ORNL/ER-418

ENVIRONMENTAL RESTORATION PROGRAM

Final Deactivation Project Report on the Integrated Process Demonstration Facility, Building 7602 Oak Ridge National Laboratory, Oak Ridge, Tennessee

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED *ph*

This document has been approved by the
Oak Ridge National Laboratory
Technical Information Office
for release to the public. Date: 9/22/97 *ENERGY SYSTEMS*

MANAGED BY
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

Advanced Integrated Management Services, Inc.

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

**Final Deactivation Project Report
on the Integrated Process
Demonstration Facility, Building 7602
Oak Ridge National Laboratory,
Oak Ridge, Tennessee**

Date Issued—September 1997

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.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

PREFACE

This document is the *Final Deactivation Project Report on the Integrated Process Demonstration Facility, Building 7602, at Oak Ridge National Laboratory, Oak Ridge, Tennessee* (ORNL/ER-418). Although this element of work is not part of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), it was accomplished in accordance with the substantive requirements of the act. This work was performed under Work Breakdown Structure 1.6.6.2.10.1, Activity Data Sheet 6502-OR. This document provides the Environmental Management and Enrichment Facilities program with the final report on the deactivation of the Integrated Process Demonstration Facility, Building 7602.

DISCLAIMER

**Portions of this document may be illegible
in electronic image products. Images are
produced from the best available original
document.**

CONTENTS

PREFACE	iii
TABLES	ix
ABBREVIATIONS	xi
EXECUTIVE SUMMARY	xiii
1. INTRODUCTION	1
1.1 PURPOSE	1
1.2 SCOPE	1
2. BACKGROUND	3
2.1 FACILITY DESCRIPTION	3
2.2 FACILITY HISTORY	3
3. FACILITY STATUS	5
3.1 PRE-DEACTIVATION FACILITY STATUS	5
3.1.1 Hazards Analysis	5
3.1.2 Internal Spaces	5
3.1.3 Building Structure and External Spaces	7
3.1.4 Process, Utility, and Support Systems	8
3.1.5 Radioactive Material, Contamination, and Waste	11
3.1.6 Hazardous Material, Contamination, and Waste	11
3.1.7 Mixed Waste	12
3.2 POST-DEACTIVATION FACILITY STATUS	12
3.2.1 Deactivation End Point Completion	12
3.2.2 Hazards Analysis	12
3.2.3 Internal Spaces	12
3.2.4 Building Structure and External Spaces	14
3.2.5 Process, Utility, and Support Systems	14
3.2.6 Radioactive Material, Contamination, and Waste	18
3.2.7 Hazardous Material and Mixed Waste	18
4. BUILDING 7602 DEACTIVATION ACTIVITIES	33
4.1 INTERNAL SPACES - ACCESS REQUIRED	33
4.1.1 ROMD High Bay	33
4.1.2 IPD High Bay	33
4.1.3 Chemical Makeup Room	33
4.1.4 Mezzanine Level	33
4.2 INTERNAL SPACES - NO ACCESS REQUIRED	34
4.2.1 Dissolver Pit	34
4.2.2 Solvent Extraction Pit	34

4.3 EXTERNAL SPACES	34
4.3.1 Building 7602 Structure	34
4.3.2 Building 7602 Roof	34
4.3.3 Building 7602 Exterior Locks	34
4.4 OPERATIONAL SYSTEMS	35
4.4.1 Building Ventilation System	35
4.4.2 Building Steam Heating System	35
4.4.3 Fire Protection System	35
4.4.4 Electrical Power	35
4.4.5 Cooling Water Headers Passing Through the Building	35
4.4.6 Radiation Monitoring Equipment	36
4.5 MOTHBALLED SYSTEMS	36
4.5.1 Safety Shower and Eye Wash Stations	36
4.6 SYSTEMS ABANDONED IN PLACE	36
4.6.1 Feed Station	36
4.6.2 Dissolution System	36
4.6.3 Accountability and Feed Adjustment	36
4.6.4 Centrifugal Contactor Test System	36
4.6.5 IPD Solvent Extraction Systems	37
4.6.6 Uranium Product Evaporation System	37
4.6.7 Organic Treatment System	37
4.6.8 Dissolver Off-Gas Treatment System	37
4.6.9 NO _x Off-Gas System	37
4.6.10 Liquid Waste Treatment System	37
4.6.11 Chemical Makeup System	37
4.6.12 Instrument Air System	37
4.6.13 Cooling Water System	38
4.6.14 Chilled Water System	38
4.6.15 Hot Water System	38
4.6.16 Vessel Off-Gas System	38
5. TRANSITION ACTIVITIES	39
5.1 MEMORANDUM OF AGREEMENT	39
5.2 REQUIREMENTS AND COMMITMENTS	39
5.2.1 Regulatory Requirements	39
5.2.2 Stakeholder Commitments	39
5.3 POST-TRANSITION DEACTIVATION ACTIVITIES	39
5.4 POTENTIAL RE-USE OF BUILDING 7602	39
6. POST-DEACTIVATION S&M	41
7. ABNORMAL ACTIVITIES/CONDITIONS	43
8. TURNOVER PACKAGE DOCUMENTATION	45
8.1 ADMINISTRATIVE TURNOVER PACKAGE	45
8.1.1 Final Deactivation Project Report	45

8.1.2 Deactivation Locks Log and Keys	45
8.2 TECHNICAL TURNOVER PACKAGE	45
8.2.1 End Points Completion Report	45
8.2.2 Updated Facility Drawings	45
8.2.3 Radioactive Materials Inventory and Survey	46
8.3 S&M TURNOVER PACKAGE	46
8.3.1 Post-Deactivation S&M Plan	46
8.3.2 Post-Deactivation S&M Procedures	46
9. REFERENCES	47
END NOTES	49
APPENDIX A - BUILDING 7602 FLOOR PLANS	A-1
APPENDIX B - BUILDING 7602 HAZARD SCREENING	B-1
APPENDIX C - BUILDING 7602 RADIOLOGICAL SURVEYS	C-1

TABLES

3.1 Building 7602 Stationary Health Physics Instrumentation	19
3.2 Draining and Flushing Record of Building 7602 Process Tanks	20
3.3 Status of Building 7602 Circuit Breakers	23

ABBREVIATIONS

AEC	Atomic Energy Commission
AIMS	Advanced Integrated Maintenance System
ALARA	As Low As Reasonably Achievable
ALEA	As Low As Economically Achievable
B/T	Buffer/Transmitter
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CCM	Converter Control Module
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
DCM	Display Control Module
DOE	United States Department of Energy
EMEF	Environmental Management and Enrichment Facilities
EM-40	DOE Office of Environmental Restoration
EM-60	DOE Nuclear Material and Facility Stabilization Program
ER	LMES Environmental Restoration Division
FDPR	Final Deactivation Project Report
FY	Fiscal Year
HEPA	High Efficiency Particulate Air (Filter)
HPIC	Health Physics Instrument Committee
HRFDP	High Ranking Facilities Deactivation Project
I&C	LMER Instrumentation and Controls Division
IPD	Integrated Process Demonstration
LMER	Lockheed Martin Energy Research
LMES	Lockheed Martin Energy Systems
MOA	Memorandum of Agreement
NE	DOE Office of Nuclear Energy
ORNL	Oak Ridge National Laboratory
ORP	ORNL Office of Radiation Protection
P&E	LMER Plant and Equipment Division
PCB	Polychlorinated Biphenyl
PCM	Process Control Module
PNC	Power Reactor and Nuclear Fuel Development Corporation
PUREX	Plutonium Uranium Extraction Process
RBA	Radiological Buffer Area
ROMD	Remote Operation Maintenance Demonstration
RPSD	ORNL Robotics and Process Systems Division
RWP	Radiological Work Permit
S&M	Surveillance and Maintenance
S/RID	Standards/Requirements Identification Document
WOCC	Waste Operations Control Center

EXECUTIVE SUMMARY

The purpose of this report is to document the condition of the Integrated Process Demonstration Facility (Building 7602) at Oak Ridge National Laboratory (ORNL) after completion of deactivation activities by the High Ranking Facilities Deactivation Project (HRFDP). This report identifies the activities conducted to place the facility in a safe and environmentally sound condition prior to transfer to the U.S. Department of Energy (DOE) Environmental Restoration EM-40 Program.

This report provides a history and description of the facility prior to commencing deactivation activities and documents the condition of the building after completion of all deactivation activities. Turnover items, such as the Post-Deactivation Surveillance and Maintenance (S&M) Plan, remaining hazardous and radioactive materials inventory, radiological controls, Safeguards and Security, and supporting documentation provided in the Office of Nuclear Material and Facility Stabilization Program (EM-60) Turnover package are discussed.

Building 7602 was stabilized during deactivation so that when transferred to the EM-40 Program, only a minimal S&M effort would be required to maintain the building safety envelope. Building 7602 will require access to perform required S&M activities to maintain the building safety envelope. Other than for minimal S&M activities, the building will be unoccupied until decommissioning activities begin. The exterior doors will be locked to prevent unauthorized access.

The hazard category for Building 7602 is "RADIOLOGICAL." All bulk quantities of hazardous and radiological materials have been removed from the building. All process equipment and utilities not required for S&M or necessary to eventually facilitate decommissioning have been deactivated and isolated to prevent the spread of radioactive contamination and minimize S&M requirements.

1. INTRODUCTION

1.1 PURPOSE

The purpose of this report is to document the condition of the Integrated Process Demonstration Facility (Building 7602) at Oak Ridge National Laboratory (ORNL) after completion of deactivation activities. This report identifies the activities conducted to place the facility in a safe and environmentally sound condition prior to transfer to the Environmental Restoration EM-40 Program.

This document provides a history and description of the facility prior to commencing deactivation activities and documents the condition of the building after completion of all deactivation activities. Turnover items, such as the Post-Deactivation Surveillance and Maintenance (S&M) Plan, remaining hazardous materials inventory, radiological controls, Safeguards and Security, and supporting documentation provided in the Office of Nuclear Material and Facility Stabilization Program (EM-60) Turnover package are discussed.

1.2 SCOPE

This document addresses the activities performed during deactivation associated with Building 7602 to place the facility in a safe and environmentally sound condition to await decommissioning, the status of the facility, and the activities required to maintain the facility following deactivation. These deactivation activities include those performed by the Lockheed Martin Energy Research (LMER) Robotics and Process Systems Division (RPSD) in fiscal year 1995, and those performed by the Lockheed Martin Energy Systems (LMES) Environmental Management and Enrichment Facilities (EMEF) Program in fiscal years 1996 and 1997. Appendix A provides the floor plans of Building 7602 and illustrates the physical boundaries of the facility.

2. BACKGROUND

2.1 FACILITY DESCRIPTION

Building 7602 is the Integrated Process Demonstration Facility. It is situated in the Robotics and Process Systems Complex, east of the main ORNL plant area. The building is physically connected to the Robotic and Remote Systems Lab (Building 7603), which is an active facility. The two buildings are separated by a partial block wall, which does not extend completely to the ceiling of the high bay area.

Building 7602 is a 15,841 ft² concrete block and steel frame building. The building has three floors. It contains three pits that collect any liquids coming from leaks. These pits are the F-14 pit, the solvent extraction pit, and the dissolver pit. The F-14 pit is on the mezzanine level of the building, and contains tanks for collecting any liquid flowing from drains. The solvent extraction pit was once used for special equipment tests, and extends downward from the main floor to the basement level. The dissolver pit is the largest feature in the building, and is visible just to the left of the main building entrance on the ground floor.¹ Depleted and natural uranium are the only radioactive contaminants in the facility present in appreciable quantities.

2.2 FACILITY HISTORY

Building 7602 was constructed in 1963 as a reactor fueling building for the Experimental Gas-Cooled Reactor. The reactor was never fueled and no nuclear fuel was ever handled in Building 7602.

The building was idle until 1974, when the original Liquid Metal Fast Breeder Reactor Fuel Cycle Program moved into the Building 7602 offices. Until approximately 1981, the building was used as part of the breeder program, which developed technology and equipment to reprocess fuel in connection with the Clinch River Breeder Reactor. During those five years, the program evolved into the Consolidated Fuel Reprocessing Program, and subsequently to the ORNL Robotics and Process Systems Division.

From 1981 through 1983, Building 7602 additions, modifications, and process/remote equipment installation were accomplished via a \$16 million line item project sponsored by DOE Office of Nuclear Energy (NE) in preparation for a collaborative fuel reprocessing program with the Power Reactor and Nuclear Fuel Development Corporation (PNC) of Japan. Half of the funding for this program was supplied by Japan. The collaborative program involved separations process development and testing, and was conducted from 1984 through 1994. The principle technology employed was the Plutonium and Uranium Extraction (PUREX) Process with centrifugal contactors. All tests were conducted using dummy fuel made from depleted and natural uranium, so no actual spent nuclear fuel was processed in the facility.²

In April 1994, DOE-NE instructed ORNL that Building 7602 would become surplus at the end of fiscal year 1994. On October 1, 1994, the deactivation of Building 7602 was initiated with NE funding. By the end of December 1994, the process and control systems of the facility were shut down. During the rest of fiscal year 1995, efforts were conducted to recycle, reuse, or dispose of the process materials remaining in the facility.

On October 1, 1995, ownership of Building 7602 was transferred from DOE-NE to the DOE EM-60 Program. Responsibility for the facility was transferred from RPSD to the Environmental Restoration Division's High Ranking Facilities Deactivation Project (HRFDP).

3. FACILITY STATUS

3.1 PRE-DEACTIVATION FACILITY STATUS

Unlike other surplus facilities at ORNL, actions to deactivate Building 7602 and place it in a safe, stable condition were initiated promptly after the facility had been declared surplus. The facility management had made significant progress in reducing the building's inventory of uranium oxide powder even before the facility was officially declared surplus. Consequently, Building 7602 did not experience an extended period of neglect and was in good condition prior to deactivation.

3.1.1 Hazards Analysis

Phase I Safety Analysis Report Update Program Hazards Screening (ORNL/CF-95/60 HS/7602/F/1/R2) was issued November 29, 1995. This hazard screening documents the postulated hazards associated with Building 7602 and the other buildings within the Robotics and Process Systems Complex while Building 7602 was operational. The hazard classification suggested for these facilities was "GENERALLY ACCEPTED."³

3.1.2 Internal Spaces

Building 7602 contained three levels. The ground floor level of Building 7602 had an area of 7686 ft². This floor included the Remote Operation Maintenance Demonstration (ROMD) High Bay, the Integrated Process Demonstration (IPD) High Bay, and the Chemical Makeup Room. The mezzanine level had an area of 6776 ft² and included the IPD Basement and the IPD Transmitter Room (ROMD Basement). The basement level, with an area of 1379 ft², consisted of the bottom of the dissolver pit.⁴

The entire building was a radiological buffer area (RBA) containing designated contamination areas, high contamination areas, and radiation areas. All contamination in the building was from natural or depleted uranium. All areas of the building contained large amounts of process equipment. Large quantities of radioactive and hazardous materials were contained within the process equipment.

3.1.2.1 ROMD High Bay

The ROMD High Bay was an extension of the Advanced Integrated Maintenance System (AIMS) High Bay of Building 7603. A partial block wall and a large shear marked the boundary between these two areas. An overhead gantry crane with a 20 ton capacity served the AIMS/ROMD High Bay areas. A lower manipulator bridge also provided remote maintenance access to these areas. After deactivation of Building 7602, the crane and manipulator bridge will be considered part of Building 7603 and will not be maintained by EM funding. The primary features of the ROMD High Bay included the feed house, the dissolver pit, the 8.4 Centrifugal Contactor Test Area, and the dissolver off-gas system.

The 8.4 Centrifugal Contactor Test Area, also known as the Chemical Systems Test Area was a full scale solvent extraction system for breeder fuel used to develop processes for uranium fuel recycling. It had the capacity to process 0.5 metric tons of heavy metal per day.⁵

The dissolver pit covered an area of over 1000 ft² and has a depth of 30 ft. The pit extended from the ground level through the mezzanine level to the basement level. The pit contained the continuous

rotary dissolver system. This system received a uranium feed that simulated sheared spent nuclear fuel and dissolved it in nitric acid to produce a uranyl nitrate solution for the solvent extraction system. The dissolver provided the uranyl nitrate solution used to test the 8.4 Centrifugal Contactor Test solvent extraction system.⁶

The feed house was located just to the west of the dissolver pit. It was created to provide the capability of supplying the dissolver simulated sheared material independent of shearing operations.⁷

The dissolver off-gas system consisted of an entrained separator, two condensers, and an NO_x scrubber. This system removed nitric acid, nitrogen dioxide, and much of the nitrogen monoxide from the dissolver off-gas before routing the dissolver off-gas to the vessel off-gas system.⁸

The ROMD High Bay contained two drains. A process floor drain routed to the F-14 pit was located along the north wall of the ROMD High Bay. This drain was plugged before the building was deactivated. The other drain was an active sump drain in the digester pit in the bottom of the dissolver pit. This process drain was routed to the 34F33 tank.⁹

3.1.2.2 IPD High Bay

The IPD High Bay was a large area to the north of the ROMD High Bay containing large amounts of process equipment. The largest feature in this area was the solvent extraction pit. The area contained an overhead crane with a 25 ton capacity that could travel the full length and width of the IPD High Bay. Process systems operating with the IPD High Bay include two solvent extraction systems, the accountability and feed adjustment system, the uranium product evaporation system, the NO_x off-gas system, and the liquid waste treatment system (32 System).

The IPD High Bay contained two solvent extraction systems, one with a capacity to process 250 kg per day and the other with a capacity of 100 kg/day. The process employed in these systems was similar to that used by the 8.4 Centrifugal Contactor Text system in the ROMD High Bay.¹⁰

The accountability and feed adjustment system provided a continuous feed to the solvent extraction systems. It monitored the uranium content of the dissolver product for accountability purposes and adjusted the concentration of the feed solution to meet feed specifications.¹¹

The liquid waste treatment system collected various liquid wastes from IPD processes, concentrated the waste, treated the concentrated waste with sucrose to reduce acidity, measured the uranium losses in the concentrated waste for accountability purposes, and finally discharged the concentrated waste to the building waste system. The primary waste stream treated by this system was the acidic fission product waste from the solvent extraction contactor. Since only dummy fuel elements made from depleted uranium were processed in Building 7602, this stream did not contain any real fission products.¹²

The NO_x off-gas system removed nitrogen oxides from the off-gases from the chemical makeup system and the liquid waste treatment system. Most of the NO_x gases were generated in the liquid waste treatment system when the concentrated waste was treated with sucrose.¹³

The uranium product evaporation system concentrated the uranium solution received from the solvent extraction processes. This was accomplished in a single phase evaporator.¹⁴

The IPD High Bay contained five drains. Two floor drains were located under the IODOX rack, two sinks were located in the high bay, and a sump drain was located in the northeast corner of the solvent extraction pit. All five drains were process drains, with the sinks and the floor drains routed to the 32F33 tank, and the solvent extraction pit sump routed to the 32F31 tank.¹⁵

3.1.2.3 Chemical Makeup Room

The Chemical Makeup Room was an appendage on the north end of Building 7602. The chemical makeup system supplied the IPD process systems with various chemicals, including recycle nitric acid, recycle water, gadolinium, synthetic fission products, sodium carbonate, sugar, degraded solvent, tributyl phosphate (TBP) diluent, magnesium nitrate, and compressed carbon dioxide.¹⁶ Most of the tanks in this room contained recycle water or nitric acid contaminated with uranium. Prior to deactivation, the heating unit serving the Chemical Makeup Room operated unreliably.

The Chemical Makeup Room contained four process floor drains. A fifth floor drain was located in the hydrazine room, the northeast corner of the Chemical Makeup Room. Two process funnel drains were located along the south wall of the Chemical Makeup Room, and one process funnel drain was located along the north wall of the room. All process drains in the Chemical Makeup Room were routed to the 32F33 tank.¹⁷

3.1.2.4 Mezzanine Level

The mezzanine level of Building 7602 contained the IPD Basement and the IPD Transmitter Room, also known as the ROMD basement. Most of the process equipment associated with the organic treatment system was located in the IPD basement. The purpose of the organic treatment system was to remove degradation products from the solvent used in the solvent extraction systems. The solvent entering the system was washed three times, first with dilute (0.02 M) nitric acid, then with a dilute (0.1 M) sodium carbonate solution, and finally with another round of dilute nitric acid. After completing this three phase washing process, the solvent was recycled back to the solvent extraction processes.¹⁸

A process floor drain routed to the F-14 pit was located on the north wall of the IPD Transmitter Room. This drain was plugged prior to deactivation. An active process scubber drain was situated in the IPD Basement around the F-14 pit. This drain was routed to the 32F31 tank. An additional process sump drain routed to the 32F31 tank was located at the bottom of the F-14 pit.¹⁹

3.1.3 Building Structure and External Spaces

3.1.3.1 Building 7602 Exterior

The exterior of Building 7602 was generally in good condition prior to the initiation of deactivation and did not require corrective maintenance to place the building in a safe shutdown condition.

3.1.3.2 Building 7602 Roof

Before deactivation, a portion of the roof of Building 7602 was approximately 30 years old. This area had deteriorated significantly over the years and allowed water to enter the IPD High Bay during

heavy rains. Other sections of the roof were also worn and had the potential to develop leaks.²⁰ The fan house on the roof contained two process floor drains routed to the 32F33 tank.²¹

3.1.4 Process, Utility, and Support Systems

3.1.4.1 Feed Station

The feed house was situated in the ROMD High Bay to the west of the dissolver pit. The feed house consisted of two chambers holding uranium oxide and a chute used to feed uranium oxide powder to the dissolver. Drums of feed material were inserted into the first chamber, where the material was pneumatically transferred from the drum to a feed hopper in the second chamber. A vibratory feeder transferred the feed material from the hopper to the chute. Prior to deactivation, the feed house contained 95 kg of uranium oxide powder. The two chambers containing the uranium oxide powder were kept under negative pressure to ensure containment of the uranium.²²

3.1.4.2 Continuous Rotary Dissolver

The continuous rotary dissolver was located inside the dissolver pit within the ROMD High Bay. The dissolver took uranium oxide powder from the feed house or the shear and dissolved it with 8 M nitric acid to create uranyl nitrate solutions. This uranyl nitrate was then delivered to the Centrifugal Contactors Test System for processing. The off-gas was directed to the dissolver off-gas system. The dissolver had a design capacity of 25 kg of uranium per day.²³

3.1.4.3 Centrifugal Contactor Test

The 8.4 Centrifugal Contactor Test, also known as the Chemical Systems Test, was a solvent extraction system used to develop processes for uranium fuel recycling. Before deactivation, the system was being used to examine a process for purifying uranium recovered from spent nuclear fuel. Depleted uranium was used in these tests to avoid any potential problems due to criticality or significant radiation. The solvent extraction process involved liquid-liquid extraction of uranium from an aqueous solution to an organic liquid. The aqueous feed solution typically contained 3.5 M nitric acid and depleted uranium at a concentration of 350 grams of uranium per liter. The organic solution contains 30 volume percent tributyl phosphate with the remainder being dodecane.²⁴

3.1.4.4 IPD Solvent Extraction Systems

The two solvent extraction systems in the IPD High Bay had capacities of 0.5 metric tons/day and 0.1 metric tons/day of uranium feed.²⁵ These systems operated similarly to the 8.4 Centrifugal Contactor Test in the ROMD High Bay described in the previous section.²⁶

3.1.4.5 Uranium Product Evaporation System

The purpose of the uranium product evaporation system was to concentrate the aqueous uranium solution coming from the solvent extraction systems. The uranium solutions were steam stripped to remove traces of solvent and were concentrated by a single-effect evaporator. The evaporated water was collected, condensed, acidified, and recycled to the solvent extraction systems. Another purpose of this system was to perform a heavy metal accountability analysis on the concentrated product solution.²⁷

3.1.4.6 Organic Treatment System

The purpose of the organic treatment system was to remove the degradation products from the solvent and recycle the cleaned solvent back to the solvent extraction systems. Solvent from the solvent extraction processes was processed through three stages of solvent washers in series. The wash solution for the first and third stage was a dilute 0.02 M nitric acid solution. The wash solution for the second stage was a dilute basic solution of 0.1 M sodium carbonate. A high percentage of degradation products were removed by the three stages of washes.²⁸

3.1.4.7 Dissolver Off-Gas System

The principal purpose of the NO_x off-gas system was to remove NO_x from the liquid waste system off-gas and the acid concentration system off-gas. The liquid effluent from the NO_x scrubber was used to continuously neutralize solvent washing wastes from the organic treatment system. The principal source of NO_x was the liquid waste system where NO_x was generated when the unwanted nitric acid in the evaporator is destroyed by reacting the acid with sucrose.²⁹

3.1.4.9 Liquid Waste Treatment System

The liquid waste treatment system combined the functions of the various waste collection and evaporation systems in the IPD into one evaporator system. The primary stream was the acidic simulated fission product waste from the first cycle solvent extraction contactor. The concentrated waste from the evaporator, which contained simulated fission products, and traces of uranium from the solvent extraction system and which was treated with sucrose to reduce the acidity, was analyzed for uranium accountability and discarded to the building waste system. The vapor from the evaporator went directly to an acid fractionator which produced nitric acid and water that were recycled to the chemical makeup area. The liquid waste system also provided a continuous aqueous scrubbing solution stream to the NO_x scrubber, thus minimizing the amount of fresh water makeup and waste water discard from the IPD system.³⁰

3.1.4.10 Chemical Makeup System

The purpose of the chemical makeup system was to supply the various chemicals required by the IPD process systems. The chemical makeup system was comprised of several separate systems consisting of preparation storage and feed equipment for each of the process chemicals. These systems included: recycle acid, recycle water, gadolinium, synthetic fission products, sodium carbonate, sucrose, synthetic degraded solvent, tributyl phosphate diluent, magnesium nitrate, and the carbon dioxide compressed gas system. Some of these systems existed to furnish chemicals to simulate radiation effects on the chemistry of the process solutions and to supply non-radioactive substitutes for fission products to investigate problem areas in process chemistry and equipment performance.³¹

3.1.4.11 Instrument Air

Prior to deactivation, the instrument air system provided air for the process systems operating in Building 7602. Building 7602 shared this system with other buildings in the Robotics and Process Systems Complex. A schematic drawing of this system is given in Appendix B of ORNL/TM-13093, *Deactivation of Building 7602*.

3.1.4.12 Cooling Water System

Before deactivation, the cooling water system provided cooling water to the process systems operating in Building 7602. Building 7602 shared this utility with other buildings in the Robotics and Process Systems Complex. A schematic drawing of this system is given in Appendix B of ORNL/TM-13093, *Deactivation of Building 7602*.

3.1.4.13 Chilled Water System

Prior to deactivation, the chilled water system provided water for the process systems operating in Building 7602. Building 7602 shared this utility with other buildings in the Robotics and Process Systems Complex. A schematic drawing of this system is given in Appendix B of ORNL/TM-13093, *Deactivation of Building 7602*.

3.1.4.14 Hot Water System

Before deactivation, the hot water system provided hot water for the process systems operating in Building 7602. Building 7602 shared this utility with other buildings in the Robotics and Process Systems Complex. A schematic drawing of this system is given in Appendix B of ORNL/TM-13093, *Deactivation of Building 7602*.

3.1.4.15 Electrical Systems

The electrical system powering Building 7602 provided up to 3500 kW of electrical power to the facility.³²

3.1.4.16 Vessel Off-Gas System

Prior to deactivation, the vessel off-gas system treated the gases emitted by the process systems operating in Building 7602. Building 7602 shared this system with other buildings in the Robotics and Process Systems Complex. A schematic drawing of this system is given in Appendix B of ORNL/TM-13093, *Deactivation of Building 7602*.

3.1.4.17 Building Ventilation System

The building ventilation system was an essential element of contamination control within Building 7602. The ventilation system ensured that all air flow was into the building, and that air leaving the facility went through a High Efficiency Particulate Absolute (HEPA) filter bank and out of a permitted stack.³³ The filter bank was located in an enclosed area on the Building 7602 roof.³⁴ Air flow in the AIMS/ROMD High Bay area was from Building 7603 to Building 7602.³⁵

3.1.4.18 Fire Protection System

The fire protection system in Building 7602 conformed to all DOE and LMES requirements. The sprinklers were designed to be able to deliver between 0.25 to 0.30 gallons/ft² per minute. Smoke detectors were installed in areas where organic solvents were employed.³⁶

3.1.4.19 Heating System

Building 7602 was heated by a steam heating system. The heating systems for Buildings 7601, 7602, and 7603 shared a common boiler.³⁷ Before deactivation, the heating unit serving the Chemical Makeup Room was old and operated unreliably.³⁸

3.1.4.20 Safety Showers and Eye Wash Baths

Since hazardous and corrosive chemicals were used in Building 7602, safety showers were installed as required by 29 CFR 1910.151. In the ROMD High Bay, one safety shower/eye wash installation was located on the main level, and another was installed at the bottom of the dissolver pit. In the IPD High Bay, three safety showers and eye washes were located on the main level, with an additional one in the solvent extraction pit. The IPD Basement and the Chemical Makeup Room each contained one safety shower and eye wash.³⁹

3.1.4.21 Radiation Monitoring Equipment

To protect workers in the facility, Building 7602 was equipped with several health physics instruments to monitor the radiation and contamination levels within the building. A list of the stationery health physics instruments in the building is provided in Table 3.1.

3.1.5 Radioactive Material, Contamination, and Waste

The only radioactive materials present in Building 7602 prior to deactivation were natural and depleted uranium. This uranium was in the form of uranium oxide powder, encapsulated fuel pins and assemblies, and uranyl nitrate solutions.

Immediately before the deactivation of Building 7602 was initiated, 95 kg of uranium oxide powder (containing 81 kg of uranium) was stored in the feed house of the ROMD High Bay. An additional 10 kg of oxide powder was estimated to be present as contamination on facility surfaces and on the inside surfaces of the process equipment and piping.⁴⁰

Dummy fuel pins and assemblies fabricated from depleted uranium were also present before deactivation. These fuel rods had been intended to be used to test processes conducted at Building 7602, such as shearing, transferring sheared fuel to the dissolver, and continuous dissolution of the sheared fuel. These fuel elements remaining after operations in the facility ceased contained 1697 kg of uranium.⁴¹

Since uranyl nitrate is a listed Resource Conservation and Recovery Act (RCRA) hazardous waste, the pre-deactivation inventories of uranyl nitrate will be discussed in Section 3.1.7.

3.1.6 Hazardous Material, Contamination, and Waste

Since all process systems in Building 7602 involved processing uranium, all hazardous materials contained in the process equipment prior to deactivation were mixed wastes, rather than hazardous materials. The only bulk quantities of hazardous chemicals present were a collection of miscellaneous chemicals in small containers.⁴² The facility was also contaminated with hexavalent chromium on the floors, in the process equipment and piping, and was suspected of possessing asbestos insulation in

equipment, piping, and drums. Some of the process equipment was contaminated with chlorofluorocarbons (CFCs).⁴³

3.1.7 Mixed Waste

When Building 7602 was placed in "safe standby" immediately prior to the initiation of deactivation activities, the facility contained 30,178 liters of uranyl nitrate solution containing 3966 kg of uranium. This material was stored in the 11F01 feed tank in the IPD High Bay.⁴⁴

Before deactivation, the facility also contained approximately 1,900 liters of 8.2 M nitric acid. This acid had been used as recycled nitric acid in process operations and was contaminated with uranium. The acid was stored within the process equipment of the facility.⁴⁵

A total of 3,346 liters of organic solvent that had been used in the facility's solvent extraction processes were also present prior to deactivation. This solvent consisted primarily of tributyl phosphate and dodecane ($\text{CH}_3(\text{CH}_2)_{10}\text{CH}_3$). This solvent was contaminated with 265 kg of uranium.⁴⁶

3.2 POST-DEACTIVATION FACILITY STATUS

3.2.1 Deactivation End Point Completion

The end point criteria for deactivation activities performed at Building 7602 are defined in Attachment 4 of the *High Ranking Facilities Deactivation Project (HRFDP) End Point Determination - Integrated Process Demonstration Facility (7602)*, (HRFDP/97/004-D). Unless otherwise stated in the Memorandum of Agreement between EM-60 and EM-40 for the transfer of the facility, the end point criteria in this document identify the state that the facility must be in to transfer into the EM-40 Program. The achievement of these end points is documented in *Building 7602 End Point Completion Report*. This report is an attachment to the Memorandum of Agreement (MOA) transferring the facility from EM-60 to EM-40. The signatures of the EM-60 and EM-40 representatives on the MOA indicate their concurrence with the end point completion report.

3.2.2 Hazards Analysis

The post-deactivation hazards associated with Building 7602 are documented in *Auditable Safety Analysis: Building 7602 Integrated Process Demonstration Facility* (HRFDP/97/001-D). The post-deactivation hazard level classification for this facility is RADIOLOGICAL. No non-radiological hazards in Building 7602 were identified beyond normal industrial hazards. A copy of this hazard screening document is provided in Appendix B.

3.2.3 Internal Spaces

3.2.3.1 ROMD High Bay

All bulk quantities of hazardous and radioactive materials have been removed from the ROMD High Bay area. The uranium oxide powder in the feed house was sent to ORNL Waste Management for disposal, and all tanks and process piping have been drained, as indicated in Table 3.2. The dissolver off-gas system, the 8.4 Centrifugal Contactor Test, feed station, and all other process systems in the area have been shut down, isolated, and abandoned in place.

The post-deactivation radiological conditions in the dissolver pit and the rest of the ROMD High Bay are documented in ORP surveys 7601-97-0042 and 7601-97-0031, respectively. Copies of these surveys are located in Appendix C. The feed house is designated as a high contamination area, a radiation area, and an airborne activity area. The dissolver pit and the 8.4 Centrifugal Contactor Test area have been designated contamination areas. The remainder of the ROMD High Bay is an RBA.

A plugged process floor drain is located by the north wall of the ROMD High Bay. An active process sump drain is located in the digester pit at the bottom of the dissolver pit. Both of these drains were built for spill containment.⁴⁷

3.2.3.2 IPD High Bay

All bulk quantities of hazardous and radioactive materials have been removed from the IPD High Bay. All tanks and process piping have been drained, as indicated in Table 3.2. All process systems in the IPD High Bay, including the liquid waste treatment system, the uranium product evaporation system, the NO_x scrubber system, and the chilled water system have been shut down, isolated, and abandoned in place.

The centrifuge house within the IPD High Bay is a designated radiation area, high contamination area, and an airborne activity area.⁴⁸ The radiological conditions within the centrifuge house are documented in ORP survey 7601-94-0063. A 400 ft² area within the solvent extraction pit is also roped off as a high contamination area, as indicated in ORP survey 7601-97-0035. The areas around the liquid waste treatment system and the 19 system are contamination areas, as shown in ORP surveys 7601-97-0075 and 7601-97-0015, respectively. The System 12 and 13 areas also remain high contamination areas, covering a 1575 ft² area.⁴⁹ The remainder of the IPD High Bay is an RBA. Copies of the radiation and contamination surveys are provided in Appendix C.

The IPD High Bay contains three drains used for spill control. Two process floor drains are located beneath the IODOX rack, and a sump drain is located in the northeast corner of the Solvent Extraction Pit. Other drains in the area consist of two process sink drains intended for laboratory liquid wastes.⁵⁰

3.2.3.3 Chemical Makeup Room

All bulk quantities of hazardous and radioactive materials have been removed from the Chemical Makeup Room. All tanks and process piping associated with the chemical makeup system have been drained, as indicated in Table 3.2. The chemical makeup system has been shut down, isolated, and abandoned in place.

In FY 1995, corrective maintenance was performed on the old heating unit servicing the Chemical Makeup Room, and a new heating unit was installed to supplement the old one to ensure freeze protection for the fire protection piping.⁵¹

Two designated contamination areas remain in the Chemical Makeup Room. The one in the northern portion of the room covers an area of 633 ft², while the southern area has a size of 773 ft². The remainder of the room is a radiological buffer area.⁵² The radiological conditions in the area are documented in ORP survey 7601-97-0033. A copy of this survey is included in Appendix C.

Spill containment in the Chemical Makeup Room is provided by four process floor drains, two process funnel drains along the north wall of the room, and one floor drain in the hydrazine room (northeast corner of the Chemical Makeup Room).⁵³

3.2.3.4 Mezzanine Level

All bulk quantities of hazardous and radioactive materials have been removed from the mezzanine level. All tanks and process piping associated with the organic treatment system in the IPD Basement have been drained, as indicated in Table 3.2. The organic treatment system has been shut down, isolated, and abandoned in place.

Except for a smear free walkway from the door to the F-14 pit, the entire IPD Basement is a high contamination area and a radiation area covering an area of 4786 ft². The radiation levels are 10 mR/hr.⁵⁴ The IPD Transmitter Room (ROMD basement) is a radiological buffer area. The radiological conditions in the IPD Basement are documented in ORP survey 7601-97-0027. A copy of this survey is provided in Appendix C.

The IPD Basement contains a process floor drain near the north wall of the building used for spill containment. The IPD Basement contains a process drain around the F-14 pit and one sump drain at the bottom of the F-14 pit for spill containment.⁵⁵

3.2.4 Building Structure and External Spaces

3.2.4.1 Building 7602 Structure

The exterior of Building 7602 is in generally good condition. It is anticipated that the building's structure will maintain the facility's safety envelope with minimal S&M requirements for a minimum of five years.

3.2.4.2 Building 7602 Roof

The thirty year old section of the roof that had been leaking has been replaced. Other potential leaks have also been repaired.⁵⁶ The roof is now capable of preventing the incursion of rainwater into the facility and the migration of contamination out of the building. The fan house on the roof contains one process floor drain for spill containment.⁵⁷

3.2.5 Process, Utility, and Support Systems

3.2.5.1 Feed Station

The solids feed system is not needed to perform S&M or to facilitate decommissioning of the building. Consequently, this system has been deactivated. All bulk quantities of uranium oxide powder have been removed from the feed house. The system has been isolated to prevent the migration of contamination.⁵⁸ The interior of the feed house is highly contaminated with uranium oxide powder, and is designated a high contamination area and an airborne activity area.⁵⁹ The radiological conditions around the feed house are documented in ORP survey 7601-97-0031. A copy of this survey is provided in Appendix C.

3.2.5.2 Continuous Rotary Dissolver

The dissolver is unnecessary to perform routine S&M and would not facilitate decommissioning of the building. Consequently, this system has been deactivated. All bulk quantities of uranyl nitrate have been drained from the system, as indicated in Table 3.2. The system has been isolated to prevent the potential migration of contamination.⁶⁰ The entire dissolver pit has been designated as a contamination area.⁶¹ The radiological conditions in the dissolver pit are documented in ORP survey 7601-97-0042. A copy of this survey may be found in Appendix C.

3.2.5.3 Centrifugal Contactor Test

The 8.4 Centrifugal Contactor Test system is not required to perform routine S&M and will not facilitate decommissioning of the building. Consequently, this system has been deactivated. All bulk quantities of uranyl nitrate and organic solvent have been drained from the system, as indicated in Table 3.2. The system has been isolated to prevent the potential migration of contamination.⁶² The area surrounding the Centrifugal Contactor Test has been designated as a contamination area.⁶³ The radiological conditions around this system are documented in ORP survey 7601-97-0031. A copy of this survey is provided in Appendix C.

3.2.5.4 IPD Solvent Extraction Systems

The two centrifugal contactor solvent extraction systems in the IPD High Bay are not required to perform routine S&M and will not facilitate decommissioning of the building. Consequently, these systems have been deactivated. All bulk quantities of uranyl nitrate and organic solvent have been drained from these systems, as indicated in Table 3.2. These systems have been isolated to prevent the potential migration of contamination.⁶⁴ The centrifuge house in the IPD High Bay has been designated a radiation area, a high contamination area, and an airborne activity area.⁶⁵

3.2.5.5 Uranium Product Evaporation System

The uranium product evaporation system is not required to perform routine S&M and will not facilitate decommissioning of the building. Consequently, this system has been deactivated. All bulk quantities of uranyl nitrate and organic solvent have been drained from the system, as indicated in Table 3.2. The system has been isolated to prevent the potential migration of contamination.⁶⁶

3.2.5.6 Organic Treatment System

The organic treatment system is not required to perform routine S&M and will not facilitate decommissioning of the building. Consequently, this system has been deactivated. All bulk quantities of process fluids have been drained from the system, as indicated in Table 3.2. The system has been isolated to prevent the potential migration of contamination.⁶⁷ The IPD Basement, where most of the process equipment associated with this system resides, has been designated a high contamination area and an airborne activity area.⁶⁸

3.2.5.7 Dissolver Off-Gas System

The dissolver off-gas system is not required to perform routine S&M and will not facilitate decommissioning of the building. Consequently, this system has been deactivated. All bulk quantities

of process fluids have been removed from the system, as indicated in Table 3.2. The system has been isolated to prevent the potential migration of contamination.⁶⁹

3.2.5.8 NO_x Off-Gas System

The NO_x off-gas system is not required to perform routine S&M and will not facilitate decommissioning of the building. Consequently, this system has been deactivated. All bulk quantities of process fluids have been drained from the system, as indicated in Table 3.2. The system has been isolated to prevent the potential migration of contamination.⁷⁰

3.2.5.9 Liquid Waste Treatment System

The liquid waste treatment system is not required to perform routine S&M and will not facilitate decommissioning of the building. Consequently, this system has been deactivated. All bulk quantities of process fluids have been drained from the system, as indicated in Table 3.2. The system has been isolated to prevent the potential migration of contamination.⁷¹

3.2.5.10 Chemical Makeup System

The chemical makeup system is not required to perform routine S&M and will not facilitate decommissioning of the building. Consequently, this system has been deactivated. All bulk quantities of recycle water, nitric acid, and other process fluids have been drained from the system, as indicated in Table 3.2. The system has been isolated to prevent the potential migration of contamination.⁷²

3.2.5.11 Instrument Air

The instrument air system serving Building 7602 remains operational after deactivation because it is still required to provide air to other buildings within the Robotics and Process Systems Complex.⁷³ The portions of this system that served Building 7602 exclusively were isolated from the rest of the system by closing valves V7602AR84 and V7603AR59.⁷⁴

3.2.5.12 Cooling Water System

The cooling water system serving Building 7602 remains operational after deactivation because it is still required to provide cooling water to other buildings within the Robotics and Process Systems Complex.⁷⁵ The portions of this system that served Building 7602 exclusively were isolated from the rest of the system by closing valves V901705-1, V880154-1, V761902-13, V761902-14, V761902-1, V761902-2, V270103-1, V880142-1, V880175-1, V320906-1, V880177-1, V321105-1, V880179-1, V321902-1, V880188-1, V323603-1, V761902-26, V761902-28, V880152-1, V110803-1, V761902-19, and V761902-20. Some cooling water headers that pass through Building 7602 but provide water to other buildings remain active.⁷⁶

3.2.5.13 Chilled Water System

The chilled water system serving Building 7602 remains operational after deactivation because it is still required to provide chilled water to other buildings within the Robotics and Process Systems Complex.⁷⁷ The portions of this system that served Building 7602 exclusively were isolated from the rest of the system by closing valves V261201-2 and V941201-1.⁷⁸

3.2.5.14 Hot Water System

The hot water system serving Building 7602 remains operational after deactivation because it is still required to provide chilled water to other buildings within the Robotics and Process Systems Complex.⁷⁹ The portions of this system that served Building 7602 exclusively were isolated from the rest of the system by closing valves V870301-3 and V871601-1.⁸⁰

3.2.5.15 Electrical Systems

Electrical power to some systems, such as lights, will be needed to conduct S&M. Other systems not required to perform S&M activities have been isolated and de-energized by opening the electrical breakers to the circuits powering these systems. A list of the circuits associated with the facility, the circuit breaker panels they are on, and whether the breakers have been opened or not is presented in Table 3.3. The Motor Control Center (MCC)-A panel is located at the entrance to the Chemical Makeup Room. The MCC-A W Panel and the MCC-A I Panel are fed from MCC-A and are located in the Chemical Makeup Room on the wall opposite MCC-A. The RTS Panel resides on the north wall of the IPD High Bay. Panel X is situated on the north wall of the ROMD High Bay behind the Centrifugal Contactor Test area. The MCC-B Panel, MCC-B Panel B, MCC-B Power Panel 1, MCC-B Power Panel 2, MCC-7 Panel, and MCC-7 Panel 2 are located in the IPD Basement.⁸¹

3.2.5.16 Vessel Off-Gas System

The vessel off-gas system serving Building 7602 remains operational after deactivation because it is still required to treat off-gases from other buildings within the Robotics and Process Systems Complex.⁸² The portions of this system that served Building 7602 exclusively were isolated from the rest of the system by closing valves PCV-F29 and V071902-1.⁸³

3.2.5.17 Building Ventilation System

The building ventilation system in Building 7602 keeps the facility under a slight negative pressure to ensure that all air flow is into the building, and all air leaving the building goes through a HEPA filter to remove any airborne uranium contamination. After deactivation, the building still contains two airborne activity areas and several other areas with transferrable contamination that could potentially become airborne. To ensure that all of this contamination remains contained within the building, the building ventilation system remains operational.⁸⁴ During deactivation, the pressure gauge indicating the pressure differential across the HEPA filters was relocated from the IPD High Bay to a position outside the building. This relocation eliminated the need for S&M personnel to enter the RBA to read this gauge.⁸⁵

3.2.5.18 Fire Protection System

The fire protection system in Building 7602 has remained operational because of the radioactive contamination within the building that could be released in the event of a fire, and because the building is connected to Building 7603, which remains in use. The sprinkler system retains the same capacity (0.25-0.30 gallons/ft² minute) that it had before deactivation.⁸⁶

3.2.5.19 Heating System

The heating system for Building 7602 has remained operational to provide freeze protection for the building's sprinkler system and cooling water lines passing through the building.⁸⁷ In FY 1995, the faulty heater in the Chemical Makeup Room was repaired, and an additional heating unit was installed in that room to supplement it.⁸⁸

3.2.5.20 Safety Showers and Eye Wash Baths

To eliminate the expense of monthly inspections and preventive maintenance, the seven safety showers and eye washes in Building 7602 were removed from service by applying the proper administrative control tags.⁸⁹ The piping to the showers remains intact, and the safety showers and eye washes could be easily put back into service if needed to support facility decommissioning.

3.2.5.21 Radiation Monitoring Equipment

With the removal of the bulk quantities of radioactive materials and the reduction in activities being performed in the building, fewer health physics instruments are required to monitor the radiation and contamination levels within Building 7602. The instruments remaining in service after deactivation are noted in Table 3.1.

3.2.6 Radioactive Material, Contamination, and Waste

All bulk quantities of radioactive material have been removed from the facility. It is estimated that approximately 10 kg of depleted uranium contamination is distributed on surfaces and on the interiors of process equipment.⁹⁰ Depleted uranium is the only radioactive contaminant present in significant quantities.

3.2.7 Hazardous Material and Mixed Waste

All bulk quantities of hazardous process material have been removed from the facility.⁹¹ Remaining hazardous materials present in indeterminate quantities include lead based paint, asbestos piping insulation, and PCBs present in electrical transformers, lubricants, and wiring insulation.

Table 3.1 Building 7602 Stationary Health Physics Instrumentation⁹²

Instrument Type	Service Designation	Status
Continuous Air Monitor	CAM185	Removed From Building 7602
Laboratory Monitor - Alpha	LMA274	Removed From Service
Laboratory Monitor - Alpha	LMA228	Removed From Service
Laboratory Monitor - Alpha	LMA392	Removed From Service
Laboratory Monitor - Beta	LMB2011	Removed From Service
Laboratory Monitor - Beta	LMB2012	Removed From Service
Laboratory Monitor - Beta	LMB2013	Removed From Service
Personnel Contamination Monitor	PCM1055	Removed From Building 7602
Laboratory Monitor - Alpha	LMA220	Operational
Laboratory Monitor - Beta	LMB2010	Operational
Low Volume Sampler	LVS575	Operational

Table 3.2 Draining and Flushing Record of Building 7602 Process Tanks⁹³

Tank No.	Original Contents	Date Emptied	Date of First Flush	Flush Method	Visual Inspection	Remarks
07F02	Uranyl Nitrate	10-Nov-94	Not Flushed		Not Possible	
07F03	Uranyl Nitrate	10-Nov-94	Not Flushed		Not Possible	
07F04	Uranyl Nitrate	10-Nov-94	Not Flushed		Not Possible	
07F12	Nitric Acid	10-Nov-94	Not Flushed		Not Possible	
09F21	Uranyl Nitrate	18-Nov-94	18-Nov-94	Water	Not Possible	
09F23	Uranyl Nitrate	18-Nov-94	18-Nov-94	Water	Not Possible	
11F01	Uranyl Nitrate	20-Dec-94	20-Dec-94	Water	Not Possible	
11F03	Uranyl Nitrate	20-Dec-94	20-Dec-94	Water	20-Dec-94	
11F10	Uranyl Nitrate	20-Dec-94	20-Dec-94	Dilute HNO ₃	Not Possible	
12F05	Nitric Acid	20-Oct-94	Not Flushed		Not Possible	
12F07	Nitric Acid	20-Oct-94	Not Flushed		Not Possible	
14F03	Uranyl Nitrate	1-Nov-94	Not Flushed		Not Possible	
14F36	Organic	1-Nov-94	1-Nov-94	Water	1-Nov-94	
14F40	Uranyl Nitrate	1-Nov-94	1-Nov-94	Water	1-Nov-94	
14J13	Uranyl Nitrate	1-Nov-94	1-Nov-94	Water	Not Possible	
19C04	Uranyl Nitrate	18-Nov-94	Not Flushed		Not Possible	
19F01	Uranyl Nitrate	18-Nov-94	Not Flushed		Not Possible	
19F05	Uranyl Nitrate	18-Nov-94	Not Flushed		Not Possible	
19F07	Uranyl Nitrate	18-Nov-94	Not Flushed		Not Possible	
19F12	Nitric Acid	10-Nov-94	Not Flushed		Not Possible	Drained to 32F01
20F17	Organic/Uranium	29-Dec-94	Not Flushed		Not Possible	
20F22	Organic/Uranium	29-Dec-94	29-Dec-94	Clean Organic	Not Possible	
20G02	Organic/HNO ₃ /U	27-Oct-94	Not Flushed		Not Possible	
20G06	Organic/HNO ₃ /U	27-Oct-94	Not Flushed		Not Possible	

Table 3.2 Draining and Flushing Record of Building 7602 Process Tanks (continued)

Tank No.	Original Contents	Date Emptied	Date of First Flush	Flush Method	Visual Inspection	Remarks
20G08	Organic/HNO ₃ /U	27-Oct-94	Not Flushed		Not Possible	
20G12	Organic/HNO ₃ /U	27-Oct-94	Not Flushed		Not Possible	
20G14	Organic/HNO ₃ /U	27-Oct-94	Not Flushed		Not Possible	
20G28	Organic/HNO ₃ /U	27-Oct-94	Not Flushed		Not Possible	
20L01	Organic/HNO ₃ /U	27-Oct-94	Not Flushed		Not Possible	
20L07	Organic/HNO ₃ /U	27-Oct-94	Not Flushed		Not Possible	
20L13	Organic/HNO ₃ /U	27-Oct-94	Not Flushed		Not Possible	
20L20	Organic/HNO ₃ /U	27-Oct-94	Not Flushed		Not Possible	
26E01	Nitric Acid	10-Nov-94	Not Flushed		Not Possible	
26F02	Nitric Acid	10-Nov-94	Not Flushed		Not Possible	
26F06	Nitric Acid	15-Nov-94	Not Flushed		Not Possible	
27E03	Uranyl Nitrate	27-Oct-94	Not Flushed		Not Possible	
27G09	Uranyl Nitrate	27-Oct-94	Not Flushed		Not Possible	
32C06	Uranyl Nitrate	27-Oct-94	27-Oct-94	Water	Not Possible	Flush Water from 32F01 for rinse
32E15	Nitric Acid	6-Jan-95	Not Flushed		Not Possible	
32F01	Uranyl Nitrate	20-Dec-94	20-Dec-94	Water	Dec-94	
32F09	Uranyl Nitrate	20-Nov-94	Not Flushed		Not Possible	
32F11	Uranyl Nitrate	20-Nov-94	Not Flushed		Not Possible	
32F17	Nitric Acid	6-Jan-95	Not Flushed		Not Possible	Solution pumped to 90F29
32F20	Recycle Water	20-Dec-94	Not Flushed		Not Possible	
32F24	Organic/Uranium	22-Nov-94	Not Flushed		Not Possible	
32F31	Uranyl Nitrate	Not Empty	Not Flushed		Not Possible	
32F33	Uranyl Nitrate	Not Empty	Not Flushed		Not Possible	
32F40	Uranyl Nitrate	26-Oct-94	27-Oct-94	Water	27-Oct-94	
32F42	Uranyl Nitrate	26-Oct-94	27-Oct-94	Water	27-Oct.-94	

Table 3.2 Draining and Flushing Record of Building 7602 Process Tanks (continued)

Tank No.	Original Contents	Date Emptied	Date of First Flush	Flush Method	Visual Inspection	Remarks
90F01	Nitric Acid	1-Nov-94	Not Flushed		Not Possible	
90F05	Nitric Acid	1-Nov-94	Not Flushed		Not Possible	
90F09	Nitric Acid	1-Nov-94	Not Flushed		Not Possible	
90F17	Recycle Water	1-Nov-94	1-Nov-94	Water	Not Possible	2 Flush 1-Nov-94
90F25	Recycle Water	2-Dec-94	Not Flushed		Not Possible	
90F29	Recycle HNO ₃	31-May-95	31-May-95	Water	Not Possible	2 Flush 31-May-95
90F45	Recycle Water	1-Nov-94	Not Flushed		Not Possible	
90F49	Recycle Water	1-Nov-94	Not Flushed		Not Possible	
90F60	Recycle Water	6-Jan-95	Not Flushed		Not Possible	
92F01	Recycle Water	1-Nov-94	Not Flushed		Not Possible	
92F04	Recycle Water	1-Nov-94	Not Flushed		Not Possible	
92F06	Recycle Water	1-Nov-94	Not Flushed		Not Possible	
93F01	Recycle Water	1-Nov-94	Not Flushed		Not Possible	
Pulse Column	Organic/Uranium	11-Jan-95	Not Flushed		Not Possible	
M-2	Nitric Acid	26-May-95	26-May-95	Water	Not Possible	2 Flush 26-May-95

Table 3.3 Status of Building 7602 Circuit Breakers⁹⁴

Circuit	Panel	Open/Closed
Lighting Panel W. Transmitter	MCC-A	Closed
Cooling Tower Fan #1	MCC-A	Closed
Chemical make-up exhaust fan #102	MCC-A	Closed
Spare	MCC-A	Closed
Cooling Tower Pump #2	MCC-A	Closed
Gad. Acid mix tank agitator 90L02	MCC-A	Open
Dilute acid feed pump 90J12	MCC-A	Open
Gad. Acid mix transfer pump 90J03	MCC-A	Open
Sugar Feed pump 90J50	MCC-A	Open
Process Water Pump 90J18	MCC-A	Open
Des. Solvent feed pump 92J08	MCC-A	Open
Recycle Water pump 90J19	MCC-A	Open
Feed for 120V pumps	MCC-A	Closed
Hydrazine make-up tank agitator 90L26	MCC-A	Open
Hydrazine make-up tank pump 90J27	MCC-A	Open
Synthetic fission product trans. pump	MCC-A	Open
2 - Chemical Makeup Receptacles	MCC-A Panel W	Closed
4 - Chemical Makeup room receptacles	MCC-A Panel W	Closed
6 - Cooling Tower Lights	MCC-A Panel W	Closed
8 - Cooling Tower Receptacle	MCC-A Panel W	Closed
10 - HV-101	MCC-A Panel W	Closed
12 Drive unit disconnect to contactor test stand	MCC-A Panel W	Closed

Table 3.3 Status of Building 7602 Circuit Breakers (continued).

Circuit	Panel	Open/Closed
14 Drive unit disconnect to contactor test stand	MCC-A Panel W	Open
16 - Cooling Tower Trace Heater	MCC-A Panel W	Open
18 - 92L07 Agitator	MCC-A Panel W	Open
20 - 90L10 Agitator	MCC-A Panel W	Open
22 - 90L01 Agitator	MCC-A Panel W	Open
24 - Lab Hood	MCC-A Panel W	Closed
26 - Vacuum Pump Iodox	MCC-A Panel W	Open
28 - Pump 28J15 Iodox	MCC-A Panel W	Open
2 - Oxide production panel	MCC-A Panel I	Open
4 - QB-1 basement 32, 20 systems	MCC-A Panel I	Open
6 - QB-3 basement systems 20, 32, 12	MCC-A Panel I	Open
8 - Organic Treatment Panel	MCC-A Panel I	Open
10 -QG-9 Iodox	MCC-A Panel I	Open
12 - Solvent extraction instrument transformer	MCC-A Panel I	Closed
14 - Solvent extraction instrument panel power	MCC-A Panel I	Closed
16 QG-26,27 signal transformer (solv. extract.)	MCC-A Panel I	Open
18 - Contactor test stand instrument cabinet	MCC-A Panel I	Closed
1 - Spare	RTS Panel	Open
3 - Back flush pump	RTS Panel	Open
5 - Spare	RTS Panel	Open
7 Instrument cabinet power strip #2 13K11B	RTS Panel	Open
9 - Spare	RTS Panel	Open
11 - Spare	RTS Panel	Open

Table 3.3 Status of Building 7602 Circuit Breakers (continued).

Circuit	Panel	Open/Closed
13 - Spare	RTS Panel	Open
15-27 Spares	RTS Panel	Open
1 - Chemical Makeup Room lights	MCC-A Panel X	Closed
3 - IPD overhead lights	MCC-A Panel X	Closed
5 - IPDF overhead lights	MCC-A Panel X	Closed
7 - Diesel generator fuel pump	MCC-A Panel X	Closed
9 - Spare	MCC-A Panel X	Closed
11 - Spare	MCC-A Panel X	Open
13 - Box OSSA IPD control room	MCC-A Panel X	Closed
UP pump 19J08	MCC-B	Open
Solvent washer agitator 20L07	MCC-B	Open
Organic Inventory pump 20J23	MCC-B	Open
Feed gas compressor 27J02	MCC-B	Open
DOG vacuum pump 28J08	MCC-B	Open
Recycle Acid pump 32J18	MCC-B	Open
Waste organic pump 32J25	MCC-B	Open
Water heater supply pump 87J03	MCC-B	Open
Power panel "B" feeder	MCC-B	Closed
2 - Pump 20J03	MCC-B Panel B	Open
4 - Pump 20J15	MCC-B Panel B	Open
6 - AC in ROMD	MCC-B Panel B	Closed
8 - Acid feed pump 29J12	MCC-B Panel B	Open
10 - Salt regen. 29J04	MCC-B Panel B	Open
12 - 120 V light and receptacle Iodox	MCC-B Panel B	Closed

Table 3.3 Status of Building 7602 Circuit Breakers (continued).

Circuit	Panel	Open/Closed
14 - Iodox lights and receptacle	MCC-B Panel B	Closed
1 - Sampler control station ROMD control room	MCC-B Panel 1	Open
3 - Spare	MCC-B Panel 1	Closed
5 - Spare	MCC-B Panel 1	Open
7 - Spare	MCC-B Panel 1	Closed
9 - Spare	MCC-B Panel 1	Closed
11 - Spare	MCC-B Panel 1	Closed
13 - Receptacles mezzanine	MCC-B Panel 1	Closed
15 - Receptacles Y axis	MCC-B Panel 1	Open
17 - Receptacles on dissolver stand	MCC-B Panel 1	Closed
19 - Duel pin shear hydraulic pump	MCC-B Panel 1	Open
21 - Duel pin shear controller	MCC-B Panel 1	Open
23 - Spare	MCC-B Panel 1	Closed
25 - Spare	MCC-B Panel 1	Open
27 - Spare	MCC-B Panel 1	Open
29-31 Spares	MCC-B Panel 1	Open
2 - QD 48 conductivity instrument	MCC-B Panel 2	Open
4 - QD-49	MCC-B Panel 2	Open
AA2 ROMD lights	MCC-7	Closed
B1 Acid tank pump M-2	MCC-7	Closed
E1 Main fed from N22 U6C	MCC-7	Closed
A2 IPD H&V unit #2 NAK- 10	MCC-7	Closed
B 2/1 Welding receptacles	MCC-7	Closed
D2 Chiller pump 26J11	MCC-7	Open
AA-3 Power panel CP-1	MC?C-7	Closed

Table 3.3 Status of Building 7602 Circuit Breakers (continued).

Circuit	Panel	Open/Closed
B 2/2 Welding Receptacles	MCC-7	Closed
B 3/2 Dist. Panel hot waste storage	MCC-7	Closed
D3 IPD first floor variable freq. Driver	MCC-7	Open
F3 Aux. Control for NJ-36 1,2,3	MCC-7	Closed
A4 ROMD H&V Unit NAK-6	MCC-7	Closed
C4 Spare	MCC-7	Closed
F4 Bldg heat hot water pump NJ-36-2	MCC-7	Closed
A5 IPD exhaust fan NAI-26	MCC-7	Closed
C5 Building heat blower	MCC-7	Closed
E5 Tank 32F42 pump 32J43	MCC-7	Open
1 - Up-ender	MCC-7 Panel 2	Open
3 - Waste ejector	MCC-7 Panel 2	Open
5 - Transfer cable	MCC-7 Panel 2	Open
7 - Pusher rotator INL MOD	MCC-7 Panel 2	Open
9 - 5 cm test stand mezzanine	MCC-7 Panel 2	Closed
11-14 Blank	MCC-7 Panel 2	Open
16 - Scramble lock system "keypad"	MCC-7 Panel 2	Closed
Cooling Tower Immersion Heaters	MCC-A	Closed
Cooling Tower Fan #2	MCC-A	Closed
RTS power and 12 cm test stand	MCC-A	Closed
Cooling Tower Pump #1	MCC-A	Closed
Cooling Tower Pump #3	MCC-A	Closed
Recycle Acid Pump 90J30	MCC-A	Open

Table 3.3 Status of Building 7602 Circuit Breakers (continued).

Circuit	Panel	Open/Closed
Chemical addition tank pump 11J11	MCC-A	Open
Recycle Acid Pump 90J31	MCC-A	Open
Gad. Acid tank pump 90J06	MCC-A	Open
Solvent feed pump 90J62	MCC-A	Open
Dilute acid feed pump 07J13	MCC-A	Open
Synthetic fission product feed 92J05	MCC-A	Open
Sugar Transfer Pump 90J47	MCC-A	Open
Mag. Nitrate feed pump 93J03	MCC-A	Open
Panel I 240/120 disconnect	MCC-A	Closed
1 - Chemical Makeup Lights	MCC-A Panel W	Closed
3 - Exhaust Fan E.F. 103	MCC-A Panel W	Closed
5 - Exhaust Fan E.F. 104	MCC-A Panel W	Closed
7 - Cooling Tower Water Treatment Cabinet	MCC-A Panel W	Closed
9 - Chemical Makeup Light	MCC-A Panel W	Closed
11 - Eye Wash Light	MCC-A Panel W	Closed
13 - Spare Circuit	MCC-A Panel W	Closed
15 - Spare Circuit	MCC-A Panel W	Open
17 - 90L61 Agitator	MCC-A Panel W	Open
19 - 93L02 Agitator	MCC-A Panel W	Open
21 - 90L36 Agitator	MCC-A Panel W	Open
23 - 92L02 Agitator	MCC-A Panel W	Open
25 - Vacuum Pumps 35R01 and 35R02	MCC-A Panel W	Open
27 - Lights at 35R01 and 2	MCC-A Panel W	Open
1 - QC_15 Chem makeup	MCC-A Panel I	Open
3 - QC-17 Chem makeup	MCC-A Panel I	Open

Table 3.3 Status of Building 7602 Circuit Breakers (continued).

Circuit	Panel	Open/Closed
5 - Hydrazine makeup panel	MCC-A Panel I	Open
7 - QB-13 system 32	MCC-A Panel I	Open
9 - QB-11 system 32	MCC-A Panel I	Open
11 - QG-5 system 9, 11	MCC-A Panel I	Open
13 - QG-7 system 19, 27	MCC-A Panel I	Open
15 - QG-19 spare	MCC-A Panel I	Open
17 - Receptacle 12 cm contactor test stand	MCC-A Panel I	Open
19 - Contactor test stand instrument cabinet	MCC-A Panel I	Open
2 - Spare	RTS Panel	Open
4 - Spare	RTS Panel	Open
6 Instrument cabinet power strip #2 13K11A	RTS Panel	Open
8 Instrument cabinet power strip #1 13K11A	RTS Panel	Open
10 - Receptacle behind test stand	RTS Panel	Open
12 - Receptacle for 13L05 and photohelic centrifugal contactor driver system	RTS Panel	Open
14 - Filter test system receptacle north wall outside Building 7602	RTS Panel	Open
28 - 3 Phase power for centrifugal contactor system driver	RTS Panel	Open
2 - Plug AR cabinet	MCC-A Panel X	Closed
4 - ROMD lights	MCC-A Panel X	Closed
6 - ROMD lights	MCC-A Panel X	Closed
8 - High Bay emergency lights	MCC-A Panel X	Closed
10 - High bay emergency lights	MCC-A Panel X	Closed

Table 3.3 Status of Building 7602 Circuit Breakers (continued).

Circuit	Panel	Open/Closed
12 - ROMD emergency lights	MCC-A Panel X	Closed
14-16 Spares	MCC-A Panel X	Open
Solvent washer agitator 20L01	MCC-B	Open
Solvent washer agitator 20L13	MCC-B	Open
Decanter pump 20J29	MCC-B	Open
Scrub solution pump 27J04	MCC-B	Open
Spares (7)	MCC-B	Open
Recycle water pump 32J21	MCC-B	Open
Floor drain sump tank pump 32J34	MCC-B	Open
Water heater 87C16	MCC-B	Open
1 - Furnace crystallizer 28C05	MCC-B Panel B	Open
3 - Pump 20J09	MCC-B Panel B	Open
5 - Pump 20J18	MCC-B Panel B	Open
7 - Acid feed pump 29J08	MCC-B Panel B	Closed
9 - ROMD lights	MCC-B Panel B	Closed
11 - ROMD light	MCC-B Panel B	Closed
13 - ROMD light	MCC-B Panel B	Closed
15 - ROMD room light	MCC-B Panel B	Closed
2 - RSS fuel feed door 1253L cable 5116	MCC-B Panel 1	Open
4 - Fuel ejector 1277L cable 5115	MCC-B Panel 1	Open
6 - Lights and receptacle on E wall dissolver pit	MCC-B Panel 1	Closed
8 - Receptacle on south wall dissolver pit	MCC-B Panel 1	Closed
10 - Test stand receptacle ROMD High Bay	MCC-B Panel 1	Open

Table 3.3 Status of Building 7602 Circuit Breakers (continued).

Circuit	Panel	Open/Closed
12 - Monitor station at shear	MCC-B Panel 1	Open
14 - Spare	MCC-B Panel 1	Open
16 - Spare	MCC-B Panel 1	Closed
18 - Spare	MCC-B Panel 1	Closed
20 - ROMD cameras	MCC-B Panel 1	Closed
22 - ROMD control panel rear	MCC-B Panel 1	Closed
24 - ROMD controller panels console front	MCC-B Panel 1	Open
26 - ROMD cameras	MCC-B Panel 1	Closed
28 - Receptacles at south end of laser	MCC-B Panel 1	Closed
1 - Receptacle Indexer	MCC-B Panel 2	Open
3 - Dissolver motor driver transformer	MCC-B Panel 2	Open
AA1 Power panel PP1	MCC-7	Closed
A1 IPD H&V unit #1 NAK-9	MCC-7	Closed
C1 Tank F-15 pump JN-25-1	MCC-7	Closed
F1 Tank 32F40 pump 32J41	MCC-7	Open
D1 Tank F-14 pump NJ-22-1	MCC-7	Closed
C2 Chiller	MCC-7	Closed
F2 Bldg. Heat hot water pump #12	MCC-7	Closed
A3 IPD H&V unit #3 NAK-11	MCC-7	Closed
B 3/1 Spare	MCC-7	Closed
C3 Pit blower F-14	MCC-7	Closed
E3 Spare	MCC-7	Closed
AA4 Hot water heater in boiler room	MCC-7	Closed
B4 Spindle motor IPD	MCC-7	Closed

Table 3.3 Status of Building 7602 Circuit Breakers (continued).

Circuit	Panel	Open/Closed
D4 IPD and ROMD roll up doors	MCC-7	Closed
AA5 - Power panel 2	MCC-7	Closed
B5 IPD Crane	MCC-7	Closed
D5 Decontamination Pump	MCC-7	Closed
F5 Bldg heat hot water pump NJ-36-3	MCC-7	Open
2 - Feedhouse enclosure door	MCC-7 Panel 2	Open
4 - Rotator carriage	MCC-7 Panel 2	Open
6 - Z axis Y axis	MCC-7 Panel 2	Open
8 - FAG's 1,2	MCC-7 Panel 2	Open
10 - 5 cm test stand mezzanine	MCC-7 Panel 2	Closed
15-5 cm test stand mezzanine	MCC-7 Panel 2	Closed

4. BUILDING 7602 DEACTIVATION ACTIVITIES

The following section addresses the major activities performed during the deactivation of Building 7602. The objectives of the deactivation process were to place the facility in a passively safe and environmentally stable configuration which can be efficiently and cost effectively maintained for an indefinite period of time. The major deactivation issues are listed below.

4.1 INTERNAL SPACES - ACCESS REQUIRED

4.1.1 ROMD High Bay

The feed station, 8.4 Centrifugal Contactor Test, and all other process systems in the ROMD High Bay have been deactivated and abandoned in place. All process materials have been removed from the systems. Valves have been closed to place the systems in a safe condition and to prevent the potential spread of contamination.⁹⁵

4.1.2 IPD High Bay

The IPD solvent extraction systems, the accountability and feed adjustment system, the NO_x off-gas system, the liquid waste treatment system, and all other process systems within the IPD High Bay have been deactivated and abandoned in place. All process materials have been removed from the systems. Valves have been closed to place the systems in a safe condition and to prevent the potential spread of contamination.⁹⁶ The portions of the instrument air, cooling water, chilled water, hot water, and vessel off-gas systems that served the IPD High Bay have been isolated.⁹⁷ Unnecessary equipment and instrumentation have been de-energized by opening the circuit breakers indicated in Table 3.3.⁹⁸ To minimize the number of times that S&M personnel must enter the RBA, the pressure gauge measuring the pressure drop across the facility HEPA filters has been relocated from the IPD High Bay to a location outside the building.⁹⁹

4.1.3 Chemical Makeup Room

The chemical makeup system and all other process systems within the Chemical Makeup Room have been deactivated and abandoned in place. All process materials have been removed from the systems. Valves have been closed to place the systems in a safe condition and to prevent the potential spread of contamination.¹⁰⁰ The portions of the instrument air, cooling water, chilled water, hot water, and vessel off-gas systems that served the Chemical Makeup Room have been isolated.¹⁰¹ Unnecessary equipment and instrumentation have been de-energized by opening the circuit breakers indicated in Table 3.3.¹⁰² A new heater was installed in the Chemical Makeup Room and the old heater repaired to ensure freeze protection for the sprinkler system and active cooling water headers.¹⁰³

4.1.4 Mezzanine Level

The organic treatment system and all other process systems located in the IPD Basement and IPD Transmitter Room have been deactivated and abandoned in place. All process materials have been removed from the systems. Valves have been closed to place the systems in a safe condition and to prevent the potential spread of contamination.¹⁰⁴ The portions of the instrument air, cooling water, chilled water, hot water, and vessel off-gas systems that served the IPD Basement and the IPD

Transmitter Room have been isolated.¹⁰⁵ Unnecessary equipment and instrumentation have been de-energized by opening the circuit breakers indicated in Table 3.3.¹⁰⁶

4.2 INTERNAL SPACES - NO ACCESS REQUIRED

4.2.1 Dissolver Pit

The continuous centrifugal dissolver and all other process systems located in the dissolver pit have been deactivated and abandoned in place. All process materials have been removed from the systems. Valves have been closed to place the systems in a safe condition and to prevent the potential spread of contamination.¹⁰⁷ The portions of the instrument air, cooling water, chilled water, hot water, and vessel off-gas systems that served the dissolver pit have been isolated.¹⁰⁸ Unnecessary equipment and instrumentation have been de-energized by opening the circuit breakers indicated in Table 3.3.¹⁰⁹

4.2.2 Solvent Extraction Pit

The IPD solvent extraction systems and all other process systems located in the solvent extraction pit have been deactivated and abandoned in place. All process materials have been removed from the systems. Valves have been closed to place the systems in a safe condition and to prevent the potential spread of contamination.¹¹⁰ The portions of the instrument air, cooling water, chilled water, hot water, and vessel off-gas systems that served the solvent extraction pit have been isolated.¹¹¹ Unnecessary equipment and instrumentation have been de-energized by opening the circuit breakers indicated in Table 3.3.¹¹²

4.3 EXTERNAL SPACES

4.3.1 Building 7602 Structure

The exterior of Building 7602 was in satisfactory condition prior to deactivation. No deactivation activities were necessary to stabilize and preserve the building structure.

4.3.2 Building 7602 Roof

When programmatic operations in Building 7602 ceased, a portion of the roof was approximately 30 years old. This section of the roof developed leaks which allowed rainwater to enter the IPD High Bay. Significant leaks occurred during heavy rains in December 1994 and June 1995. These leaks had the potential to cause the migration of contamination into "smear clean" walk aisles. The 30 year-old section of the roof was replaced, and other potential leaks were repaired during September 1995.¹¹³

4.3.3 Building 7602 Exterior Locks

To prevent unauthorized entry, Building 7602 is kept locked. However, prior to deactivation, numerous copies of the keys to the building existed, making it difficult to control access to the building. To reassert control, eleven lock cores were changed in September 1996. The changed locks were on the two west interior entrances to the ROMD High Bay, the double doors to the ROMD High Bay from the ROMD Control Room, the south entrance to the ROMD High Bay from the AIMS High Bay, the door to the ROMD High Bay from Lab 7 in Building 7603, the east cargo entrance to the

ROMD High Bay, the east exterior entrance to the ROMD High Bay, the east cargo entrance to the IPD High Bay, the east exterior entrance to the Chemical Makeup Room, the east cargo entrance to the Chemical Makeup Room, and the door between the IPD Transmitter Room and the Control/Buffer Room in Building 7603. Only four copies of the key to the new locks were made. These keys were given to the facility manager, the facility surveillance operator, the Office of Radiation Protection (ORP) technician assigned to the facility, and the HRFDP S&M Manager.¹¹⁴ The doors at the bottom of the dissolver pit leading to the Control/Buffer Room of Building 7603 have been sealed.¹¹⁵

4.4 OPERATIONAL SYSTEMS

4.4.1 Building Ventilation System

The building ventilation system remains operational to ensure the containment of radioactive contamination within the building.¹¹⁶ The only deactivation activity performed on the ventilation system was the relocation of the gauge measuring the pressure drop across the HEPA filters. This gauge had been inside the IPD High Bay, where personnel had to enter the RBA daily in order to read it. It was relocated outside of the building where it could be read without requiring personnel to enter any radiological area.¹¹⁷

4.4.2 Building Steam Heating System

The Building 7602 steam heating system shares a boiler with Buildings 7601 and 7603. Since the boiler must continue to operate to support these two facilities, little savings would be realized by shutting off the steam heat to Building 7602. Since heat is desirable to provide freeze protection for the sprinkler system piping and the cooling water headers that pass through the building, the heating system has remained operational.¹¹⁸

Before deactivation, the heating unit serving the Chemical Makeup Room was old, inadequate, and unreliable. In FY 1995, corrective maintenance was performed on the heater, and a second heating unit was added to supplement the original unit.¹¹⁹

4.4.3 Fire Protection System

Since Building 7602 is connected to the operational Building 7603, and since Building 7602 contains radioactive contamination that could be released into the environment during a major fire, the fire protection system of Building 7602 has remained operational. No deactivation activities have been performed on this system.¹²⁰

4.4.4 Electrical Power

All electrical services that were not essential to the basic surveillance and maintenance operations were de-energized by opening electrical breakers. A list specifying which breakers were opened and which were left closed is provided in Table 3.3.

4.4.5 Cooling Water Headers Passing Through the Building

Although the portions of the Robotics and Process Systems Complex cooling water system that serve Building 7602 have been isolated and deactivated, some cooling water headers serving other

buildings pass through Building 7602. These lines remain operational and no deactivation activities have been performed on them.¹²¹

4.4.6 Radiation Monitoring Equipment

The reduction in the inventories of radioactive materials in Building 7602 has reduced the need for radiation and contamination monitoring. By agreement with the ORNL Health Physics Instrument Committee, the number of stationery health physics instruments in Building 7602 has been reduced.¹²² These reductions are noted in Table 3.1.

4.5 MOTHBALLED SYSTEMS

4.5.1 Safety Shower and Eye Wash Stations

The safety showers and eye wash stations in Building 7602 were administratively tagged out of service in December 1996. Regular preventive maintenance on them has been discontinued.¹²³ However, the piping serving the showers and eye washes remains connected, and the showers and eye washes could be quickly returned to service if they were required to support decommissioning activities.

4.6 SYSTEMS ABANDONED IN PLACE

4.6.1 Feed Station

The feed station has been deactivated and abandoned in place. All bulk quantities of uranium oxide powder were removed from the feed house. The system has been isolated to prevent the migration of contamination.¹²⁴

4.6.2 Dissolution System

The continuous rotary dissolver has been deactivated and abandoned in place. All bulk quantities of uranyl nitrate were drained from the system. The system was isolated to prevent the potential migration of contamination.¹²⁵

4.6.3 Accountability and Feed Adjustment

The accountability and feed adjustment system has been deactivated and abandoned in place. All bulk quantities of uranyl nitrate and organic solvent were drained from the system. The system was isolated to prevent the potential migration of contamination.¹²⁶

4.6.4 Centrifugal Contactor Test System

The 8.4 Centrifugal Contactor System has been deactivated and abandoned in place. All bulk quantities of uranyl nitrate and organic solvent were drained from the system. The system was isolated to prevent the potential migration of contamination.¹²⁷

4.6.5 IPD Solvent Extraction Systems

Both solvent extraction systems in the IPD High Bay have been deactivated and abandoned in place. All bulk quantities of uranyl nitrate and organic solvent were drained from these systems. These systems were isolated to prevent the potential migration of contamination.¹²⁸

4.6.6 Uranium Product Evaporation System

The uranium product evaporation system has been deactivated and abandoned in place. All bulk quantities of uranyl nitrate and organic solvent have been drained from the system. The system was isolated to prevent the potential migration of contamination.¹²⁹

4.6.7 Organic Treatment System

The organic treatment system has been deactivated and abandoned in place. All bulk quantities of process fluids were drained from the system. The system was isolated to prevent the potential migration of contamination.¹³⁰

4.6.8 Dissolver Off-Gas Treatment System

The dissolver off-gas system has been deactivated and abandoned in place. All bulk quantities of process fluids were removed from the system. The system was isolated to prevent the potential migration of contamination.¹³¹

4.6.9 NO_x Off-Gas System

The NO_x off-gas system has been deactivated and abandoned in place. All bulk quantities of process fluids have been drained from the system. The system was isolated to prevent the potential migration of contamination.¹³²

4.6.10 Liquid Waste Treatment System

The liquid waste treatment system has been deactivated and abandoned in place. All bulk quantities of process fluids were drained from the system. The system was isolated to prevent the potential migration of contamination.¹³³

4.6.11 Chemical Makeup System

The chemical makeup system has been deactivated and abandoned in place. All bulk quantities of recycle water, nitric acid, and other process fluids were drained from the system. The system was isolated to prevent the potential migration of contamination.¹³⁴

4.6.12 Instrument Air System

The portion of the Robotics and Process Systems Complex instrument air system that served Building 7602 has been isolated and abandoned in place.¹³⁵ This portion was isolated by closing valves V7602AR84 and V7603AR59.¹³⁶

4.6.13 Cooling Water System

The portion of the Robotics and Process Systems Complex cooling water system that served Building 7602 has been isolated and abandoned in place.¹³⁷ This portion was isolated by closing valves V901705-1, V880154-1, V761902-13, V761902-14, V761902-1, V761902-2, V270103-1, V880142-1, V880175-1, V320906-1, V880177-1, V321105-1, V880179-1, V321902-1, V880188-1, V323603-1, V761902-26, V761902-28, V880152-1, V110803-1, V761902-19, and V761902-20. Some cooling water headers that pass through Building 7602 but provide water to other buildings remain active.¹³⁸

4.6.14 Chilled Water System

The portion of the Robotics and Process Systems Complex chilled water system that served Building 7602 has been isolated and abandoned in place.¹³⁹ This portion was isolated by closing valves V261201-2 and V941201-1.¹⁴⁰ The Freon and oil from the chilled water compressor were drained in December 1996. Analysis of the oil and Freon found them to be nonradiological. The Freon was recycled in another HVAC system, while the oil was combined with other used oil from the 7600 area.¹⁴¹

4.6.15 Hot Water System

The portion of the Robotics and Process Systems Complex hot water system that served Building 7602 has been isolated and abandoned in place.¹⁴² This portion was isolated by closing valves V870301-3 and V871601-1.¹⁴³

4.6.16 Vessel Off-Gas System

The portion of the Robotics and Process Systems Complex vessel off-gas system that served Building 7602 has been isolated and abandoned in place.¹⁴⁴ This portion was isolated by closing valves PCV-F29 and V071902-1.¹⁴⁵

5. TRANSITION ACTIVITIES

Building 7602 will be officially transferred from the DOE EM-60 Program to the EM-40 Program by an MOA. The facility will be accepted "as is" by EM-40 at the time of transfer.

5.1 MEMORANDUM OF AGREEMENT

The MOA documents the requirements agreed upon between EM-60 and EM-40. The signed MOA indicates acceptance by EM-40 that the criteria outlined in the MOA have been completed satisfactorily, with the potential exception of post-transition punchlist items that have been agreed upon by both EM-60 and EM-40, and that the level of deactivation of the facility is acceptable for transition to the EM-40 Program.

Post-transition punchlist items will be finished after deactivation is complete using EM-60 funding. The details of how the punchlist items will be completed and documented are addressed in the MOA.

5.2 REQUIREMENTS AND COMMITMENTS

5.2.1 Regulatory Requirements

Regulatory requirements for managing Building 7602 in its deactivated state include all federal, state, and local laws, the requirements identified in the LMES Standards/Requirements Identification Document (S/RID), and the DOE orders and directives identified in the EMEF Work Smart Standards and Appendix E of the LMES Contract.

5.2.2 Stakeholder Commitments

No stakeholder commitments have been identified pertaining to Building 7602.

5.3 POST-TRANSITION DEACTIVATION ACTIVITIES

Currently, no post-transition punchlist items have been identified for Building 7602. All deactivation activities have been completed prior to transfer to EM-40.

5.4 POTENTIAL RE-USE OF BUILDING 7602

Building 7602 is in sound physical condition and it does not possess inordinately high contamination levels. These attributes make the facility a promising candidate for reuse, either by another DOE program or by private industry. Numerous tours were given in 1997 for various groups who had expressed an interest in reusing the facility. Since reuse of the facility would eliminate S&M and decommissioning costs associated with the facility, it is recommended that such possibilities continue to be pursued after transition into the EM-40 Program.

6. POST-DEACTIVATION S&M

The post-deactivation S&M plan for Building 7602 covers S&M activities associated with the interior spaces, operational and mothballed systems, and external areas related to Building 7602. The objectives of the S&M Program for Building 7602 include:

- Ensure adequate containment of radioactive contamination.
- Provide physical safety and security control for the facility.
- Maintain the facility in a manner that will minimize potential hazards to workers and the public.
- Provide a mechanism for the identification and compliance with applicable environmental, safety, and health requirements.

The post-deactivation S&M plan for Building 7602 details the specific S&M items to be performed and estimates the annual cost of performance. The S&M cost estimates are based on previous operational costs associated with similar S&M activities at ORNL.

The S&M activities associated with Building 7602 include the following types of activities:

- Walkdowns and inspections for structural integrity, safety, radioactive contamination, and hazardous material conditions;
- General housekeeping of the interior and exterior of the building as needed; and
- Maintenance activities required to maintain the security and safety envelope of the facility.

7. ABNORMAL ACTIVITIES/CONDITIONS

No abnormal activities or conditions have been identified for Building 7602.

8. TURNOVER PACKAGE DOCUMENTATION

8.1 ADMINISTRATIVE TURNOVER PACKAGE

Administrative turnover consists of a collection of administrative documents. This collection includes procedures, agreements, permits, and other documents not directly related to the physical facility. The level of detail depends on the conditions, requirements, and agreements specific to the facility. The following sections detail the contents of the applicable sections required for Building 7602.

8.1.1 Final Deactivation Project Report

This report provides a management summary of the facility deactivation completion, general status and conditions, demonstrating conformance with DOE's specification of the overall end point. It identifies management actions needed that are not routine. Unresolved issues are also described.

8.1.2 Deactivation Locks Log and Keys

This includes a formal "Deactivation Lock System" for facility access, isolation of electrical components, chaining of valves, and other situations where physical access is to be controlled. The primary purpose of this system is to ensure control as the work force "backs out" of the facility as specified end points are achieved.

8.2 TECHNICAL TURNOVER PACKAGE

Technical turnover consists of a collection of technical documents that describe the facility, its equipment, and the conditions at the completion of all deactivation activities. The level of detail depends on the condition requirements and agreements specific to the facility. The following sections detail the contents of the applicable sections required for Building 7602.

8.2.1 End Points Completion Report

The End Points Completion Report documents the achievement of the end points identified in Attachment 4 of the *High Ranking Facilities Deactivation Project (HRFDP) End Point Determination - Integrated Process Demonstration Facility (7602)*, (HRFDP/97/004-D). The End Points Completion Report will be an attachment to the MOA transferring the facility from EM-60 to EM-40. The signatures of the EM-60 and EM-40 representatives on the MOA shall indicate their concurrence with the end point completion report.

8.2.2 Updated Facility Drawings

These drawings include facility, room, and cell arrangements drawings to the extent they exist. However, except in unique circumstances, as-builts of the deactivated conditions are not provided. The documentation addresses systems, such as water, sewer, air, electric, gas process (mechanical and chemical), and fire protection systems.

8.2.3 Radioactive Materials Inventory and Survey

This survey includes an inventory of radioactive and fissile material remaining as contamination with characterization information, where available. The final radiological/hazardous materials survey records, final configuration and surveillance and maintenance requirements, available drawings, specifications, procedures, manuals, and unplanned occurrences records applicable to the facility are included.

8.3 S&M TURNOVER PACKAGE

S&M turnover consists of a collection of documents required to support post-deactivation S&M activities. The level of detail depends on the S&M specific to the facility. Attachment 6, "S&M Turnover Package Checklist," reflects the documents required for this facility with respect to S&M turnover. The following sections detail the contents of the applicable sections required for Building 7602.

8.3.1 Post-Deactivation S&M Plan

This document describes the S&M plan for the facility after deactivation is complete, up to the initiation of decommissioning. The S&M activities will be integrated into the decommissioning work and phased out as decommissioning is completed.

8.3.2 Post-Deactivation S&M Procedures

A general procedure for S&M of Building 7602 (DIV-SM-CKS-018, *Routine Surveillance and Maintenance Procedure for Building 7602*) was prepared and issued by the RPSD Facility Operations group.¹⁴⁶ This procedure outlines the maintenance activities and special surveillance required to ensure that the facility conditions and safety envelope remain consistent until decommissioning can take place.

9. REFERENCES

Document Number	Document Title
ORNL/TM-13093	<i>Deactivation of Building 7602</i>
ORNL/ER-322	<i>Work Plan for the High Ranking Facilities Deactivation Project at Oak Ridge National Laboratory, Oak Ridge, Tennessee</i>
ORNL/CF-95/60 HS/7602/F/1/R2	<i>Phase I Safety Analysis Report Update Program Hazard Screening</i>
HRFDP/97/004-D	<i>High Ranking Facilities Deactivation Project (HRFDP) End Point Determination - Integrated Process Demonstration Facility (7602)</i>
HRFDP/97/010-D	<i>Building 7602 End Points Completion Report</i>
ORNL/ER-351	<i>High-Ranking Facilities Deactivation Project Surveillance and Maintenance Work Plan</i>
DIV-SM-CKS-018	<i>Routine Surveillance and Maintenance Procedure for Building 7602</i>
RP-213 Rev. 0	<i>Radiological Work Permits</i>
RPP-230 Rev. 3	<i>Radiological Posting</i>
HRFDP/97/001-D	<i>Auditable Safety Analysis: Building 7602 Integrated Process Demonstration Facility</i>
DOE/OR/01-1515&D1	<i>Removal Site Evaluation Report on Building 7602 at Oak Ridge National Laboratory, Oak Ridge, Tennessee</i>
HPIC-55-96	<i>Stationary Instruments in 7602/7603</i>

END NOTES

1. ORNL/ER-322, page A-24
2. ORNL/ER-322, page A-24
3. ORNL/CF-95/60 HS/7602/F/1/R2, page 1
4. ORNL/TM-13093, page 3
5. ORNL/CF-95/60 HS/7602/F/1/R2, page 17
6. ORNL/CF-95/60 HS/7602/F/1/R2, page 15
7. ORNL/CF-95/60 HS/7602/F/1/R2, page 15
8. ORNL/CF-95/60 HS/7602/F/1/R2, page 16
9. Internal Correspondence, C. H. Scott to C. E. Nix, 8/15/94, *Robotics and Process Systems Division (RPSD) Sink and Drain Survey*
10. ORNL/CF-95/60 HS/7602/F/1/R2, page 17
11. ORNL/CF-95/60 HS/7602/F/1/R2, page 17
12. ORNL/CF-95/60 HS/7602/F/1/R2, page 22
13. ORNL/CF-95/60 HS/7602/F/1/R2, page 22
14. ORNL/CF-95/60 HS/7602/F/1/R2, page 21
15. Internal Correspondence, C. H. Scott to C. E. Nix, 8/15/94, *Robotics and Process Systems Division (RPSD) Sink and Drain Survey*
16. ORNL/CF-95/60 HS/7602/F/1/R2, page 22
17. Internal Correspondence, C. H. Scott to C. E. Nix, 8/15/94, *Robotics and Process Systems Division (RPSD) Sink and Drain Survey*
18. ORNL/CF-95/60 HS/7602/F/1/R2, page 21
19. Internal Correspondence, C. H. Scott to C. E. Nix, 8/15/94, *Robotics and Process Systems Division (RPSD) Sink and Drain Survey*
20. ORNL/TM-13093, page 17

21. Internal Correspondence, C. H. Scott to C. E. Nix, 8/15/94, *Robotics and Process Systems Division (RPSD) Sink and Drain Survey*
22. ORNL/CF-95/60 HS/7602/F/1/R2, page 16
23. ORNL/CF-95/60 HS/7602/F/1/R2, page 16
24. ORNL/CF-95/60 HS/7602/F/1/R2, page 25
25. ORNL/TM-13093, page 14
26. ORNL/CF-95/60 HS/7602/F/1/R2, page 17
27. ORNL/CF-95/60 HS/7602/F/1/R2, page 21
28. ORNL/CF-95/60 HS/7602/F/1/R2, page 21
29. ORNL/CF-95/60 HS/7602/F/1/R2, page 22
30. ORNL/CF-95/60 HS/7602/F/1/R2, page 22
31. ORNL/CF-95/60 HS/7602/F/1/R2, page 22
32. Surplus Facility Inventory and Assessment Project questionnaire, completed 3/31/94
33. ORNL/TM-13093, page 15
34. Telephone conversations with H. R. Yook, 5/22/95 to 5/23/95
35. ORNL/ER-322, page A-24
36. ORNL/CF-95/60 HS/7602/F/1/R2, page 30
37. ORNL/ER-322, page A-24
38. ORNL/TM-13093, page 17
39. HRFDP Inventory Database
40. ORNL/TM-13093, page 9
41. ORNL/TM-13093, page 9
42. ORNL/TM-13093, page 13
43. Surplus Facility Inventory and Assessment Project questionnaire, completed 3/31/94
44. ORNL/TM-13093, page 10

45. ORNL/TM-13093, page 11
46. ORNL/TM-13093, page 13
47. ORNL Drain System Survey Checklist, completed 2/28/97 by K. Smith
48. ORNL Radiological Area Inventory, 10/14/96,
<http://wwworp.ornl.gov/cgi-shl/dbml.exe?Template=/cfdocs/orp/RadAreas/main.dbm>
49. ORNL Radiological Area Inventory, 10/14/96,
<http://wwworp.ornl.gov/cgi-shl/dbml.exe?Template=/cfdocs/orp/RadAreas/main.dbm>
50. ORNL Drain System Survey Checklist, completed 2/28/97 by K. Smith
51. ORNL/TM-13093, page 17
52. ORNL Radiological Area Inventory, 10/14/96,
<http://wwworp.ornl.gov/cgi-shl/dbml.exe?Template=/cfdocs/orp/RadAreas/main.dbm>
53. ORNL Drain System Survey Checklist, completed 2/28/97 by K. Smith
54. ORNL Radiological Area Inventory, 10/14/96,
<http://wwworp.ornl.gov/cgi-shl/dbml.exe?Template=/cfdocs/orp/RadAreas/main.dbm>
55. ORNL Drain System Survey Checklist, complete 2/28/97 by K. Smith
56. ORNL/TM-13093, page 17
57. ORNL Drain System Survey Checklist, completed 2/28/97 by K. Smith
58. ORNL/TM-13093, page 14
59. ORNL Radiological Area Inventory, 10/14/96,
<http://wwworp.ornl.gov/cgi-shl/dbml.exe?Template=/cfdocs/orp/RadAreas/main.dbm>
60. ORNL/TM-13093, page 14
61. ORNL Radiological Area Inventory, 10/14/96,
<http://wwworp.ornl.gov/cgi-shl/dbml.exe?Template=/cfdocs/orp/RadAreas/main.dbm>
62. ORNL/TM-13093, page 14
63. ORNL Radiological Area Inventory, 10/14/96,
<http://wwworp.ornl.gov/cgi-shl/dbml.exe?Template=/cfdocs/orp/RadAreas/main.dbm>
64. ORNL/TM-13093, page 14

65. ORNL Radiological Area Inventory, 10/14/96,
<http://wwworp.ornl.gov/cgi-shl/dbml.exe?Template=/cfdocs/orp/RadAreas/main.dbm>
66. ORNL/TM-13093, page 14
67. ORNL/TM-13093, page 14
68. ORNL Radiological Area Inventory, 10/14/96,
<http://wwworp.ornl.gov/cgi-shl/dbml.exe?Template=/cfdocs/orp/RadAreas/main.dbm>
69. ORNL/TM-13093, page 14
70. ORNL/TM-13093, page 14
71. ORNL/TM-13093, page 14
72. ORNL/TM-13093, page 14
73. ORNL/TM-13093, page 15
74. ORNL/TM-13093, Appendix B
75. ORNL/TM-13093, page 15
76. ORNL/TM-13093, page 23
77. ORNL/TM-13093, page 15
78. ORNL/TM-13093, Appendix B
79. ORNL/TM-13093, page 15
80. ORNL/TM-13093, Appendix B
81. ORNL/TM-13093, Appendix B
82. ORNL/TM-13093, page 15
83. ORNL/TM-13093, Appendix B
84. ORNL/TM-13093, page 15
85. ORNL/TM-13093, page 17
86. ORNL/TM-13093, page 23
87. ORNL/TM-13093, page 23
88. ORNL/TM-13093, page 17

89. E-mail, T. L. Collins to W. C. Stone, Jr., 1/3/97
90. ORNL/TM-13093, page 9
91. ORNL/TM-13093, pages 9-13
92. Health Physics Instrument Committee Approval HPIC-55-96, 10/24/96
93. ORNL/TM-13093, Appendix A
94. ORNL/TM-13093, Appendix B
95. ORNL/TM-13093, page 14
96. ORNL/TM-13093, page 14
97. ORNL/TM-13093, page 15
98. ORNL/TM-13093, Attachment B
99. ORNL/TM-13093, page 17
100. ORNL/TM-13093, page 14
101. ORNL/TM-13093, page 15
102. ORNL/TM-13093, Attachment B
103. ORNL/TM-13093, page 17
104. ORNL/TM-13093, page 14
105. ORNL/TM-13093, page 15
106. ORNL/TM-13093, Attachment B
107. ORNL/TM-13093, page 14
108. ORNL/TM-13093, page 15
109. ORNL/TM-13093, Attachment B
110. ORNL/TM-13093, page 14
111. ORNL/TM-13093, page 15
112. ORNL/TM-13093, Attachment B
113. ORNL/TM-13093, page 17

114. E-mail from T. L. Collins to W. C. Stone, Jr., 9/19/96
115. Conversation between T. L. Collins and W. C. Stone, Jr., 11/8/96
116. ORNL/TM-13093, page 23
117. ORNL/TM-13093, page 17
118. ORNL/ER-322, page A-24
119. ORNL/TM-13093, page 17
120. ORNL/TM-13093, page 23
121. ORNL/TM-13093, page 23
122. Health Physics Instrument Committee Approval HPIC-55-96, 10/24/96
123. E-mail, T. L. Collins to W. C. Stone, Jr., 1/3/97
124. ORNL/TM-13093, page 14
125. ORNL/TM-13093, page 14
126. ORNL/TM-13093, page 14
127. ORNL/TM-13093, page 14
128. ORNL/TM-13093, page 14
129. ORNL/TM-13093, page 14
130. ORNL/TM-13093, page 14
131. ORNL/TM-13093, page 14
132. ORNL/TM-13093, page 14
133. ORNL/TM-13093, page 14
134. ORNL/TM-13093, page 14
135. ORNL/TM-13093, page 15
136. ORNL/TM-13093, Appendix B
137. ORNL/TM-13093, page 15
138. ORNL/TM-13093, page 23

- 139. ORNL/TM-13093, page 15
- 140. ORNL/TM-13093, Appendix B
- 141. E-mail, T. L. Collins to W. C. Stone, Jr., 3/4/97
- 142. ORNL/TM-13093, page 15
- 143. ORNL/TM-13093, Appendix B
- 144. ORNL/TM-13093, page 15
- 145. ORNL/TM-13093, Appendix B
- 146. ORNL/TM-13093, page 17

APPENDIX A

BUILDING 7602 FLOOR PLANS

First floor plan.

SM015.DWG

A-4

Mezzanine plan.

A-5

SM010.DWG

Basement plan.

APPENDIX B

BUILDING 7602 HAZARD SCREENING

AUDITABLE SAFETY ANALYSIS:

BUILDING 7602

INTEGRATED PROCESS DEMONSTRATION FACILITY

Date Issued: December 20, 1996

Prepared by:

**Robotics & Process Systems Division
Lockheed Martin Energy Research, Inc.
Oak Ridge National Laboratory**

Issued by:

**High Ranking Facilities Deactivation Project
Environmental Restoration
Lockheed Martin Energy Systems, Inc.
Oak Ridge, Tennessee 37831**

**Prepared for the U.S. Department of Energy
under U.S. Government contract DE-AC-05-84OR21400**

Prepared by:

H. R. Yook
Robotics & Process Systems Division (RPSD)

11-22-96

Date

Reviewed by:

C. H. Scott
RPSD Safety Officer

12-5-96

Date

R. K. McConathy
Office of Operational Readiness and
Facility Safety

12/11/96

Date

Concurrence by:

R. S. McKeehan
for ORNL Installation Facility
Safety Manager

12/11/96

Date

D. G. Renfro
T&PS Services Manager
for System Safety Engineering

12/17/96

Date

Approved by:

T. L. Collins
Facility Manager

12-17-96

Date

K. O. Constant
High Ranking Facilities Deactivation
Project Manager

12/20/96

Date

M. W. Kohring
PSET Chairman

12.20.96

Date

CONTENTS

FIGURES	iii
TABLE	iii
SUMMARY	v
1. FACILITY DESCRIPTION AND STATUS	1-1
1.1 BACKGROUND	1-1
1.2 DESCRIPTION	1-1
1.3 DEACTIVATION	1-5
1.4 FACILITY STATUS AND CONDITION AFTER DEACTIVATION	1-7
2. PRELIMINARY HAZARD SCREENING	2-1
3. FACILITY CLASSIFICATION	3-1
4. HAZARD MITIGATION	4-1

FIGURES

1.1 Building 7602	1-2
1.2 Basement plan	1-3
1.3 Mezzanine plan	1-4
1.4 First floor plan	1-6
3.1 Hazard identification and facility classification	3-2

TABLE

2.1 Preliminary hazard screening worksheet	2-2
--	-----

SUMMARY

Building 7602, the Integrated Process Demonstration Facility, was deactivated during FY 1995. Since then the facility has been inactive and under surveillance and maintenance.

A hazard screening for the Robotics & Process Systems Complex, performed in FY 1994, covered Building 7602 along with five other facilities in the Complex. The results of that screening are reported in ORNL/CF-94/46, Phase I Safety Analysis Update Program - Hazard Screening - Robotics & Process Systems Complex, January 14, 1994. All facilities in the Complex were classified "Other Industrial." At that time Building 7602 was fully operational with engineering scale process operations using depleted uranium.

This auditable safety analysis covers only Building 7602 and reflects the current inactive status of the facility. The results of the analysis indicate that Building 7602 is a Radiological Facility. The basis for this classification is radioactive surface contamination which exceeds the values in Attachment 2, Surface Radioactivity Guides, of DOE Order 5480.11. This hazard is mitigated by the radiological control program in Building 7602, which meets the requirements of the ORNL Radiation Protection Program, and is compliant with 10 CFR 835. The facility contains only occupational non-radiological hazards which are adequately controlled using established standard industrial hygiene and safety programs.

This document has been prepared in accordance with the requirements of DOE-EM-STD-5502-94, Hazard Baseline Documentation, section 5.2 since Building 7602 is a surplus facility under the responsibility of the DOE Office of Environmental Management (EM).

1. FACILITY DESCRIPTION AND STATUS

1.1 BACKGROUND

Building 7602 was originally constructed in 1963 as a Reactor Service Building for the Experimental Gas-Cooled Reactor (EGCR). The EGCR project was terminated during construction in 1965, and the reactor was never fueled or operated.

In 1974 the Liquid Metal Fast Breeder Reactor Fuel Recycle Program was formed in the Chemical Technology Division (CTD) at Oak Ridge National Laboratory (ORNL). The initial program staff moved into Building 7601 in November 1974 with plans to use Buildings 7602 and 7603 as test facilities, and the program was subsequently renamed the Consolidated Fuel Reprocessing Program (CFRP). The program separated from CTD in 1981 and became the Fuel Recycle Division while retaining the original CFRP programmatic role.

Congress authorized a \$16-million line-item project in 1979 [the Integrated Equipment Test (IET) Project] to modify Building 7602 for the CFRP. The project sponsor was the Department of Energy (DOE)—Nuclear Energy (NE). From 1981 through 1983, Building 7602 modifications, additions, and the installation of process and remote equipment were accomplished under the IET project, preparing the facility for development and testing of advanced reprocessing and remote systems technology.

Separations process and equipment development and testing were initiated in Building 7602 in 1984 under DOE-NE sponsorship. The principal materials used in the processes were depleted and natural uranium, nitric acid, and organic solution (dodecane, a normal paraffin hydrocarbon, and tributyl phosphate). Process and equipment development and testing continued for 10 years (through FY 1994). During the first 3 years, the work was fully sponsored by DOE-NE. DOE-NE then formed a collaborative program with the Power Reactor and Nuclear Fuel Development Corporation (PNC) of Japan. From 1987 through 1994, funding for the program was provided jointly by DOE-NE and PNC.

1.2 DESCRIPTION

Building 7602 (see Fig. 1.1) is located in the Robotics and Process Systems Complex at the east end of the ORNL site. It is constructed of steel frame, concrete block, and metal siding and contains 15,841 sq ft of usable floor space. The entire facility is a radiological buffer area (RBA) and has designated contamination areas within the buffer area due to depleted uranium contamination.

The building has three levels designated as the basement level, the mezzanine level, and the first (or ground) floor level. The primary entry to, and egress from, the building is on the first-floor level. Each of these levels is described as follows:

Basement: An area of 1379 sq ft bounded approximately by column lines C, D, 2, and 4 (see Fig. 1.2), called the Dissolver Pit.

Mezzanine: An area of 6776 sq ft bounded approximately by column lines A, D, 2, and 5 (see Fig. 1.3), which includes the Dissolver Pit, the Integrated Process Demonstration (IPD) Transmitter Room, and the IPD Basement.

ORNL-PHOTO 3635-80

Fig. 1.1 Building 7602.

Fig. 1.2 Basement plan.

SM010.DWG

Fig. 1.3 Mezzanine plan.

First Floor: An area of 7686 sq ft with a Chemical Makeup Room bounded approximately by column lines 3, 5, and A and a line 30 ft north of column line A; a high-bay area (IPD High Bay) bounded approximately by column lines A, B, 2, and 7; and another high-bay area (includes the Dissolver Pit, Feed House Area, and adjacent floor spaces) bounded approximately by column lines B, D, 2, and 5 (see Fig. 1.4).

The IPD High Bay in Building 7602 has a 25-t capacity bridge crane which can travel the full length and width of the bay. The crane has a maximum hook height of 30 ft. This crane is operational and has remote controls which allow "swing-free" operation.

The other high-bay area in the south portion of Building 7602 is served by a bridge crane with a 20-t overall capacity which has two 10-t hoists on trolleys. The crane has a maximum hook height of 48 ft. This bridge crane also serves adjacent Building 7603. Also, a lower manipulator bridge provides remote maintenance capability to both this high-bay area of Building 7602 and adjacent Building 7603.

All areas of Building 7602 contain engineering-scale processing equipment which was used for development of advanced reprocessing technology using centrifugal contactors. Most of this equipment is contaminated with depleted and natural uranium on the interior surfaces with some spot contamination on exterior surfaces.

1.3 DEACTIVATION

In April 1994 DOE-NE sent supplemental FY 1994 guidance for the CFRP stating that in FY 1995 and beyond, Building 7602 is considered surplus to NE programs and missions and shall be shut down and maintained in a radiologically and industrially safe condition with minimal surveillance and maintenance (S&M). The guidance also stated that every effort should be made to support and solicit "Work For Others" that may be carried out independent of NE involvement in the facility. Cost estimates for shutdown and S&M of Building 7602 in FY 1995 were provided to DOE-NE, and DOE provided funds totaling \$701,000 for that purpose.

Deactivation of Building 7602 was initiated on October 1, 1994. The principal activity during the first quarter of FY 1995 was removal of all process materials (chemicals and uranium) from the systems. The process systems were operated to achieve chemical solution concentrations needed for reuse or disposal of the solutions prior to removal of the materials from the systems. During this phase of deactivation the process materials processed and removed were:

Uranyl nitrate solution	30,178 L containing 4490 kg of uranium
Nitric acid (neutralized)	9850 L containing less than 0.013 kg of uranium
Organic solution	3346 L containing 265 kg of uranium
Uranium oxide powder	95 kg
Miscellaneous chemicals	(small unrecorded quantities)

At the end of December 1994, the process systems and control systems were shut down and deactivated.

Preparations for S&M of Building 7602 included corrective maintenance such as replacement

Fig. 1.4 First floor plan.

and repair of roof sections, relocation of several critical gages to locations outside the radiological buffer area, and preparation of a procedure for S&M. S&M was formally initiated in April 1995 and continued through September 1995 under DOE-NE funding.

1.4 FACILITY STATUS AND CONDITION AFTER DEACTIVATION

Building 7602 has been deactivated to a safe and environmentally sound condition. The process systems (including tanks) have all been drained, some tanks have been flushed, and the process fluids and chemicals have been removed from the facility, although small quantities of residual process material remain on the inside surfaces of pipes, tanks, and other process equipment. Also, all waste materials and unused non-contaminated portable test equipment have been removed from the facility. A portion of the roof has been replaced, and other sections have been repaired. The potential for environmental insults has been minimized.

The entire building is a RBA with defined contamination areas. Contamination in the facility is in the form of depleted and natural uranium. Some of the contamination is on the inside surfaces of systems and equipment, and some is both area and spot contamination on floors and walls in the facility. The contamination is both fixed and removable. Radiation control procedures require Health Physics technician support and dress-out when entering designated contamination areas. Walk aisles throughout the facility are maintained "smear clean" to support cost-effective S&M. Some concern remains about the potential for airborne contamination as surfaces dry out; therefore, a portable low-volume air sampler is used by the Health Physics technician to provide indication of airborne contamination. No airborne contamination has been detected.

All process fluids and uranium (except that in contamination and residuals in the process systems) have been removed from the facility. Systems and equipment, with the exception of those necessary for environmental control, safety, and emergencies, have been shut down. Systems still operational are (1) ventilation, (2) fire protection sprinklers, (3) electrical, (4) heating steam, (5) cooling water headers which pass through Building 7602 to serve other facilities. S&M has continued under EM-60 funding which began in October 1995 via the High Ranking Facilities Deactivation Project (HRFDP).

2. PRELIMINARY HAZARD SCREENING

Table 2.1 shows the preliminary hazard screening worksheet. The worksheet indicates that the only hazard kept is radioactive surface contamination in excess of the values in attachment 2 of DOE Order 5480.11.

The contamination in Building 7602 is depleted and natural uranium. Attachment 2 of DOE order 5840.11 lists a limit for fixed and removable uranium (U-nat, U-235, and U-238) of 5,000 dpm α /100 cm² and a limit for beta-gamma emitters of 5,000 dpm β - γ /100 cm². Contamination surveys conducted after deactivation show that α radiation is below the DOE limit but that β - γ radiation (from daughter products) is above the DOE β - γ limit in spot contamination. Measured radiation from both area and spot contamination ranges from below detectable limits up to 8 mRad. Copies of the contamination survey maps are shown in Appendix D of ORNL/TM-13093, Deactivation of Building 7602, dated October 1995.

Table 2.1. Preliminary Hazard Screening Worksheet

Facility Building 7602 System, subsystem All
 Document No. HRF1D/P/97/001-D Date

Type Hazard	Keep if criteria are exceeded	Action (Keep or Screen Out)	Action Basis (include inventory and form of all materials)
Radioactive material	Any radioisotope meeting or exceeding the Table A1, DOE-STD-1027-92 TQ criteria; or exceeding the Appendix B, 40 CFR 302 RQ criteria. The inventory/RQ or inventory/TQ ratios should be added when making this evaluation.	Screen Out	10 kg depleted U in 7602 = 6.6 F ⁻³ CI, well below any TQ & RQ limits
Radioactive surface contamination	Measurements of fixed, removable, or both exceed values in Attachment 2 of DOE 5480.11 (reproduced in Appendix C of E/S/CSET-2A).	Keep	Contamination survey maps show values in excess of Attachment 2 to DOE 5480.11.
Radioactive waste	> 0.002 μ Ci per gram of waste	Screen Out	No radioactive waste stored or processed in Building 7602.
Toxic material (include combustion products)	Any toxic chemical or combustion products > RQ from Table 302.4, 40 CFR 302; or any other known toxic material (e.g., NIOSH Pocket Guide to Chemical Hazards lists an IDLH)	Screen Out	Residual nitric acid and uranyl nitrate in the process systems are below RQ. Nitric Acid RQ = 1000 lb. Uranyl nitrate RQ = 100 lb.
Carcinogen	Any known carcinogen > RQ from Table 302.4, 40 CFR 302 or any other known carcinogen if not treated as toxic material (e.g., a substance listed in E'S Chemical Carcinogen Report which is available on System Select 69)	Screen Out	No known carcinogens were used in process operations in Building 7602 (process knowledge).
Biohazard	Any known biohazard where special controls are required (see Section 4.2.5.2 of CSET2/R2)	Screen Out	There are no known biohazards in the facility (process knowledge).
Asphyxiant	Any asphyxiant (i.e., gas at ambient temperatures that is denser than air) that could either affect a large number of people or any unsuspecting people	Screen Out	There are no known asphyxiants in the facility (process knowledge).
Flammable material	> 5000 lb. of liquid with a flash point < 100°F or > 3000 standard ft ³ of a gas with an established lower explosive limit (LEL)	Screen Out	There are no flammable materials of significant quantity in the facility (process knowledge).
Reactive material	> 10 lb. of a substance with an NFPA reactivity hazard level $\geq$ 2	Screen Out	There are no reactive materials in the facility (process knowledge).
Explosive material	Any 49 CFR 173 Division 1.1, 1.2, or 1.3; or > 10 oz. OF Division 1.4	Screen Out	There are no explosive materials in the facility (process knowledge).

Table 2.1. (Continued)

Document No. HRF12P/97/001-D

Date

Type Hazard	Keep if criteria are exceeded	Action (Keep or Screen Out) ¹	Action Basis (include inventory and form of all materials)
Incompatible chemical reaction products	Presence of > 1 kg of two or more incompatible chemicals listed in Appendix G of "Analysis References for Hazard Identification and Facility Classification" in same area	Screen out	Residual chemicals in process systems are compatible. They were used in direct contact for process testing.
Electrical Energy	Unusual application not adequately controlled by OSHA (e.g., soil vitrification); ≥ 800 volts and 24 ma output; or stored energy > 50 joules at 600 volts	Screen Out	Electrical service in Building 7602 ranges from 110 volts to 450 volts.
Kinetic Energy	High energy (e.g., flywheel or centrifuge type equipment)	Screen Out	No high energy equipment. All equipment shut down except ventilation.
High Pressure	≥ 3,000 psig or ≥ 0.1 lb TNT (1.4 x 10 ³ ft-lb) equivalent energy	Screen Out	No high pressure equipment in facility (process knowledge).
Lasers	Any Class IV, and Class III with non-enclosed beam per American National Standards Institute Z-136.1	Screen Out	No lasers in Building 7602.
Potential Energy	Elevated mass with "high" potential energy	Screen Out	No "high" potential energy sources in Building 7602.
Accelerators	Keep (Classify based on DOE Order 5480.25)	Screen Out	No accelerators in Building 7602.
X-ray Machines	Any not meeting ANSI N537/NBS123 requirements	Screen Out	No x-ray machines in Building 7602
Other			

¹ Action decision is "Keep" if criterion is exceeded or "screen out" if : a) criterion not exceeded, b) criterion is not applicable, or c) criterion is exceeded but justification as "Other Industrial" hazard requiring no further evaluation is attached and approved.

3. FACILITY CLASSIFICATION

Building 7602 is classified as a Radiological Facility due to the surface contamination discussed above. This determination is based on section 4.1.4.3 of ET/CSET-2/R2, Hazard Identification and Facility Classification Guide dated December 1995. The facility classification is documented on Fig. 3.1. Since the hazard screening worksheet shows no other hazards in Building 7602 above applicable limits, the non-radiological hazards are classified as occupational (or "Other Industrial").

Document No. HRFDP/97/001-D

HAZARD IDENTIFICATION AND FACILITY CLASSIFICATION

Building No: 7602Site: X10Facility/Operations Name: Integrated Process Demonstration FacilityResponsible Organization: Robotics & Process Systems Division for the High Rankin
Facilities Deactivation Project

- ☐ This facility is classified as an "OTHER INDUSTRIAL" FACILITY (no additional boxes should be checked.)

For radiological hazards this facility is classified as (check one):

- ☐ Radiological hazards are either insignificant compared to background, or the inventory of radionuclides is less than RQs listed in 40 CFR 302, Appendix B.
- ☒ RADIOLOGICAL FACILITY
- ☐ CATEGORY 3
- ☐ CATEGORY 2
- ☐ CATEGORY 1

For non-radiological hazards this facility is classified as (check one):

- ☒ This facility contains only occupational non-radiological hazards.
- ☐ LOW
- ☐ MODERATE
- ☐ HIGH (Designated by DOE)

Activity:	Name:	Organization:	Date:
Prepared by:	<i>RR Yook</i>	<i>R PSD</i>	<i>11-22-96</i>
Reviewed by:	<i>See approval page at front of report.</i>		
Approved by:			
Approved by:			

NOTE: If segmentation of the facility is used, the classification for each segment should be included.

Fig. 3.1 Hazard identification and facility classification.

4. HAZARD MITIGATION

The hazard associated with surface contamination in Building 7602 is mitigated by the radiological control program for the facility, which meets the requirements of the ORNL Radiation Protection Program and is compliant with 10 CFR 835. This program is carried out by the division Radiation Control Officer and an on-site Health Physics technician who is assigned one-quarter time to Building 7602. An effective radiation control program has been maintained in Building 7602 for more than ten years. Under this program, the entire facility is a RBA. Smear-clean walkways are maintained throughout the facilities and contamination areas are clearly marked and posted. Thus, it is possible to conduct most surveillance and maintenance tasks without entering a contaminated area.

The ventilation system for Building 7602 maintains a slight negative pressure in the building to ensure that there is a continuous air flow into the facility. The ventilation air is discharged to the atmosphere via a HEPA filter bank and a stack. The ventilation system and HEPA filter bank are maintained operational by the surveillance and maintenance program. Also, a low-volume portable air sampler is operated by the Health Physics technician in the facility to detect any airborne contamination.

The non-radiological occupational hazards are adequately controlled using established standard industrial hygiene and safety programs.

APPENDIX C

BUILDING 7602 RADIOLOGICAL SURVEYS

ORNL Radiological Survey Data

Survey Number: 7601-97-0015

7601 Field Office

Date: 2/13/97

Time: 9:30

Surveyor Badge Number: 34160

☒ Routine Survey

RWP Number: na

Building: 7602

Specific Location: 19 SYSTEM AREA

Description:

RADIATION/CONTAMINATION SURVEY

Instruments Used and Calibration Due Date:

3047-081

8/9/97

7603-16P

8/10/96

General Description of Radiological Conditions:

SEE ATTACHED MAP FOR MORE INFORMATION.

Division or Group Needing the Survey: EM-60

Person-hours spent on the survey: 5

of Pages: 2

Completed By: *Chi Bracy*Reviewed by: *Adew L. King*

Date: 3/31/97

Smear Results (dpm/100 cm² unless noted)

Smear Number	α	β	Location	Smear Number	α	β	Location	Smear Number	α	β	Location
1	NC	2,000	SEE MAP	2	NC	3.5mRad	..	3	NC	3.5mRad	..
4	NC	6,000	..	6	NC	3,000	..	8	NC	20,000	..
7	NC	20,000	..	8	NC	30,000	..	9	NC	80,000	..
10	NC	20,000	..	11	NC	6,000	..	12	NC	7mRad	..
13	NC	20,000	..	14	NC	2,000	..	15	NC	4,000	..
16	NC	<1000	..	17	NC	2,000	..	18	NC	10,000	..
19	NC	10.5mRad	..	20	NC	3.5mRad	..				

ORNL Radiological Survey Data

Survey Number: 7641-97-0015

7601 Field Office

Date: 2/13/97 Time: 09:30

IPD High Bay
19 System Area

(#) - Smear Location	Boundary Designations	
(#) - Large Area Smear	RA - Radiation Area	BA - Radiological Buffer Area
# - Contact Dose Rate	HR - High Radiation Area	CA - Contamination Area
# - 30 cm Dose Rate	VR - Very High Radiation Area	HC - High Contamination Area
# - General Area Dose Rate	AR - Airborne Radioactivity Area	FC - Fixed Contamination Area
SOB - Step-off Pad	RM - Radioactive Materials Area	SC - Soil Contamination Area
AS - Air Sample Location	UM - Underground Radioactive Material Area	
Default units are in mR/hr and are for open window beta/gamma readings. Letter suffixes with the number indicate specific radiations: B - Beta(mRad/hr), G - Gamma(mR/hr), N - Neutron(mRem/hr). Boundary designations are looking in the direction the arrow points.		

ORNL Radiological Survey Data

Survey Number: 7601-97-0035

7601 Field Office

Date: 5/5/97

Time: 18:58

Surveyor Badge Number: 34180

☒ Routine Survey

RWFP Number: NA

Building: 7602

Specific Location: SOLVENT EXTRACTION PIT

Description:

CONTAMINATION/RADIATION SURVEY

Instruments Used and Calibration Due Date:

3047-061

6/9/97

7603-22P

7/28/97

CTA061

10/20/97

CTB033

10/20/97

General Description of Radiological Conditions:

SEE DETAILED SURVEY MAP.

Division or Group Needing the Survey: EM-60/RP

Person-hours spent on the survey: 3.5

of Pages: 2

Completed By: *Chris Brann*

Reviewed by: _____

Date: _____

Smear Results (dpm/100 cm² unless noted)

Smear Number	α	β	Location	Smear Number	α	β	Location	Smear Number	α	β	Location
1	<MDA	<MDA	SEE MAP	2	NC	3,000	**	3	<MDA	<MDA	**
4	72	257	**	6	NC	2,000	**	6	<MDA	<MDA	**
7	28	<MDA	**	8	NC	10,000	**	9	<MDA	<MDA	**
10	NC	3,000	**	11	NC	6,000	**	12	NC	30,000	**
13	NC	2,000	**	14	NC	3,000	**	15	NC	3,000	**

Copy

ORNL Radiological Survey Data

Survey Number: 7601-97-0035

7601 Field Office

Date: 5-8-97 Time: 18:58

① - Smear Location	Boundary Designations	
② - Large Area Smear	RA - Radiation Area	BA - Radiological Buffer Area
# - Contact Dose Rate	HR - High Radiation Area	CA - Contamination Area
# - 30 cm Dose Rate	VR - Very High Radiation Area	HC - High Contamination Area
# - General Area Dose Rate	AR - Airborne Radioactivity Area	FC - Fixed Contamination Area
[SOP] - Step-off Pad	RM - Radioactive Materials Area	SC - Soil Contamination Area
AS - Air Sample Location	UM - Underground Radioactive Materials Area	

Default units are in mR/hr and are for open window beta/gamma readings. Letter suffixes with the number indicate specific radiations: B - Beta (mRad/hr), G - Gamma (mR/hr), N - Neutron (mRem/hr). Boundary designations are looking from the designations into the zoned area.

ORNL Radiological Survey Data

Survey Number: 7801-97-0075

7601 Field Office

Date: 8/11/97

Time: 9:14

Surveyor Badge Number: 34180

☒ Routine Survey

RWP Number: NA

Building: 7692

Specific Location: 32 SYSTEM

Description:

RADIATION/CONTAMINATION SURVEY

Instruments Used and Calibration Due Date:

CTAD81 10/20/97

CTB033 10/20/97

7080-021

1/18/98

7603-20P

11/1/97

General Description of Radiological Conditions:

SEE SURVEY MAP FOR DETAILS.

Division or Group Needing the Survey: EM-60

Person-hours spent on the survey: 5

of Pages: 7

Completed By: *Ch. Brown*Reviewed by: *James L. King*

Date: 9/15/97

Smear Results (dpm/100 cm² unless noted)

Smear Number	α	β	Location	Smear Number	α	β	Location	Smear Number	α	β	Location
1	<MDA	<MDA	SEE MAP	2	<MDA	<MDA	"	3	NC	8,000	"
4	NC	10,000	"	5	28	<MDA	"	6	<MDA	<MDA	"
7	NC	3,000	"	8	NC	10,000	"	9	NC	20,000	"
10	NC	10,000	"	11	NC	3,000	"	12	NC	8,000	"
13	NC	4,000	"	14	NC	2,000	"	15	NC	2,000	"
16	NC	20,000	"	17	NC	60,000	"	18	33	230	"
19	NC	2,000	"	20	<MDA	<MDA	"	21	NC	60,000	"

Survey Data

Survey Number: 7601-97-0075

7601 Field Office

Date: 8-11-97

Time: 9:41

IPD High Bay
32 System Area

Symbol	Smear Location	Boundary Designations
①	Smear Location	RA - Radiation Area
②	Large Area Smear	BA - Radiological Buffer Area
③	Contact Dose Rate	CA - Contamination Area
④	30 cm Dose Rate	HR - High Radiation Area
⑤	General Area Dose Rate	VR - Very High Radiation Area
⑥	Step-off Pad	AR - Airborne Radioactivity Area
⑦	Air Sample Location	FC - Fixed Contamination Area
⑧		RM - Radioactive Materials Area
⑨		SC - Soil Contamination Area
⑩		UM - Underground Radioactive Material Area

Default units are in mR/hr and are for open window beta/gamma readings. Letter suffixes with the number indicate specific radiations: B - Beta(mRad/hr), G - Gamma(mR/hr), N - Neutron(mRem/hr). Boundary designations are looking in the direction the arrow points.

ORNL Radiological Survey Data

Survey Number: 7601-97-0031

7601 Field Office

Date: 5/7/97

Time: 14:31

Surveyor Badge Number: 34160

☒ Routine Survey

RWP Number: NA

Building: 7602

Specific Location: CHEMICAL SYSTEMS TEST AREA

Description:

RADIATION/CONTAMINATION SURVEY

Instruments Used and Calibration Due Date:

3047-081

6/9/97

7603-22P

7/28/97

CTA061

10/20/97

CTB033

10/20/97

General Description of Radiological Conditions:

SEE DETAILED SURVEY MAP. INCLUDED ON THIS PARTICULAR SURVEY IS FEED HOUSE AREA AND SHEAR FLOOR.

Division or Group Needing the Survey:

EM-60/RP

Person-hours spent on the survey:

6

of Pages: 2

Completed By:

Chris Brann

Reviewed by:

Date:

Smear Results (dpm/100 cm² unless noted)

Smear Number	α	β	Location	Smear Number	α	β	Location	Smear Number	α	β	Location
1	<MDA	<MDA	SEE MAP	2	NC	10,000	" "	3	NC	80,000	" "
4	NC	60,000	" "	6	77	407	" "	6	NC	10,000	" "
7	142	690	" "	8	NC	6,000	" "	9	NC	3,000	" "
10	91	451	" "	11	NC	5,000	" "	12	NC	15,000	" "
13	NC	40,000	" "	14	67	336	" "	16	NC	80,000	" "
16	NC	2,000	" "	17	88	345	" "	18	NC	60,000	" "
19	NC	120,000	" "	20	NC	20,000	" "				

COPIED

ROMD Bay Chemical System Test Area

Legend		Boundary Designations	
① - Smear Location		RA - Radiation Area	BA - Radiological Buffer Area
② - Large Area Smear		HR - High Radiation Area	CA - Contamination Area
③ - Contact Dose Rate		VR - Very High Radiation Area	HC - High Contamination Area
④ - 30 cm Dose Rate		AR - Airborne Radioactivity Area	FC - Fixed Contamination Area
⑤ - General Area Dose Rate		RM - Radioactive Materials Area	SC - Soil Contamination Area
SOE - Step-off Pad		UM - Underground Radioactive Material Area	
AS - Air Sample Location			

Default units are in mR/hr and are for open window beta/gamma readings. Letter suffixes with the number indicate specific radiations: B - Beta(mRad/hr), G - Gamma(mR/hr), N - Neutron(mRem/hr). Boundary designations are looking in the direction the arrow points.

ORNL Radiological Survey Data

Survey Number: 7601-04-0063	7601 Field Office	Date: 1/11/94	Time: 06:43
Surveyor Badge Number: 34160	☒ Routine Survey	RWP Number: _____	
Building: 7602	Specific Location: CENTRIFUGE HOUSE		
Description: RADIATION / CONTAMINATION SURVEY. AREA SURVEY FOR PRE-DECON. DATE OF SURVEY 12/02/93.			
Instruments Used and Calibration Due Date:			
7900-101	2/18/94	7603-01P	2/28/94
CTB033	2/17/94	CTA061	4/13/94
General Description of Radiological Conditions: FOR SURVEY INFORMATION SEE DETAILED SURVEY MAP.			
Division or Group Needing the Survey RP		Person-hours spent on the survey: 4.5	

NON-ROUTINE
Chi. Brany

COPY

CENTRIFUGE

Survey Number 7601-94-0063Date 12-2-9
1400
☐ Weekly
☐ Monthly
☒ Non-Routine

Smear No.	Smear Area (cm ²)	Smear Area (cm ²)
1	N/C	50,000
2		100,000
3		100,000
4		60,000
5	125	482
6	109	438
7	716	3848
8	241	1161
9	N/C	140,000
10		60,000
11	493	1295
12	N/C	60,000
13		60,000
14		150,000
15		3mRAD
16		3mRAD
17	561	1929
18	698	1366
19	118	393
20	N/C	80,000

REMARKS: PRE-DECON / JOB SURVEY . . 5 TO
 1.5 mRAD ON CONTACT WITH EQUIPMENT
 IN CENTRIFUGE HOUSE.

2	Contact Dose Rate (mR/hr)	8	General Area Dose Rates
⚠	Neutron Dose Rate (mRem/hr)	⊙	Smear Location
P	Portable Air Sample Location	XXX	Radiation Area Boundary
-	Contamination Area Boundary	X-X-X	Radiation & Contamination Area Boundary
☐	Step-off Pad Location	HHH	High Radiation Area Boundary
---	Decontamination Area Boundary	VVV	Very High Radiation Area Boundary

ORNL Radiological Survey Data

Survey Number: 7801-97-0034

7801 Field Office

Date: 5/8/97

Time: 18:17

Surveyor Badge Number: 34160

☒ Routine Survey

RWP Number: NA

Surveying: 7802

Specific Location: 12 AND 13 SYSTEM AREA

Option:

CONTAMINATION/CONTAMINATION SURVEY

Instruments Used and Calibration Due Date:

3047-081	8/9/97	7803-22P	7/28/97	7803-04S	8/25/97	CTA061	10/20/97
CTB033	10/20/97						

General Description of Radiological Conditions:

DETAILED SURVEY MAP FOR DETAILED INFORMATION.

Person or Group Needing the Survey: EM-60/RP

Person-hours spent on the survey: 4

Pages: 2 Completed By: *Chris B...* Reviewed by: _____ Date: _____

Smear Results (dpm/100 cm² unless noted)

	α	β	Location	Smear Number	α	β	Location	Smear Number	α	β	Location
1	<MDA	<MDA	SEE MAP	2	NC	3,000	"	3	NC	4,000	"
4	NC	3,000	"	6	NC	10,000	"	6	NC	5,000	"
7	<MDA	230	"	8	NC	3,000	"	8	NC	4,000	"
10	NC	40,000	"	11	NC	10,000	"	12	NC	3,000	"
13	NC	6,000	"	14	NC	3,000	"	16	91	451	"
16	44	248	"	17	NC	3,000	"	18	NC	6,000	"
19	NC	3,000	"	20	NC	10,000	"				

COPY

OKNL Radiological Survey Data

Survey Number: 7601-97-0034

7801 Field Office

Date: 5-8-97 Time: 18:17

IPD High Bay
12 & 13 Systems Area

①	- Smear Location	Boundary Designations	
②	- Large Area Smear	RA - Radiation Area	BA - Radiological Buffer Area
③	- Contact Dose Rate	HR - High Radiation Area	CA - Contamination Area
④	- 30 cm Dose Rate	VR - Very High Radiation Area	HC - High Contamination Area
⑤	- General Area Dose Rate	AR - Airborne Radioactivity Area	FC - Fixed Contamination Area
SOP	- Step-off Pad	RM - Radioactive Materials Area	SC - Soil Contamination Area
AS	- Air Sample Location	UM - Underground Radioactive Materials Area	

Default units are in mR/hr and are for open window beta/gamma readings. Letter suffixes with the number indicate specific radiations: B - Beta (mRad/hr), G - Gamma (mR/hr), N - Neutron (mRem/hr). Boundary designations are looking from the designations into the zoned area.

ORNL Radiological Survey Data

Survey Number: 7601-97-0042

7601 Field Office

Date: 5/9/97

Time: 11:09

Surveyor Badge Number: 34160

☒ Routine Survey

RWP Number: NA

Building: 7602

Specific Location: DISSOLVER PIT

Description:

RADIATION/CONTAMINATION SURVEY

Instruments Used and Calibration Due Date:

7603-04S

8/25/97

7603-22P

7/28/97

CTA061

10/20/97

CTB033

10/20/97

3047-061

6/9/97

General Description of Radiological Conditions:

SEE DETAILED SURVEY MAP FOR INFORMATION.

Division or Group Needing the Survey: EM-60/RP

Person-hours spent on the survey: 5

of Pages: 2

Completed By:

Reviewed by:

Date:

Smear Results (dpm/100 cm² unless noted)

Smear Number	α	β	Location	Smear Number	α	β	Location	Smear Number	α	β	Location
1	<MDA	<MDA	SEE MAP	2	<MDA	<MDA	..	3	<MDA	<MDA	..
4	<MDA	<MDA	..	6	142	319	..	6	NC	6,000	..
7	NC	140,000	..	8	67	231	..	9	<MDA	<MDA	..
10	<MDA	<MDA	..	11	NC	120,000	..	12	NC	2,000	..
13	<MDA	<MDA	..	14	NC	10,000	..	15	NC	2,000	..
16	NC	60,000	..	17	67	<MDA	..	18	NC	80,000	..
19	NC	3,000	..	20	NC	7mRad	..	21	NC	20,000	..
22	NC	6,000	..	23	NC	4,000	..	24	<MDA	<MDA	..
25	NC	30,000	..								

Survey Data

Survey Number: 7601-97-0042

7601 Field Office

Date: 5-9-97 Time: 11:09

7602 DISSOLVER PIT

NOTE
 PA = PROBE
 dpm/100cm² $\propto$
 DISTRIBUTED
 CONTAMINATION
 LATED XKEING
 7500

Boundary Designations	
② - Smear Location	RA - Radiation Area
③ - Large Area Smear	BA - Radiological Buffer Area
# - Contact Dose Rate	HR - High Radiation Area
# - 30 cm Dose Rate	CA - Contamination Area
# - General Area Dose Rate	VR - Very High Radiation Area
# - General Area Dose Rate	HC - High Contamination Area
SOP - Step-off Pad	AR - Airborne Radioactivity Area
AS - Air Sample Location	FC - Fixed Contamination Area
	SC - Soil Contamination Area
	RM - Radioactive Materials Area
	UM - Underground Radioactive Materials Area

Default units are in mR/hr and are for open window beta/gamma readings. Letter suffixes with the number indicate specific radiations: B - Beta (mRad/hr), G - Gamma (mR/hr), N - Neutron (mRem/hr). Boundary designations are looking from the designations into the zoned area.

ORNL Radiological Survey Data

Survey Number: 7601-97-0033

7601 Field Office

Date: 5/6/97

Time: 17:01

Surveyor Badge Number: 34160

☒ Routine Survey

RWP Number: NA

Building: 7602

Specific Location: CHEMICAL MAKE-UP ROOM

Description:

RADIATION/CONTAMINATION SURVEY

Instruments Used and Calibration Due Date:

3047-081

6/9/97

7603-22P

7/28/97

CTA061

10/20/97

CTB033

10/20/97

General Description of Radiological Conditions:

SEE DETAILED SURVEY MAP.

Division or Group Needing the Survey:

RP/EM-60

Person-hours spent on the survey:

4

of Pages: 2

Completed By:

Chris Beatty

Reviewed by:

Date:

Smear Results (dpm/100 cm² unless noted)

Smear Number	α	β	Location	Smear Number	α	β	Location	Smear Number	α	β	Location
1	<MDA	<MDA	SEE MAP	2	<MDA	<MDA	"	3	<MDA	<MDA	"
4	<MDA	<MDA	"	6	<MDA	<MDA	"	6	<MDA	<MDA	"
7	<MDA	<MDA	"	8	<MDA	<MDA	"	9	<MDA	<MDA	"
10	<MDA	<MDA	"	11	<MDA	<MDA	"	12	<MDA	<MDA	"
13	<MDA	<MDA	"	14	<MDA	<MDA	"	16	<MDA	<MDA	"
16	86	363	"	17	NC	3,000	"	18	NC	6,000	"
19	NC	15,000	"	20	NC	3,000	"	21	46	248	"
22	42	<MDA	"	23	NC	3,000	"	24	NC	20,000	"
26	NC	80,000	"								

copy

A hand-drawn floor plan of a building, likely a school or institutional structure, featuring 22 numbered rooms and various architectural details. The plan includes a central corridor system and several large open areas.

- Room 1:** A large rectangular room at the bottom right, labeled "1000 Box".
- Room 2:** A small rectangular room adjacent to Room 1.
- Room 3:** A small rectangular room above Room 2.
- Room 4:** A small rectangular room to the left of Room 3.
- Room 5:** A large rectangular room at the bottom right, containing several circular tables.
- Room 6:** A large rectangular room above Room 5, containing a desk and chair.
- Room 7:** A small rectangular room to the left of Room 6.
- Room 8:** A small rectangular room above Room 7.
- Room 9:** A large rectangular room above Room 6, containing a desk and chair.
- Room 10:** A small rectangular room to the right of Room 9.
- Room 11:** A small rectangular room above Room 10.
- Room 12:** A large rectangular room at the top center.
- Room 13:** A large rectangular room to the right of Room 12.
- Room 14:** A small rectangular room to the left of Room 12.
- Room 15:** A small rectangular room to the left of Room 14.
- Room 16:** A small rectangular room to the right of Room 9.
- Room 17:** A small rectangular room to the right of Room 16.
- Room 18:** A small rectangular room to the right of Room 7.
- Room 19:** A large oval-shaped room to the right of Room 18.
- Room 20:** A small rectangular room to the right of Room 19.
- Room 21:** A small rectangular room to the right of Room 20.
- Room 22:** A small rectangular room to the right of Room 21.

Other features and annotations include:

- Stairs:** Indicated by sets of parallel lines in Rooms 7, 18, and 22.
- Entrances:** Marked with arrows at the top center and bottom right.
- Handwritten Notes:**
 - "14,000 sq ft per km² R₈" near Room 7.
 - "14,000 sq ft per km² R₈" near Room 2.
 - "1000 Box" near Room 1.
 - "1000 Box" near Room 2.
 - "1000 Box" near Room 2.
 - "1000 Box" near Room 2.
- Room Numbers:** Circled numbers 1 through 22.
- Room Labels:** "1000 Box" near Room 1, "1000 Box" near Room 2, "1000 Box" near Room 2, "1000 Box" near Room 2.
- Room Dimensions:** "14,000 sq ft per km² R₈" near Room 7, "14,000 sq ft per km² R₈" near Room 2.
- Room Area:** "1000 Box" near Room 1, "1000 Box" near Room 2, "1000 Box" near Room 2, "1000 Box" near Room 2.

(S) - Smear Location	Boundary Designations	
(S) - Large Area Smear	RA - Radiation Area	BA - Radiological Buffer
(S) - Contact Dose Rate	HR - High Radiation Area	CA - Contamination Area
(S) - 30 cm Dose Rate	VR - Very High Radiation Area	HC - High Contamination
(S) - General Area Dose Rate	AR - Airborne Radioactivity Area	FC - Fixed Contamination
SOP - Step-off Pad	RM - Radioactive Materials Area	SC - Soil Contamination
AS - Air Sample Location	UM - Underground Radioactive Material Area	

Default units are in mR/hr and cm.

Default units are in mR/hr and are for open window beta/gamma readings. Letter suffixes with number indicate specific radiations: B - Beta(mRad/hr), G - Gamma(mR/hr), N - Neutron(mRem/hr). Boundary designations are looking in the direction the arrow points.

ORNL Radiological Survey Data

Survey Number: 7601-97-0027

7601 Field Office

Date: 5/1/97

Time: 14:37

Surveyor Badge Number: 34180

☒ Routine Survey

RWP Number: NA

Building: 7602

Specific Location: I.P.D. BASEMENT

Description:

RADIATION/CONTAMINATION SURVEY

Instruments Used and Calibration Due Date:

3047-08I

6/9/97

7603-22P

7/28/97

General Description of Radiological Conditions:

SEE ATTACHED SURVEY. BETA CAL FACTOR FOR 3047-08I IS 3.5 (mrad/hr / mR/hr). 30 cm B-CF=1.1.

Division or Group Needing the Survey: EM-60/RP

Person-hours spent on the survey: 5

of Pages: 2 Completed By: *Chris Brannan* Reviewed by: _____ Date: _____

Smear Results (dpm/100 cm² unless noted)

Smear Number	α	β	Location	Smear Number	α	β	Location	Smear Number	α	β	Location
1	NC	300,000	FREE MAP	2	NC	100,000	**	3	NC	80,000	**
4	NC	200,000	**	5	NC	80,000	**	6	NC	120,000	**
7	NC	60,000	**	8	NC	140,000	**	9	NC	80,000	**
10	NC	3,000	**	11	NC	4mRad	**	12	NC	4mRad	**
13	NC	6,000	**	14	NC	3,000	**	15	NC	15,000	**
16	NC	20,000	**	17	NC	6,000	**	18	NC	3,000	**
19	NC	40,000	**	20	NC	2,000	**				

COPY

Date: 5-1-97

② - Smear Location	Boundary Designation	
② ② - Large Area Smear	RA - Radiation Area	BA - Radiolo
② ② - Contact Dose Rate	HR - High Radiation Area	CA - Contan
② ② - 30 cm Dose Rate	VR - Very High Radiation Area	HC - High C
② ② - General Area Dose Rate	AR - Airborne Radioactivity Area	FC - Fixed C
② ② - Step-off Pad	RM - Radioactive Materials Area	SC - Soil Co
② ② - Air Sample Location	UM - Underground Radioactive Material Area	

Default units are in mR/hr and are for open window beta/gamma readings. Letter number indicate specific radiations: B - Beta(mRad/hr), G - Gamma(mR/hr), N - N.

Boundary designations are looking in the direction the arrow points.

DISTRIBUTION

1. L.V. Asplund
2. T. W. Burwinkle
3. T. J. Cofer
4. T. L. Collins
- 5-9. K. Constant
10. S. A. Herron
11. T. R. Nelson
12. T. M. Koepp
13. P. T. Owen
14. L. D. Owens
15. L. B. Raulston
16. Central Research Library
17. File—EMEF DMC—RC