenance action for remediating tanks LA-104, WC-7, and 4501-P were met. Tables 1, 2, and 3 provide a chronology of maintenance action field activities related to remediating each tank. All maintenance activities were conducted in accordance with the construction specifications as developed and amended by LMES.

Table 1. Tank LA-104 Chronology of Events

Date	Event
12/04/95	Mobilized at LA-104 site.
12/13/95	Obtained samples of residue from inside the tank for analysis.
12/06/95	Began cutting to isolate tank LA-104 system piping.
12/15/95	Completed cutting pipes, welding caps, and inspecting welds for pipe isolation.
01/15/96	Cut sample specimen from the tank wall for analysis.
01/29-02/01/96	Removed interferences in vault and cut tank loose from supports.
02/07/96	Removed tank LA-104 from vault.
02/09/96	Demobilized at LA-104 site; completed cleanup of area.

Table 2. Tank WC-7 Chronology of Events

Date	Event
05/01/96	Mobilized at WC-7 site. Began excavation in South Tank Farm to uncover the junction of the 2533 sump discharge line and the tank WC-7 discharge line. Drained liquid from WC-7 discharge line. Cut and capped tank WC-7 discharge line in South Tank Farm. Filled tank WC-7 and its discharge lines with grout. Poured concrete pad over the tank WC-7 site.
05/31/96	Demobilized at the tank WC-7 site and completed cleanup of the area.

Table 3. Tank 4501-P Chronology of Events

Date	Event
07/15/96	Mobilized at 4501-P site. Started ventilation system in the room containing the 4501-P vault. Isolated tank 4501-P system piping. Grouted tank 4501-P and removed asbestos-containing insulation.
08/15/96	Demobilized at 4501-P site; completed cleanup of area.

The engineering drawings listed in Sect. 6 will be revised to show the "as-built" configuration of the piping systems remaining at the sites after completion of the maintenance action.

5. REMOVAL FROM FEDERAL FACILITY AGREEMENT LIST

Completion of these maintenance actions has met the intent of the FFA for remediation of inactive tanks LA-104, WC-7, and 4501-P. EPA and TDEC will be requested to approve a change to the FFA removing these tanks from the Appendix F list of inactive tanks. Since the associated tank piping systems remain in-place, it will further be requested that these systems be included in Appendix C of the FFA for future remedial consideration.

6. RETENTION OF MAINTENANCE ACTION RECORDS

Records for these maintenance actions will be retained under Project Record Number (PRN) X1996-0003 for tank LA-104, and tank WC-7, and PRN X1996-0020 for tank 4501-P, as described in the Project Records Plan.

The engineering drawings in Table 4 will be revised and maintained in the Engineering Drawing Information System to show the as-built status of the piping systems remaining at each tank site.

Table 4. As-Built Drawings

Tank	Drawing number	Drawing title
LA-104	P3E020399C017	Isolation of Tank System LA-104 Piping As-built.
LA-104	P-20399-Y-008-E-1	Engineering Flow Diagram Steam, Vacuum, and Off-Gas Systems
LA-104	P-20399-Y-039-E-2	Equipment Isometrics, Instrumentation Details and Hot Drain Shielding
WC-7	P3E020530C026 Rev. A	FFA LLLW Tank Isolation of Tank System WC-7 Plan, Sections, Details, and Notes
WC-7	C20013EA028 Rev. F	Waste Collection Header Plan and Profile, Sheet 2
4501-P	P3E020635C091	Isolation of Tank System 4501-P, Sect., Det., Notes

7. REFERENCES

The information provided in this report is a summary of the following individual tank remediation completion reports prepared by Waste Management Division. More detailed information, including photographs and a data package for each tank remediated, can be found in these reports.

Completion Report for the Isolation and Remediation of Inactive Liquid Low-Level Radioactive Waste Tank LA-104 at Oak Ridge National Laboratory, Oak Ridge, Tennessee (WMRA-FFAER-502).

Completion Report for the Isolation and Remediation of Inactive Liquid Low-Level Radioactive Waste Tank WC-7 at Oak Ridge National Laboratory, Oak Ridge, Tennessee (WMRA-FFAER-501).

Completion Report for the Isolation and Remediation of Inactive Liquid Low-Level Radioactive Waste Tank 4501-P at Oak Ridge National Laboratory, Oak Ridge, Tennessee (Draft).

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