Risk Management Study for the Hanford Site Facilities

Risk-Reduction Cost Comparison for the Retired Hanford Site Facilities

G. A. Coles
R. G. Egge
E. Senger
M. V. Shultz
W. E. Taylor

Date Published
February 1994

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
and Waste Management

**Westinghouse
Hanford Company**

P.O. Box 1970
Richland, Washington 99352

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

Approved for Public Release

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

875

LEGAL DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

This report has been reproduced from the best available copy.
Available in paper copy and microfiche.

Available to the U.S. Department of Energy
and its contractors from
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831
(615) 576-8401

Available to the public from the U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650

Printed in the United States of America

DISCLM-1.CHP (1-91)

Date Received: 9-28-93		INFORMATION RELEASE REQUEST		Reference: WHC-CM-3-4	
Complete for all Types of Release					
Purpose			ID Number (include revision, volume, etc.) WHC-EP-0619, VOLUME 4		
☐ Speech or Presentation ☐ Full Paper (Check only one suffix) ☐ Summary ☐ Abstract ☐ Visual Aid ☐ Speakers Bureau ☐ Poster Session ☐ Videotape			☐ Reference ☒ Technical Report ☐ Thesis or Dissertation ☐ Manual ☐ Brochure/Flier ☐ Software/Database ☐ Controlled Document ☐ Other		
			List attachments. Appendices A, B, C, D, and F		
			Date Release Required September 30, 1993		
Title Risk-Reduction Cost Comparison for the				Unclassified Category	
Retired Hanford Site Facilities				Impact Level	
New or novel (patentable) subject matter? ☒ No ☐ Yes If "Yes", has disclosure been submitted by WHC or other company? ☐ No ☐ Yes Disclosure No(s).			Information received from others in confidence, such as proprietary data, trade secrets, and/or inventions? ☒ No ☐ Yes (Identify)		
Copyrights? ☒ No ☐ Yes If "Yes", has written permission been granted? ☐ No ☐ Yes (Attach Permission)			Trademarks? ☒ No ☐ Yes (Identify)		
Complete for Speech or Presentation					
Title of Conference or Meeting			Group or Society Sponsoring		
Date(s) of Conference or Meeting		City/State	Will proceedings be published? ☐ Yes ☐ No		
			Will material be handed out? ☐ Yes ☐ No		
Title of Journal					
CHECKLIST FOR SIGNATORIES					
Review Required per WHC-CM-3-4		Yes	No	Reviewer - Signature Indicates Approval	
				Name (printed)	Signature Date
Classification/Unclassified Controlled Nuclear Information		☐	☒		
Patent - General Counsel		☒	☐	S.W. Berglin } <i>[Signature]</i> 10/1/93	
Legal - General Counsel		☒	☐		
Applied Technology/Export Controlled Information or International Program		☐	☒		
WHC Program/Project		☐	☒		
Communications		☒	☐	W.P. Whiting } <i>[Signature]</i> 10-4-93	
RL Program/Project		☒	☐	J.P. Sullivan } <i>[Signature]</i> 2/1/94	
Publication Services		☒	☐	L. Orgill } <i>[Signature]</i> 2/4/94	
Other Program/Project		☐	☒		
Information conforms to all applicable requirements. The above information is certified to be correct.					
References Available to Intended Audience		Yes ☒	No ☐	INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP Stamp is required before release. Release is contingent upon resolution of mandatory comments.
Transmit to DOE-HQ/Office of Scientific and Technical Information		☐	☐		
Author/Requestor (Printed/Signature) <i>[Signature]</i> Date 9/20/93 G. A. Coles/M.V. Shultz/W. E. Taylor					
Intended Audience					
☐ Internal ☐ Sponsor ☒ External Responsible Manager (Printed/Signature) Date N. R. Kerr <i>[Signature]</i> 9-28-93		Date Cancelled		Date Disapproved	

APPROVAL PAGE

DOCUMENT TITLE: RISK-REDUCTION COST COMPARISON FOR THE RETIRED
HANFORD SITE FACILITIES

Prepared by:

G. A. Coles
G. A. Coles, Engineer

9-28-93
Date

M. V. Shultz
M. V. Shultz, Engineer

9/24/93
Date

R. G. Egge
R. G. Egge, Engineer

9/27/93
Date

E. Senger
E. Senger, Estimator

9/27/93
Date

Approved by:

W. E. Taylor
W. E. Taylor, Program Manager

9/24/93
Date

N. R. Kerr
N. R. Kerr, Manager,
Environmental Restoration
Safety Support

9/24/93
Date

M. C. Hughes
M. C. Hughes, Acting Manager,
Inactive Facilities Surveillance
and Maintenance

9/27/93
Date

M. R. Morton
M. R. Morton, Manager,
Decommissioning Support

9-27-93
Date

M. C. Hughes
M. C. Hughes, Manager,
Environmental Restoration Operations

9/27/93
Date

This page intentionally left blank.

RISK-REDUCTION COST COMPARISON FOR THE RETIRED HANFORD SITE FACILITIES

G. A. Coles
R. G. Egge
E. Senger
M. V. Shultz
W. E. Taylor

ABSTRACT

This document provides a cost-comparison evaluation for implementing certain risk-reduction measures and their effect on the overall risk of the 100 and 200 Area retired, surplus facilities. The evaluation is based on conditions that existed at the time the risk evaluation team performed facility investigations, and does not acknowledge risk-reduction measures that occurred soon after risk identification. This evaluation is one part of an overall risk management study for these facilities.

The retired facilities investigated for this evaluation are located in the 100 and 200 Areas of the 1,450-km² (570-mi²) Hanford Site. The Hanford Site is a semiarid tract of land in southeastern Washington State. The nearest population center is Richland, Washington, (population 32,000) 30 km (20 mi) southeast of the 200 Area.

This cost-comparison evaluation (1) determines relative costs for reducing risk to acceptable levels; (2) compares the cost of reducing risk using different risk-reduction options; and (3) compares the cost of reducing risks at different facilities. The result is an identification of the cost effective risk-reduction measures. Supporting information required to develop costs of the various risk-reduction options also is included.

This page intentionally left blank.

EXECUTIVE SUMMARY

This document provides a cost-comparison evaluation for implementing risk-reduction measures on the 100 and 200 Area retired, surplus facilities at the Hanford Site. It includes cost-comparisons for different risk-reduction options and their effect on the overall risk. It is based on conditions that existed at the time the risk evaluation team performed investigations on the facilities. This document does not acknowledge risk-reduction measures that occurred soon after the risks were identified.

This cost-comparison evaluation is part of an overall risk management study for the retired, surplus facilities. This evaluation builds on risk results documented in the risk evaluation work procedure¹ that included the development of risk information.

The overall risk management study is the product of a major effort performed in fiscal year 1993 to produce qualitative information that characterizes certain risks associated with these facilities. The primary motivation for this effort is an integrated action plan outlined in correspondence² from Westinghouse Hanford Company (WHC) to the U.S. Department of Energy, Richland Operations Office following the fatal accident that occurred at the 105-F Reactor Building in 1992.

¹Coles, G. A., M. V. Shultz, and W. E. Taylor, *Risk Management Study for the Retired Hanford Site Facilities - Risk Evaluation Work Procedure for the Retired Hanford Site Facilities*, WHC-EP-0619, VOL. 2, Westinghouse Hanford Company, Richland, Washington.

²Hughes, M. C., 1992, *Westinghouse Hanford Company Integrated Plan for the Followup to the Fatality at 105-F Building* (external letter 9204633B R2 to J. D. Wagoner, U.S. Department of Energy, Richland Field Office, August 10, 1992), Westinghouse Hanford Company, Richland, Washington.

The objectives of this cost-comparison evaluation are based on the objectives of the risk evaluation. The objectives of the risk evaluation were to (1) identify on a qualitative basis the risk to humans and the environment from retired, surplus facilities; (2) differentiate risk in near term (0 to 5 years) and long term (5 to 10 years); and (3) use a common basis for evaluating risk that provides a basis of comparison and prioritization between facilities and risks. The objectives of this cost-comparison are to determine (1) relative costs for reducing risks to acceptable levels, and (2) to compare the cost of reducing risk at different retired facilities using various risk-reduction options. Accordingly, the cost-effective, risk-reduction measures are identified.

Not all risks identified in the risk evaluation work procedure are significant. Risks rated as critical, serious, or moderate are considered important risk contributors and candidates for risk-reduction measures.

Three general ways to mitigate risk contributors were considered: (1) physical repairs, (2) isolation of the facility from workers while containing the hazard, and (3) demolition of the facility, thereby eliminating the risk.

The cost of eliminating all critical, serious, and moderate risks is approximately \$15,932,354. This total cost is the cost of reducing all the identified risks to acceptable levels. These totals are based on the least expensive risk-reduction options; the total cost is higher if more expensive options are used. The minimum cost for eliminating all critical risk is \$1,738,368; to eliminate all serious risk is \$9,991,212; and to eliminate all moderate risk is \$4,202,772.

It is apparent in the cases of several facilities that significant risk-reduction can be obtained for an expenditure of between \$1,000 and \$5,000 for certain critical, serious, and moderate hazards. After this group of risk-reduction measures is obtained, costs for the next risk-reduction measures increase dramatically to the \$10,000 and \$100,000 range.

Tables 1, 2, and 3 show the minimum risk-reduction cost (by facility) for critical, serious, and moderate risk, respectively. These costs are based on selecting the least expensive options available for reducing risk.

Except for certain demolition costs, cost estimates in this evaluation are for comparison purposes only and are not meant as a basis to establish budgets. Most demolition costs were derived from the *Surplus Facilities Program Plan, Fiscal Year 1993*³. Other costs, such as isolation or repair costs, are determined by estimating actual materials and labor involved.

Also, it is apparent that isolating facilities to reduce risk is less expensive than the demolition or repair option for many facilities. However, yearly administrative costs incurred by isolating a building are not taken into account in this cost-comparison evaluation. Isolation also requires future administrative commitment that is difficult to quantify.

Another cost not accounted for in this evaluation is the cost of controlling biological and temperature extreme hazards. This cost was not included because it will be part of the administrative costs that will occur

³Winship, R. A., and M. C. Hughes, 1992, *Surplus Facilities Program Plan, Fiscal Year 1993*, WHC-EP-0231-5, Westinghouse Hanford Company, Richland, Washington.

on an annual basis for all facilities. Again, as with isolation measures, this control requires future administrative commitment that is difficult to quantify. This introduces a degree of uncertainty. General experience shows that a commitment to administrative controls will be strong initially, but decline with time. This could increase future risk and cost.

Table 1. Minimum Risk-Reduction Cost by Critical Risk.

Minimum cost for eliminating CRITICAL hazards		
Building	Hazard	Cost
105-B Reactor	Falling, electric shock	\$222,135
105-D Reactor	Electric shock	\$1,000
105-DR Reactor	Falling, electric shock	\$1,092,040
105-F Reactor	Falling, electric shock, fire	\$420,193
105-H Reactor	Electric shock	\$1,000
190-KW Process Water Pump House	Falling	\$1,000
221-U Canyon	Electric shock	\$1,000
Total		\$1,738,368.00

Table 2. Minimum Risk-Reduction Cost by Serious Risk.

Minimum cost for eliminating SERIOUS hazards		
Building	Hazard	Cost
105-C Reactor	Falling, electric shock	\$2,734,142
105-D Reactor	Falling	\$1,517,827
105-DR Reactor	Falling, struck-by, electric shock, explosion	\$400,787
105-F Reactor	Falling, electric shock	\$1,130,601
105-H Reactor	Falling, electric shock	\$1,289,069
105-KE Reactor	Electric shock	\$4,000
105-KW Reactor	Falling	\$694,135
103-B Riggers Loft	Electric shock	\$11,448
1701-BA Exclusion Area Badge House	Electric shock	\$1,000
1702-C Badge House	Electric shock	\$6,000
1714-C Solvent Storage	Electric shock	\$1,000
1713-H Warehouse	Struck-by, electric shock	\$5,000
165-KW Power Control	Electric shock	\$2,000
205-A Solvent Handling Facility	Falling	\$14,185
224-B Office and Canyon	Electric, radiation exposure	\$1,275,985
215-C Storage	Electric shock	\$41,856
212-P Fuel Storage Facility	Electric shock	\$29,450
212-R Fuel Storage Facility	Falling, electric shock	\$260,755
202-S Canyon	Radiation exposure	\$234,244
233-S Plutonium Concentration Facility	Struck, electric, radiation exposure	\$9,072
291-S Exhaust Fan Facility	Electric shock	\$1,650
241-SX-401 Waste Disposal Condenser House	Electric shock	\$47,733
241-SX-402 Waste Disposal Condenser House	Electric shock	\$47,733
221-U Canyon	Radiation exposure	\$209,580
292-U Jet Pit House	Electric shock	\$19,360
232-Z Plutonium Incinerator Facility	Radiation exposure	\$1,000
Total		\$9,995,214.00

Table 3. Minimum Risk-Reduction Cost by Moderate Risk.

Minimum cost for eliminating MODERATE hazards		
Building	Hazard	Cost
105-DR Reactor	Falling	\$3,000
105-KE Reactor	Radiation exposure	\$154,800
105-KW Reactor	Electric shock, radiation exposure	\$165,616
103-B Riggers loft	Falling	\$500
185-B Water Treatment Plant/ 190-B Main Pump House	Falling, struck-by, biological, temperature extreme	\$2,240,000
190-B Tunnel/Annex	Struck-by	\$200,000
183-C Filter Plant Pump Room	Struck-by, biological	\$235,000
103-D Fresh Metal Storage	Falling	\$1,000
108-F Biology Laboratory Building	Biological, temperature extreme	\$809,362
183-F Clearwell Facility	Falling	\$33,034
202-S Canyon Building	Fire	\$332,232
233-SA Exhaust Filter	Radiation exposure	\$1152
291-S Exhaust Fan Facility	Radiation exposure	\$990
2711-S Stack Gas Monitoring	Falling	\$16,786
271-U Office Building	Fire	\$1,000
291-U Exhaust Fan Facility	Radiation exposure, biological	\$990
232-Z Plutonium Incinerator Facility	Falling	\$7310
Total		\$4,202,772.00

Risk contribution from an explosion in the sodium burn facility attached to the 105-DR Reactor Building is a potential issue that has not been addressed in terms of cost or risk-reduction measures. A large quantity of sodium (39,000 lb) represents a significant explosion potential. A conservative estimation of this explosion risk was made because this facility is not under the management jurisdiction of WHC. Further investigation of this facility, therefore, is recommended. Accordingly, no cost is estimated for possible risk-reduction measures.

This cost-comparison was performed on the risk determination for the 0 to 5-year cases. Risk clearly increases with time and continued degradation as shown in the increase of scores for the 5 to 10-year case. Additionally, because of the previously discussed uncertainties and the fact that costs here are given in present value only, it is recommended that this cost-comparison

be updated periodically. As more experience in demolition and decommissioning is gained on the Hanford Site, an improvement of cost and risk estimates will occur.

As a final precautionary note, the process of reducing risk (e.g., roof repair) can actually introduce new risk. Therefore, all repair, isolation, and demolition activities should be analyzed carefully for risk concerns before work begins.

This page intentionally left blank.

CONTENTS

1.0	INTRODUCTION AND PURPOSE	1-1
2.0	CONCLUSIONS AND RECOMMENDATIONS	2-1
3.0	RESULTS	3-1
4.0	EVALUATION PROCESS	4-1
4.1	RISK-REDUCTION MEASURES	4-1
4.2	COSTS	4-13
4.2.1	Fix and Repair Costs	4-14
4.2.2	Isolation Costs	4-15
4.2.3	Demolition Costs	4-16
5.0	REFERENCES	5-1

APPENDICES

A	RISK-REDUCTION OPTION COSTS	A-1
B	105-F REACTOR REPAIR, ISOLATION, AND DEMOLITION WORK BREAKDOWN STRUCTURE	B-1
C	REPAIR COSTS	C-1
D	FACILITY ISOLATION COSTS	D-1
E	DEMOLITION COSTS	E-1
F	ISOLATION AND DEMOLITION CONSIDERATIONS	F-1

LIST OF FIGURES

3-1	Risk-Reduction Cost Comparison Master Flow Chart	3-2
4-1	105-B Reactor Building Plan View of Major Sections	4-5
4-2	105-C Reactor Building Plan View of Major Sections	4-6
4-3	105-D Reactor Building Plan View of Major Sections	4-7
4-4	105-DR Reactor Building Plan View of Major Sections	4-8
4-5	105-F Reactor Building Plan View of Major Sections	4-9
4-6	105-H Reactor Building Plan View of Major Sections	4-10
4-7	105-KE Reactor Building Plan View of Major Sections	4-11
4-8	105-KW Reactor Building Plan View of Major Sections.	4-12

LIST OF TABLES

3-1	Minimum Risk-Reduction Cost by Critical Risk	3-3
3-2	Minimum Risk-Reduction Cost by Serious Risk	3-3
3-3	Minimum Risk-Reduction Cost by Moderate Risk	3-4
3-4	Minimum Risk-Reduction Cost for Critical Risk	3-4
3-5	Minimum Risk-Reduction Cost for Serious Risk	3-5
3-6	Risk-Reduction Cost for Moderate Risk	3-6
3-7	100 Area Nonreactor Risk Contributors	3-7
3-8	200 Area Nonreactor Risk Contributors	3-8
3-9	105 Reactor Building Section Risk Contributors	3-9
4-1	Option Viability for the 100 Area Nonreactor Facilities	4-2
4-2	Option Viability for the 200 Area Facilities	4-3
4-3	Option Viability for the 105 Reactor Buildings	4-4

**RISK-REDUCTION COST COMPARISON FOR
THE RETIRED HANFORD SITE
FACILITIES**

1.0 INTRODUCTION AND PURPOSE

This document provides a cost-comparison evaluation of implementing risk-reduction measures on the 100 and 200 Area retired, surplus facilities at the Hanford Site. It includes cost-comparisons for different risk-reduction options and their effect on the overall risk of the 100 and 200 Area retired, surplus facilities. The evaluation is based on conditions that existed at the time the risk evaluation team performed investigations on the facilities. This document does not acknowledge risk-reduction measures that occurred soon after risk identification.

This document is the fourth in a four volume series that comprise the risk management study for the retired, surplus facilities. Volume 1 is the executive summary of the risk management study; volume 2 is the risk evaluation work procedure; volume 3 provides the results of the risk evaluation; and volume 4 is the risk-reduction cost comparison.

This cost comparison is part of an overall risk management study for the retired, surplus facilities. This evaluation builds on risk results documented in Coles et al. 1993 that included the development of risk information.

The overall risk management study is the product of a major effort performed in fiscal year 1993 to produce qualitative information that characterizes certain risks associated with these surplus facilities. The primary motivation for this effort is an integrated action plan outlined in correspondence (Hughes 1992) from Westinghouse Hanford Company (WHC) to the U.S. Department of Energy, Richland Operations Office (RL) following the fatal accident that occurred at the 105-F Reactor Building in 1992. The plan is a response to a large number of findings, recommendations, and proposed actions that followed reviews of that accident.

The objectives of this cost-comparison evaluation are based on the objectives of the risk evaluation. The objectives of the risk evaluation were to (1) identify on a qualitative basis the risk to humans and the environment from retired, surplus facilities; (2) differentiate risk in near term (0 to 5 years) and long term (5 to 10 years); and (3) use a common basis for evaluating risk that provides a basis of comparison and prioritization between facilities and risks. The objectives of this cost-comparison evaluation are (1) to determine relative costs for reducing risk to acceptable levels, and (2) to compare the cost of reducing risk at different retired facilities using various risk-reduction options. Accordingly, the cost-effective, risk-reduction measures can be identified.

This evaluation was performed on risks identified for the 0 to 5-year cases. Risk clearly increases with time and continued degradation as shown in the increase of scores for the 5 to 10-year cases. Therefore, this evaluation should be updated periodically to monitor and reflect this predicted increase.

Not all the risks identified in Coles et al. 1993 are significant. Only the risks rated as critical, serious, or moderate are considered important risk contributors and candidates for risk-reduction.

In this evaluation, three general ways to mitigate risk contributors are considered: (1) physical repairs or fixes, (2) isolation of the facility from workers while containing the hazard, and (3) demolition of the facility, consequently eliminating the risk.

The cost estimates in this evaluation are for comparing similar types of risk-reduction costs only and are not intended for establishing budgets. Most demolition costs are from the *Surplus Facilities Program Plan, Fiscal Year 1993* (Winship and Hughes 1992). Other costs, such as isolation or repair costs, are determined by estimating actual materials and labor involved.

Section 2.0 provides a summary of results, conclusions, and insights. Section 3.0 includes the results and risk-reduction options, their corresponding costs, and other supporting information. Section 4.0 provides a discussion of the evaluation process and the basis for the risk-reduction measures, their associated costs, and other supporting information.

2.0 CONCLUSIONS AND RECOMMENDATIONS

The total cost for reducing all risk to an acceptable level is \$15,932,354. The cost to eliminate all critical risk is \$1,738,368; to eliminate all serious risk is \$9,991,212; and to eliminate all moderate risk is \$4,202,772. In general, the most benefit is obtained by addressing the critical risks because these are the least expensive to remediate and contribute the most to the overall risk.

It is apparent in several facilities that significant risk reduction can be obtained for an expenditure of between \$1,000 and \$5,000 for certain critical, serious, and moderate hazards. After this group of risk-reduction measures is obtained, the costs for the next risk-reduction measures increase dramatically to the \$10,000 and \$100,000 range.

Of the three options for reducing risk, demolition not only reduces risk but also meets the goal of decommissioning facilities. In a similar way, isolating a facility partially fulfills decommissioning goals because most of the hazardous material is removed in the process. Repairing the facilities is generally the most expensive option and does little in terms of meeting long-term decommissioning goals.

It is also apparent that isolating facilities to reduce risk is less expensive than the demolition or repair option for many facilities. However, yearly administrative costs incurred by isolating a building are not taken into account in this evaluation. Isolation also requires future administrative commitment that is difficult to quantify.

The cost of controlling biological and temperature extreme hazards is not accounted for in this evaluation. This cost was not included because it will be part of the administrative costs that occur on an annual basis for all facilities. Again, as with the isolation measures, this control requires future administrative controls that are hard to quantify; this introduces a degree of uncertainty. General experience shows that a commitment to administrative controls will initially be strong, but will decline with time--this could increase future risk and cost.

Given the previously discussed uncertainties and the fact that costs here are given in present value only, it is recommended that this cost-comparison evaluation be updated periodically. As more experience in demolition and decommissioning is gained on the Hanford Site, an improvement in cost and risk estimates will be possible.

As a final precautionary note, the process of reducing risk (e.g., roof repair) can actually introduce new risk. Therefore, all repair, isolation, and demolition actions should be analyzed carefully for risk concerns.

This page intentionally left blank.

3.0 RESULTS

This section provides costs and cost-comparisons for reducing risk at the retired, surplus facilities. It provides the total cost of reducing all risk to an acceptable level, and independently eliminating critical, serious, and moderate risks. It also compares risk on a facility and risk-category basis. Risks that are rated critical, serious, or moderate are considered unacceptable.

Although the objective of risk-reduction measures is to reduce risk to an acceptable level (i.e., minor or negligible risk categories), other layers of lesser, but still important, risk issues may be uncovered. For example, the roof may be repaired to mitigate critical falling hazards, but a serious falling hazard related to guard rails remain. These issues are addressed by increasing levels of detail.

The cost for eliminating all critical, serious, and moderate risks is \$15,932,354. This total cost is the cost of reducing all risk to an acceptable level. These totals are based on the least expensive risk-reduction options. The total cost would be higher if more expensive options are used. The minimum cost for eliminating all critical risk is \$1,738,368; to eliminate all serious risk is \$9,991,212; and to eliminate all moderate risk is \$4,202,772.

The rest of the information in this section is presented in a series of tables with an increasing level of detail. The most general tables are presented first. The general information provides a basic overall summary; an increased understanding can be achieved by analyzing the succeeding tables that provide specific risk-reduction measures and corresponding costs. Figure 3-1 shows how the tables relate to each other. For example, it shows that data in Table 3-1 were derived from Table 3-4. The information in Table 3-4 is derived from the data in Appendix A, Tables A-1 through A-9.

The most general information is contained in Tables 3-1, 3-2, and 3-3. The minimum risk-reduction total cost by facility for critical, serious, and moderate risk is provided in these tables, respectively. Again, these total costs are based on the least expensive options for reducing risk. For certain facilities, important risk-reduction can be obtained for low expenditures (\$1,000 to \$5,000).

Figure 3-1. Risk-Reduction Cost Comparison Master Flow Chart.

*Provided in Coles et al. 1993.

Table 3-1. Minimum Risk-Reduction Cost by Critical Risk.

Minimum cost for eliminating CRITICAL hazards		
Building	Hazard	Cost
105-B Reactor	Falling, electric shock	\$222,135
105-D Reactor	Electric shock	\$1,000
105-DR Reactor	Falling, electric shock	\$1,092,040
105-F Reactor	Falling, electric shock, fire	\$420,193
105-H Reactor	Electric shock	\$1,000
190-KW Process Water Pump House	Falling	\$1,000
221-U Canyon	Electric shock	\$1,000
Total		\$1,738,368.00

Table 3-2. Minimum Risk-Reduction Cost by Serious Risk.

Minimum cost for eliminating SERIOUS hazards		
Building	Hazard	Cost
105-C Reactor	Falling, electric shock	\$2,734,142
105-D Reactor	Falling	\$1,517,827
105-DR Reactor	Falling, struck-by, electric shock, explosion	\$400,787
105-F Reactor	Falling, electric shock	\$1,130,601
105-H Reactor	Falling, electric shock	\$1,289,069
105-KE Reactor	Electric shock	\$4,000
105-KW Reactor	Falling	\$694,135
103-B Riggers Loft	Electric shock	\$11,448
1701-BA Exclusion Area Badge House	Electric shock	\$1,000
1702-C Badge House	Electric shock	\$6,000
1714-C Solvent Storage	Electric shock	\$1,000
1713-H Warehouse	Struck-by, electric shock	\$5,000
165-KW Power Control	Electric shock	\$2,000
205-A Solvent Handling Facility	Falling	\$14,185
224-B Office and Canyon	Electric, radiation exposure	\$1,275,985
215-C Storage	Electric shock	\$41,856
212-P Fuel Storage Facility	Electric shock	\$29,450
212-R Fuel Storage Facility	Falling, electric shock	\$260,755
202-S Canyon	Radiation exposure	\$234,244
233-S Plutonium Concentration Facility	Struck, electric, radiation exposure	\$9,072
291-S Exhaust Fan Facility	Electric shock	\$1,650
241-SX-401 Waste Disposal Condenser House	Electric shock	\$47,733
241-SX-402 Waste Disposal Condenser House	Electric shock	\$47,733
221-U Canyon	Radiation exposure	\$209,580
292-U Jet Pit House	Electric shock	\$19,360
232-Z Plutonium Incinerator Facility	Radiation exposure	\$1,000
Total		\$9,995,214.00

Table 3-3. Minimum Risk-Reduction Cost by Moderate Risk.

Minimum cost for eliminating MODERATE hazards		
Building	Hazard	Cost
105-DR Reactor	Falling	\$3,000
105-KE Reactor	Radiation exposure	\$154,800
105-KW Reactor	Electric shock, radiation exposure	\$165,616
103-B Riggers loft	Falling	\$500
185-B Water Treatment Plant/ 190-B Main Pump House	Falling, struck-by, biological, temperature extreme	\$2,240,000
190-B Tunnel/Annex	Struck-by	\$200,000
183-C Filter Plant Pump Room	Struck-by, biological	\$235,000
103-D Fresh Metal Storage	Falling	\$1,000
108-F Biology Laboratory Building	Biological, temperature extreme	\$809,362
183-F Clearwell Facility	Falling	\$33,034
202-S Canyon Building	Fire	\$332,232
233-SA Exhaust Filter	Radiation exposure	\$1152
291-S Exhaust Fan Facility	Radiation exposure	\$990
2711-S Stack Gas Monitoring	Falling	\$16,786
271-U Office Building	Fire	\$1,000
291-U Exhaust Fan Facility	Radiation exposure, biological	\$990
232-Z Plutonium Incinerator Facility	Falling	\$7310
Total		\$4,202,772.00

An increased level of detail is provided in Tables 3-4, 3-5, and 3-6. The risk-reduction cost by facility for critical, serious, and moderate risk is provided in these tables, respectively. In this level, the cost for each viable risk-reduction option is provided and the reactor buildings are divided into facility sections.

Table 3-4. Minimum Risk-Reduction Cost for Critical Risk.

Costs for eliminating CRITICAL hazards				
Building/section	Hazard	Fix option	Isolation option	Demolition option
105-B/storage basin	Electric shock	\$43,385	*	*
105-B/fan house	Electric shock	\$41,760	*	*
105-B/process area	Electric shock	\$844,285	*	*
105-B/work/valve pit area	Electric shock, falling	\$68,495	*	*
105-B/office/miscellaneous	Electric shock	\$24,210	*	*
105-D/process area	Electric shock	\$1,000	*	*
105-DR/storage basin	Falling, electric shock	\$834,130	\$320,050	*
105-DR/process area	Electric shock	\$1,000	*	*
105-DR/work/valve pit area	Falling	\$770,990	*	*
105-F/storage basin	Falling	\$577,005	\$26,631	*
105-F/fan house/valve pit	Electric, fire	*	*	\$393,562
105-H/process area	Electric shock	\$1,000	*	*
190-KW Process Water Pump House	Falling	\$1,000	*	\$2,802,666
221-U Canyon	Electric shock	\$1,000	*	\$156,452,000

* Not a viable option.

Table 3-5. Minimum Risk-Reduction Cost for Serious Risk.

Costs for eliminating SERIOUS hazards				
Building/section	Hazard	Repair option	Isolation option	Demolition option
105-C/storage basin	Falling, electric shock	\$972,720	\$270,772	*
105-C/fan house	Falling, electric shock	\$708,400	\$197,340	\$688,160
105-C/process area	Falling, electric shock	\$1,217,230	*	*
105-C/work area	Falling, electric shock	\$1,048,600	*	*
105-D/storage basin	Falling	\$578,005	\$26,631	*
105-D/fan house	Falling	\$547,105	\$25,056	\$217,152
105-D/process area	Falling	\$575,705	*	*
105-D/work/valve pit area	Falling	\$890,435	*	*
105-DR/storage basin	Struck-by, falling, explosion	\$2,200	\$320,050	*
105-DR/fan house	Falling, explosion	\$380,120	\$168,422	\$523,980
105-DR/process area	Falling, explosion	\$1,000	*	*
105-DR/work/valve pit area	Struck-by, electric shock, explosion	\$59,340	*	*
105-DR/office/miscellaneous	Falling, electric shock, explosion	\$476,510	\$169,825	\$382,704
105-F/storage basin	Electric shock	\$44,385	\$26,631	*
105-F/process area	Falling, electric shock	\$619,990	*	*
105-F/work area	Falling, electric shock	\$483,980	*	*
105-H/storage basin	Falling	\$904,240	\$240,024	\$1,633,896
105-H/process area	Falling, electric shock	\$731,080	*	*
105-H/work area	Falling, electric shock	\$317,965	*	*
105-KE/control/fan room/miscellaneous	Electric shock	\$2,000	*	*
105-KE/process area	Electric shock	\$1,000	*	*
105-KE/work, supply fan area	Electric shock	\$1,000	*	*
105-KW/work/supply fan area	Falling	\$694,135	*	*
103-B Riggers Loft	Electric shock	\$11,448	*	\$51,000
1701-BA Exclusion Area Badge House	Electric shock	\$1,000	*	\$12,000
1702-C Badge House	Electric shock	*	\$15,053	\$6,000
1714-C Solvent Storage	Electric shock	\$1,000	*	\$13,398
1713-H Warehouse	Struck-by, electric shock	\$5,000	*	\$524,000
165-KW Power Control	Electric shock	\$2,000	*	*
205-A Solvent Handling	Falling	*	\$14,185	\$481,000
224-B Office and Canyon	Electric, radiation exposure	*	\$1,275,985	\$14,835,000
215-C Storage	Electric shock	*	\$41,856	\$87,740
212-P Fuel Storage	Electric shock	\$29,450	*	\$1,343,000
212-R Fuel Storage	Falling, electric shock	*	\$260,755	\$1,343,000
202-S Canyon	Struck, electric shock, radiation exposure	\$234,244	*	\$174,582,000
233-S Plutonium Concentration	Struck, electric shock, radiation exposure	\$9,072	*	\$16,873,000
291-S Exhaust Fan	Electric shock	\$1,650	*	\$1,034,000
241-SX-401 Waste Disposal Condenser House	Electric shock	*	\$47,733	*
241-SX-402 Waste Disposal Condenser House	Electric shock	*	\$47,733	*
221-U Canyon	Electric shock, radiation exposure	\$209,580	*	\$154,178,630
292-U Jet Pit House	Electric shock	*	\$24,162	\$19,360
232-Z Plutonium Incinerator Facility	Radiation exposure	\$1,000	*	\$2,370,000

* Not a viable option.

Table 3-6. Risk-Reduction Cost for Moderate Risk.

Costs for eliminating MODERATE hazards				
Building/section	Hazard	Repair option	Isolation option	Demolition option
105-DR/storage basin	Falling	\$1,000	\$320,050	^a
105-DR/fan house	Falling	\$1,000	\$0 ^b	\$0 ^b
105-DR/process area	Falling	\$1,000	^a	^a
105-DR/work area	Falling	\$1,000	^a	^a
105-DR/office/miscellaneous	Falling	\$1,000	\$0 ^b	\$0 ^b
105-KE/process area	Radiation exposure	\$154,800	^a	^a
105-KW/process area	Electric shock, radiation exposure	\$165,616	^a	^a
103-B Riggers Loft	Falling	\$500	^a	\$51,000
185-B Water Treatment Plant/ 190-B Main Pump House	Falling, struck-by, biological, temperature extreme	^{c, a}	^a	\$2,240,000
190-B Tunnel/Annex	Struck-by	^a	^a	\$200,000
183-C Filter Plant Pump Room	Struck-by, biological	^c \$5,915,520	\$2,328,654	\$235,000
103-D Fresh Metal Storage	Falling	\$1,000	\$49,125	\$49,000
108-F Biology Laboratory	Biological, temperature extreme	^{c, a}	\$809,362	\$4,272,000
183-F Clearwell	Falling	^a	\$33,034	\$73,803
202-S Canyon	Fire	\$332,232	^a	\$174,582,084
233-SA Exhaust Filter	Radiation exposure	\$1,152	^a	\$1,330,000
291-S Exhaust Fan	Radiation exposure	\$990	^a	\$113,770
2711-S Stack Gas Monitoring	Falling	^a	\$16,786	\$57,184
271-U Office	Fire	\$1,000	^a	\$1,598,000
291-U Exhaust Fan	Radiation exposure, biological	^c \$990	^a	\$113,770
232-Z Plutonium Incinerator	Falling	\$7,310	^a	\$0 ^b

Notes:

^a Not a viable option.^b These hazards were eliminated when the serious hazards were eliminated by isolation or demolition; therefore, no additional expenditure is required.^c Biological hazards and temperature extreme hazards were rated as moderate in many facilities; however, the cost of mitigation is not included here because the cost for related controls will be included in administrative costs for all facilities.

The third level of detail is provided in Appendix A. These tables provide risk-reduction option costs for each 100 and 200 Area retired facility. Because removing or isolating a portion of the reactor might be advantageous, the reactor facilities are divided into sections. These tables display costs for different risk-reduction options associated with an individual facility. They show the hazard each cost is associated with and which risk category that hazard was grouped with. Additionally, index numbers that correspond to individual descriptions of dominant risk contributors are contained in Tables 3-7, 3-8, and 3-9.

Table 3-7. 100 Area Nonreactor Risk Contributors.

Designator	Description	Risk category
A	General degradation of electrical system in the 103-B Riggers Loft Building	Serious
B	Degraded guardrail on loading ramp on south end of the 103-Riggers Loft Building	Moderate
C	Generally degraded roof over the 185-B Water Treatment Plant and 190-B Main Pump House	Moderate
D	Biological and temperature extreme hazards	Moderate
E	Protruding metal brackets (global) and nails at the 190-B Tunnel/Annex	Moderate
F	Energized light fixture and raceway at the outside north end of the 1701-BA Exclusion Area Badge House	Serious
G	Generally degraded roof over the 183-C Filter Plant Pump Room; a new roof is needed	Moderate
H	Protruding conductors from disconnect so they can be energized on the inside of the south wall of the 1702-C Badge House	Serious
I	Protruding conductors from disconnect can be energized on the outside north wall of the 1714-C Solvent Storage Building	Serious
J	Degraded wooden steps and guard rails near the loading ramp on the west side of the 103-D Fresh Metal Storage Building	Moderate
K	Semicollapsed 183-F Clearwells need to be demolished, filled in, and graded	Moderate
L	Degraded interior wall between south and north sections need to be reinforced with structural steel at the 1713-H Warehouse	Serious
M	Degraded electrical panel "C" at the north end of the building and receptacles on the south wall of the north end of the 1713-H Warehouse	Serious
N	Degraded flexible power cord for a battery pack on the west wall of the ground floor electrical room; degraded 120-V heater control circuit on the concrete column in the control room needs to be metallic sheathed at the 165-KW Power Control Building	Serious
O	Damaged floor grate outside the fenced area inside the 190-KW Process Water Pump House	Critical

Table 3-8. 200 Area Nonreactor Risk Contributors.

Designator	Description	Risk category
A	Degraded roof over the valve protection area of the 205-A Solvent Handling Facility needs to be replaced	Serious
B	Cover plate over the pipe trench in the 205-A Solvent Handling Facility basin area is missing	Moderate
C	Deteriorated circular foundations under tanks TK-P1, TK-P2, TK-P3, and TK-P4 need reinforcement to reduce a struck-by hazard	Moderate
D	General electrical degradation at the 224-B Office and Canyon Building	Serious
E	The door to the canyon is severely contaminated; additionally, there is poor contamination control and radioactive debris at the 224-B Office and Canyon Building	Serious
F	Cover of the main "E" electrical panel in the electrical room on the west side of the 215-C Storage Building is missing	Serious
G	Contamination is spread by biological agents; particularly, birds at the 215-C Storage Building	Moderate
H	General electrical degradation at the 212-P Fuel Storage Facility	Serious
I	The degraded roof at the 212-R Fuel Storage Facility needs a delta roof. There are improper guards for ladder access into the basin located on the west walkway	Serious
J	Damaged steps at the outside southwest side and supply fan room on the east side of the 212-R Fuel Storage Facility	Moderate
K	Electric hazards associated with light fixtures at the north wall of the basin above the east doorway and north wall of the transfer bay above the west doorway at the 212-R Fuel Storage Facility	Serious
L	Biological and temperature extreme hazards	Moderate
M	Severely degraded cantilever support of a roof beam in the locker room of the 202-S Canyon Building needs reinforcement	Serious
N	General electrical degradation at the 202-S Canyon Building	Serious
O	Poor radiation control, particularly related to posting and labeling in the 202-S Canyon Building	Serious
P	Debris around the transformers north outside the location of the 202-S Canyon Building	Moderate
Q	Poor radiation control and building maintenance at the 233-S Plutonium Concentration Facility	Serious
R	Poor radiation control and building maintenance at the 233-SA Exhaust Filter Building	Moderate
S	General electrical degradation at the 291-S Exhaust Fan Facility	Serious
T	Poor radiation control building and building maintenance at the 291-S Exhaust Fan Facility	Moderate
U	Badly degraded wooden roof at the 2711-S Stack Gas Monitoring Building	Moderate
V	Degraded electrical distribution panel at the outside southwest corner, and the label for incoming fuel service at the 241-SX-401 Waste Disposal Condenser House Building needs to be replaced	Serious
W	Electrical distribution control panel at the south end of the building needs to be repaired; several roof leaks at the 241-SY-402 Waste Disposal Condenser House that contribute to this electrical hazard also needs repair	Serious
X	Degraded four square electrical box above operating gallery just above door 11 at the 221-U Canyon Building	Critical
Y	Steam leak in motor control center in the electrical gallery, Section 89 at the 221-U Canyon Building	Critical
Z	Poor radiation control and maintenance, contaminated scape equipment, and improper posting and labelling	Moderate
AA	Degraded fluorescent light fixture in the shower stall at the 271-U Office Building	Moderate
BB	Poor radiation control, including improper posting and labeling at the 291-U Exhaust Fan Facility	Moderate
CC	Degraded electrical service to the 292-U Jet Pit House	Serious
DD	Degraded metal stair-landing outside the 232-Z Plutonium Incinerator Facility	Moderate
EE	Poor radiation control and maintenance at the 232-Z Plutonium Incinerator Facility	Serious

Table 3-9. 105 Reactor Building Section Risk Contributors.

Designator	Description	Risk category
All	Biological and temperature extreme hazards	Moderate
A	Critical general degradation of the electrical system in the 105-B storage basin, fan house, process area, work area/valve pit area, and office/miscellaneous areas	Critical
B	Generally degraded roof over the 105-C storage basin/miscellaneous storage area, fan house, work area, control room, electrical room, and process area	Serious
C	General degradation of the electrical system in the 105-C storage basin, miscellaneous storage area, fan house, work area, control room, electrical room, and process area	Serious
D	Bare energized 440-V wires, outside south wall, north of the Sample Building at the 105-D Reactor Building	Critical
E	Generally degraded roof over the 105-D storage basin, fan house, process area and work/valve pit area; floor planks near the east access of the storage basin need to be replaced	Serious
F	Critical general degradation of the roof over the 105-DR storage basin and work/valve pit area	Critical
G	Hazards include unprotected energized wires hanging from the conduit in the north wall of the hallway between the metal storage and transfer area; exposed energized conductors on the wet wall of the storage basin; and a water leak into a light fixture and conduit near the rear south side stairwell (30-ft level) of process area	Critical
H	Sodium reaction hazard from nearby facility for 105-DR Building occupants	Serious
I	Hazards include general degradation of the roof over the 105-DR Fan House and office/miscellaneous space; severely degraded wood planking on the north side of the X-1 level needs reinforcement; guardrail that was cut in half at north side of far-side laboratory area needs to be heightened; and there are 2-ft gaps in guard rails at the storage basin area	Serious
J	General degradation of electrical system for the 105-DR work/valve pit area and office/miscellaneous space	Serious
K	Deformed grating throughout the 105-DR Building	Moderate
L	Protruding exposed rebar on exterior south side of the 105-DR Building	Moderate
M	Critical general degradation of roof over the 105-F storage basin	Critical
N	Critical general degradation of the electrical system in the 105-F Fan House/valve pit area	Critical
O	General electrical degradation in the 105-F storage basin, process, and work area	Serious
P	General degradation of the 105-F building in process work area and fan house/valve pit near delta roof	Serious
Q	Critical electrical hazard in the plastic film greenhouse and exposed energized conductors in the southeast corner of power block S of the outer rod room in 105-H Building	Critical
R	Hazards include general degradation of the 105-H roof over storage basin/mechanical shop area, process and work area; cages are missing from fixed metal ladders, and metal protrusions exist	Serious
S	Exposed energized conductors in men's change room between corridors 11 and 13, and at the northeast corner of the power block area (instrument repair shop)	Serious
T	Hazards include energized conductors at the 105-KE "F" elevator lobby and corridor 6 north of the lobby; energized conductors associated with thermostat on concrete column in the center of the control room; abrasion and electrical shock potential in instrument cabinet at east end of the control room; and energized conductors associated with the light switch on the west side of the work-area fuel spacer storage area	Serious
U	Hazards include contamination, poor posting, and lack of radiation control in the 3X equipment area, top of the reactor, and inner and outer rod control rooms of the 105-KW Reactor Building	Moderate
V	Energized conductors below equipment racks under staircase on the east side of the reactor	Moderate
W	Hazards include contamination, poor posting, and lack of radiation control in the 3X equipment area, top of the reactor and inner and outer rod control rooms of the 105-KW Reactor Building	Moderate
X	Degraded roof over the 105-KW work area/supply fan area	Serious

In the Appendix A tables, note "a" indicates that the corresponding risk-reduction option is not considered viable. For example, in Table A-1 for critical risks, isolating or demolishing the 105-B Reactor Building is not an option; this building is a registered, national historical landmark and tours are provided regularly through the facility. These tables do not identify what is involved in the cost-reduction measure other than the hazard category it is associated with.

Eliminating the risk represented by one hazard might reduce or eliminate another. For example, money spent to reduce a critical risk (such as falling through a deteriorated roof) might also reduce a lesser risk, such as being struck by a falling roof member. This is the case for the 105-F Reactor Building storage and transfer area (shown in Table A-5). Accordingly, no additional money is needed to reduce the lesser risk.

Tables 3-4, 3-5, and 3-6 contain specific descriptions of the dominant risk contributors. These statements are summarized from results presented in Coles et al. (1993) and are specific enough to develop cost estimates.

Risk contribution from an explosion in the sodium burn facility attached to the 105-DR Reactor Building is an issue that has not been addressed in terms of cost or risk-reduction measures. A large quantity of sodium (39,000 lb) represents a significant explosion potential. A conservative estimation of this explosion risk was made because this facility is not under the management jurisdictions of WHC, which manages the 105-DR Reactor Building. In addition, a large degree of uncertainty concerning this sodium burn facility also contributed to the conservative estimation. Further investigation of this facility is recommended. Accordingly, no cost was estimated for possible risk-reduction measures.

4.0 EVALUATION PROCESS

The evaluation process consists of identifying the dominant risk contributors and determining appropriate risk-reduction measures and associated costs. Decision making is introduced because there is typically more than one way to reduce a particular specific risk contributor, and removal of these eliminating contributors have varying effects on risk reduction. These different ways of eliminating risk are referred to as risk-reduction options and each have different estimated costs.

In the preparation of this evaluation, it was assumed that risks rated critical, serious, or moderate were not acceptable and were considered dominant risk contributors. Accordingly, risk-reduction measures reduce risks to minor or negligible levels. A wide spectrum of risk contributors rated as minor are identified in Coles et al. (1993). These are not considered significant risk contributors and would be expensive to mitigate or remove. However, these hazards should be monitored periodically to determine if the associated risk increases.

Although the objective of risk-reduction measures is to reduce risk to an acceptable level (i.e., minor or negligible risk categories), other layers of lesser but still important risk issues may be uncovered. For example, the roof may be repaired to mitigate a critical falling hazard, but a serious falling hazard related to guard rails remain. These issues are addressed in tables by increased levels of detail.

The cost comparison of risk reduction in levels of detail are provided in this section. For example, it might cost \$15 million to reduce risk at all the reactor facilities to an acceptable level. However, this fact alone does not provide any specific information how reduction should be performed and where the cost should be incurred; more information is needed. Some levels of detail may not be needed in some cases, but may be needed in others. The levels of detail provided in this evaluation are sufficient to help management develop actual work plans to reduce specific risk contributors.

Section 4.1 provides a description of how risk-reduction measures and costs were determined.

4.1 RISK-REDUCTION MEASURES

Dominant risk contributors are those most important to a critical, serious, or moderate risk rating. Dominant risk contributors are identified in Coles et al. (1993). Descriptions of dominant risk contributors are identified in this evaluation with sufficient detail that personnel and material requirements for cost estimating can be performed. A summary of these dominant risk contributors is provided in Tables 3-5, 3-6, and 3-7.

The cost of risk-reduction measures at the retired reactor buildings are subdivided by building sections for cost-comparison advantages. This enables the reduction of risk by repairing, isolating, or demolishing only the important section or sections. This is especially true for specific hazards that occur only in localized parts of a facility. The reactors have been

subdivided into four or five major sections by the structural safety investigator. These subdivisions are used in reporting risk-reduction measures and are shown in Figures 4-1 through 4-8.

In this evaluation, three general classes of risk-reduction options were addressed: (1) physical repairs, (2) isolation of the facility from workers while containing the hazard, and (3) demolition of the facility, consequently eliminating the risk. Some risk-reduction options are not viable. Tables 4-1, 4-2, and 4-3 indicate which risk-reduction options are considered and which are not viable.

In general, most facilities (with the exception of the 105-B Reactor Building, sections of other reactor facilities, and two 200 Area facilities) can be demolished. If there is a use or activity planned for a particular facility or section, demolition is not considered an option. In many cases, it is not considered feasible to isolate a facility if there is some process, use, or monitoring activity still occurring. It is also not considered feasible to isolate a highly contaminated facility, as the cost to contain and isolate the hazardous material without demolishing it would be prohibitive. In still other cases, it would be inappropriate to repair a facility that has no planned or current use scheduled for early demolition, or if repair costs are very high compared to other risk-reduction options.

Table 4-1. Option Viability for the 100 Area Nonreactor Facilities.

Building	Repair	Isolation	Demolition
103-B Riggers Loft	x	--	x
185-B Water Treatment Plant/ 190-B Main Pump House	--	--	x
190-B Tunnel/Annex	--	--	x
1701-BA Exclusion Area Badge House	x	--	x
183-C Filter Plant Pump Room	x	x	x
1702-C Badge House	--	x	x
1714-C Solvent Storage	x	--	x
103-D Fresh Metal Storage	x	x	x
108-F Biology Laboratory Building	--	x	x
183-F Clearwell Facility	--	x	x
1713-H Warehouse	x	--	x
182-K Emergency Water Reservoir and Pump House	x	x	x
115-KE Gas Recirculation	--	x	x
115-KW Gas Recirculation	--	x	x
165-KW Power Control	x	--	--
183-KW Filter Plant	x	--	x
190-KW Process Water Pump House	x	--	x

--Not considered a viable option.

xConsidered to be a viable option.

Table 4-2. Option Viability for the 200 Area Facilities.

Building	Repair	Isolation	Demolition
205-A Solvent Handling	--	X	X
224-B Office and Canyon	--	X	X
215-C Storage	--	X	X
212-P Fuel Storage	X	--	X
212-R Fuel Storage	--	X	X
202-S Canyon	X	--	X
233-S Plutonium Concentration	X	--	X
233-SA Exhaust Filter	X	--	X
291-U Exhaust Fan Room	X	--	X
293-S Offgas Treatment	--	X	X
2711-S Stack Gas Monitoring	--	X	X
2718-S Sand Filter Sampler	--	X	X
2904-SA Cooling Water Sampler	X	--	X
241-SX-401 Waste Disposal Condenser House	--	X	--
241-SX-402 Waste Disposal Condenser House	--	X	--
221-U Canyon	X	--	X
271-U Office	X	--	X
291-U Exhaust Fan	X	--	X
292-U Jet Pit House	--	X	X
232-Z Plutonium Incinerator	X	--	X

Notes:

--Not considered a viable option.

XConsidered to be a viable option.

Table 4-3. Option Viability for the 105 Reactor Buildings.

Building/sections	Repair	Isolation	Demolition
105-B Reactor Building			
Storage basin and transfer area	x	--	--
Fan house	x	--	--
Process area	x	--	--
Work area/valve pit area	x	--	--
Office/miscellaneous	x	--	--
105-C Reactor Building			
Storage basin/miscellaneous storage	x	x	--
Fan house	x	x	x
Process area	x	--	--
Work area	x	--	--
105-D Reactor Building			
Storage basin and transfer area	x	x	--
Fan house	x	x	x
Process area	x	--	--
Work area/valve pit	x	--	--
Office/miscellaneous	x	x	x
105-DR Reactor Building			
Storage area and transfer area	x	x	--
Fan house	x	x	x
Process area	x	--	--
Work area/valve pit area	x	--	--
Office/miscellaneous	x	x	x
105-F Reactor Building			
Storage basin and transfer area	x	x	--
Fan house/valve pit area	--	--	x
Process area	x	--	--
Work area	x	--	--
Office/miscellaneous	x	x	x
105-H Reactor Building			
Storage basin/mechanical shop	x	x	x
Fan house	x	x	--
Process area	x	--	--
Work area	x	--	--
Control room/offices	x	x	x
Plastic film greenhouse	x	--	x
105-KE Reactor Building			
Storage basin and transfer area	x	--	--
Control room/exhaust fan room/miscellaneous	x	--	--
Process area	x	--	--
Work area/supply fan area	x	--	--
105-KV Reactor Building			
Storage basin and transfer area	x	--	--
Control room/exhaust fan room/miscellaneous	x	--	--
Process area	x	--	--
Work area/supply fan room/ miscellaneous	x	--	--

Notes:

--Not considered a viable option.

XConsidered to be a viable option.

Figure 4-1. 105-B Reactor Building Plan View of Major Sections.

Figure 4-2. 105-C Reactor Building Plan View of Major Sections.

Figure 4-3. 105-D Reactor Building Plan View of Major Sections.

Figure 4-4. 105-DR Reactor Building Plan View of Major Sections.

Figure 4-5. 105-F Reactor Building Plan View of Major Sections.

Figure 4-6. 105-H Reactor Building Plan View of Major Sections.

Figure 4-7. 105-KE Reactor Building Plan View of Major Sections.

Figure 4-8. 105-KW Reactor Building Plan View of Major Sections.

4.2 COSTS

Cost of risk-reduction measures are estimated for dominant risk contributors. These costs are calculated as present values only. When future estimates are needed, it is assumed that cost and risk updates will be performed by integrating more current information gained from decommissioning and demolition experience. This section provides the cost estimation for repair, isolation, and demolition risk-reduction measures.

Cost for risk-reduction measures for biological hazards and temperature extremes will be applied at the program level for all retired reactor buildings. Because this is an annual cost and will be incurred regardless of risk-reduction decisions, it is not estimated as a cost in this evaluation.

Costs of risk-reduction measures are estimated using unit costs with one exception--costs associated with demolition were derived from Winship and Hughes (1992). Specific unit costs were developed for different kinds of work activity on the Hanford Site. Several unit costs were developed by using the 105-F Reactor Building as a baseline building (provided in detail in Appendix B). The following unit costs were used in this evaluation:

- Delta Roof System (\$50.00 to \$65.00/ft²). The more expensive system should be used in cases where a stub wall has to be built at the perimeter of the structure to span across the roof-mounted duct and equipment
- Netting (\$15 per square foot). Should be installed to prevent damaged masonry roof panels from falling
- Nonradiation asbestos removal and disposal (\$22.00 per square foot). Costs double when removing asbestos from a radiation zone
- Decontamination of low-level waste on wall and floor surfaces (\$16.00 per square foot)
- Removal of equipment (nonradiation), dense \$58.00; medium \$40.00; and light \$20.00 (all costs per square foot)
- Nonradiation demolition and disposal (\$26.00 per square foot)
- Upgrade electrical system, e.g., relamp (\$5.00 per square foot)
- Limited lighting, structural repair, and house cleaning for routine surveillance and maintenance (\$3.00 per square foot)
- Step repairs (\$75.00 per step). One step for every 7 inches of height
- Loading dock guard rails and open-stairway hand rails (\$50.00 per linear foot)
- Liquid or solid hazardous waste disposal (\$1,110 per container). Includes packaging, container, characterizing, and disposal

- General housekeeping, routine maintenance, structural, electrical, roof repair, plus all miscellaneous items (\$3.00 per square foot annually)
- Encapsulate asbestos (\$5.00 per square foot)
- Average work crew for one day (\$1,000.00)
- Isolate WHC utilities electrical power (\$1,000.00 per isolation)
- Remove and dispose of Transite¹ shake siding and roofing (\$3.00 per square foot)
- Install fencing (\$38.00 per linear foot).

4.2.1 Fix and Repair Costs

There are four general types of fix and repair costs: (1) major roof reconstruction; (2) major electrical system upgrade; (3) small localized repairs of structures, fixtures or electrical equipment; and (4) radiation decontamination and control. Many risk-reduction options involve combinations of these four types.

The dominant risk contributors are associated with the following hazards: falling, struck-by or strike, electrical shock, radiation exposure, fire (primarily electrical), and biological and temperature extreme hazards. These dictated which unit costs were developed for the repair option of risk-reduction. Several other hazards exist that could introduce other costs, but these are rated only minor or negligible. There is no unit cost calculated for reduction of biological hazards and temperature extreme risks. This cost is not included because it will be part of administrative costs already established and will occur on an annual basis spread over all facilities.

The unit cost for roof reconstruction is \$50 to \$60 per square foot based on a Delta roof system design prepared by Kaiser Engineering (KEH 1993). In this design, the old roof is not removed--a new roof is built over the old one. Also associated with roof repair is the cost (\$15 per square foot) of installing netting to keep pieces of roof from falling and striking surveillance and maintenance workers as the roof deteriorates.

The unit cost for electrical system upgrades is \$5 per square foot. The cost was derived from experience gained by upgrading the electrical system at the 105-F Reactor Building. Upgrades include removal of the old system and installation of minimum service. Occasionally, electrical upgrades require general housekeeping to make the area safe for workers. The cost of general housekeeping is \$3 per square foot.

¹Transite is a registered trademark of Johns-Mansville Corp., New York, New York.

The cost of small localized repairs of structures, fixtures, and electrical equipment is based on \$1,000 per day, per crew. These are fairly simple repairs that can be measured in one or two crew-days. Repair of steps and hand railing have specific costs of \$75 per step and \$50 per foot, respectively.

The cost of radiation decontamination is \$16 per square foot of surface to be cleaned. General contamination cleanup and reposting of radiation signs is calculated using general housekeeping costs of \$3 per square foot.

Costs and supporting information for risk-reduction measures involving repair are provided in Appendix C, Tables C-1, C-2, and C-3. Table C-1 displays cost information for the 100 Area nonreactor facilities; Table C-2 displays cost information for the 200 Area facilities; and Table C-3 displays cost information for the 105 reactor buildings.

4.2.2 Isolation Costs

Isolation is a viable option for reducing risk in some facilities. This option is attractive because the cost in many cases is quite low in comparison to other options. However, isolation is not appropriate for facilities that require active systems for maintaining control of radioactive material. Isolation is also not appropriate for very large facilities (such as the 202-S or 221-U Canyon Building) or for facilities that have some planned use (such as the 105-B Reactor Building). Because this option relies in part on administrative controls, there will be some ongoing cost. This cost has not been estimated or included in this analysis. As a result of administrative control being a part of this option, there will be some uncertainty regarding maintaining control of risk for the long term. Historical patterns at private, as well as government, facilities indicate a tendency to maintain a strong commitment to a set of administrative controls for only a few years. After the initial emphasis period, there is a slow decline in concern and efforts with an eventual loss of control.

Isolation of hazards to reduce risk consists of a two-step process of cleaning up the area or facility and erecting barriers that prevent access to the hazards that remain. Because the isolation option permits the facility to continue to physically degrade, cleanup before isolation of hazards is necessary to ensure that the cost of the subsequent demolition does not dramatically increase.

Cleanup costs are based on what materials have to be removed from the facility. Asbestos requires removal, and areas having uncontained radioactive material will be decontaminated. Trash and loose materials will also be removed. The cost of each type of cleanup is applied on a unit area basis. These costs are shown in Section 4.2.

The type of barrier used to complete the physical isolation of an area or facility depends on access availability. For many facilities of small to moderate size, the barrier is a chain-link fence topped with barbed wire. The amount of fence required is calculated by adding 50 ft to the perimeter dimensions of the facility. The cost of fence on a per-foot basis is contained in Section 4.2. In the case of the 105 reactor buildings, it is not

feasible to isolate the entire facility. However, it may be advantageous to isolate certain portions of the facility. The costs of cleanup for an area is calculated in the same manner as for an entire facility. A fence is not an appropriate barrier for isolating an area in a facility, so the cost of the barrier is assumed to be included in the general cleanup cost (\$3.00 per square foot). Permanent sealing of entry openings with plates or walls is assumed. Additional isolation costs are provided in Appendix D.

4.2.3 Demolition Costs

Demolition of a facility or section of a facility results in risk reduction because the hazard causing the risk is completely eliminated. This option gives the highest risk reduction because the ending risk is zero. Isolation, in comparison, never results in a zero-risk state. The costs for demolition are the sum of the costs for asbestos removal, area/equipment decontamination, facility equipment removal, actual destruction of the structure and foundation, and disposal of the rubble. Costs were determined by using one of the following methods. If costs were available from *Surplus Facilities Program Plan, Fiscal Year 1993* (Winship and Hughes 1992), those were used. If current program estimates were not available, demolition costs were estimated based on unit costs reflecting the type of material present applied to the square footage for a facility. The demolition costs for portions of the 105 reactor buildings were based on application of unit costs to section square footage, as Winship and Hughes (1992) do not address partial demolition. Tables F1-1 through F1-9 in Appendix F present the area characteristics for the 105 reactor facilities. Demolition costs are presented in Appendix E, Tables E1-1 through E1-9.

5.0 REFERENCES

- KEH, 1993, *Engineering Assessment 105-H Front Face Work Area Roof*, ER-2903-ASSESSMENT, Kaiser Engineering Hanford, Richland, Washington.
- Coles, G. A., M. V. Shultz, and W. E. Taylor, 1993, *Risk Management Study for the Retired Hanford Site Facilities - Risk Evaluation Work Procedure for the Retired Hanford Site Facilities*, Vol. 2, WHC-EP-0619, Westinghouse Hanford Company, Richland, Washington.
- Winship, R. A. and M. C. Hughes, 1992, *Surplus Facilities Program Plan, Fiscal Year 1993*, WHC-EP-0231-5, Westinghouse Hanford Company, Richland, Washington.

This page intentionally left blank.

DISTRIBUTION

Number of CopiesONSITE3 U. S. Department of Energy -
Richland Operations Office

J. K. Erickson	A5-19
A. C. Harris	A5-19
DOE-RL Public Reading Room	A1-65

Kaiser Engineers Hanford

1 M. S. Ruben	E6-31
--------------------	-------

2 Pacific Northwest Laboratory

G. J. Vargo	K3-56
PNL Technical Files	K1-11

36 Westinghouse Hanford Company

W. J. Adam	H4-67
E. L. Ahola	L4-90
F. G. Cain	H4-70
G. A. Coles	H4-65
C. L. Cooley	R3-54
R. G. Egge	R2-77
J. E. Hodgson	X7-02
M. C. Hughes	R2-81
T. F. Johnson	X0-21
D. G. Kachele	S4-67
N. R. Kerr	H4-67
H. E. Marquez	H4-67
R. E. Merriman	L4-90
C. M. Monasmith	L4-90
M. R. Morton	R2-77
J. F. Renken	X7-02
E. Senger	R2-77
J. B. Shannon	T3-11
M. V. Shultz	H4-65
S. R. Staley	R3-54
W. E. Taylor	H4-67
M. A. Tredway	R3-54
B. F. Weaver	T3-11
R. A. Winship	A3-30
J. J. Zimmer	H4-67
Central Files (2)	L8-04
Docket Files	H5-36
Environmental Program	
Information Center (2)	H6-08

WHC-EP-0619 VOLUME 4

DISTRIBUTION (cont)

Environmental Restoration	
Safety Support Files (3)	H4-67
Information Release	
Administration (3)	H4-17

APPENDIX A

RISK-REDUCTION OPTION COSTS

This page intentionally left blank.

CONTENTS

A	RISK-REDUCTION OPTION COSTS	A-1
A1.0	INTRODUCTION	A-1

LIST OF TABLES

A1-1	Risk-Reduction Option Cost for the 105-B Reactor Building	A-2
A1-2	Risk-Reduction Option Cost for the 105-C Reactor Building	A-3
A1-3	Risk-Reduction Option Cost for the 105-D Reactor Building	A-4
A1-4	Risk-Reduction Option Cost for the 105-DR Reactor Building	A-5
A1-5	Risk-Reduction Option Cost for the 105-F Reactor Building	A-7
A1-6	Risk-Reduction Option Cost for the 105-H Reactor Building	A-8
A1-7	Risk-Reduction Option Cost for the 105-KE Reactor Building	A-10
A1-8	Risk-Reduction Option Cost for the 105-KW Reactor Building	A-11
A1-9	Risk-Reduction Option Cost for the 100 Area Nonreactor Facilities	A-13
A1-10	Risk-Reduction Option Cost for the 200 Area Facilities	A-16

This page intentionally left blank.

APPENDIX A

RISK-REDUCTION OPTION COSTS

A1.0 INTRODUCTION

The following tables display costs associated with each individual facility. The left-most column shows these risk categories: critical, serious, and moderate. The next column shows if any risk was identified in the risk categories (shown in the first column) and which hazard categories they were grouped with. The third column labelled "Problem" contains cross-reference indexes. These indexes correspond to individual descriptions of dominant risk contributors that follow as notes (also contained in Tables 3-16, 3-17, and 3-18), and calculations of repair cost, contained in Appendix C. The final three columns contain the cost for each available cost-reduction option.

Some cells in Tables A1-1 through A1-10 contain zero dollars for one of two reasons: (1) no findings are identified related to that risk category, or (2) no additional expense is incurred to reduce the risks in that category. An example of the latter is money spent to reduce a critical risk (such as falling through a deteriorated roof) might also reduce a lesser risk, such as being struck by a falling roof member. Therefore, no additional repair cost is needed to reduce the lesser risk.

Table A1-1. Risk-Reduction Option Cost for the 105-B Reactor Building.

Risk category	Hazard	Problem	Cost to eliminate hazard		
			Fix option	Isolation option	Demolition option
Storage basin and transfer area					
Critical	Electric shock	A-105B	\$43,385	a	a
Serious	None	- -	\$0	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$43,385	- -	- -
Fan house					
Critical	Electric shock	A-105B	\$41,760	a	a
Serious	None	- -	\$0	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$41,760	- -	- -
Process area					
Critical	Electric shock	A-105B	\$44,285	a	a
Serious	None	- -	\$0	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$44,285	- -	- -
Work area/valve pit area					
Critical	Electric shock, falling	A-105B	\$68,495	a	a
Serious	None	- -	\$0	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$68,495	- -	- -
Office/miscellaneous area					
Critical	Electric shock	A-105B	\$24,210	a	a
Serious	None	- -	\$0	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$24,210	- -	- -

NOTES:

^a Not considered a viable option.

^b Biological hazards and temperature extreme hazards were actually rated moderate in all 105 facilities as well as certain other facilities; however, the cost of mitigation is not included here because the cost for related controls will be included in administrative costs for all facilities.

A-105B. Critical general degradation of electrical system in the 105-B storage basin, fan house, process area, work area/valve pit area, and office/miscellaneous areas.

Table A1-2. Risk-Reduction Option Cost for the 105-C Reactor Building.

Risk category	Hazard	Problem	Cost to eliminate hazard		
			Fix option	Isolation option	Demolition option
Storage basin and miscellaneous storage					
Critical	None	- -	\$0	\$0	a
Serious	Falling, electric shock	B,C-105C	\$972,720	\$270,972	a
Moderate	None ^b	- -	\$0	\$0	a
Total			\$972,720	\$270,972	- -
Fan house					
Critical	None	- -	\$0	\$0	\$0
Serious	Falling, electric shock	B,C-105C	\$708,400	\$197,340	\$688,160
Moderate	None ^b	- -	\$0	\$0	\$0
Total			\$708,400	\$197,340	\$688,160
Process area					
Critical	None	- -	\$0	a	a
Serious	Falling, electric shock	B,C-105C	\$1,217,230	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$1,217,230	- -	- -
Work area					
Critical	None	- -	\$0	a	a
Serious	Falling, electric shock	B,C-105C	\$1,048,600	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$1,048,600	- -	- -

NOTES:

^a Not considered a viable option.

^b Biological hazards and temperature extreme hazards were actually rated moderate in all 105 facilities as well as certain other facilities; however, the cost of mitigation is not included here because the cost for related controls will be included in administrative costs for all facilities.

B-105C. Generally degraded roof over 105-C storage basin and miscellaneous storage area, fan house, work area, control room, electrical room, and process area.

C-105C. General degradation of electrical system in 105-C storage basin and miscellaneous storage area, fan house, work area, control room, electrical room, and process area.

WHC-EP-0619 VOLUME 4

Table A1-3. Risk-Reduction Option Cost for the 105-D Reactor Building.

Risk category	Hazard	Problem	Cost to eliminate hazards		
			Fix option	Isolation option	Demolition option
Storage basin and transfer area					
Critical	None	- -	\$0	\$0	a
Serious	Falling	E-105D	\$578,005	\$26,631	a
Moderate	None ^b	- -	\$0	\$0	a
Total			\$578,005	\$26,631	- -
Fan house					
Critical	None	- -	\$0	\$0	\$0
Serious	Falling	E-105D	\$547,105	\$25,056	\$217,152
Moderate	None ^b	- -	\$0	\$0	\$0
Total			\$547,105	\$25,056	\$217,152
Process area					
Critical	Electric shock	D-105D	\$1,000	a	a
Serious	Falling	E-105D	\$575,705	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$576,705	- -	- -
Work area/valve pit area					
Critical	None	- -	\$0	a	a
Serious	Falling	E-105D	\$890,435	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$890,435	- -	- -
Office/miscellaneous					
Critical	None	- -	\$0	\$0	\$0
Serious	None	- -	\$0	\$0	\$0
Moderate	None ^b	- -	\$0	\$0	\$0
Total			- -	- -	- -

NOTES:

^a Not considered a viable option.

^b Biological hazards and temperature extreme hazards were actually rated moderate in all 105 facilities as well as certain other facilities; however, the cost of mitigation is not included here because the cost for related controls will be included in administrative costs for all facilities.

D-105D. Bare, energized 440-V located outside the south wall, north of the sample building.

E-105D. Generally degraded roof over 105-D storage basin, fan house, process area and work/valve pit area; floor planks near east access of storage basin need replacement.

Table A1-4. Risk-Reduction Option Cost for the 105-DR Reactor Building.
(2 sheets)

Risk category	Hazard	Problem	Cost to eliminate hazard		
			Fix option	Isolation option	Demolition option
Storage basin and transfer area					
Critical	Falling, electric shock	F,G-105DR	\$834,130	\$320,050	a
Serious	Struck-by, falling, explosion ^c	F,I,H-105DR	\$2,200	\$0	a
Moderate	Falling ^b	K-105DR	\$1,000	\$0	a
Total			\$837,130	\$320,050	- -
Fan house					
Critical	None		\$0	\$0	\$0
Serious	Falling, explosion ^c	I,H-105DR	\$380,120	\$168,422	\$523,980
Moderate	Falling ^b	K-105DR	\$1,000	\$0	\$0
Total			\$381,120	\$168,422	\$523,980
Process area					
Critical	Electric shock	G-105DR	\$1,000	a	a
Serious	Falling, explosion ^c	I,H-105DR	\$1,000	a	a
Moderate	Falling ^b	K-105DR	\$1,000	a	a
Total			\$3,000	- -	- -
Work area/valve pit area					
Critical	Falling	F-105DR	\$770,900	a	a
Serious	Struck-by, electric shock, explosion ^c	F,J,H-105DR	\$59,340	a	a
Moderate	Falling ^b	K-105DR	\$1,000	a	a
Total			\$831,240	- -	- -

Table A1-4. Risk-Reduction Option Cost for the 105-DR Reactor Building.
(2 sheets)

Risk category	Hazard	Problem	Cost to eliminate hazard		
			Fix option	Isolation option	Demolition option
Office/miscellaneous area					
Critical	None	- -	\$0	\$0	\$0
Serious	Falling, electric shock, explosion ^c	I,J,H-105DR	\$476,510	\$169,825	\$382,704
Moderate	Struck-by ^b	L-105DR	\$1,000	\$0	\$0
Total			\$479,510	\$169,825	\$382,704

NOTES:

^a Not a viable option.

^b Biological hazards and temperature extreme hazards were actually rated moderate in all 105 facilities as well as certain other facilities; however, the cost of mitigation is not included here because the cost for related controls will be included in administrative costs for all facilities.

^c The risk contribution from explosion is related to the attached sodium burn facility. This facility is not under the jurisdiction of WHC that manages the 105-DR Reactor Building. A large degree of uncertainty resulted in conservative estimation of the risk; further investigation is recommended. Therefore, no cost was estimated for possible risk-reduction measures.

F-105DR. Critical general degradation of the roof has occurred over the 105-DR storage basin and work/valve pit area.

G-105DR. Unprotected, energized wires are hanging from the conduit in the north wall of the hallway between the metal storage and transfer area. Exposed energized conductors are on the wet wall of the storage basin. There is a water leak that seeps into the light fixture and conduit in the rear south-side stairwell (30-ft level) of the process area.

H-105DR. Sodium reaction hazard from nearby facility for 105-DR Building occupants.

I-105DR. General degradation of the roof over the 105-DR Fan House and office/miscellaneous space has occurred. Wood planking on the north side of the X-1 level needs to be reinforced. The guardrail that was cut in half in the north side of the far-side lab area needs to be heightened. There are 2-ft gaps in the guard rails at the storage basin that need to be repaired.

J-105DR. General degradation of the electrical system has occurred at the 105-DR work/valve pit area and office/miscellaneous space.

K-105DR. There is deformed grating throughout the 105-DR Reactor Building.

L-105DR. There is protruding exposed rebar on the exterior south side of the 105-DR Reactor Building.

Table A1-5. Risk-Reduction Option Cost for the 105-F Reactor Building.

Risk category	Hazard	Problem	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
Storage basin and transfer area					
Critical	Falling	M-105F	\$577,005	\$26,631	a
Serious	Electric shock	O-105F	\$44,385	\$0	a
Moderate	Struck-by ^b	M-105F	\$0	\$0	a
Total			\$621,390	\$26,631	- -
Fan house/valve pit area					
Critical	Electric shock, fire	N-105F	a	a	\$393,562
Serious	Falling	P-105F	a	a	\$0
Moderate	None ^b	- -	a	a	\$0
Total			- -	- -	\$393,562
Process area					
Critical	None		\$0	a	a
Serious	Falling, electric shock	O,P-105F	\$619,990	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$619,990	- -	- -
Work area					
Critical	None		\$0	a	a
Serious	Falling, electric shock	O,P-105F	\$483,980	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$483,980	- -	- -
Office/miscellaneous					
Critical	None	- -	\$0	\$0	\$0
Serious	None	- -	\$0	\$0	\$0
Moderate	None ^b	- -	\$0	\$0	\$0
Total			- -	- -	- -

NOTES:

^a Not considered a viable option.^b Biological hazards and temperature extreme hazards were actually rated moderate in all 105 facilities as well as certain other facilities; however, the cost of mitigation is not included here because the cost for related controls will be included in administrative costs for all facilities.

M-105F. Critical general degradation of roof over the 105-F storage basin.

N-105F. Critical general degradation of electrical system in the 105-F Fan House/valve pit area.

O-105F. General electrical degradation in the 105-F storage basin, process area, and work area.

P-105F. General degradation of the 105-F roof in the process work area and the fan house/valve pit.

WHC-EP-0619 VOLUME 4

Table A1-6. Risk-Reduction Option Cost for the 105-H Reactor Building.
(2 sheets)

(2 sheets)

Risk category	Hazard	Problem	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
Storage basin and transfer area					
Critical	None	- -	\$0	\$0	\$0
Serious	Falling	R-105H	\$904,240	\$240,024	\$1,633,896
Moderate	Struck-by ^b	R-105H	\$0	\$0	\$0
Total			\$904,240	\$240,024	\$1,633,896
Fan house and dryer rooms					
Critical	None	- -	\$0	\$0	a
Serious	None	- -	\$0	\$0	a
Moderate	None ^b	- -	\$0	\$0	a
Total			- -	- -	- -
Process area					
Critical	Electric shock	Q-105H	\$1,000	a	a
Serious	Falling, electric shock	R,S-105H	\$731,080	a	a
Moderate	Struck-by ^b	R-105H	\$0	a	a
Total			\$732,080	- -	- -
Work area					
Critical	None	- -	\$0	a	a
Serious	Falling, electric	R,S-105H	\$317,965	a	a
Moderate	Struck-by ^b	R-105H	\$0	a	a
Total			\$317,965	- -	- -

Table A1-6. Risk-Reduction Option Cost for the 105-H Reactor Building.
(2 sheets)

Risk category	Hazard	Problem	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
Offices and control room					
Critical	None	- -	\$0	\$0	\$0
Serious	None	- -	\$0	\$0	\$0
Moderate	None ^b	- -	\$0	\$0	\$0
Total			- -	- -	- -
Plastic film greenhouse					
Critical	Electric shock	Q-105H	a	a	\$2,000
Serious	None	- -	a	a	\$0
Moderate	None ^b	- -	a	a	\$0
Total			- -	- -	\$2,000

NOTES:

^a Not considered a viable option.

^b Biological hazards and temperature extreme hazards were actually rated moderate in all the 105 facilities as well as certain other facilities; however, the cost of mitigation is not included here because the cost for related controls will be included in administrative costs for all facilities.

Q-105H. There is a critical electrical hazard in the plastic film greenhouse and exposed energized conductors in the 105-H Building in the southeast corner of the power block "S" of the outer rod room.

R-105H. General degradation of the 105-H roof has occurred over the storage basin/mechanical shop area, process area, and work area. Fixed metal ladders need cages and metal protrusions removed.

S-105H. There are exposed energized conductors in the men's change room between corridors 11 and 13, and at the northeast corner of the power block area instrument repair shop.

Table A1-7. Risk-Reduction Option Cost for the 105-KE Reactor Building.

Risk category	Hazard	Problems	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
Storage basin and transfer area					
Critical	None	- -	\$0	a	a
Serious	None	- -	\$0	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$0	- -	- -
Control room, exhaust fan area, and miscellaneous area					
Critical	None	- -	\$0	a	a
Serious	Electric shock	T-105KE	\$2,000	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$2,000	- -	- -
Process area					
Critical	None	- -	\$0	a	a
Serious	Electric shock	T-105KE	\$1,000	a	a
Moderate	Radiation exposure ^b	U-105KE	\$154,800	a	a
Total			\$155,800	- -	- -
Work area and supply fan area					
Critical	None	- -	\$0	a	a
Serious	Electric shock	T-105KE	\$1,000	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$1,000	- -	- -

NOTES:

^a Not considered a viable option.

^b Biological hazards and temperature extreme hazards were actually rated moderate in all the 105 facilities as well as certain other facilities; however, the cost of mitigation is not included here because the cost for related controls will be included in administrative costs for all facilities.

T-105KE. There are energized conductors at the 105-KE "FM" elevator lobby and in corridor 6 north of the "FM" elevator lobby. Energized conductors are also present in the thermostat on the concrete column in the center of the control room. There is abrasion and potential electrical shock present in the instrument cabinet on east end of the control room. There are energized conductors on the light switch on the west side of the work area dummy storage area.

U-105KE. Decontamination and proper posting at the top of the reactor, bell hopper area, and inner and outer control rod rooms is needed.

Table A1-8. Risk-Reduction Option Cost for the 105-KW Reactor Building.

Risk category	Hazard	Problems	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
Storage basin and transfer area					
Critical	None	- -	\$0	a	a
Serious	None	- -	\$0	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$0	- -	- -
Control room, exhaust fan area, and miscellaneous area					
Critical	None	- -	\$0	a	a
Serious	None	- -	\$0	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$0	- -	- -
Process area					
Critical	None	- -	\$0	a	a
Serious	None	- -	\$0	a	a
Moderate	Electric shock, radiation exposure ^b	V,W-105KW	\$165,616	a	a
Total			\$165,616	- -	- -
Work area and supply fan area					
Critical	None	- -	\$0	a	a
Serious	Falling	X-105KW	\$694,135	a	a
Moderate	None ^b	- -	\$0	a	a
Total			\$694,135	- -	- -

NOTES:

^a Not considered a viable option.

^b Biological hazards and temperature extreme hazards were actually rated moderate in all 105 facilities as well as certain other facilities; however, the cost of mitigation is not included here because the cost for related controls will be included in administrative costs for all facilities.

V-105KW. There are energized conductors below the equipment racks under the staircase on the east side of the reactor.

W-105KW. Better radiation control and some decontamination is needed at the 105-KW Building. Survey and appropriate administrative controls is needed, such as posting in the ball 3X equipment area on the top of reactor and inner and outer rod rooms.

X-105KW. The roof over the 105-KW Reactor Building work area/supply fan area is degraded.

Table A1-9. Risk-Reduction Option Cost for the 100 Area Nonreactor Facilities. (4 sheets)

Non-hazardous Facilities: (4 sheets)

Risk category	Hazard	Problems	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
103-B Riggers Loft					
Critical	None	- -	\$0	a	\$0
Serious	Electric shock	A-100	\$11,448	a	\$51,000
Moderate	Falling ^b	B-100	\$500	a	\$0
Total			\$11,948	- -	\$51,000
185-B Water Treatment Plant and 190-B Main Pump House					
Critical	None	- -	a	a	\$0
Serious	None	- -	a	a	\$0
Moderate	Falling, struck-by, biological, temperature extreme ^b	- -	a	a	\$2,240,000
Total			- -	- -	\$2,240,000
190-B Tunnel/Annex					
Critical	None	- -	a	a	\$0
Serious	None	- -	a	a	\$0
Moderate	Struck-by ^b	E-100	a	a	^c \$200,000
Total			- -	- -	\$200,000
1701-8A Exclusion Area Badge House					
Critical	None	- -	\$0	a	\$0
Serious	Electric shock	F-100	\$1,000	a	\$12,000
Moderate	None	- -	\$0	a	\$0
Total			\$1,000	- -	\$12,000
183-C Filter Plant Pump Room					
Critical	None	- -	\$0	\$0	\$0
Serious	None	- -	\$0	\$0	\$0
Moderate	Struck-by, biological ^b	G-100	\$5,915,520 ^b	\$2,328,654	\$235,000
Total			\$5,915,520	\$2,328,654	\$235,000

Table A1-9. Risk-Reduction Option Cost for the 100 Area
Nonreactor Facilities. (4 sheets)

Risk category	Hazard	Problems	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
1702-C Badge House					
Critical	None	- -	a	\$0	\$0
Serious	Electric shock	H-100	a	\$15,053	\$6,000
Moderate	None	- -	a	\$0	\$0
Total			- -	\$15,053	\$6,000
1714-C Solvent Storage					
Critical	None	- -	\$0	a	\$0
Serious	Electric shock	I-100	\$1,000	a	\$13,398
Moderate	None	- -	\$0	a	\$0
Total			\$1,000	- -	\$13,398
103-D Fresh Metal Storage					
Critical	None	- -	\$0	\$0	\$0
Serious	None	- -	\$0	\$0	\$0
Moderate	Falling	J-100	\$1,000	\$49,125	\$49,000
Total				\$49,125	\$49,000
108-F Biology Laboratory Building					
Critical	None	- -	a	\$0	\$0
Serious	None	- -	a	\$0	\$0
Moderate	Biological, temperature extreme	- -	a	\$809,362	\$4,272,000
Total			- -	\$809,362	\$4,272,000
183-F Clearwell Facility					
Critical	None	- -	a	\$0	\$0
Serious	None	- -	a	\$0	\$0
Moderate	Falling	- -	a	\$33,034	\$73,803
Total			- -	\$33,034	\$73,803
1713-H Warehouse					
Critical	None	- -	\$0	a	\$0
Serious	Struck-by, electric shock	L,M-100	\$5,000	a	\$524,000
Moderate	None	- -	\$0	a	\$0
Total			\$5,000	- -	\$524,000

Table A1-9. Risk-Reduction Option Cost for the 100 Area Nonreactor Facilities. (4 sheets)

Risk category	Hazard	Problems	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
182-K Emergency Water Reservoir and Pump House					
Critical	None	- -	\$0	\$0	\$0
Serious	None	- -	\$0	\$0	\$0
Moderate	Biological, temperature extreme	- -	- -	\$122,395	\$97,000
Total			- -	\$122,395	\$97,000
115-KE Gas Recirculation Building					
Critical	None	- -	a	\$0	\$0
Serious	None	- -	a	\$0	\$0
Moderate	Biological ^b	- -	a	\$175,261	\$1,400,000
Total			- -	\$175,261	\$1,400,000
115-KV Gas Recirculation Building					
Critical	None	- -	a	\$0	\$0
Serious	None	- -	a	\$0	\$0
Moderate	Biological ^b	- -	a	\$175,261	\$1,429,000
Total			- -	\$175,261	\$1,429,000
165-KV Power Control Building					
Critical	None	- -	\$0	a	a
Serious	Electric shock	N-100	\$2,000	a	a
Moderate	None	- -	\$0	a	a
Total			\$2,000	- -	- -
183-KV Filter Plant					
Critical	None	- -	\$0	a	\$0
Serious	None	- -	\$0	a	\$0
Moderate	Biological, temperature extreme	- -	a	a	\$1,561,700
Total			- -	- -	\$1,561,700

Table A1-9. Risk-Reduction Option Cost for the 100 Area Nonreactor Facilities. (4 sheets)

Risk category	Hazard	Problems	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
190-KW Process Water Pump House					
Critical	Falling	0-100	\$1,000	a	\$2,802,666
Serious	None	- -	\$0	a	\$0
Moderate	Temperature extreme ^b	- -	a	a	\$0
Total			\$1,000	- -	\$2,802,666

NOTES:

^a Not considered a viable option.

^b Biological hazards and temperature extreme hazards were actually rated moderate in all 105 facilities as well as certain other facilities; however, the cost of mitigation is not included here because the cost for related controls will be included in administrative costs for all facilities.

^c The 190-Tunnel/Annex demolition cost is about 10 percent of the total estimated cost.

A-100. General degradation of the electrical system is present in the 103-B Riggers Loft Building.

B-100. There are degraded guardrails on the loading ramp on the south end of the 103-B Riggers Loft Building.

C-100. The roof over 185-B Water Treatment Plant and the 190-B Main Pump House exhibits general degradation--a new roof is needed.

E-100. Protruding metal brackets and nails are globally present at the 190-B Tunnel Annex.

F-100. An energized light fixture and raceway is present outside the north end of the 1701-BA Exclusion Area Badgehouse.

G-100. The 183-C Filter Plant/Pump Room has a roof that is generally degraded--a new roof is needed.

H-100. Protruding conductors are present from the circuit disconnect and can be energized from inside the south wall of the 1702-C Badgehouse.

I-100. Protruding conductors are present from the circuit disconnect and can be energized from the outside north wall of the 1714-C Solvent Storage Building.

J-100. There are degraded wooden steps and guard rails near the loading ramp on the west side of the 103-D Fresh Metal Storage Building.

K-100. The 183-F Clearwells need to be demolished, filled in, and graded.

L-100. The wall between the north and south sections of the 1713-H Warehouse needs to be reinforced with structural steel.

M-100. The electrical panel "C" at the north end of the building and receptacles on the south wall of the north end of the 1713-H Warehouse are degraded.

N-100. The flexible power cord for battery pack on west wall of ground floor electrical room is degraded. The 120-V heater control circuit on concrete column in control room is also degraded and needs to be metallic sheathed at the 165-KW Power Control Building.

O-100. There is a damaged floor grate outside the fenced area inside the 190-KW Process Water Pump House that needs to be replaced.

Table A1-10. Risk-Reduction Option Cost for the 200 Area Facilities.
(5 sheets)

Risk category	Hazard	Problems	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
205-A Solvent Handling Facility					
Critical	None	- -	a	\$0	\$0
Serious	Falling	A-200	a	\$14,185	\$481,000
Moderate	Struck-by	B,C-200	a	\$0	\$0
Total			- -	\$14185	\$481,000
224-B Office and Canyon Building					
Critical	None	- -	a	\$0	\$0
Serious	Electric shock, Radiation Exposure	D,E-200	a	\$1,275,985	\$14,835,000
Moderate	None	- -	a	\$0	\$0
Total			- -	\$1,275,985	\$14,835,000
215-C Storage Building					
Critical	None	- -	a	\$0	\$0
Serious	Electric shock	F-200	a	\$41,856	\$87,740
Moderate	Radiation Exposure	G-200	a	\$0	\$0
Total			- -	\$41,856	\$87,740
212-P Fuel Storage Facility					
Critical	None	- -	\$0	a	\$0
Serious	Electric shock	H-200	\$29,450	a	\$1,343,000
Moderate	None	- -	\$0	a	\$0
Total			\$29,450	- -	\$1,343,000
212-R Fuel Storage Facility					
Critical	None	- -	a	\$0	\$0
Serious	Falling, electric shock	I,K-200	a	\$260,755	\$1,343,000
Moderate	Struck-by ^b	I-200	a	\$0	\$0
Total			- -	\$260,744	\$1,343,00
202-S Canyon Building					
Critical	None	- -	\$0	a	\$0
Serious	Struck-by, electric shock, radiation exposure	M,N,O-200	\$234,244	a	\$174,582,000
Moderate	Fire	P-200	\$332,232	a	\$0
Total			\$566,476	- -	\$174,582,000

Table A1-10. Risk-Reduction Option Cost for the 200 Area Facilities.
(5 sheets)

Risk category	Hazard	Problems	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
233-S Plutonium Concentration Facility					
Critical	None	- -	\$0	a	\$0
Serious	Radiation exposure	Q-200	\$9,072	a	\$16,873,000
Moderate	None	- -	\$0	a	\$0
Total			\$9,072	- -	\$16,873,000
233-SA Exhaust Filter Building					
Critical	None	- -	\$0	a	\$0
Serious	None	- -	\$0	a	\$0
Moderate	Radiation exposure	R-200	\$1,152	a	\$2,100,000
Total			\$1,152	- -	\$2,100,000
291-S Exhaust Fan Facility					
Critical	None	- -	\$0	a	\$0
Serious	Electric shock	S-200	\$1,650	a	\$1,034,000
Moderate	Radiation exposure	T-200	\$990	a	\$0
Total			\$2,640	- -	\$1,034,000
293-S Offgas Treatment and Recovery Building					
Critical	None	- -	a	\$0	\$0
Serious	None	- -	a	\$0	\$0
Moderate	Biological ^b	- -	a	\$40,335	\$71,000
Total				\$40,335	\$71,000
2711-S Stack Gas Monitoring Building					
Critical	None	- -	a	\$0	\$0
Serious	None	- -	a	\$0	\$0
Moderate	Falling	U-200	a	\$16,786	\$57,184
Total			- -	\$16,786	\$57,184
2718-S Sand Filter Sampler Building					
Critical	None	- -	a	\$0	\$0
Serious	None	- -	a	\$0	\$0
Moderate	Biological ^b	- -	a	\$16,786	\$38,508
Total			- -	\$16,786	\$38,508

Table A1-10. Risk-Reduction Option Cost for the 200 Area Facilities.
(5 sheets)

Risk category	Hazard	Problems	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
2904-SA Cooling Water Sampler Building					
Critical	None	- -	\$0	a	\$0
Serious	None	- -	\$0	a	\$0
Moderate	Biological ^b	- -	- -	a	\$140,000
Total			- -	a	\$140,000
241-SX-401 Waste Disposal Condenser House					
Critical	None	- -	a	\$0	a
Serious	Electric shock	V-200	a	\$47,733	a
Moderate	None	- -	a	\$0	a
Total			- -	\$47,733	- -
241-SX-402 Waste Disposal Condenser House					
Critical	None	- -	a	\$0	a
Serious	Electric shock	W-200	a	\$47,733	a
Moderate	None	- -	a	\$0	a
Total			- -	\$47,733	- -
221-U Canyon Building					
Critical	Electric shock	X-200	\$1,000	a	\$154,178,000
Serious	Radiation exposure, electrical shock	Y,Z-200	\$209,580	a	\$0
Moderate	None	- -	\$0	a	\$0
Total			\$210,580	- -	\$154,178,000
271-U Office Building					
Critical	None	- -	\$0	a	\$0
Serious	None	- -	\$0	a	\$0
Moderate	Fire	AA-200	\$1,000	a	\$1,598,000
Total			\$1,000	- -	\$1,598,000
291-U Exhaust Fan Facility					
Critical	None	- -	\$0	a	\$0
Serious	None	- -	\$0	a	\$0
Moderate	Radiation exposure, biological ^b	BB-200	\$990	a	\$113,770
Total			\$990	- -	\$113,770

Table A1-10. Risk-Reduction Option Cost for the 200 Area Facilities.
(5 sheets)

Risk category	Hazard	Problems	Cost to eliminate hazard		
			Repair option	Isolation option	Demolition option
292-U Jet Pit House					
Critical	None	- -	a	\$0	\$0
Serious	Electric shock	CC-200	a	\$24,162	\$19,360
Moderate	Biological ^b	- -	a	\$0	\$0
Total			- -	\$24,162	\$19,360
232-Z Plutonium Incinerator Facility					
Critical	None	- -	\$0	a	\$0
Serious	Radiation exposure	DD-200	\$1,000	a	\$2,370,000
Moderate	Falling	EE-200	\$7,310	a	\$0
Total			\$8,310	- -	\$2,370,000

NOTES:

^a Not a viable option.

^b The cost of reducing risk from biological hazards and temperature extreme hazards will be reflected in an increased surveillance and maintenance annual budget. The cost will be for increased controls and will be spread across all facilities.

A-200 The roof over the 205-A Solvent Handling Valve Protection Building is degraded. Replacement of metal-frame roof is not an option at the 205-A Building.

B-200 The cover plate over the pipe trench in the basin area at the 205-A Building is missing. Replacement of cover plate over the pipe trench at the 205-A Building is not an option.

C-200 The circular foundations under tanks TK-P1, TK-P2, TK-P3, and TK-P4 need to be reinforced because of deterioration to reduce the struck-by hazard. Reinforcement of the deteriorated circular foundations under the four 205-A storage tanks is not an option.

D-200 There is general electrical degradation in the 224-B Office and Canyon Building.

E-200 A door to the canyon area is severely alpha contaminated, there is poor contamination control, and there is radioactive debris present at the 224-B Canyon Building.

F-200 The cover for the main "E" electrical panel in the electrical room on the west side of the 215-C Storage Building is missing.

G-200 There is contamination spread occurring from biological agents, particularly birds, at the 215-C Storage Building.

H-200 The electrical system at the 212-P Fuel Storage Facility is degraded.

I-200 The roof at the 212-R Fuel Storage Facility is degraded. There are improper guards for ladder access into the basin located on the west walkway.

J-200 Damaged steps are present at the outside southwest side of the building and the supply fan room on the east side of the 212-R Fuel Storage Facility.

K-200 Electric hazards are present at the light fixtures on the north wall of the basin above the east door way and the north wall of the transfer bay above the west doorway at the 212-R Building.

Table A1-10. Risk-Reduction Option Cost for the 200 Area Facilities.
(5 sheets)

M-200 A severely degraded cantilever support of a roof beam is present in the locker room of the 202-S Canyon Building and requires reinforcement.

N-200 General electrical system degradation exists in the 202-S Canyon Building.

O-200 Poor radiation control exists in the 202-S Building, particularly related to inadequate posting and labeling.

P-200 Debris is present around transformers located outside the north side of the 202-S Building, creating a fire hazard.

Q-200 There is poor radiation control and building maintenance in the 233-S Plutonium Concentration Facility.

R-200 There is poor radiation control and building maintenance in the 233-SA Exhaust Filter Building.

S-200 General electrical system degradation is present in the 291-S Exhaust Fan Facility.

T-200 There is poor radiation control and building maintenance at the 291-S Exhaust Fan Facility.

U-200 The 2711-S Stack Gas Monitoring Building has a badly degraded wood roof. Replacement of the wooden roof over the 2711-S Building is not an option.

V-200 A degraded electrical distribution panel is present outside the southwest corner of the 241-SX-401 Waste Disposal Condenser House. A label on the incoming feed service at the 241-SX-401 Waste Disposal Condenser House needs to be replaced.

W-200 An electrical distribution panel in the control area at the south end of the building needs to be fixed. Several roof leaks at the 241-SY-402 Waste Disposal Condenser House contribute to the problem.

X-200 A degraded four square electrical box is present above the operating gallery just above door 11 in the 221-U Canyon Building.

Y-200 A steam leak exists in the motor control center in the electrical gallery (Section 89) in the 221-U Canyon Building.

Z-200 There is poor radiation control and maintenance in the 221-U Canyon Building, including poor control of contaminated scrap equipment and a lack of proper posting and labelling.

AA-200 There is a degraded fluorescent light fixture in a shower stall at the 271-U Office Building.

BB-200 Poor radiation control, including posting and labeling, at the 291-U Exhaust Fan Facility.

CC-200 There is a degraded electrical service to the 292-U Jet Pit House. General electrical upgrade at the 292-U Building is not an option.

DD-200 There is a degraded metal stair-landing outside the 232-Z Plutonium Incinerator Facility.

EE-200 There is poor radiation control and maintenance at the 232-Z Plutonium Incinerator Facility.

APPENDIX B

105-F REACTOR REPAIR, ISOLATION, AND DEMOLITION WORK BREAKDOWN STRUCTURE

This page intentionally left blank.

CONTENTS

B	105-F REACTOR REPAIR, ISOLATION, AND DEMOLITION WORK	
	BREAKDOWN STRUCTURE	B-1
	B1.0 INTRODUCTION	B-1

LIST OF TABLES

B1-1	Checklist for Overall Demolition Work Breakdown Structure	B-2
B1-2	Checklist for Equipment Removal, Packaging, Shipping, and Disposal of Work Breakdown Structure	B-3
B1-3	Checklist for Surface Decontamination Work Breakdown Structure of Walls, Floors, and Ceilings	B-4
B1-4	Checklist for Asbestos Removal, Packaging, Shipping, and Disposal Work Breakdown Structure	B-5
B1-5	Checklist for Netting Installation Work Breakdown Structure	B-6
B1-6	Checklist for Work Breakdown Structure to Isolate the Facility for Limited or No Maintenance	B-8
B1-7	Checklist for the Work Breakdown Structure of the Delta Roof System Upgrade	B-9
B1-8	The Electrical Upgrade Work Breakdown Structure. (Upgrade the Electrical System Equal to the 105-F Reactor Building Upgrade Standards)	B-10

This page intentionally left blank.

APPENDIX B

105-F REACTOR REPAIR, ISOLATION, AND DEMOLITION WORK BREAKDOWN STRUCTURE

B1.0 INTRODUCTION

Estimates for the 105-F Reactor Building were used as the basis for the unit costs used to estimate costs of risk-reduction measures in this cost comparison. The 105-F Reactor Building has a combination of safety problems common to the other 100 and 200 Area facilities evaluated in this cost-comparison analysis. All work components required to achieve reduction of specific risks were identified and their costs developed. These work components are identified in a work breakdown structure. The following are major components of risk-reducing work:

- Demolition of a facility or facility section
- Equipment removal, packaging, shipping, and disposal
- Decontaminating, e.g., walls, floors, and ceilings
- Installation of netting fastened to the ceiling in designated areas
- Isolation of a facility for zero maintenance
- Electrical upgrades
- Roof upgrades.

The unit cost for electrical upgrades is based on actual work performed at the 105-F Reactor Building. Unit cost for construction of a Delta roof is based on estimates made by Kaiser Engineers Hanford.

The following pages are the work breakdown structure for the major components of the work that is completed, in progress, or is planned.

Table B1-1. Checklist for Overall Demolition Work Breakdown Structure.

1.0 Engineering

1.1 Site preparation engineering

- 1.1.1 Prepare the job control system packages for the site preparation work
- 1.1.2 Prepare a sample plan to obtain the required samples
- 1.1.3 Prepare the Engineering Change Notices for the isolation of utilities
- 1.1.4 Prepare a safety-training plan
- 1.1.5 Obtain hazardous work permits
- 1.1.6 Obtain the radiation work permit
- 1.1.7 Identify items needed for the site preparation work
- 1.1.8 Procure the required items for the site preparation work

1.2 Decommissioning engineering

- 1.2.1 Prepare the job control system packages for the decommissioning work
- 1.2.2 Ensure National Environmental Policy Act is in place
- 1.2.3 When applicable, ensure environmental assessment is prepared and correct
- 1.2.4 When applicable, ensure closure plan is prepared and correct
- 1.2.5 Ensure that all required permits are prepared and correct
- 1.2.6 Ensure that the required documentation for demolition is prepared and correct before the start of work
- 1.2.7 Provide shipping support as required
- 1.2.8 Provide engineering support during demolition
- 1.2.9 Prepare a final report at the completion of demolition activities

2.0 Site Preparation Work

- 2.1 Mobilize equipment and personnel for site preparation work
- 2.2 Rope off and post the demolition work area
- 2.3 Obtain samples as identified in the sample plan
- 2.4 Isolate all utilities connected to the facility, with the exception of electrical power that will be isolated by WHC utilities
- 2.5 Safety training for personnel participating in site preparation work

3.0 Demolition

- 3.2 Mobilize equipment and personnel for demolition activities and rubble disposal
- 3.3 Safety training for personnel participating in demolition work
- 3.4 Demolition activities, and rubble removal and disposal
- 3.5 Fill and grade the demolition area

Table B1-2. Checklist for Equipment Removal, Packaging, Shipping, and Disposal of Work Breakdown Structure.

1.0 Engineering

1.1 Site preparation engineering

- 1.1.1 Prepare the job control system packages for the site preparation work
- 1.1.2 Prepare a sample plan to obtain the required samples
- 1.1.3 Prepare the required Engineering Change Notices
- 1.1.4 Prepare and present a safety-training plan
- 1.1.5 Obtain the hazardous work permits
- 1.1.6 Obtain the radiation work permit
- 1.1.7 Identify procurement items for site preparation work
- 1.1.8 Procure the required items for the site preparation work

1.2 Equipment removal, packaging, shipping and disposal engineering

- 1.2.1 Prepare the job control system packages for equipment removal
- 1.2.2 Prepare the shipping papers
- 1.2.3 Identify items needed for the site preparation work
- 1.2.4 Procure the required items for the site preparation work
- 1.2.5 Ensure all documentation for equipment removal, packaging, and disposal is prepared and correct

2.0 Site Preparation Work Before Equipment Removal

- 2.1 Obtain and characterize samples
- 2.2 Survey facility to verify radiological condition
- 2.3 Install temporary portable lighting
- 2.4 Rope off and post the work area
- 2.5 Set up lunch rooms, change rooms, and rest rooms
- 2.6 Stretch netting across the ceiling below the deteriorated panels

3.0 Equipment Removal and Disposal

- 3.1 Mobilize personnel and equipment
- 3.2 Ensure personnel have safety training for equipment removal
- 3.3 Dismantle and dispose of equipment
- 3.4 Install watertight panels at the interior door openings leading to the interior corridors
- 3.5 At the completion of equipment removal and door panel installation, remove the temporary lighting
- 3.6 Demobilize

**Table B1-3. Checklist for Surface Decontamination Work Breakdown
Structure of Walls, Floors, and Ceilings.**

1.0 Engineering

- 1.1 Decontamination site preparation engineering
 - 1.1.1 Prepare the job control system packages for the site preparation work
 - 1.1.2 Prepare a sample plan to obtain the required samples
 - 1.1.3 Prepare the Engineering Change Notices for the netting installation
 - 1.1.4 Prepare a safety-training plan
 - 1.1.5 Obtain the hazardous work permit
 - 1.1.6 Obtain the radiation work permit
 - 1.1.7 Identify items needed for the site preparation work
 - 1.1.8 Procure the required items for the site preparation work
- 1.2 Decontamination engineering
 - 1.2.1 Prepare the job control system packages for the decontamination work
 - 1.2.2 Ensure all participating personnel attend the safety-training presentation
 - 1.2.3 Identify items needed for decontamination
 - 1.2.4 Procure the required items for decontamination
 - 1.2.5 Ensure all documentation for decontamination is prepared and correct
 - 1.2.6 Provide shipping support during decontamination
 - 1.2.7 Provide engineering support during decontamination
 - 1.2.8 Prepare a final report at the completion of decontamination activity

2.0 Decontamination Site Preparation Work

- 2.1 Mobilize equipment and personnel for site preparation work
- 2.2 Rope off and post the decontamination work area
- 2.3 Obtain and characterize samples
- 2.4 Install a portable lighting system
- 2.5 Ensure all participating personnel attend the safety-training presentation
- 2.6 Install the ceiling safety net

3.0 Decontamination Work

- 3.1 Mobilize personnel and equipment for decontamination work
- 3.2 Ensure all personnel attend the safety-training presentation
- 3.3 Decontaminate concrete surfaces with the scarifying method
- 3.4 Package and ship contaminated waste
- 3.5 Survey and obtain a release of the contaminated area
- 3.6 Demobilize

Table B1-4. Checklist for Asbestos Removal, Packaging, Shipping, and Disposal Work Breakdown Structure.

1.0 Engineering

1.1 Site preparation engineering

- 1.1.1 Prepare the job control system packages for the site preparation work
- 1.1.2 Prepare a sample plan to obtain the required samples
- 1.1.3 Prepare a safety-training plan
- 1.1.4 Schedule Hanford Environmental Health Foundation monitor
- 1.1.5 Obtain the hazardous work permits
- 1.1.6 Obtain a radiation work permit
- 1.1.7 Identify items needed for site preparation work
- 1.1.8 Procure the required items for site preparation work

1.2 Asbestos removal engineering

- 1.2.1 Prepare the job control system packages to remove, package, and dispose of asbestos
- 1.2.2 Prepare the shipping papers for asbestos disposal
- 1.2.3 Identify items needed for the site preparation work
- 1.2.4 Procure the required items for the site preparation work
- 1.2.4 Ensure that all documentation for asbestos work is prepared and correct
- 1.2.5 Ensure engineer and shipping support during asbestos removal
- 1.2.6 Obtain asbestos release documentation

2.0 Asbestos Removal Site Preparation Work

- 2.1 Obtain and characterize samples
- 2.2 Attend the safety-training presentation
- 2.3 Install temporary portable lighting
- 2.4 Rope off and post the asbestos work area
- 2.5 Install air lock and portable air-exchange
- 2.6 Set up change trailer for asbestos workers

3.0 Asbestos Removal, Packaging, and Shipping to Disposal

- 3.1 Mobilize personnel and equipment
- 3.2 Attend the safety-training presentation
- 3.3 Remove, package, and dispose of asbestos
- 3.4 Personnel from the Hanford Environmental Health Foundation shall monitor the asbestos work-area for release
- 3.5 Demobilize

Table B1-5. Checklist for Netting Installation Work Breakdown Structure.

1.0 Engineering

1.1 Site preparation engineering

- 1.1.1 Prepare the job control system packages for the site preparation work
- 1.1.2 Obtain a radiological survey
- 1.1.3 Prepare a safety-training plan
- 1.1.4 Identify items needed for the site preparation work
- 1.1.5 Procure the required items for the site preparation work
- 1.1.6 Obtain a radiation work permit
- 1.1.7 Prepare and present a safety-training plan
- 1.1.8 Ensure engineering support during site preparation work

1.2 Net installation engineering

- 1.2.1 Prepare the job control system packages for the net installation
- 1.2.2 Prepare a safety-training plan
- 1.2.3 Safety-training plan presentation
- 1.2.4 Safety-net installation instructions

2.0 Site Preparation Work

- 2.1 Mobilize personnel and equipment
- 2.2 Install portable temporary lighting
- 2.3 Rope off and post the work area
- 2.4 Attend safety training before the start of site preparation work

3.0 Safety-Net Installation

- 3.1 Mobilize personnel and equipment
- 3.2 Attend safety-training presentation
- 3.3 Install the safety net
- 3.4 Demobilize

Table B1-6. Checklist for Work Breakdown Structure to Isolate the Facility for Limited or No Maintenance.
(2 sheets)

1.0 Engineering

1.1 Site preparation engineering

- 1.1.1 Prepare the job control system package to install temporary lighting
- 1.1.2 Prepare the job control system package to isolate utilities, with the exception of electrical power that will be isolated to designated areas only
- 1.1.3 Prepare a safety-training plan for work orientation
- 1.1.4 Prepare the job control system package to perform safety upgrade work

2.0 Engineering

- 2.1 Prepare the letter of instruction to Kaiser Engineers Hanford for the electrical upgrade for lighting in designated areas
- 2.2 Prepare a bid package and letter of instruction to Kaiser Engineers Hanford for the Delta roof system to be installed through a fixed price contractor
- 2.3 Prepare the Engineering Change Notices and the job control system packages to seal off the "No Maintenance Required" areas
- 2.4 Identify items needed for the site preparation work
- 2.5 Procure the required items for the site preparation work
- 2.6 Prepare a safety-training orientation presentation
- 2.7 Provide engineering support during site-safety upgrade work and during fixed price contractor work

3.0 Site Preparation Work

- 3.1 Rope off and post the work areas
- 3.2 Survey and remove outdated postings, leaving current postings
 - 3.2.1 Update radiological posting to current requirements
- 3.3 Install temporary lighting as needed to perform work to put facility in a no maintenance or limited maintenance status

**Table B1-6. Checklist for Work Breakdown Structure to Isolate the Facility for Limited or No Maintenance.
(2 sheets)**

4.0 Isolate the Facility

- 4.1 Identify all materials and equipment required to seal off doors and openings leading to radiological contaminated areas
- 4.2 Procure the required items
- 4.3 Remove the temporary lighting from areas designated as a "No Maintenance" area
- 4.4 Install the Delta roof system over limited maintenance areas. Utilize percentage and unit costs developed from the Kaiser Engineers Hanford estimate
- 4.5 Upgrade the lighting in the limited maintenance areas. Utilize percentage and unit costs developed from the Kaiser Engineers Hanford estimate
- 4.6 At the completion of the lighting upgrade, remove the temporary lighting

**Table B1-7. Checklist for the Work Breakdown Structure
of the Delta Roof System Upgrade.**

- 1.0 Westinghouse Hanford Company, Environmental Restoration Operations
Decommissioning Engineering Support**
 - 1.1 Prepare a letter of instruction with the required instructions to Kaiser Engineers Hanford to prepare a design and bid package for a fixed-price contract of the designated roof areas
 - 1.2 Review and approve the Delta roof design and fixed-price bid package
 - 1.3 Decommissioning Engineering shall review and approve fixed price contractors safety submittal
 - 1.4 Provide engineering support during fixed-price work
 - 1.5 Inspect work for final acceptance, prepare a punch list, and approve the roof system for final acceptance
 - 1.6 Provide Health Physics technician support during fixed-price work
- 2.0 Kaiser Engineers Hanford Delta Roof System**
 - 2.1 Prepare the roof design
 - 2.2 Prepare the fixed-price bid package
 - 2.3 Advertise and award fixed-price contract
 - 2.4 Give notice to proceed with roof work
 - 2.5 Hold preconstruction meeting
 - 2.6 Contract administrative support
 - 2.7 Provide safety supervision and inspection
- 3.0 Fixed-Price Contract Work**
 - 3.1 Obtain bid and performance bonds
 - 3.2 Identify items needed for the Delta roof system
 - 3.3 Procure the required items needed for the Delta roof system
 - 3.4 Attend the preconstruction meeting
 - 3.5 Mobilize personnel and equipment
 - 3.6 Assemble the Delta roof sections and install them on roof as specified
 - 3.7 Demobilize

**Table B1-8. The Electrical Upgrade Work Breakdown Structure
(Upgrade the Electrical System Equal to the
105-F Reactor Building Upgrade Standards).**

1.0 Engineering

- 1.1 Westinghouse Hanford Company, Environmental Restoration Operations Decommissioning Engineering Support
 - 1.1.1 Prepare a letter of instruction to Kaiser Engineers Hanford to prepare and estimate plant work forces to perform the electrical upgrade
 - 1.1.2 Review and approve the cost estimate for Kaiser Engineers Hanford to perform the work
 - 1.1.3 Provide engineering support during the electrical upgrade work
 - 1.1.4 Inspect the electrical work as it is being performed and approve for final acceptance
- 1.2 Site preparation engineering support
 - 1.2.1 Prepare the job control system package for the site preparation work
 - 1.2.2 Obtain a radiation worker permit
 - 1.2.3 Prepare a safety-training orientation and present the orientation to all personnel entering the 105 buildings

2.0 Site Preparation Work

- 2.1 Attend the safety-training orientation
- 2.2 Survey and post in accordance with current posting requirements
- 2.3 Install temporary lighting

3.0 Kaiser Engineers Hanford

- 3.1 Prepare a cost estimate
- 3.2 Identify items needed for the upgrade work on electrical components
- 3.3 Procure the required items for the upgrade work
- 3.4 Mobilize personnel and equipment
- 3.5 Attend the safety-training orientation
- 3.6 Kaiser Engineers Hanford plant forces shall perform the electrical upgrade work
- 3.7 Demobilize

APPENDIX C

REPAIR COSTS

This page intentionally left blank.

CONTENTS

C	REPAIR COSTS	C-1
C1.0	INTRODUCTION	C-1

LIST OF TABLES

C1-1	Repair Costs for the 100 Area Facilities	C-1
C1-2	Repair Cost for 200 Area Facilities	C-2
C1-3	Repair Cost for 105 Reactor Facilities	C-4

This page intentionally left blank.

APPENDIX C

REPAIR COSTS

C.O INTRODUCTION

The following tables display costs associated with fixing or repairing problems that contribute significantly to risk at an individual facility. The left most column labelled "Repair" contains a cross-reference index. This index corresponds to individual descriptions of dominant risk contributors contained in Tables 3-16, 3-17, and 3-18. These index numbers are referred to in the Appendix A tables, which show risk-reduction option cost by facility or section.

Table C1-1. Repair Costs for the 100 Area Facilities.

Repair	Description	Cost
A-100	General electrical upgrade at the 103-B Riggers Loft is based on \$5/square foot (1,481 square feet) plus general housecleaning and preparation at \$3/square foot (1,481 square feet)	\$11,448
B-100	Repair cost for guard rails at the 103-B Riggers Loft loading ramp is based on \$50/ft	\$500
C-100	Repair of the 185-B Water Treatment Plant and 190-B Main Pump House roof is not an option	- -
D-100	Cost of increased biological and temperature-related controls will be included in future administrative costs for all facilities	- -
E-100	Removal cost of protrusions in the 190-B Tunnel/Annex is based on \$1,000/crew/day	\$1,000
F-100	Cost for upgrade of specific light fixture/raceway at the 1701-BA Exclusion Area Badge House is based on \$1,000/crew/day	\$1,000
G-100	Cost for construction of new metal-framed roof over the 183-C Filter Plant Pump Room and installation of netting below transite panels is based on \$50 per square foot plus \$15/square foot (91,008 square feet)	\$5,915,520
H-100	Specific electrical repair at the 1702-C Badge House is based on \$1,000/crew/day	\$1,000
I-100	Specific electrical repair at the 1714-C Solvent Storage is based on \$1,000/crew/day	\$1,000
J-100	Repair cost of wooden steps and guard rails at the 103-D Fresh Metal Storage is based on \$75/step and \$50/ft, respectively	\$1,000
K-100	Repair of the 183-F Clearwell Facility roof is not an option	- -
L-100	Cost for reinforcement of the 1713-H Warehouse interior bearing wall is based on \$1,000 for materials plus \$1,000/crew/day (3 days)	\$4,000
M-100	Specific electrical repair cost at the 1713-C Solvent Storage is based on \$1,000/crew/day	\$1,000
N-100	Cost for two separate specific electrical repairs at the 165-KW Power Control Building is based on \$1,000/crew/day	\$2,000
O-100	Cost for replacement of the floor grate in the 190-KW Process Water Pump House is estimated at \$1,000/crew/day	\$1,000

Table C1-2. Repair Cost for 200 Area Facilities.
(2 sheets)

Repair	Description	Cost
A-200	Replacement of the metal-frame roof is not an option at the 205-A Solvent Handling Facility	- -
B-200	Replacement of the cover plate over the pipe trench at the 205-A Solvent Handling Facility is not an option	- -
C-200	Reinforcement of the deteriorated circular foundations under four 205-A Solvent Handling Facility storage tanks is not an option	- -
D-200	General electrical upgrade at the 224-B Office and Canyon Building is not an option	- -
E-200	Decontamination of the canyon door at the 224-B Office and Canyon Building for continued surveillance and maintenance is not an option	- -
F-200	Replacement or repairing of specific 215-C Storage Building electrical covers is not an option	- -
G-200	Blocking the opening for contamination spread by biological agents at the 215-C Storage Building is not an option for continued surveillance and maintenance	- -
H-200	Cost of general electrical upgrade at the 212-P Fuel Storage Facility is based on \$5/square foot (5,890 square feet)	\$29,295
I-200	Cost of construction of a Delta roof over the 212-R Fuel Storage Facility is based on \$50/square foot (5,890 square feet), installation of netting is based on \$15/square foot, and a ladder access guards upgrade is based on \$1,000/crew/day	\$383,850
J-200	Repair cost of steps at the 212-R Fuel Storage Facility is based on \$50/step	\$500
K-200	Cost of specific electrical repair at the 212-R Fuel Storage Facility is based on \$5/square foot (5,890 square feet)	\$29,450
L-200	Cost of increased biological and temperature-related controls will be included in future administrative costs for all facilities	- -
M-200	Cost of reinforcement of cantilever roof beam in the 202-S Canyon Building is based on \$500 of materials plus \$1,000/crew/day (2 days)	\$2,500
N-200	Cost of general electrical upgrade at the 202-S Canyon Building is based on \$5/square foot (2,000 square feet) outside area	\$10,000
O-200	Cost for better radiation control, including new posting at the 202-S Canyon Building, and costs related to the increased building maintenance, is based on \$2/square foot (110,744 square feet)	\$221,488
P-200	Cost of clearing the debris from around transformers at the 202-S Canyon Building is based on general housekeeping costs at \$3/square foot (110,744 square feet)	\$332,232
Q-200	Cost of better radiation control at the 233-S Plutonium Concentration Facility, including costs related to increased building maintenance, is based on \$3/square foot (3,024 square feet)	\$9,072
R-200	Better radiation control at the 233-SA Exhaust Filter Building including costs related to increased building maintenance is based on \$3/square foot (384 square feet)	\$1,152
S-200	General electrical upgrade at the 291-S Exhaust Fan Facility is based on \$5/square foot (330 square feet)	\$1,650
T-200	Cost of better radiation control at the 291-S Exhaust Fan Facility, including costs related to increased building maintenance, is based on \$3/square foot (330 square feet)	\$990
U-200	Replacement of the wooden roof over the 2711-S Stack Gas Monitoring Building is not an option	- -
V-200	Specific electrical repairs at the 241-SX-401 Waste Disposal Condenser House is not an option	- -

Table C1-2. Repair Cost for 200 Area Facilities.
(2 sheets)

Repair	Description	Cost
W-200	Specific electrical repairs at the 241-SX-402 Waste Disposal Condenser House is not an option	- -
X-200	Specific electrical repairs at the 221-U Canyon Building is based on \$1,000/crew/day	\$1,000
Y-200	Repair of the steam leak at the 221-U Canyon Building is based on \$1,000/crew/day (3 days)	\$3,000
Z-200	Cost for better radiation control, including new posting and removal of contaminated scape, and costs related to increased building maintenance at the 221-U Canyon Building is based on \$3/square foot (68,860 square feet)	\$206,580
AA-200	Specific electrical repairs at the 221-U Canyon Building is based on \$1,000/crew/day	\$1,000
BB-200	Cost for better radiation control at the 291-U Exhaust Fan Facility, including costs related to increased building maintenance, is based on \$3/square foot (330 square feet)	\$990
CC-200	General electrical upgrades at the 292-U Exhaust Fan Facility is not an option	- -
DD-200	Cost for repair of the stair landing outside the 232-Z Plutonium Incinerator Facility is based on \$1,000/crew/day	\$1,000
EE-200	Cost for better radiation control at the 232-Z Plutonium Incinerator Facility, including costs related to increased building maintenance, is based on \$3/square foot (2,577 square feet)	\$7,310

Table C1-3. Repair Cost for 105 Reactor Facilities.
(3 sheets)

Repair	Description	Cost
ALL-105	Cost of increased biological and temperature-related controls will be included in future administrative costs for all facilities	- -
A	Cost for general electrical upgrade in all areas of the 105-B Reactor Building is based on \$5/square foot Storage basin and transfer area: 8,877 square feet (\$5/square foot) = \$43,385 Fan house: 8,352 square feet (\$5/square foot) = \$41,760 Process area: 8,857 square feet (\$5/square foot) = \$44,285 Work area/valve pit area: 13,699 square feet (\$5/square foot) = \$68,495 Office/miscellaneous: 4,842 square feet (\$5/square foot) = \$24,210	\$218,185
B	Cost for construction of Delta roof over the 105-C Reactor Building is based on \$50/square foot, and installation of netting is based on \$15/square foot Storage area and transfer area: 13,896 square feet (\$65/square foot) = \$903,240 Fan house: 10,120 square feet (\$65/square foot) = \$657,800 Process area: 17,389 square feet (\$65/square foot) = \$1,130,285 Work area: 14,980 square feet (\$65/square foot) = \$973,700	\$3,665,025
C	Cost for general electrical upgrade in all areas of the 105-C Reactor Building is based on \$5/square foot. Storage basin and transfer area: 13,896 square feet (\$5/square foot) = \$69,480 Fan house: 10,129 square feet (\$5/square foot) = \$50,600 Process area: 17,389 square feet (\$5/square foot) = \$86,945 Work area: 14,980 square feet (\$5/square foot) = \$74,900	\$281,925
D	Cost for specific electrical repair on the outside wall of the process area of the 105-D Reactor Building is based on \$1,000/crew/day	\$1,000
E	Cost for construction of a Delta roof over all areas of the 105-D Reactor Building (except the office/miscellaneous area) is based on \$50/square foot; installation of netting is based on \$15/square foot; and replacement of specific floor planks in the basin area is based on \$1,000/crew/day Storage basin and transfer area: 8,877 square feet (\$65/square foot) plus \$1,000 = \$578,005 Fan house: 8,352 square feet (\$65/square foot) = \$547,105 Process area: 8,857 square feet (\$65/square foot) = \$575,705 Work area/valve pit: 13,699 square feet (\$65/square foot) = \$890,435	\$2,591,250
F	Cost for Delta roof over the 105-DR Reactor Building storage basin (12,802 square foot) and work/valve pit area (11,868 square feet) is based on \$50/square foot; installation of netting is based on \$15/square foot Storage basin and transfer area: 12,802 square feet (\$65/square foot) = \$832,130 Work/valve pit area: 11,860 square feet (\$65/square foot) = \$770,900	\$1,603,030
G	Cost for three specific electrical repairs in the 105-DR Reactor Building storage basin, transfer area, and process area stairwell are based on \$1,000/crew/day Storage basin and transfer area: \$2,000 Process area: \$1,000	\$3,000
H	Agreement with Pacific Northwest Laboratory landlords to remove the 105-DR Reactor Building sodium burn facility or do a safety study; cost is based on engineering judgement	\$?

Table C1-3. Repair Cost for 105 Reactor Facilities.
(3 sheets)

Repair	Description	Cost
I	Cost for construction of Delta roof over the 105-DR Reactor Building fan house and office/miscellaneous area is based on \$50/square foot; installation of netting is based on \$15/square foot; specific wood plank repair in process area is based on \$1,000 crew/day; specific guard rail upgrades at near side lab area is based on \$1,000/crew/day; and the storage basin is based on \$200 material and \$1,000/crew/day (2 days) Storage and transfer area: \$2200 Fan house: 5,848 square feet (\$65/square foot) = \$380,120 Process area: \$1,000 Office/miscellaneous area: 6,793 square feet (\$65/square foot) plus \$1,000 = \$442,545	\$825,865
J	Cost for general electrical repairs in the 105-DR Reactor Building work/valve pit area (11,868 square feet) and office/miscellaneous (6,793 square feet) Work/valve pit area: 11,868 square feet (\$5/square foot) = \$59,340 Office/miscellaneous area: 6,793 square feet (\$5/square foot) = \$33,965	\$93,305
K	Cost to replace deformed grating throughout the 105-DR Reactor Building is based on \$2,000 material and \$1,000/crew/day (2 days) Storage and transfer area: \$1,000 Fan house: \$1,000 Process area: \$1,000 Work area/valve pit area: \$1,000	\$4,000
L	Cost for specific removal of protruding rebar on the exterior south side of the 105-DR Reactor Building is based \$1,000/crew/day	\$1,000
M	Cost for construction of Delta roof over the 105-F Reactor Building storage basin and transfer area is based on \$50/square foot and installation of netting is based \$15/square foot Storage basin and transfer area: 8,877 square feet (\$65/square foot) = \$577,005	\$577,005
N	Cost for general electrical upgrade in the 105-F Reactor Building fan house/valve pit area is based on \$5/square foot Fan house/valve pit: 15,137 square feet (\$5/square foot) = \$75,685	\$75,685
O	Cost for general electrical upgrade in the 105-F Reactor Building storage basin and transfer area, process area, and work area are based on \$5/square foot Storage basin and transfer area: 8,877 square feet (\$5/square foot) = \$44,385 Process area: 8,857 square feet (\$5/square foot) = \$44,285 Work area: 6,914 square feet (\$5/square foot) = \$34,570	\$123,240
P	Cost for Delta roof over the 105-F Reactor Building process area, work area, and fan house/valve pit area are based on \$50/square foot; installation of netting is based on \$15/square foot Process area: 8,857 square feet (\$60/square foot) = \$575,705 Work area: 6,914 square feet (\$65/square foot) = \$449,410 Fan house/valve pit area: 15,137 square feet (\$65/square foot) = \$983,905	\$2,009,020
Q	Cost for specific electrical repairs in the 105-H Reactor Building plastic film greenhouse and process area are based on \$1,000/crew/day	\$2,000
R	Cost for construction of Delta roof over the 105-H Reactor Building storage basin and transfer area, mechanical shop area, process area, and work area are based on \$50/square foot; installation of netting is based on \$15/square foot; upgrade of repaired metal ladders is based on \$1,000/crew/day (3 days) Storage basin and transfer, mechanical shop area: 13,896 square feet (\$65/square foot) plus \$1,000 = \$904,240 Process area: 11,232 square feet (\$65/square foot) plus \$1,000 = \$731,080 Work area: 4,861 square feet (\$65/square foot) plus \$1,000 = \$316,965	\$1,952,285

Table C1-3. Repair Cost for 105 Reactor Facilities.
(3 sheets)

Repair	Description	Cost
S	Cost for specific electrical repairs in the 105-M Reactor Building process and work area are based on \$1,000/crew/day Process area: \$1,000 Work area: \$1,000	\$2,000
T	Cost for four separate specific electrical repairs; two in the control room, one in the process area, and one in the work area are based on \$1,000/crew/day Control room/exhaust fan/miscellaneous area: \$2,000 Process area: \$1,000 Work area: \$1,000	\$4,000
U	Cost for decontamination of the top of the 105-KE Reactor Building reactor/ball hopper area (2,000 square feet) and inner/outer rod rooms is based on \$16/square foot; more general building maintenance related to radiation control is based on \$3/square foot Process area: (2,000 square feet; 4,864 square feet; 1,800 square feet) (\$16/square foot; \$3/square foot) = \$154,800	\$164,616
V	Cost for specific electrical repair in the 105-KW Reactor Building process area east side staircase is based on \$1,000/crew/day	\$1,000
W	Cost for decontamination of the top of the 105-KE Reactor Building reactor/ball hopper area (2,000 square feet) and inner/outer rod rooms are based on \$16/square foot; more general building maintenance related to radiation control is based on \$3/square foot Process area: (2,000 square feet; 4,864 square feet; 1,800 square feet) (\$16/square foot; \$3/square foot) = \$154,800	\$164,616
X	Cost for construction of Delta roof over the 105-KW Reactor Building work area/supply fan area (10,679 square feet) is based on \$50/square foot, and installation of netting is based on \$15/square foot	\$694,135

APPENDIX D

FACILITY ISOLATION COSTS

This page intentionally left blank.

CONTENTS

D	FACILITY ISOLATION COSTS	D-1
D1.0	INTRODUCTION	D-1

LIST OF TABLES

D1-1	Cost of Isolation of Nonreactor 100 Area Facilities	D-2
D1-2	Cost of Isolation of 200 Area Facilities	D-3
D1-3	105-B Reactor Building Sectional Isolation Costs	D-4
D1-4	105-C Reactor Building Sectional Isolation Costs	D-5
D1-5	105-D Reactor Building Sectional Isolation Costs	D-6
D1-6	105-DR Reactor Building Sectional Isolation Costs	D-7
D1-7	105-F Reactor Building Sectional Isolation Costs	D-8
D1-8	105-H Reactor Building Sectional Isolation Costs	D-9
D1-9	105-KE and KW Reactor Building Sectional Isolation Costs	D-10

This page intentionally left blank.

APPENDIX D

FACILITY ISOLATION COSTS

D1.0 INTRODUCTION

The following tables display cost information for isolation of nonreactor 100 Area facilities to reduce risk.

Table D1-1. Cost of Isolation of Nonreactor 100 Area Facilities.

Building	Fence cost	Asbestos removal	Radiation decontamination	Cleanup	Total isolation cost
103-B Riggers Loft	\$13,349	\$31,482	\$22,896	\$4,293	\$72,020
104-B-2 Tritium Laboratory	\$10,179	\$6,336	\$4,608	\$864	\$21,987
116-B Exhaust Stack	\$38,000	- -	- -	- -	\$38,000
185-B Water Treatment Plant/190-B Main	\$25,961	\$321,024	- -	\$43,776	\$390,761
190-B Tunnel/Annex	\$15,200	- -	- -	- -	\$15,200
1608-B Gas Line Pressure/Vacuum Seal	\$9,424	\$3,168	\$2,304	\$432	\$15,328
1701-BA Exclusion Area Badge House	\$10,640	\$8,800	- -	\$1,200	\$20,640
183-C Filter Plant Pump Room	\$53,454	\$2,002,176	- -	\$273,024	\$2,328,654
1702-C Badge House	\$9,802	\$4,620	- -	\$630	\$15,052
1714-C Solvent Storage	\$9,498	\$3,432	- -	\$468	\$13,398
103-D Fresh Metal Storage	\$13,349	\$31,482	- -	\$4,293	\$49,124
116-D Reactor Exhaust Stack	\$38,000	- -	- -	- -	\$38,000
116-DR Reactor Exhaust Stack	\$38,000	- -	- -	- -	\$38,000
117-DR Exhaust Air Filter Building	\$14,891	\$50,622	\$36,816	\$6,903	\$109,232
119-DR Exhaust Air Sample Building	\$10,484	\$7,920	\$5,760	\$1,080	\$25,244
1702-DR Area Badge House	\$10,640	\$8,800	- -	\$1,200	\$20,640
108-F Biology Laboratory Building	\$34,362	\$682,000	- -	\$93,000	\$809,362
183-F Clearwell Facility	\$33,034	- -	- -	- -	\$33,034
1701-FA Gate House	\$11,445	\$14,080	\$10,240	\$1,920	\$37,685
1713-H Warehouse	\$25,579	\$307,824	- -	\$41,976	\$375,379
167-K Crosstie Tunnel Building	\$9,461	\$3,300	\$2,400	\$450	\$15,611
182-K Emergency Water Reservoir and	\$15,365	\$57,420	\$41,760	\$7,830	\$122,375
115-KE Reactor Exhaust Stack	\$17,042	\$84,898	\$61,744	\$11,577	\$175,261
116-KE Reactor Exhaust Stack	\$38,000	- -	- -	- -	\$38,000
117-KE Exhaust Air Filter Building	\$14,891	\$50,622	\$36,816	\$6,903	\$109,232
1702-KE Badge House	\$10,640	\$8,800	- -	\$1,200	\$20,640
1713-KER Warehouse	\$11,899	\$17,600	- -	\$2,400	\$31,899
115-KW Gas Recirculation Building	\$17,042	\$84,898	\$61,744	\$11,577	\$175,261
116-KW Reactor Exhaust Stack	\$3,000	- -	- -	- -	\$38,000
117-KW Exhaust Air Filter Building	\$14,891	\$50,622	\$36,816	\$6,903	\$109,232
165-KW Power Control Building	\$32,297	\$580,800	- -	\$79,200	\$692,297
183-KW Filter Plant	\$21,544	\$185,152	- -	\$25,248	\$231,944
190-KW Process Water Pump House	\$31,057	\$209,589	- -	\$142,902	\$383,578
1702-KW Badge House	\$10,640	\$8,800	- -	\$1,200	\$20,640
1714-KW Warehouse	\$11,899	\$17,600	- -	\$2,400	\$31,899

Table D1-2. Cost of Isolation of 200 Area Facilities.

Building	Fence Cost	Asbestos removal	Radiation decontamination	Cleanup	Total isolation cost
205-A Solvent Handling Facility	\$9,265	\$2,640	\$1,920	\$360	\$14,185
224-B Office and Canyon Building	\$34,054	\$666,402	\$484,656	\$90,873	\$1,275,985
215-C Storage Building	\$11,720	\$16,170	\$11,760	\$2,205	\$41,855
212-N Fuel Storage Facility	\$19,265	\$129,580	\$94,240	\$17,670	\$260,755
212-P Fuel Storage Facility	\$19,265	\$129,580	\$94,240	\$17,670	\$260,755
212-R Fuel Storage Facility	\$19,265	\$129,580	\$94,240	\$17,670	\$260,755
202-S Canyon Building	- -	- -	- -	- -	*
233-S Plutonium Concentration Facility	- -	- -	- -	- -	*
233-SA Exhaust Filter Building	\$11,469	\$7,920	\$5,760	\$1,080	\$26,229
276-S Solvent Handling Building	\$15,190	\$54,868	\$39,904	\$7,482	\$117,444
291-S Exhaust Fan Facility	- -	- -	\$4,480	\$840	\$5,320
292-S Jet Pit House	\$9,994	\$5,457	\$3,969	\$744	\$20,164
293-S Offgas Treatment/Recovery	\$11,622	\$15,406	\$11,204	\$2,100	\$40,334
2711-S Stack Gas Monitoring Building	\$9,610	\$3,850	\$2,800	\$525	\$16,785
2715-S Storage Building	\$9,546	- -	- -	\$480	\$10,026
2718-S Sand Filter Sample Building	\$9,500	\$3,168	\$2,304	\$432	\$15,404
2904-SA Cooling Water Sampler Building	\$8,853	\$1,496	\$1,088	\$204	\$11,641
S Plant Butler Building	\$10,640	- -	- -	\$1,200	\$11,840
241-SX-401 Waste Disposal Condenser	\$12,309	\$19,008	\$13,824	\$2,592	\$47,733
241-SX-402 Waste Disposal Condenser	\$12,309	\$19,008	\$13,824	\$2,592	\$47,733
221-U Canyon Building	- -	- -	- -	- -	*
271-U Canyon Building	- -	\$168,960	\$122,880	\$23,040	\$314,880
276-U Solvent Handling Facility	\$16,674	\$78,408	\$57,024	\$10,692	\$162,798
291-U Exhaust Fan Facility	\$10,357	\$7,260	- -	\$990	\$18,607
292-U Jet Pit House	\$10,386	\$7,392	\$5,376	\$1,008	\$24,162
232-Z Plutonium Incinerator Facility	\$14,461	\$44,827	\$32,601	\$6,112	\$98,002

*Not an option.

Table D1-3. 105-B Reactor Building Sectional Isolation Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Barrier cost	Total isolation cost
Transfer bay	Storage basin and transfer area		\$47,212	\$6,438	\$53,650
Fuel storage basin	Storage basin and transfer area		\$131,868	\$17,982	\$149,850
Fuel storage washdown pad	Storage basin and transfer area		\$16,214	\$2,211	\$18,425
Sample room	Process area		\$7,128	\$972	\$8,100
Storage area	Process area		\$5,544	\$756	\$6,300
Control room	Process area		\$26,950	\$3,675	\$30,625
Miscellaneous storage room	Office/miscellaneous		\$29,920	\$4,080	\$34,000
Process area	Process area		\$155,232	\$21,168	\$176,400
Work area	Work area/valve pit area		\$69,168	\$9,432	\$78,600
Outer rod room	Office/miscellaneous	\$21,280	\$29,260	\$3,990	\$54,530
Miscellaneous storage	Office/miscellaneous		\$29,920	\$4,080	\$34,000
Air conditioning equipment	Office/miscellaneous		\$11,088	\$1,512	\$12,600
Office	Office/miscellaneous		\$6,336	\$864	\$7,200
Charge preparation	Work area/valve pit area		\$21,780	\$2,970	\$24,750
Accumulators	Work area/valve pit area		\$31,680	\$4,320	\$36,000
Electrical equipment	Work area/valve pit area		\$17,600	\$2,400	\$20,000
Instrument repair	Work area/valve pit area		\$6,600	\$900	\$7,500
Restrooms	Work area/valve pit area		\$5,280	\$720	\$6,000
Fan room	Fan house		\$183,744	\$25,056	\$208,800
Valve pit & pit extension	Work area/valve pit area		\$149,270	\$20,355	\$169,625

Table D1-4. 105-C Reactor Building Sectional Isolation Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Barrier cost	Total isolation cost
Process area	Process area		\$36,894	\$6,708	\$43,602
C-elevator work area	Process area		\$48,114	\$8,748	\$56,862
Control room office records	Work area		\$43,312	\$7,875	\$51,187
Metal and dummy storage	Work area		\$23,826	\$4,332	\$28,158
Electrical room/battery room	Work area		\$19,536	\$3,552	\$23,088
D-elevator	Work area		\$9,108	\$1,656	\$10,764
Maintenance and lower rod room	Work area		\$9,240	\$1,680	\$10,920
Office 1,2,5,6, and 7	Work area		\$18,612	\$3,384	\$21,996
Women's rest room	Work area		\$5,940	\$1,080	\$7,020
Lunch room	Work area		\$8,316	\$1,512	\$9,828
Instrument room/storage	Work area		\$9,504	\$1,728	\$11,232
Instrument repair	Work area		\$7,392	\$1,344	\$8,736
Inner rod room	Process area	\$6,771	\$48,879	\$6,348	\$61,998
Outer rod room	Process area	\$9,126	\$65,881	\$8,556	\$83,563
Hot storage / decontamination room	Work area	\$2,841	\$17,582	\$2,664	\$23,088
Soiled clothing	Work area		\$4,752	\$864	\$5,616
Change room	Work area		\$6,732	\$1,224	\$7,956
Clean clothes storage	Work area		\$7,128	\$1,296	\$8,424
Showers and dressing area	Work area		\$4,752	\$864	\$5,616
Blue tool room	Work area	\$384	\$3,960	\$720	\$5,064
Gas instrument room	Work area		\$3,960	\$720	\$4,680
Laboratory	Work area		\$6,336	\$1,152	\$7,488
Sewage station	Work area		\$20,790	\$3,780	\$24,570
Monitor room	Work area		\$4,290	\$780	\$5,070
Compressor room	Work area		\$4,092	\$744	\$4,836
Health physics office	Work area		\$7,507	\$1,365	\$8,872
Health physics room	Work area		\$3,432	\$624	\$4,056
Lab, corridor, elevator	Process area		\$32,670	\$5,940	\$38,610
Corridors	Process area		\$87,268	\$15,867	\$103,135
Transfer bay	Storage basin and misc. storage		\$36,630	\$6,660	\$43,290
Storage basin/washdown pad	Storage basin and misc. storage		\$167,904	\$30,528	\$198,432
Fan room	Fan house		\$166,980	\$30,360	\$197,340
Mechanical shop	Storage basin and misc. storage		\$24,750	\$4,500	\$29,250

Table D1-5. 105-D Reactor Building Sectional Isolation Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Barrier cost	Total isolation cost
Transfer bay	Storage basin and transfer area	\$21,280		\$6,438	\$6,438
Fuel storage basin	Storage basin and transfer area			\$17,982	\$17,982
Fuel storage washdown pad	Storage basin and transfer area			\$2,211	\$2,211
Sample room	Process area			\$972	\$972
Storage area	Process area			\$756	\$756
Control room	Process area			\$3,675	\$3,675
Miscellaneous storage room	Office/miscellaneous			\$4,080	\$4,080
Process area	Process area			\$21,168	\$21,168
Work area	Work area/valve pit area			\$9,432	\$9,432
Outer rod room	Office/miscellaneous			\$3,990	\$25,270
Miscellaneous storage	Office/miscellaneous			\$4,080	\$4,080
Air conditioning equipment	Office/miscellaneous			\$1,512	\$1,512
Office	Office/miscellaneous			\$864	\$864
Charge preparation	Work area/valve pit area			\$2,970	\$2,970
Accumulators	Work area/valve pit area			\$4,320	\$4,320
Electrical equipment	Work area/valve pit area			\$2,400	\$2,400
Instrument repair	Work area/valve pit area			\$900	\$900
Restrooms	Work area/valve pit area			\$720	\$720
Fan room	Fan house			\$25,056	\$25,056
Valve pit and pit extension	Work area/valve pit area			\$20,355	\$20,355

Table D1-6. 105-DR Reactor Building Sectional Isolation Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Barrier cost	Total isolation cost
Process area	Process area		\$73,986	\$10,089	\$84,075
Work area	Work area/valve pit area		\$68,992	\$9,408	\$78,400
Valve pit	Work area/valve pit area		\$72,072	\$9,828	\$81,900
Solid feed	Work area/valve pit area		\$24,948	\$3,402	\$28,350
Storage room	Work area/valve pit area		\$25,872	\$3,528	\$29,400
Accumulator room	Work area/valve pit area		\$23,276	\$3,174	\$26,450
Restroom	Work area/valve pit area		\$7,436	\$1,014	\$8,450
Lunchroom	Work area/valve pit area		\$17,556	\$2,394	\$19,950
Electrical equipment	Work area/valve pit area		\$12,320	\$1,680	\$14,000
Instrument repair	Work area/valve pit area		\$8,624	\$1,176	\$9,800
Miscellaneous storage room	Office/miscellaneous		\$38,016	\$5,184	\$43,200
Control room	Office/miscellaneous		\$28,512	\$3,888	\$32,400
Air conditioning equipment	Office/miscellaneous		\$5,280	\$720	\$6,000
Counting room	Office/miscellaneous		\$3,960	\$540	\$4,500
Clean clothing	Office/miscellaneous		\$3,960	\$540	\$4,500
Laboratory	Office/miscellaneous		\$4,224	\$576	\$4,800
Monitor room	Office/miscellaneous		\$8,800	\$1,200	\$10,000
Office 1,2,3, and 4	Office/miscellaneous		\$32,758	\$4,467	\$37,225
Corridor	Storage basins & transfer area		\$73,920	\$10,080	\$84,000
Gas instrument room	Office/miscellaneous		\$23,936	\$3,264	\$27,200
Fan room	Fan house	\$9,356	\$141,521	\$17,544	\$168,422
Farside downcomer, etc	Process area		\$57,728	\$7,872	\$65,600
Farside instrument room	Process area		\$19,712	\$2,688	\$22,400
Storage room 2, farside	Process area		\$5,544	\$756	\$6,300
Stair farside	Process area		\$4,224	\$576	\$4,800
Fuel storage basin	Storage basins & transfer area		\$120,472	\$16,428	\$136,900
Wash pad	Storage basins & transfer area		\$23,760	\$3,240	\$27,000
Transfer bay	Storage basins & transfer area		\$63,492	\$8,658	\$72,150

Table D1-7. 105-F Reactor Building Sectional Isolation Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Barrier cost	Total isolation cost
Transfer bay	Storage basin and transfer area	\$21,280		\$6,438	\$6,438
Fuel storage basin	Storage basin and transfer area			\$17,982	\$17,982
Fuel storage washdown pad	Storage basin and transfer area			\$2,211	\$2,211
Sample room	Process area			\$972	\$972
Storage area	Process area			\$756	\$756
Control room	Process area			\$3,675	\$3,675
Miscellaneous storage room	Office/miscellaneous			\$4,080	\$4,080
Process area	Process area			\$21,168	\$21,168
Work area	Work area			\$9,432	\$9,432
Outer rod room	Office/miscellaneous			\$3,990	\$25,270
Miscellaneous storage	Office/miscellaneous			\$4,080	\$4,080
Air conditioning equipment	Office/miscellaneous			\$1,512	\$1,512
Office	Office/miscellaneous			\$864	\$864
Charge preparation	Work area			\$2,970	\$2,970
Accumulators	Work area			\$4,320	\$4,320
Electrical equipment	Work area			\$2,400	\$2,400
Instrument repair	Work area			\$900	\$900
Restrooms	Work area			\$720	\$720
Fan room	Fan house & valve pit			\$25,056	\$25,056
Valve pit & pit extension	Fan house & valve pit			\$20,355	\$20,355

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Barrier cost	Total isolation cost
Process area	Process area			\$6,708	\$6,708
C-elevator work area	Process area			\$8,748	\$8,748
Control room office records	Offices and control room			\$7,875	\$7,875
Metal and dummy storage	Work area			\$4,332	\$4,332
Electrical room/battery room	Offices and control room			\$3,552	\$3,552
D-elevator	Process area			\$1,656	\$1,656
Maintenance and lower rod room	Process area			\$1,680	\$1,680
Offices 1,2,5,6, and 7	Offices and control room			\$3,384	\$3,384
Women's restroom	Offices and control room			\$1,080	\$1,080
Lunch room	Offices and control room			\$1,728	\$1,728
Instrument repair	Offices and control room			\$1,344	\$1,344
Inner rod room	Process area			\$6,348	\$6,348
Outer rod room	Process area			\$8,556	\$8,556
Hot storage / decontamination room	Fan and dryer areas	\$14,208		\$2,664	\$16,872
Soiled clothing	Fan and dryer areas	\$4,608		\$864	\$5,472
Change room	Fan and dryer areas	\$6,528		\$1,224	\$7,752
Clean clothes storage	Fan and dryer areas	\$6,912		\$1,296	\$8,208
Showers and dressing area	Work area			\$1,872	\$1,872
Blue tool room	Work area			\$450	\$450
Gas instrument room	Fan and dryer areas	\$3,840		\$720	\$4,560
Laboratory	Fan and dryer areas	\$5,408		\$1,014	\$6,422
Sewage station	Fan and dryer areas	\$20,160		\$3,780	\$23,940
Monitor room	Fan and dryer areas	\$4,160		\$780	\$4,940
Compressor room	Fan and dryer areas	\$3,968		\$744	\$4,712
Health physics office	Work area	\$10,608		\$1,989	\$12,597
Lab, corridor, elevator	Work area	\$31,680		\$5,940	\$37,620
Corridors	Offices and control room			\$15,867	\$15,867
Transfer bay	Storage basin and transfer area	\$35,520		\$6,660	\$42,180
Miscellaneous storage	Storage basin and transfer area			\$4,500	\$4,500
Storage basin/washdown pad	Storage basin and transfer area	\$162,816		\$30,528	\$193,344
Fan room	Fan and dryer areas			\$14,580	\$14,580
Greenhouse					

Table D1-8. 105-H Reactor Building Sectional Isolation Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Barrier cost	Total isolation cost
Process area	Process area		\$52,272	\$7,128	\$59,400
Work area	Work area and supply fan area		\$107,008	\$14,592	\$121,600
Inner rod room	Process area		\$26,400	\$3,600	\$30,000
Outer rod room	Process area		\$39,600	\$5,400	\$45,000
Miscellaneous storage	Work area and supply fan area		\$29,568	\$4,032	\$33,600
Electrical equipment	Process area		\$28,336	\$3,864	\$32,200
D elevator	Process area		\$52,272	\$7,128	\$59,400
Dolly tool room	Process area		\$19,008	\$2,592	\$21,600
Laboratory	Control room, exterior fan and misc.		\$23,496	\$3,204	\$26,700
Elevator, lobby	Process area		\$8,712	\$1,188	\$9,900
Monitor room	Control room, exterior fan and misc.		\$15,488	\$2,112	\$17,600
Control room	Control room, exterior fan and misc.		\$36,432	\$4,968	\$41,400
Counting room	Control room, exterior fan and misc.		\$2,640	\$360	\$3,000
Air conditioning	Control room, exterior fan and misc.		\$3,696	\$504	\$4,200
Office	Control room, exterior fan and misc.		\$7,128	\$972	\$8,100
Locker room	Control room, exterior fan and misc.		\$19,712	\$2,688	\$22,400
Fan room access stairs	Work area and supply fan area	\$652	\$5,385	\$612	\$6,650
Change room	Control room, exterior fan and misc.		\$4,576	\$624	\$5,200
Janitorial/storage & decon	Control room, exterior fan and misc.	\$2,912	\$12,012	\$1,092	\$16,016
Radiation monitor office #3	Control room, exterior fan and misc.		\$21,120	\$2,880	\$24,000
Instrument repair	Control room, exterior fan and misc.		\$25,344	\$3,456	\$28,800
Fan room	Work area and supply fan area	\$12,313	\$101,587	\$11,544	\$125,444
Metal storage	Work area and supply fan area		\$21,208	\$2,892	\$24,100
Corridors	Control room, exterior fan and misc.		\$72,666	\$9,909	\$82,575
Storage basin	Storage basin and transfer areas	\$158,656	\$436,304	\$29,748	\$624,708
Transfer bay	Storage basin and transfer areas	\$69,856	\$192,104	\$13,098	\$275,058
Valve pit	Process area		\$17,952	\$2,448	\$20,400
Wash/ room	Storage basin and transfer areas	\$13,824	\$38,016	\$2,592	\$54,432
Cask/equipment storage room	Storage basin and transfer areas	\$11,648	\$32,032	\$2,184	\$45,864
Hot storage	Storage basin and transfer areas	\$9,216	\$25,344	\$1,728	\$36,288
Maintenance shop	Control room, exterior fan and misc.		\$9,592	\$1,308	\$10,900
Wash pad	Storage basin and transfer areas	\$11,520	\$31,680	\$2,160	\$45,360

Note: Isolation currently not an option.

Table D1-9. 105-KE and KW Reactor Building Sectional Isolation Costs.

APPENDIX E
DEMOLITION COSTS

This page intentionally left blank.

CONTENTS

E	FACILITY DEMOLITION COSTS	D-1
E1.0	INTRODUCTION	D-1

LIST OF TABLES

E1-1	Costs for Demolition of 100 Area Nonreactor Facilities	E-2
E1-2	Costs for Demolition of 200 Area Facilities	E-3
E1-3	105-B Reactor Building Sectional Demolition Costs	E-4
E1-4	105-C Reactor Building Sectional Demolition Costs	E-5
E1-5	105-D Reactor Building Sectional Demolition Costs	E-6
E1-6	105-DR Reactor Building Sectional Demolition Costs	E-7
E1-7	105-F Reactor Building Sectional Demolition Costs	E-8
E1-8	105-H Reactor Building Sectional Demolition Costs	E-9
E1-9	105-KE and KW Reactor Building Sectional Demolition Costs	E-10
E1-10	Demolition Costs for Total Reactor Building Removal	E-11

This page intentionally left blank.

APPENDIX E

FACILITY DEMOLITION COSTS

E1.0 INTRODUCTION

The following tables display costs associated with demolishing an individual facility or parts of a facility.

Table E1-1.
Costs for Demolition of 100 Area Nonreactor Facilities.

Building	Demolition cost
103-B Riggers Loft	\$51,000
104-B-1 Tritium Vault	\$35,000
104-B-2 Tritium Laboratory	\$35,000
105-B Water Tunnel	\$150,000
115-B/C Gas Recirculation Building	\$768,000
116-B Reactor Exhaust Stack	\$337,000
185-B Water Treatment Plant/ 190-B Pump House	\$2,240,000
190-B Annex/Tunnel	* \$200,000
1608-B Gas Line Pressure/Vacuum Seal House	
1701-BA Exclusion Area Badge House	\$12,000
105-C Water Tunnels	\$150,000
183-C Filter Plant/Pumphoom	\$235,000
117-C Exhaust Air Filter Building	\$281,000
1702-C Badge House	\$6,000
1714-C Solvent Storage	\$6,000
103-D Fresh Metal Storage	\$49,000
105-D and 105-DR Water Tunnels	\$71,000
116-D Reactor Exhaust Stack	\$337,000
116-DR Reactor Exhaust Stack	\$350,000
117-DR Exhaust Air Filter Building	\$316,000
119-DR Exhaust Air Sample Building	\$19,000
1702-DR Area Badge House	\$9,000
108-F Biology Laboratory Building	\$4,272,000
183-F Clearwell Facility	\$73,803
1701-FA Gate House	\$17,000
1713-H Warehouse	\$524,000
1720-HA Arsenal	\$6,000
167-K Crosstie Tunnel Building	\$6,000
182-K Emergency Water Reservoir and Pump House	\$97,000
105-KE Water Tunnel	\$150,000
110-KE Gas Storage Facility	\$394,000
115-KE Gas Recirculation Building	\$1,400,000
116-KE Reactor Exhaust Stack	\$600,000
117-KE Exhaust Air Filter Building	\$320,000
119-KE Exhaust Air Sampling Building	\$19,000
166-AKE Oil Storage Facility	\$8,000
1702-KE Badge House	\$8,000
1713-KER Warehouse	\$23,000
105-KW Water Tunnel	\$150,000
110-KW Gas Storage Facility	\$394,000
115-KW Gas Recirculation Building	\$1,429,000
116-KW Reactor Exhaust Stack	\$600,000
117-KW Exhaust Air Filter Building	\$321,000
119-KW Exhaust Air Sampling Building	\$19,000
165-KW Power Control Building	\$702,000
183-KW Filter Plant	\$1,561,700
190-KW Process Water Pumphouse	\$2,802,666
1702-KW Badge House	\$12,000
1714-KW Warehouse	\$21,000

* Estimated from breakdown of total 185-B/190-B Tunnel/Annex demolition cost.

Table E1-2. Costs for Demolition of 200 Area Facilities.

Building	Demolition cost
205-A Solvent Handling Facility	\$481,000
224-B Office and Canyon Building	\$14,835,000
215-C Storage Building	\$87,740
212-N Fuel Storage Facility	\$1,343,000
212-P Fuel Storage Facility	\$1,343,000
212-R Fuel Storage Facility	\$1,343,000
202-S Canyon Building (REDOX)	\$174,582,084
233-S Plutonium Concentration Facility	\$16,873,000
233-SA Exhaust Filter Building	\$1,330,000
276-S Solvent Handling Building	\$1,034,000
291-S Exhaust Fan Facility	\$1,034,000
292-S Jet Pit House	\$27,224
293-S Offgas Treatment and Recovery Building	\$71,000
2711-S Stack Gas Monitoring Building	\$57,184
2715-S Storage Building	\$10,660
2718-S Sand Filter Sampler Building	\$38,508
2904-SA Cooling Water Sampler Building	\$140,000
S Plant Butler Building	Portable
241-SX-401 Waste Disposal Condenser House	\$1,620,000
241-SX-402 Waste Disposal Condenser House	\$1,620,000
221-U Canyon Building (U Plant)	\$154,178,630
271-U Office Building	\$1,598,000
276-U Solvent Handling Facility	\$561,600
291-U Exhaust Fan Facility	\$113,770
292-U Jet Pit House	\$19,360
232-Z Plutonium Incinerator Facility	\$2,370,000

Table E1-3. 105-B Reactor Building Sectional Demolition Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Equipment removal cost	Demolition cost	Total demolition cost
Transfer bay	Storage basin and transfer area		\$47,212	\$42,920	\$55,796	\$145,928
Fuel storage basin	Storage basin and transfer area		\$131,868		\$155,844	\$287,712
Fuel storage washdown pad	Storage basin and transfer area		\$16,214		\$19,162	\$35,376
Sample room	Process area		\$7,128		\$8,424	\$15,552
Storage area	Process area		\$5,544		\$6,552	\$12,096
Control room	Process area		\$26,950	\$24,500	\$31,850	\$83,300
Miscellaneous storage room	Office/miscellaneous		\$29,920		\$35,360	\$65,280
Process area	Process area		\$155,232		\$183,456	\$338,688
Work area	Work area/valve pit area		\$69,168		\$81,744	\$150,912
Outer rod room	Office/miscellaneous	\$21,280	\$29,260	\$26,600	\$34,580	\$111,720
Miscellaneous storage	Office/miscellaneous		\$29,920		\$35,360	\$65,280
Air conditioning equipment	Office/miscellaneous		\$11,088		\$13,104	\$24,192
Office	Office/miscellaneous		\$6,336		\$7,488	\$13,824
Charge preparation	Work area/valve pit area		\$21,780		\$25,740	\$47,520
Accumulators	Work area/valve pit area		\$31,680		\$37,440	\$69,120
Electrical equipment	Work area/valve pit area		\$17,600		\$20,800	\$38,400
Instrument repair	Work area/valve pit area		\$6,600		\$7,800	\$14,400
Restrooms	Work area/valve pit area		\$5,280		\$6,240	\$11,520
Fan room	Fan house		\$183,744		\$217,152	\$400,896
Valve pit and pit extension	Work area/valve pit area		\$149,270		\$176,410	\$325,680

Table E1-4. 105-C Reactor Building Sectional Demolition Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Equipment removal cost	Demolition cost	Total demolition cost
Process area	Process area		\$36,894		\$58,136	\$95,030
C-elevator work area	Process area		\$48,114		\$75,816	\$123,930
Control room office records	Work area		\$43,312	\$52,500	\$68,250	\$164,062
Metal and dummy storage	Work area		\$23,826	\$28,880	\$37,544	\$90,250
Electrical room/battery room	Work area		\$19,536	\$23,680	\$30,784	\$74,000
D-elevator	Work area		\$9,108		\$14,352	\$23,460
Maintenance and lower rod room	Work area		\$9,240		\$14,560	\$23,800
Offices 1,2,5,6, and 7	Work area		\$18,612		\$29,328	\$47,940
Women's rest room	Work area		\$5,940		\$9,360	\$15,300
Lunch room	Work area		\$8,316		\$13,104	\$21,420
Instrument room/storage	Work area		\$9,504		\$14,976	\$24,480
Instrument repair	Work area		\$7,392		\$11,648	\$19,040
Inner rod room	Process area	\$6,771	\$48,879	\$42,320	\$55,016	\$152,986
Outer rod room	Process area	\$9,126	\$65,881	\$165,416	\$74,152	\$314,575
Hot storage / decontamination room	Work area	\$2,841	\$17,582	\$17,760	\$23,088	\$61,272
Soiled clothing	Work area		\$6,336		\$7,488	\$13,824
Change room	Work area		\$8,976		\$10,608	\$19,584
Clean clothes storage	Work area		\$9,504		\$11,232	\$20,736
Showers and dressing area	Work area		\$6,336	\$5,760	\$7,488	\$19,584
Blue tool room	Work area	\$384	\$3,960	\$4,800	\$6,240	\$15,384
Gas instrument room	Work area		\$5,280		\$6,240	\$11,520
Laboratory	Work area		\$8,448		\$9,984	\$18,432
Sewage station	Work area		\$27,720	\$25,200	\$32,760	\$85,680
Monitor room	Work area		\$5,720		\$6,760	\$12,480
Compressor room	Work area		\$5,456	\$4,960	\$6,448	\$16,864
Health physics office	Work area		\$10,010	\$9,100	\$11,830	\$30,940
Health physics room	Work area		\$4,576	\$4,160	\$5,408	\$14,144
Lab, corridor, elevator	Process area		\$43,560	\$39,600	\$51,480	\$134,640
Corridors	Process area		\$116,358	\$105,780	\$137,514	\$359,652
Transfer bay	Storage basin and misc storage		\$48,840	\$44,400	\$57,720	\$150,960
Storage basin/washdown pad	Storage basin and misc storage		\$223,872	\$203,520	\$264,576	\$691,968
Fan room	Fan house		\$222,640	\$202,400	\$263,120	\$688,160
Mechanical shop	Storage basin and misc storage		\$33,000	\$30,000	\$39,000	\$102,000

Table E1-5. 105-D Reactor Building Sectional Demolition Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Equipment removal cost	Demolition cost	Total demolition cost
Transfer bay	Storage basin and transfer area			\$42,920	\$55,796	\$98,716
Fuel storage basin	Storage basin and transfer area				\$155,844	\$155,844
Fuel storage washdown pad	Storage basin and transfer area				\$19,162	\$19,162
Sample room	Process area				\$8,424	\$8,424
Storage area	Process area				\$6,552	\$6,552
Control room	Process area			\$24,500	\$31,850	\$56,350
Miscellaneous storage room	Office/miscellaneous		\$29,920		\$35,360	\$65,280
Process area	Process area				\$183,456	\$183,456
Work area	Work area/valve pit area				\$81,744	\$81,744
Outer rod room	Office/miscellaneous	\$21,280	\$58,520	\$26,600	\$34,580	\$140,980
Miscellaneous storage	Office/miscellaneous		\$29,920		\$35,360	\$65,280
Air conditioning equipment	Office/miscellaneous		\$11,088		\$13,104	\$24,192
Office	Office/miscellaneous		\$6,336		\$7,488	\$13,824
Charge preparation	Work area/valve pit area				\$25,740	\$25,740
Accumulators	Work area/valve pit area				\$37,440	\$37,440
Electrical equipment	Work area/valve pit area				\$20,800	\$20,800
Instrument repair	Work area/valve pit area				\$7,800	\$7,800
Restrooms	Work area/valve pit area				\$6,240	\$6,240
Fan room	Fan house				\$217,152	\$217,152
Valve pit and pit extension	Work area/valve pit area				\$176,410	\$176,410

Table E1-6. 105-DR Reactor Building Sectional Demolition Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Equipment removal cost	Demolition cost	Total demolition cost
Process area	Process area				\$87,438	\$87,438
Work area	Work area/valve pit area				\$81,536	\$81,536
Valve pit	Work area/valve pit area			\$190,008	\$85,176	\$275,184
Solid feed	Work area/valve pit area			\$65,772	\$29,484	\$95,256
Storage room	Work area/valve pit area				\$30,576	\$30,576
Accumulator room	Work area/valve pit area				\$27,508	\$27,508
Restroom	Work area/valve pit area				\$8,788	\$8,788
Lunchroom	Work area/valve pit area				\$20,748	\$20,748
Electrical equipment	Work area/valve pit area				\$14,560	\$14,560
Instrument repair	Work area/valve pit area				\$10,192	\$10,192
Miscellaneous storage room	Office/miscellaneous		\$38,016		\$44,928	\$82,944
Control room	Office/miscellaneous		\$28,512	\$51,840	\$33,696	\$114,048
Air conditioning equipment	Office/miscellaneous		\$5,280	\$4,800	\$6,240	\$16,320
Counting room	Office/miscellaneous		\$3,960		\$4,680	\$8,640
Clean clothing	Office/miscellaneous		\$3,960		\$4,680	\$8,640
Laboratory	Office/miscellaneous		\$4,224		\$4,992	\$9,216
Monitor room	Office/miscellaneous		\$8,800		\$10,400	\$19,200
Offices 1,2,3, and 4	Office/miscellaneous		\$32,758		\$38,714	\$71,472
Corridor	Storage basins and transfer area				\$87,360	\$87,360
Gas instrument room	Office/miscellaneous		\$23,936		\$28,288	\$52,224
Fan room	Fan house	\$9,356	\$128,656	\$233,920	\$152,048	\$523,980
Farside downcomer, etc	Process area				\$68,224	\$68,224
Farside instrument room	Process area				\$23,296	\$23,296
Storage room 2, farside	Process area				\$6,552	\$6,552
Stair farside	Process area				\$4,992	\$4,992
Fuel storage basin	Storage basins and transfer area			\$109,520	\$142,376	\$251,896
Wash pad	Storage basins and transfer area			\$21,600	\$28,080	\$49,680
Transfer bay	Storage basins and transfer area			\$57,720	\$75,036	\$132,756

Table E1-7. 105-F Reactor Building Sectional Demolition Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Equipment removal cost	Demolition cost	Total demolition cost
Transfer bay	Storage basin and transfer area			\$42,920	\$55,796	\$98,716
Fuel storage basin	Storage basin and transfer area				\$155,844	\$155,844
Fuel storage washdown pad	Storage basin and transfer area				\$19,162	\$19,162
Sample room	Process area				\$8,424	\$8,424
Storage area	Process area				\$6,552	\$6,552
Control room	Process area			\$24,500	\$31,850	\$56,350
Miscellaneous storage room	Office/miscellaneous		\$29,920		\$35,360	\$65,280
Process area	Process area				\$183,456	\$183,456
Work area	Work area				\$81,744	\$81,744
Outer rod room	Office/miscellaneous	\$21,280	\$29,260	\$26,600	\$34,580	\$111,720
Miscellaneous storage	Office/miscellaneous		\$29,920		\$35,360	\$65,280
Air conditioning equipment	Office/miscellaneous		\$11,088		\$13,104	\$24,192
Office	Office/miscellaneous		\$6,336		\$7,488	\$13,824
Charge preparation	Work area				\$25,740	\$25,740
Accumulators	Work area				\$37,440	\$37,440
Electrical equipment	Work area				\$20,800	\$20,800
Instrument repair	Work area				\$7,800	\$7,800
Restrooms	Work area				\$6,240	\$6,240
Fan room	Fan house and valve pit				\$217,152	\$217,152
Valve pit and pit extension	Fan house and valve pit				\$176,410	\$176,410

Table E1-8. 105-H Reactor Building Sectional Demolition Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Equipment removal cost	Demolition cost	Total demolition cost
Process area	Process area		\$49,192		\$58,136	\$107,328
C-elevator work area	Process area		\$64,152		\$75,816	\$139,968
Control room office records	Offices and control room		\$57,750		\$68,250	\$126,000
Metal and dummy storage	Work area		\$31,768		\$37,544	\$69,312
Electrical room/battery room	Offices and control room		\$26,048		\$30,784	\$56,832
D-elevator	Process area		\$12,144		\$14,352	\$26,496
Maintenance and lower rod room	Process area		\$12,320		\$14,560	\$26,880
Offices 1,2,5,6, and 7	Offices and control room		\$24,816		\$29,328	\$54,144
Women's restroom	Offices and control room		\$7,920		\$9,360	\$17,280
Lunch room	Offices and control room		\$12,672		\$14,976	\$27,648
Instrument repair	Offices and control room		\$9,856		\$11,648	\$21,504
Inner rod room	Process area		\$46,552		\$55,016	\$101,568
Outer rod room	Process area		\$62,744		\$74,152	\$136,896
Hot storage / decon room	Fan and dryer areas	\$14,208	\$39,072	\$17,760	\$23,088	\$94,128
Soiled clothing	Fan and dryer areas	\$4,608	\$12,672	\$5,760	\$7,488	\$30,528
Change room	Fan and dryer areas	\$6,528	\$17,952	\$8,160	\$10,608	\$43,248
Clean clothes storage	Fan and dryer areas	\$6,912	\$19,008	\$8,640	\$11,232	\$45,792
Showers and dressing area	Work area		\$13,728		\$16,224	\$29,952
Blue tool room	Work area		\$3,300		\$3,900	\$7,200
Gas instrument room	Fan and dryer areas	\$3,840	\$10,560	\$9,600	\$6,240	\$30,240
Laboratory	Fan and dryer areas	\$5,408	\$14,872	\$13,520	\$8,788	\$42,588
Sewage station	Fan and dryer areas	\$20,160	\$55,440	\$50,400	\$32,760	\$158,760
Monitor room	Fan and dryer areas	\$4,160	\$11,440	\$10,400	\$6,760	\$32,760
Compressor room	Fan and dryer areas	\$3,968	\$10,912	\$9,920	\$6,448	\$31,248
Health physics office	Work area	\$10,608	\$29,172	\$26,520	\$17,238	\$83,538
Lab, corridor, elevator	Work area	\$31,680	\$87,120		\$51,480	\$170,280
Corridors	Offices and control room		\$116,358		\$137,514	\$253,872
Transfer bay	Storage basin and transfer area	\$35,520	\$97,680	\$88,800	\$57,720	\$279,720
Miscellaneous storage	Storage basin and transfer area		\$33,000		\$39,000	\$72,000
Storage basin/washdown pad	Storage basin and transfer area	\$162,816	\$447,744	\$407,040	\$264,576	\$1,282,176
Fan room	Fan and dryer areas		\$106,920	\$194,400	\$126,360	\$427,680
Greenhouse						\$2,000

Table E1-9. 105-KE & KW Reactor Building Sectional Demolition Costs.

Facility room/area name	Risk assessment area assignment	Decontamination cost	Asbestos removal cost	Equipment removal cost	Demolition cost	Total demolition cost
Process area	Process area		\$52,272		\$61,776	\$114,048
Work area	Work area and supply fan area		\$107,008		\$126,464	\$233,472
Inner rod room	Process area		\$26,400		\$31,200	\$57,600
Outer rod room	Process area		\$39,600		\$46,800	\$86,400
Miscellaneous storage	Work area and supply fan area		\$29,568		\$34,944	\$64,512
Electrical equipment	Process area		\$28,336		\$33,488	\$61,824
D-elevator	Process area		\$52,272		\$61,776	\$114,048
Dolly tool room	Process area		\$19,008		\$22,464	\$41,472
Laboratory	Control room, exterior fan and misc.		\$23,496		\$27,768	\$51,264
Elevator, lobby	Process area		\$8,712		\$10,296	\$19,008
Monitor room	Control room, exterior fan and misc.		\$15,488		\$18,304	\$33,792
Control room	Control room, exterior fan and misc.		\$36,432		\$43,056	\$79,488
Counting room	Control room, exterior fan and misc.		\$2,640		\$3,120	\$5,760
Air conditioning	Control room, exterior fan and misc.		\$3,696		\$4,368	\$8,064
Office	Control room, exterior fan and misc.		\$7,128		\$8,424	\$15,552
Locker room	Control room, exterior fan and misc.		\$19,712		\$23,296	\$43,008
Fan room access stairs	Work area and supply fan area	\$652	\$5,385	\$4,080	\$5,304	\$15,422
Change room	Control room, exterior fan and misc.		\$4,576		\$5,408	\$9,984
Janitorial/storage & decon	Control room, exterior fan and misc.	\$2,912	\$12,012		\$9,464	\$24,388
Radiation monitor office #3	Control room, exterior fan and misc.		\$21,120		\$24,960	\$46,080
Instrument repair	Control room, exterior fan and misc.		\$25,344		\$29,952	\$55,296
Fan room	Work area and supply fan area	\$12,313	\$101,587	\$76,960	\$100,048	\$290,908
Metal storage	Work area and supply fan area		\$21,208		\$25,064	\$46,272
Corridors	Control room, exterior fan and misc.		\$72,666		\$85,878	\$158,544
Storage basin	Storage basin and transfer areas	\$158,656	\$436,304	\$198,320	\$257,816	\$1,051,096
Transfer bay	Storage basin and transfer areas	\$69,856	\$192,104	\$87,320	\$113,516	\$462,796
Valve pit	Process area		\$17,952	\$32,640	\$21,216	\$71,808
Wash/ room	Storage basin and transfer areas	\$13,824	\$38,016	\$17,280	\$22,464	\$91,584
Cask/equipment storage room	Storage basin and transfer areas	\$11,648	\$32,032	\$14,560	\$18,928	\$77,168
Hot storage	Storage basin and transfer areas	\$9,216	\$25,344	\$11,520	\$14,976	\$61,056
Maintenance shop	Control room, exterior fan and misc.		\$9,592		\$11,336	\$20,928
Wash pad	Storage basin and transfer areas	\$11,520	\$31,680	\$14,400	\$18,720	\$76,320

Table E1-10. Demolition Costs for Total Reactor Building Removal.

Building	Demolition cost
105-B Reactor	\$33,307,000
105-C Reactor	\$34,372,000
105-D Reactor	\$31,621,000
105-DR Reactor	\$32,011,000
105-F Reactor	\$35,406,000
105-H Reactor	\$34,066,000
105-KE Reactor	\$33,436,000
105-KW Reactor	\$33,346,000

This page intentionally left blank.

APPENDIX F

ISOLATION AND DEMOLITION CONSIDERATIONS

This page intentionally left blank.

CONTENTS

F	ISOLATION AND DEMOLITION CONSIDERATIONS	F-1
F1.0	INTRODUCTION	F-1

LIST OF TABLES

F1-1	100 Area Facility Square Footage	F-2
F1-2	200 Area Facility Square Footage	F-3
F1-3	105-B Reactor Building Square Footage, Equipment Density, and Contamination	F-4
F1-4	105-C Reactor Building Square Footage, Equipment Density, and Contamination	F-5
F1-5	105-D Reactor Building Square Footage, Equipment Density, and Contamination	F-6
F1-6	105-DR Reactor Building Square Footage, Equipment Density, and Contamination	F-7
F1-7	105-F Reactor Building Square Footage, Equipment Density, and Contamination	F-8
F1-8	105-H Reactor Building Square Footage, Equipment Density, and Contamination	F-9
F1-9	105-KE and 105-KW Reactor Building Square Footage, Equipment Density, and Contamination	F-10

This page intentionally left blank.

APPENDIX F

ISOLATION AND DEMOLITION CONSIDERATIONS

F1.0 INTRODUCTION

The following tables display considerations for demolition and isolation of facilities, such as square footage, building dimensions, equipment densities, and amount of contamination.

WHC-EP-0619 VOLUME 4

Table F1-1. 100 Area Facility Square Footage.

Building	Length	Width	Area	Total area
103-B Riggers Loft	53.0	27.0	1,431.0	1,431.0
104-B-2 Tritium Laboratory	12.0	24.0	288.0	288.0
185-B Water Treatment Plant/ 190-B Main Pump House	304.0	48.0	14,592.0	14,592.0
1608-B Gas Line Pressure/Vacuum Seal House	12.0	12.0	144.0	144.0
1701-BA Exclusion Area Badge House	20.0	20.0	400.0	400.0
183-C Filter Plant Pump Room	316.0	288.0	91,008.0	91,008.0
1702-C Badge House	- -	- -	210.0	210.0
1714-C Solvent Storage	- -	- -	156.0	156.0
103-D Fresh Metal Storage	53.0	27.0	1,431.0	1,431.0
117-DR Exhaust Air Filter Building	59.0	39.0	2,301.0	2,301.0
119-DR Exhaust Air Sample Building	15.0	24.0	360.0	360.0
1702-DR Area Badge House	20.0	20.0	400.0	400.0
108-F Biology Laboratory Building	- -	- -	20,000.0	31,000.0
108-F 2nd Floor Clearwell Facility	- -	- -	11,000.0	- -
1701-FA Gate House	20.0	32.0	640.0	640.0
105-H Reactor Building	- -	- -	- -	50,821.0
1713-H Warehouse	62.0	156.0	9,672.0	13,992.0
	72.0	60.0	4,320.0	- -
167-K Crosstie Tunnel Building	10.0	15.0	150.0	150.0
182-K Emergency Water Reservoir and Pump House	- -	- -	2,610.0	2,610.0
115-KE Gas Recirculation Building	113.5	34.0	3,859.0	3,859.0
117-KE Exhaust Air Filter Building	59.0	39.0	2,301.0	2,301.0
1702-KE Badge House	20.0	20.0	400.0	400.0
1713-KER Warehouse	- -	- -	800.0	800.0
115-KW Gas Recirculation Building	113.5	34.0	3,859.0	3,859.0
117-KW Exhaust Air Filter Building	59.0	39.0	2,301.0	2,301.0
165-KW Power Control Building	240.0	110.0	26,400.0	26,400.0
183-KW Filter Plant	136.0	31.0	4,216.0	8,416.0
	70.0	60.0	4,200.0	- -
1702-KW Badge House	20.0	20.0	400.0	400.0
1714-KW Warehouse	- -	- -	800.0	800.0

Table F1-2. 200 Area Facility Square Footage.

Building	Length	Width	Area	Total area
205-A Solvent Handling Facility	12.0	10.0	120.0	120.0
224-B Office and Canyon Building	69.0	197.0	13,593.0	30,291.0
	69.0	197.0	13,593.0	- -
	69.0	45.0	3,105.0	- -
215-C Storage Building	35.0	21.0	735.0	735.0
212-N Fuel Storage Facility	27.0	74.0	1,998.0	5,890.0
	49.0	72.0	3,528.0	- -
	14.0	26.0	364.0	- -
212-P Fuel Storage Facility	27.0	74.0	1,998.0	5,890.0
	49.0	72.0	3,528.0	- -
	14.0	26.0	364.0	- -
212-R Fuel Storage Facility	27.0	74.0	1,998.0	5,890.0
	49.0	72.0	3,528.0	- -
	14.0	26.0	364.0	- -
202-S Canyon Building	468.0	161.0	75,348.0	75,348.0
233-S Plutonium Concentration Facility	86.0	43.0	3,690.0	3,698.0
233-SA Exhaust Filter Building	24.0	27.0	648.0	648.0
276-S Solvent Handling Building	43.0	58.0	2,494.0	2,494.0
291-S Exhaust Fan Facility	20.0	14.0	280.0	280.0
292-S Jet Pit House	15.8	15.8	248.1	248.1
293-S Offgas Treatment and Recovery Building	29.0	16.0	464.0	700.3
	8.5	27.8	236.3	- -
2711-S Stack Gas Monitoring Building	14.0	12.5	175.0	175.0
2715-S Storage Building	- -	- -	- -	160.0
2718-S Sand Filter Sampler Building	12.5	14.0	175.0	175.0
2904-SA Cooling Water Sampler Building	8.0	8.5	68.0	68.0
S Plant Butler Building	- -	- -	- -	1,700.0
241-SX-401 Waste Disposal Condenser House	36.0	24.0	864.0	960.0
	12.0	8.0	96.0	- -
241-SX-402 Waste Disposal Condenser House	36.0	24.0	864.0	960.0
	12.0	8.0	96.0	- -
221-U Canyon Building	810.0	66.0	53,460.0	53,460.0
271-U Office Building	160.0	48.0	7,680.0	7,680.0
276-U Solvent Handling Facility	66.0	54.0	3,564.0	3,564.0
291-U Exhaust Fan Facility	19.0	18.0	343.0	343.0
292-U Jet Pit House	21.0	16.0	336.0	336.0
232-Z Plutonium Incinerator Facility	56.6	36.0	2,037.6	2,037.6

Table F1-3. 105-B Reactor Building Square Footage, Equipment Density, and Contamination.

Building room/area name	Area square footage	Equipment density	Radioactively contaminated
Fuel storage basin	5,994	Low	- -
Fuel storage washdown pad	737	- -	- -
Sample room	324	- -	- -
Storage area	252	- -	- -
Control room	1,225	- -	- -
Miscellaneous storage room	1,360	- -	- -
Process area	7,056	- -	- -
Work area	3,144	- -	- -
Outer control rod room	1,330	Low	Yes
Miscellaneous storage	1,360	- -	- -
Air conditioning equipment	504	- -	- -
Office	288	- -	- -
Charge preparation	990	- -	- -
Accumulators	1,440	- -	- -
Electrical equipment	800	- -	- -
Instrument repair	300	- -	- -
Restrooms	240	- -	- -
Fan room	8,352	- -	- -
Valve pit and pit extension	6,785	- -	- -

Table F1-4. 105-C Reactor Building Square Footage, Equipment Density, and Contamination.

Building room/area name	Area square footage	Equipment density	Radioactively contaminated
Process area	2,236	- -	- -
C-elevator work area	2,916	- -	- -
Control room office records	2,625	Low	- -
Metal and dummy storage	1,444	Low	- -
Electrical room/battery room	1,184	- -	- -
D-elevator	552	- -	- -
Maintenance and lower rod room	560	- -	- -
Offices 1, 2, 5, 6, and 7	1,128	- -	- -
Women's rest room	360	- -	- -
Lunch room	504	- -	- -
Instrument room/storage	576	- -	- -
Instrument repair	448	- -	- -
Inner control rod room	2,116	Low	20%
Outer control rod room	2,852	High	20%
Hot storage/decontamination room	888	Low	20%
Soiled clothing	288	- -	- -
Change room	408	- -	- -
Clean clothes storage	432	- -	- -
Showers and dressing area	288	Low	10%
Blue tool room	240	Low	- -
Gas instrument room	240	- -	- -
Laboratory	384	- -	- -
Sewage station	1,260	Low	- -
Monitor room	260	- -	- -
Compressor room	248	Low	- -
Health Physics office	455	- -	- -
Health Physics room	208	- -	- -
Lab, corridor, elevator	1,980	- -	- -
Corridors	5,289	- -	- -
Transfer bay	2,220	- -	- -
Storage basin/washdown pad	10,176	- -	- -
Fan room	10,120	- -	- -
Miscellaneous storage	1,500	- -	- -

Table F1-5. 105-D Reactor Building Square Footage, Equipment Density, and Contamination.

Building room/area name	Area square footage	Equipment density	Radioactively contaminated
Transfer bay	2,146	Low	- -
Fuel storage basin	5,994	- -	- -
Fuel storage washdown pad	737	- -	- -
Sample room	324	- -	- -
Storage area	252	- -	- -
Control room	1,225	Low	- -
Miscellaneous storage room	1,360	- -	- -
Process area	7,056	- -	- -
Work area	3,144	- -	- -
Outer control rod room	1,330	Low	Yes
Miscellaneous storage	1,360	- -	- -
Air conditioning equipment	504	- -	- -
Office	288	- -	- -
Charge preparation	990	- -	- -
Accumulators	1,440	- -	- -
Electrical equipment	800	- -	- -
Instrument repair	300	- -	- -
Restrooms	240	- -	- -
Fan room	8,352	- -	- -
Valve pit and pit extension	6,785	- -	- -

Table F1-6. 105-DR Reactor Building Square Footage, Equipment Density, and Contamination.

Building room/area name	Area square footage	Equipment density	Radioactively contaminated
Process area	3,363	- -	- -
Work area	3,136	- -	- -
Valve pit	3,276	High	- -
Solid feed	1,134	High	- -
Storage room	1,176	- -	- -
Accumulator room	1,058	- -	- -
Restroom	338	- -	- -
Lunchroom	798	- -	- -
Electrical equipment	560	- -	- -
Instrument repair	392	- -	- -
Miscellaneous storage room	1,728	- -	- -
Control room	1,296	Medium	- -
Air conditioning equipment	240	Low	- -
Counting room	180	- -	- -
Clean clothing	180	- -	- -
Laboratory	192	- -	- -
Monitor room	400	- -	- -
Offices 1, 2, 3, and 4	1,489	- -	- -
Corridor	3,360	- -	- -
Gas instrument room	1,088	- -	- -
Fan room	5,848	Medium	10%
Farside downcomer, etc	2,624	- -	- -
Farside instrument room	896	- -	- -
Storage room 2, farside	252	- -	- -
Stair farside	192	- -	- -
Fuel storage basin	5,476	Low	Yes
Wash pad	1,080	Low	Yes
Transfer bay	2,886	Low	Yes

Table F1-7. 105-F Reactor Building Square Footage, Equipment Density, and Contamination.

Building room/area name	Area square footage	Equipment density	Radioactively contaminated
Transfer bay	2,146	Low	- -
Fuel storage basin	5,994	- -	- -
Fuel storage washdown pad	737	- -	- -
Sample room	324	- -	- -
Storage area	252	- -	- -
Control room	1,225	Low	- -
Miscellaneous storage room	1,360	- -	- -
Process area	7,056	- -	- -
Work area	3,144	- -	- -
Outer control rod room	1,330	Low	Yes
Miscellaneous storage	1,360	- -	- -
Air conditioning equipment	504	- -	- -
Office	288	- -	- -
Charge preparation	990	- -	- -
Accumulators	1,440	- -	- -
Electrical equipment	800	- -	- -
Instrument repair	300	- -	- -
Rest rooms	240	- -	- -
Fan room	8,352	- -	- -
Valve pit and pit extension	6,785	- -	- -

Table F1-8. 105-H Reactor Building Square Footage, Equipment Density, and Contamination.

Building room/area name	Area square footage	Equipment density	Radioactively contaminated
Process area	2,236	- -	- -
C-Elevator work area	2,916	- -	- -
Control room office records	2,625	- -	- -
Metal and dummy storage	1,444	- -	- -
Electrical room/battery room	1,184	- -	- -
D-elevator	552	- -	- -
Maintenance and lower rod room	560	- -	- -
Offices 1, 2, 5, 6, and 7	1,128	- -	- -
Women's rest room	360	- -	- -
Lunch room	576	- -	- -
Instrument repair	448	- -	- -
Inner control rod room	2,116	- -	- -
Outer control rod room	2,852	- -	- -
Hot storage/decon room	888	Low	Yes
Soiled clothing	288	Low	Yes
Change room	408	Low	Yes
Clean clothes storage	432	Low	Yes
Showers and dressing area	624	- -	- -
Blue tool room	150	- -	- -
Gas instrument room	240	Medium	Yes
Laboratory	338	Medium	Yes
Sewage station	1,260	Medium	Yes
Monitor room	260	Medium	Yes
Compressor room	248	Medium	Yes
Health Physics office	663	Medium	Yes
Lab, corridor, elevator	1,980	- -	Yes
Corridors	5,289	- -	- -
Transfer bay	2,220	Medium	Yes
Miscellaneous storage	1,500	- -	- -
Storage basin/washdown pad	10,176	Medium	Yes
Fan room	4,860	Medium	- -

WHC-EP-0619 VOLUME 4

Table 11-9. 105-KE and 105-KW Reactor Building Square Footage, Equipment Density, and Contamination.

Building room/area name	Area square footage	Equipment density	Radioactively contaminated
Process area	2,376	- -	- -
Work area	4,864	- -	- -
Inner control rod room	1,200	- -	- -
Outer control rod room	1,800	- -	- -
Miscellaneous storage	1,344	- -	- -
Electrical equipment	1,288	- -	- -
D elevator	2,376	- -	- -
Dolly tool room	864	- -	- -
Laboratory	1,068	- -	- -
Elevator, lobby	396	- -	- -
Monitor room	704	- -	- -
Control room	1,656	- -	- -
Counting room	120	- -	- -
Air conditioning	168	- -	- -
Office	324	- -	- -
Locker room	896	- -	- -
Fan room access stairs	204	- -	20%
Change room	208	- -	- -
Janitorial/storage and decon	364	- -	50%
Radiation monitor office #3	960	- -	- -
Instrument repair	1,152	- -	- -
Fan room	3,848	Low	20%
Metal storage	964	- -	- -
Corridors	3,303	- -	- -
Storage basin	9,916	Low	Yes
Transfer bay	4,366	Low	Yes
Valve pit	816	Medium	- -
Wash/decontamination room	864	Low	Yes
Cask/equipment storage room	728	Low	Yes
Hot storage	576	Low	Yes
Maintenance shop	436	- -	- -
Wash pad	720	Low	Yes

OFFSITE

U. S. Department of Energy - Trevion II
ATTN: Don Mackenzie, EM-442
19901 German Town
German Town, Maryland 20585

W. J. Adam	H4-67
E. L. Ahola	L4-90
F. G. Cain	H4-70
G. A. Coles	H4-65
C. L. Cooley	R3-01
R. G. Egge	T7-05
J. E. Hodgson	X7-02
M. C. Hughes	X5-55
T. F. Johnson	X0-21
D. G. Kachele	S4-67
N. R. Kerr	H4-67
H. E. Marquez	H4-67
R. E. Merriman	L4-90
C. M. Monasmith	L4-90
M. R. Morton	X5-55
E. Senger	X5-55
J. B. Shannon	T7-05
A. R. Schade	H4-60

DISTRIBUTION (cont)

M. V. Shultz	H4-65
K. A. Smith	N1-06
C. D. Stuart	H4-67
W. E. Taylor	H4-67
M. A. Tredway	R3-54
R. A. Winship	A3-30
M. D. Zentner (2)	H4-65
J. J. Zimmer	H4-67
Central Files (2)	L8-04
Docket Files	H5-36
Environmental Program Information Center (2)	H6-08
Environmental Restoration Safety Support Files (3)	H4-67
Information Release Administration (3)	H4-17

DATE

FILMED

5/25/94

END