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Evaluation of Nuclear-Facility Decommissioning Projects

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Summary Report
Ames Laboratory Research Reactor

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Washington, D.C. 20555
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EVALUATION OF NUCLEAR FACILITY DECOMMISSIONING PROECTS

SUMMARY REPORT

AMES LABORATORY RESEARCH REACTOR

Reviewed By DOE-RL:

J. D. White, Director, Surplus Facilities Management Program Office — 6/9/83 Date

Approved By UNC:

T. E. Dabrowski, Director, Decommissioning Programs Department — 6/8/83 Date

Approved By NRC:

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ABSTRACT

This document summarizes the available information concerning the decommissioning of the Ames Laboratory Research Reactor (ALRR), a five-megawatt heavy water moderated and cooled research reactor. The data were placed in a computerized information retrieval/manipulation system which permits its future utilization for purposes of comparative analysis. This information is presented both in detail in its computer output form and also as a manually assembled summarization which highlights the more important aspects of the decommissioning program. Some comparative information with reference to generic decommissioning data extracted from NUREG/CR 1756, "Technology, Safety and Costs of Decommissioning Nuclear Research and Test Reactors," is included.

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1.0 INTRODUCTION

This document summarizes the available information concerning the decommissioning of the Ames Laboratory Research Reactor (ALRR) in the DECON mode, as defined in Section 1.1. Although the removal and disposal of the reactor and all reactor-associated equipment and material was completed, the existance of very low levels of residual radioactivity precluded the facility's release for "unrestricted use". Further information on final site conditions is presented in Section 5.0.

The decision to shut down and decommission the ALRR, made jointly by the Department of Energy and the Ames Laboratory, was brought about by continuing reductions in funding for basic nuclear research. Because the space utilized by the reactor and its associated equipment was considered desirable for future Laboratory activities, the DECON decommissioning mode was chosen in order to clear the space in question for "unrestricted use".

The prompt institution of the decommissioning program was determined to be necessary for several reasons; among them, a knowledgeable staff of reactor employees was available and could be maintained, and the inflationary escalation of costs could conceivably be minimized.

The services of a nuclear consultant firm were utilized for preparation of the necessary documentation, and in the pre-decommissioning cost estimates. The original sum budgeted for the decommissioning program was 4.5 million dollars. The decommissioning schedule called for completion of the physical work in 3 years and of post-decommissioning documentation in an additional six months. The actual work was completed nine months later than the original schedule and the large majority of required documentation completed at approximately the same time.

The decommissioning data were assembled in a form that permitted its input into a computerized data-handling system. The computer program used results in a flexible data accumulation, manipulation and retrieval system which can provide such benefits as:

- Greater accuracy of cost, labor and radiation exposure estimates
- Increased perception concerning ALARA responsiveness
- Guidance in time schedule projections
- Predictability of radiation and contamination levels

- Identification of special areas of difficulty in the decommissioning process

As the accumulation of data from actual decommissioning projects mounts, the value of the program as a decommissioning aid is enhanced. Some comparative information with reference to reference research and test reactors is included in Section 2.0.

1.1 Acronyms - Abbreviations - Definitions

Definitions of Decommissioning Alternatives

DECON - to immediately remove all radioactive material to permit unrestricted release of the property.

SAFSTOR - to fix and maintain property so that risk to safety is acceptable for period of storage followed by decontamination and/or decay to an unrestricted level.

ENTOMB - to encase and maintain property in a strong and structurally long-lived material (e.g., concrete) to assure retention until radioactivity decays to an unrestricted level.

Acronyms - Abbreviations

A/C	Activated or Contaminated
AEC	Atomic Energy Commission
ALARA	As Low As Reasonably Achievable
Alum	Aluminum Metal
ANL	Argonne National Laboratory
BARN	Barnwell, S. Carolina (waste disposal site)
BIO	Biological
CH	DOE Chicago Operations
Ci	Curie
CS	Carbon Steel
Cu Ft	Cubic Feet
DDS	Decommissioning Data System
DNA	Data Not Available
DOE	Department of Energy
DOS RED FCT	Dose Reduction Factor
DPM	Disintegrations per Minute
HVAC	Heating, Ventilation, Air Conditioning
HX	Heat Exchanger
LSA	Low Specific Activity
MAPPER	Maintain, Prepare, and Produce Executive Reports
MW	Megawatt
MWd	Megawatt Days

MWdt	Megawatt Days Thermal
MWt	Megawatt Thermal
N/A	Not Applicable
NRC	U.S. Nuclear Regulatory Commission
OSU	Oregon State University
RICH	Richland U.S. Ecology Disposal Site
RHO	Hanford DOE Disposal Site (Operated by Rockwell Hanford)
SPEC NO	Specification Number
SS	Stainless Steel
SYS/COMP	System Component
TRIP LEN	Trip Length
TYP	Type
UNC	UNC Nuclear Industries, Operations Division

2.0 FACILITY SUMMARY REPORT

This section contains a manually summarized duplication of the computer-output information presented in Section 7.0, and comparative information with reference to generic decommissioning data extracted from NUREG/CR 1756, "Technology, Safety and Costs of Decommissioning Nuclear Research and Test Reactors."

The purpose for this section is two-fold: (1) to provide the reader with a condensed overview of the decommissioning of a 5MWt D_2O research reactor, similar to several U.S reactors which will, of course, eventually be decommissioned, and (2) to present a brief comparison of major facets of the above decommissioning project with those of the generic decommissioning of a reference 1 MWt research reactor (RRR) and of a reference 60 MWt Test Reactor (RTR).

Cost information for RRR and RTR is assumed to be in 1981 dollars, while comparative ALRR information is assumed to be in approximate 1980 dollars. As ALRR cost items became due, they were paid on approximately the completion dates of the specific cost items being charged.

2.1 Facility Description

Name:	ALRR Ames Laboratory Research Reactor	RRR Reference Research Reactor	RTR Reference Test Reactor
Location:	Ames, IA	Corvallis, OR	Sandusky, OH
Owner:	Department of Energy	Oregon St. University	NASA
Operator:	Ames Laboratory	OSU	NASA
Reactor Type:	Research (D_2O)	TRIGA (Pool-Type)	Test, (H_2O)
Operating Lifetime:	12 yrs	40 yr. (5% operating)	40 yr.
Decommissioning Mode:	DECON	DECON	DECON
Power Rating:	5 MWt	1 MWt (Steady State)	60 MWt
Lifetime Power:	15200 MWdt	740 MWdt	98000 MWdt
Reason for Decommissioning:	Reduced funding	End-of-Life	End-of-Life

2.2 Summary of Costs and Radioactive Waste

	ALRR	RRR	RTR
Total Decommissioning Cost, Dollars:	4,335,000	850,000	15,600,000
Personnel Exposure, Manrem:	69.4	18.3	322

	ALRR	RRR	RTR
Radwaste Volume, Cu. Ft.:	40,830	5650	174,200
Radionuclide Inventory, Radwaste, Curies:	6832	1500	369,000

2.3 Comparisons of Cost Items

2.3.1 Dollar Costs

The following listed items are compared to total dollar costs for the decommissioning project.

	ALRR		RRR		RTR	
Item (Unit)	No. of Units	No. of $ Per Unit	No. of Units	No. of $ Per Unit	No. of Units	No. of $ Per Unit
Radionuclide Inventory (Ci.)	6832	634.43	1500	566.67 ~~56.67~~	369000	42.28
Radwaste (Cu. Ft.)	40830	106.18	5650	150.44 ~~15.04~~	174200	89.55
Lifetime Pwr. Output (MWdt)	15200	285.16	740	1148.65 ~~114.86~~	98000	159.18
Spending Rate (Mon)	45	96320	8.5	100000.	25	624000

2.3.2 Man-Rem Costs

The following listed items are compared to the total personnel exposure to radiation during the decommissioning program.

	ALRR		RRR		RTR	
Item (Unit)	No. of Units	No. of Units Per Manrem	No. of Units	No. of Units Per Manrem	No. of Units	No. of Units per Manrem
Radionuclide Inventory (Ci.)	6832	98.44	1500	81.97	369000	1145.96
Radwaste Volume (Cu. Ft.)	40830	588.33	5650	308.74	174200	540.99
Decommissioning Costs ($)	4335000	62460	850000	46450	15600000	48450

3.0 DESCRIPTION OF COMPUTER REPORTS

The reports described below are the basic reports used in the DDS program. The descriptions, as presented, are intentionally idealized. It should be understood that all functional facets of the reports will not always be utilized, simply because the documentation of decommissioning information will vary from project to project. In addition to the basic reports, MAPPER provides the ability to produce supplementary reports by manipulating the data available in the basic reports.

3.1 General Information

This report is a free format input report designed to accommodate descriptive data of any kind. Entries may be given any title and related to any facility system by a system component number. Data are entered in any format on any subject. The report should be used to record information that does not fit into any of the report types organized by column. This includes facility location, description, owners, operators, builders. Summary data may also be included where it is not readily derivable from other reports or for convenient reference.

3.2 Decommissioning Code Table/Index

This report contains a list of unit items, including facility buildings, systems and system components, and budgetary items, with a corresponding identification number for each unit. The identification system is used throughout DDS to relate data to specifically identified units.

This basic report type may be expanded to include tables or indices of other kinds related to facility decommissioning. Candidate tables are labor category wage rates, shipping company rates, shipping company name codes, disposal site name codes and rates, or archived file tape names.

One of the basic values of this report is the fact that, by utilizing an index which can ultimately be made common to all reactor facilities included in the program, the report can become the intercomparison base for the DDS. The full utilization of this base will not be possible until a certain minimum number of facilities as yet unspecified, are included in the DDS.

3.3 Significant Event Report

This report is used to record the facility's operating history, which in some cases could impact facility decommissioning. It contains dates, system/component numbers, and event descriptions. Noteworthy events such as construction completion, startup, shutdowns, significant incidents, and accidents are recorded in this report.

3.4 Radionuclide Inventory

An inventory of radionuclides present in each facility system will be made prior to the start of decommissioning. The amount of each radionuclide or its concentration, the measurement date, and a description of each system's material composition will be recorded. It will be noted whether a radionuclide present in a system is the result of neutron activation or contamination.

3.5 Project Cost/Exposure Report

Costs, schedules, man-hours, man-rem, both estimated and actual, are listed for each activity specification number. These costs may be broken out on lines having a subactivity specification number. This report is the main respository of cost and exposure information for a decommissioning project.

3.6 Dose Rate and Contamination Report

Dose rates at locations throughout each facility are recorded prior to decommissioning. Locations relative to a reference map, elevation, system/component number, and type of measurement are recorded for each measurement. Both upper and lower limits of dose rates or contamination levels (in disintegrations per minute) are listed.

3.7 Project Labor Report

Decommissioning labor costs, exposure, and man-weeks for each activity specification are recorded at a to-be-determined frequency. This supplements the project cost/exposure report by providing data on how costs and exposures accumulate over the course of a decommissioning project.

3.8 ALARA Report

The ALARA report contains records of ALARA efforts by activity specification number. The affected facility system, date, cost items, exposure information, and a description of the ALARA effort are listed. This report can be used to calculate by activity

specification number or for all activities the total estimated man-rem saved as well as total cost incurred through the implementation of the ALARA effort.

3.9 Shipment Report

Volumes, weights, and other physical data are recorded by waste type for material produced by each activity specification. These data are listed for each shipment of material from the decommissioning site. Trip lengths and vehicle dose rates are recorded in order to calculate public exposure.

3.10 Disposal Costs

The costs associated with each waste disposal shipment are recorded in the Disposal Costs Report. Costs are divided into transportation, burial, and container categories. Costs for each container type on the shipment are also listed.

3.11 Surveillance Report

The surveillance report is used to record annual costs and exposures associated with long term surveillance of a decommissioned facility. Under normal conditions a surveillance report would not be required for a facility decommissioned under Mode DECON.

3.12 Public Dose Report

The exposure of the public to radiation which results from the decommissioning of nuclear facilities is one criterion which is to be considered during the pre-decommissioning evaluation phase. This report presents an estimate of such exposure information, based on extrapolations of measurement data and numerous assumptions, including both routine and accident conditions.

4.0 COST ADJUSTMENTS

All cost information included in this document is presented in actual dollars as the charges were paid through the decommissioning program. For adjusting costs listed in the computer reports to year of interest, use the inflation rate table below.

Normalized Cost Escalation Table

Annual Inflation Rate *	Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
0.029	1966													
0.029	1967													
0.042	1968													
0.054	1969													
0.059	1970	1.000												
0.043	1971	1.043	1.000											
0.033	1972	1.076	1.033	1.000										
0.062	1973	1.138	1.095	1.062	1.000									
0.110	1974	1.248	1.295	1.172	1.110	1.000								
0.091	1975	1.339	1.296	1.263	1.201	1.091	1.000							
0.058	1976	1.397	1.354	1.321	1.259	1.149	1.058	1.000						
0.065	1977	1.462	1.419	1.386	1.324	1.214	1.123	1.065	1.000					
0.077	1978	1.539	1.496	1.463	1.401	1.291	1.200	1.142	1.077	1.000				
0.113	1979	1.652	1.609	1.576	1.514	1.404	1.313	1.255	1.190	1.113	1.000			
0.135	1980	1.787	1.744	1.711	1.649	1.539	1.448	1.390	1.325	1.248	1.135	1.000		
0.089	1981	1.876	1.833	1.800	1.738	1.628	1.537	1.479	1.414	1.337	1.224	1.089	1.000	
0.060**	1982	1.936	1.893	1.860	1.798	1.688	1.597	1.539	1.474	1.397	1.284	1.149	1.060	1.000

Example: A cost paid in 1971 dollars would increase to a cost of 1.893 times the original, if paid in 1982 dollars.

*Source: Statistical abstract of the United States, 1981 Consumer Price Index.

**1982 data are interim estimated.

In planning for large decommissioning projects which cover long time spans or are scheduled to start at some time in the future, cost estimates should consider the "worth" of current money and then adjust cost estimates to reflect this consideration. This exercise, referred to as a "time value cost analysis", considers the year of expenditure, interim surveillance and maintenance costs, major non-routine maintenance costs, and inflation rates. "Worth" of current money is usually based upon an average yield on stable, non-speculative investments such as long and short-term treasury bills. A "time value cost analysis" results in a percentage value, referred to as the discount rate, which is used to discount the cost of a future project to the current "worth" of money. This discount rate includes consideration of financial uncertainties, such as project cost overruns, recovery costs for major accidents, etc.

Example - A discount rate of two percent yields the following table:

Year	Discount Factor	Year	Discount Factor
1	0.9804	6	0.8880
2	0.9612	7	0.8706
3	0.9423	8	0.8513
4	0.9238	9	0.8535
5	0.9057	10	0.8204

If project is estimated to cost $10,000 during a time period six years from today, the amount of money presently required to be invested is ($10,000) (0.8880) or $8,800.

Detailed discussions and suggested assumptions may be found in the following references:

1. Methodology for Establishing Decommissioning Priorities U.S. Department of Energy, Richland Operations Office, RLO/SFM-82-7, June, 1982.

2. The Rate of Discount for Evaluating Public Projects Mikesell, R. F., 1977

   American Enterprise Institute for Public Policy Research, Washington, D.C.

3. Navigating through the Interest Rate Morass: Some Basic Principles Santoni, G. J., and C. C. Stone 1981
   Federal Reserve Bank of St. Louis Review, March, 1981

5.0 FINAL SITE CONDITION

5.1 Criteria

The original goal for decommissioning the ALRR as stated in the Environmental Impact Assessment was to place the building and site in condition for unrestricted use by removing the reactor-related radioactivity. The radiochemistry laboratories in a laboratory wing, the laboratory part of a Warehouse/Laboratory Building, and the Waste Disposal Building were excluded from the goal of unrestricted use since it was considered that they would be in continued use involving radioactive materials. However, removal of reactor-related radioactivity from these areas was included in the decommissioning plan.

The exact values of residual levels of radioactivity acceptable for unrestricted use were not well-defined and appeared to undergo change during the course of decommissioning. Guidelines used were those of DOE Order 5480.1, Chapter XI, Table II (also in 10-CFR-20, Appendix B), and the unrestricted use levels of NRC Regulatory Guide 1.86. The former are maximum values averaged over a year for the concentrations of radioactive isotopes in water and air releasable to the general public. The relationship between allowable residual radioactivity in soil and concrete and these values is not at all clear. The criteria originally suggested were that concentrations of radioactivity in water, soil and concrete of 10% of the Table II value for water could be allowed to remain. This was to be defined on a weight basis, i.e., concentrations in uCi/g of the material in place of uCi/ml of water used in Table II.

In informal discussion with CH, it was indicated that levels in the range of 1-3% of the Table II value should be the goal rather than 10% in guiding the removal of soil in areas which contained low levels of contamination.

The discovery of widespread low-level diffusion of tritiated water into the concrete of the reactor room floors and walls made it obvious that the criterion of 1-3% of the Table II value could not be met for tritium in this part of the building. An ANL-based Radiological Survey Group* stated in their report, "Interim Overview/Certification Activities Report for the Ames Laboratory Research Reactor Facility, Ames, Iowa" of February 11, 1981 that, "It is also quite evident, from

*Authorized to perform in behalf of the Department of Energy in matters concerning radiological safety.

the airborne tritium levels encountered, that the release of this structure for unrestricted use is not possible at this time or in the near future." This conclusion was endorsed by CH and agreed to by the Ames Laboratory and has been used as the basis for decontamination of the reactor room. However, this decision does not imply that the room cannot be used. Another conclusion by the Survey Group was that it appears possible "to essentially allow uncontrolled access" to the room as long as Health Physics surveillance of airborne tritium is maintained.

Exemptions from strict adherence to the unrestricted criteria for removal of radioisotopes other than tritium were granted for several pipe lines buried in concrete. These aspects of the problem are discussed in the next section.

5.2 Final Site Condition

The reactor and its associated systems, components and wastes were removed, and major decontamination was completed. Only the tasks of final detailed survey remain to be completed, and will be documented in the form of interim and final addenda to the final decommissioning report referenced in the General Information Report of Section 7.0.

5.2.1 Site, Other Structures and Reactor Building Outside the Reactor Room

In August and September 1981, soil samples were taken at two depths from 65 sites around the reactor building using a grid based on quadrant/radial segment areas centered on the reactor, including area inside and outside of the reactor exclusion fence. Samples were also taken from five control sites. To this date all control site samples and seven of the reactor site samples have been analyzed by gamma spectroscopy. All samples contain ^{137}Cs, but with no significant difference between reactor site and control samples. Additional samples have been prepared for gamma analysis and sufficient samples will be analyzed to provide adequate documentation.

Traces of radioactivity dating to pre-reactor days remain in a controlled waste holding area on the site which has been used by the Laboratory since 1950. Most of the radioactive material stored in this area was removed, and much of it included with decommissioning waste shipments. Survey results showed small areas of slightly contaminated soil, with uranium and thorium the major components.

The laboratory half of the Warehouse/Laboratory Building was not cleared of radioactivity because work with radioactive materials is expected to continue in these laboratories. However, no radioactivity

produced from or related to the ALRR remains. At present some neutron diffraction equipment which was slightly activated at the face of the reactor is stored in the warehouse half of this building. This equipment is considered by the experimenter to be too valuable to consign to waste and continues to be of potential usefulness in the continuing program in neutron scattering conducted by Ames Laboratory scientists at the Oak Ridge Reactor. This equipment is catalogued and will be kept on the record as radioactive as long as it shows radiation levels above background.

The Radioactive Waste Disposal Building will be maintained for handling, packaging and temporarily storing radioactive waste. Since shipments of waste in less than truck load quantities presents problems, storage may last for more than a year.

The Laboratory Wing of the Reactor Building includes several laboratories in which radioactive material from the ALRR was handled and used. It was earlier considered that these laboratories would continue to be utilized for radiochemical research, but programs which do not involve radioactivity were installed after decommissioning was completed, and the laboratories were decontaminated. The hood exhausts in the laboratories included horizontal runs of square ducts made of an asbestos composition. Since the ducts were slightly radioactive, they were removed, crushed, boxed and included in last waste shipments. The vertical runs of the hood exhausts to the roof, the exhaust fans and the fume hoods were surveyed for removable and fixed contamination and were decontaminated where necessary. One hood was decontaminated, removed and stored for future use within the Laboratory. The laboratories were decontaminated and surveyed. With the exception of tritium contamination the final survey showed the facility could be released for unrestricted use using the guidelines from NRC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors."
The Staging Area section of the Reactor Building were cleared and surveyed. The accessible floors and walls were determined to be free of removable contamination.

5.2.2. Reactor Room and Basement

As stated above, it is not possible to release the Reactor Room for unrestricted use at this time because of the tritium present as tritiated water of hydration in the concrete. Since this action permits the use of the room as laboratory space, the removal of other radioisotopes which might further restrict the use of the room remained the objective with the unrestricted use criteria as the basis.

This objective has been achieved in all but a few inaccessible locations in buried drain lines. Exemption from strict application of the removal criteria for radioisotopes other than tritium was made on the basis of inaccessibility and the very small amounts of radioactivity. The walls and floor of the reactor room and basement were washed down and surveyed for both removable and fixed contamination. Removable activity met the unrestricted use criteria in all areas. In small areas scattered over the reactor room floor, the residual fixed activity level was above these criteria. A survey by the Radiological Survey Group showed a number of these areas, and others were found in a thorough survey by the Laboratory Health Physics Group. Since further scrubbing did not remove all of the radioactivity, various abrasive and chipping devices were used to remove a surface layer of concrete from 1/8 to 1/2 inch deep in these areas. The only reactor-related radioactivities identified in samples of the surface concrete by gamma spectroscopy were ^{137}Cs and ^{60}Co. Removal of a single thin layer of concrete usually reduced the contamination to below unrestricted use criteria. If the activity still exceeded these levels, the process was repeated. The ceiling, walls and floor areas of the main floor of the reactor room were brought to levels below the unrestricted use level of NRC Regulatory Guide 1.86 for all radioisotopes other than tritium.

On completion of this survey and decontamination effort, and of similar work in the reactor basement, staging area and other possibly contaminated areas, documentation will be presented in addenda to the final decommissioning report.

6.0 CONCLUSIONS AND LESSONS LEARNED*

Decommissioning of the Ames Laboratory Research Reactor was accomplished within the original budget authorization of $4.5M. Because of escalation, the cost of decommissioning cannot be directly compared to the construction costs.

A delay of approximately seven months occurred in one task as a result of contractor's problems and an unforeseen error in as-built drawings. Change in DOE policy on waste disposal caused a delay of about one month. With these exceptions, the original schedule was followed fairly closely. Completion was six to nine months later than scheduled, but preparation of the final report was not delayed as much.

The decision to proceed with decommissioning immediately after shutdown seems to have been correct. Although this action resulted in funding on an annual rather than a continuing basis, the original staff was intact to begin the work, and it otherwise would have been necessary to bring in more contract workers with much less knowledge of the system to be removed, in all likelihood at a greater cost. Also, the rate of inflation during the years of decommissioning has been usually high. Although this was not predictable, if the work had been postponed, the total cost would have been considerably greater.

The use of annually appropriated rather than line item funds which could be carried into subsequent fiscal years did create problems, particularly because of the delay in completion of one contract and the mandatory postponement of following work. The time available between the decision to shut down the reactor and the scheduled start of decommissioning was not sufficient to obtain funding as a line item.

The matter of the type of subcontracts to be used was discussed in planning the decommissioning. As is customary in the DOE, contracts were awarded on a fixed-bid basis, but some consideration was given to the use of cost-plus-fixed-fee contracts. In this project, the cost for subcontract work was unquestionably less with the fixed bid procedure. In two of the contracts, the low bid may have led to a substantial loss by the contractor. Soliciting bidders on a cost-plus

*The information presented in this section was taken from the final ALRR decommissioning report referenced on page 17 under "References".

basis would have cost more, but could have provided personnel with more experience leading to more prompt completion of the work. Whether greater prior experience is required and whether completion on schedule is worth the extra costs are debatable questions which depend on other circumstances.

It was suggested by subcontractors that they would rather see the complete work as a single package. It might be advantageous to include all of those tasks for which contractors were hired, e.g., core tank and thermal shield removal and pedestal demolition, in a single package to enhance continuity. However, time would still be required to prepare the bid specifications and it is doubtful if any savings in time or money would be realized. Several vendors would have welcomed the opportunity to provide managerial and/or engineering services for the complete task. Such contracts were not considered and it seems doubtful if the work would have proceeded any more smoothly or at a comparable cost under such an arrangement.

In future decommissioning projects it is suggested that the bid specifications be expanded to include more information on radiation levels and radioactivity content in order to assist the vendors in planning and preparing cost proposals. A major problem in providing this information is the potential exposure of personnel in obtaining it. The cost and time for the preparation of specifications would also be increased.

7.0 COMPUTER REPORTS

The following section comprises the basic computerized data which was taken from available documentation, stored reactor records and on-site interviews with Ames Laboratory employees associated with the decommissioning program.

PAGE NO. 1

ALRR-DECON UNC DECOMMISSIONING DATA SYSTEM GENERAL INFORMATION REPORT 72C1104

SYSTEM/COMPONENT	.SYS/COMP. NUMBER	ENTRY TITLE

DESCRIPTION

		OPERATING HISTORY	
NAME:	ALRR	STARTUP DATE:	FEBRUARY 1965
LOCATION:	AMES, IOWA	SHUTDOWN DATE:	DECEMBER 1977
OWNER:	DOE	MEGAWATT DAYS:	1.52E4
OPERATOR:	AMES LABORATORY	MAJOR SHUTDOWNS:	3 MONTHS, MAJOR VALVE REPAIRS
ARCHITECT/ENGINEER:	BURNS & ROE	DECOMMISSIONING MODE:	DECON
BUILDER:	MAXON CONSTRUCTION		
DESIGNER:	AMF ATOMICS		

REFERENCES

REPORTS:

ALRR FINAL HAZARDS SUMMARY REPORT

FINAL REPORT, DECOMMISSIONING OF THE AMES LABORATORY RESEARCH REACTOR, IS-4789, UC 78A

PAPERS:

1. PLANS AND PROGRESS IN DECOMMISSIONING A RESEARCH REACTOR, A F VOIGT, ET AL, IAEA, VIENNA, 1979, PP. 237-248

2. DECOMMISSIONING OF THE AMES LABORATORY RESEARCH REACTOR, B W LINK, A F VOIGT, INTERNATIONAL DECOMMISSIONING SYMPOSIUM, SEATTLE, 1982, PAGES IV-19 THROUGH IV-38

DOCUMENTS PREPARED

CATEGORY	TITLE
DECOMMISSIONING ALTERNATIVES	'DECOMMISSIONING ALTERNATIVES FOR THE AMES LABORATORY RESEARCH REACTOR', CH ERDA, JULY, '77
	ADDENDUM TO THE ABOVE, AUG/'77
ENVIRONMENTAL IMPACT	'ENVIRONMENTAL IMPACT ASSESSMENT FOR DECOMMISSIONING THE AMES LABORATORY RESEARCH REACTOR REACTOR', REACTOR DIVISION, AMES LABORATORY. ORIGINAL SUBMISSION JULY 1977, REVISED NOV.'77
PROPOSED SCHEDULES	'DECOMMISSIONING ALTERNATIVES' ALRR STAFF JULY,'77 AND NOV.'77
	'DECOMMISSIONING STEPS' ALRR STAFF, MAR'78
	'DECOMMISSIONING WORK REMAINING' ALRR STAFF MARCH '80
SHIPPING GUIDE	'RADIOACTIVE MATERIAL SHIPPING GUIDE', PREPARED BY CONSULTANT FIRM, JULY,'78

.ALRR-DECON UNC DECOMMISSIONING DATA SYSTEM GENERAL INFORMATION REPORT 72C1104

* SYSTEM/COMPONENT	.SYS/COMP. NUMBER .	ENTRY TITLE
DECOMMISSIONING PLANS		'PLAN FOR DISMANTLING THE AMES LABORATORY RESEARCH REACTOR' REACTOR DIVISION, AMES LABORATORY
		PART A: 'PLACING THE REACTOR IN STAND-BY STATUS', NOV'77
		PART B: 'DISPOSAL OF REMOVABLE PARTS', AUG'78
		PART C: 'REMOVING REACTOR INTERNAL STRUCTURE'
		SECTION 1: FY79 PORTION, NOV'78
		SECTION 2: FY80 PORTION, AUG'79
		PART D: 'REMOVAL OF REMAINING RADIOACTIVITY', MARCH'81
OPERATING LIMITS AND POLICY		IN ABOVE DECOMMISSIONING PLANS, ALSO
		'ADJUSTMENT OF ALRR OPERATING POLICY', MAR'81
		'OPERATING POLICY', MAY'81
BID SPECIFICATIONS, PREPARED BY CONSULTANT FIRM, REVISED BY ALRR STAFF, REVISED AND APPROVED BY CHICAGO OPERATIONS OFFICE, DOE		
		'REMOVAL AND DISPOSAL OF THE ALRR TOP PLUG' DEC'78
		'REMOVAL AND DISPOSAL OF THE ALRR D2O TANK' FEB'79
		'REMOVAL AND DISPOSAL OF THE ALRR THERMAL SHIELD', APRIL'79
		'REMOVAL AND DISPOSAL OF THE ALRR THERMAL SHIELD TANK AND CONCRETE REACTOR PEDESTAL', AUG'79
QUARTERLY PROGRESS REPORTS		ISSUED FROM JAN'78 THROUGH SEPT'81

.DECOMMISSIONING INFORMATION

PERSONNEL RADIATION EXPOSURE

NUMBER OF PERSONNEL MONITORED:	92
AVERAGE DOSE IN MANREM:	0.754
TOTAL MANREM USED:	69.4
DOSE TO PUBLIC IN MANREM:	DNA

.ALRR-DECON UNC DECOMMISSIONING DATA SYSTEM GENERAL INFORMATION REPORT 72C1104

* .SYS/COMP.

* SYSTEM/COMPONENT . NUMBER . ENTRY TITLE

*==========.========.==========.

. NOTE CONCERNING FOLLOWING COST INFORMATION-

. IN ORDER TO MAKE APPROXIMATE COST COMPARISONS, ALRR COST DATA MAY BE ASSUMED

. TO BE IN 1980 DOLLARS. AS COST ITEMS BECAME DUE, THEY WERE PAID ON APPROX-

. IMATELY THE FINISH DATE OF THE SPECIFIC COST ITEMS BEING CHARGED.

.++

. DECOMMISSIONING COST SUMMARY

.

ITEM	COST,$	SUMS,$
A. ADMINISTRATION\DOCUMENTATION		6.36E5
1) ADMINISTRATION, DOCUMENTATION, SUPERVISION	5.103E5	
2) SECURITY	1.257E5	
B. OPERATIONS, AMES LABORATORY		2.2793E6
1) REACTOR OPERATIONS: SALARIES, BENEFITS, ETC.	7.364E5	
2) PURCHASED SUPPLIES & SERVICES	4.555E5	
3) IN-HOUSE SERVICES	3.827E5	
4) HEALTH PHYSICS	6.727E5	
5) COUNTING EQUIPMENT	3.2E4	
C. OPERATIONS, SUBCONTRACTOR	5.929E5	5.929E5
D. WASTE DISPOSAL		6.015E5
1) PACKAGING, AMES LABORATORY	3.12E4	
2) PACKAGING, SUBCONTRACTOR	5.05E4	
3) CASK RENT, WASTE SHIPPING, AMES LABORATORY	1.628E5	
4) CASK RENT, WASTE SHIPPING, SUBCONTRACTOR	1.875E5	
5) DISPOSAL, AMES LABORATORY	9.63E4	
6) DISPOSAL, SUBCONTRACTOR	7.37E4	
E. SITE RESTORATION	2.253E5	2.253E5
DECOMMISSIONING COST TOTAL		4.335E6

. LABOR RATES ($/HR) DNA

. WASTE DISPOSAL RATES

. BURIAL COSTS PER CU FT: 4.29

. CASK RENTAL RATES: DNA

. TRANSPORTATION RATES: DNA

. SURCHARGES: DNA

.

.ALRR-DECON UNC DECOMMISSIONING DATA SYSTEM GENERAL INFORMATION REPORT 72C1104

* SYSTEM/COMPONENT	.SYS/COMP. NUMBER .	ENTRY TITLE

. OTHER COSTS (TOTAL THRU DECOMMISSIONING PERIOD)

. UTILITIES:	4.186E5
. MISC. SUPPLIES AND SERVICES:	6.362E5
. NUCLEAR INS.:	N/A
. LICENSE FEES:	N/A
. FINAL SITE SURVEY:	SEE SPECIAL SECTION AT END OF THIS REPORT
. TAXES:	N/A
. REAL ESTATE SALE VALUE:	N/A

.MATERIAL DISPOSAL INFORMATION

.	RADIOACTIVE WASTE		SALVAGE DISPOSAL	
. NUMBER OF SHIPMENTS:	83		NUMBER OF SHIPMENTS:	27
. TOTAL VOLUME:	40830 CU. FT.		TOTAL VOLUME:	4400 CU.FT.
. TOTAL MASS:	1350 TONS		TOTAL WEIGHT:	14.9 TONS
. NUMBER OF CONTAINERS:	933		SPENT FUEL, CURIES:	3.12E5
. TOTAL RADWASTE INVENTORY, CURIES:	6832		D20 AND CONTAMINATED EQUIPMENT,CURIES:	1.2E4
.			TRANSPORT COSTS:	$37400

.FINAL SITE CONDITIONS, SUMMARY

. BASIS FOR CRITERIA:	DOE ORDER 5480.1, CHAPTER XI, TABLE II NRC REGULATORY GUIDE 1.86 UNOFFICIAL LIMITS ENDORSED BY DOE-CH
. CRITERIA SUMMARY:	UNRESTRICTED RELEASE UNATTAINABLE-'MONITORED USE' CRITERIA UTILIZED

. INSTRUMENTS USED:	TECH. ASSOC. PUG 1E	ORNL CP-5
	EBERLINE PAC 4G	VICTOREEN 470A
	NMC SMEAR COUNTERS	VICTOREEN THYAC III
	TELETECTOR R METERS	TRACOR NORTHERN GE LI DETECTOR
. SURVEY RESULT SUMMARY:	FINAL SURVEY INCOMPLETE-WILL BE PUBLISHED AT A LATER TIME	

.ALRR-DECON UNC DECOMMISSIONING DATA SYSTEM GENERAL INFORMATION REPORT 72C1104

* SYSTEM/COMPONENT	.SYS/COMP. NUMBER .	ENTRY TITLE

.COMPARISON ITEMS

TOTAL COST OF DECOMMISSIONING: 4.3344E6

$$\frac{\text{DECOMMISSIONING COST}}{\text{NO. OF UNITS}} = \text{COST/UNIT}$$

ITEM	NO. OF UNITS	COMPARISON COSTS	
CURIES	6832	634.43	DOLLARS/CURIE
RAD WASTE (CU FT)	40830	106.18	DOLLARS/CU FT
SPENDING RATE (MONTHS)	45	96320	DOLLARS/MONTH
POWER RATING (MWE)	N/A	N/A	DOLLARS/MWE
LIFETIME (MWDT)	1.52E4	285.16	DOLLARS/MWDT

TOTAL MANREM USED: 69.4

$$\frac{\text{NO. OF UNITS}}{\text{TOTAL MANREM}} = \text{UNITS/MANREM}$$

ITEM	NO OF UNITS	COMPARISON	
RADIONUCLIDE INVENTORY (CURIES)	6832	98.44	CURIES/MANREM
RAD WASTE (CU FT)	40830	588.33	CU.FT./MANREM
TOTAL COST ($)	4.3344E6	62455	DOLLARS/MANREM
LIFETIME MEGAWATT DAYS	1.52E4	219	MWDT/MANREM
* THERMAL (MWDT)			
POWER RATING (MWE)	N/A	N/A	MWE/MANREM

.COST CONDITIONS

. ALL COSTS ARE AS CHARGED, AND WERE PAID AS THEY WERE PRESENTED THROUGH
. THE APPROXIMATE FOUR YEAR DECOMMISSIONING PERIOD.

.ALRR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - DECOMM CODE TABLE/INDEX 72B1102

* FACILITY * SYSTEM/COMPONENT	.SYS/COMP. . NUMBER .	
01	A	PLACEMENT OF REACTOR IN STANDBY STATUS
01.01	A-1	DISPOSE OF FUEL
01.02	A-2	DISPOSE OF D20
01.03	A-3	DISPOSE OF THERMAL SHIELD WATER
01.04	A-4	DISPOSE OF PLUG COOLING WATER
01.05	A-5	REMOVE EXPERIMENTAL EQUIPMENT
01.06	A-6	DISPOSE OF RADIOACTIVE PARTS (PRIOR USE)
01.07	A-7	REACTOR FACILITY SURVEILLANCE(PRE-FUEL DISPOSAL)
01.08	A-8	EFFLUENT AND ENVIRONMENTAL MONITORING
01.09	A-9	REPORT WRITING
01.10	A-10	FABRICATE DISMANTLING TOOLS
01.11	A-11	REMOVE COOLING TOWER
01.12	A-12	CONSULTANT SERVICES
01.13	A-13	REMOVE WATER TOWER
01.14	A-14	ADD REACTOR ROOM ACCESS DOOR
02	B	DISPOSAL OF REMOVABLE PARTS
02.01	B-1	DISASSEMBLY AND DISPOSAL OF CONTROL RODS
02.02	B-2	REMOVAL AND DISPOSAL OF CURRENT REACTOR PLUGS AND EQUIPMENT
02.03	B-3	REMOVAL AND DISPOSAL OF TOP PLUG (REACTOR TANK PLUG)
02.04	B-4	DISMANTLEMENT OF CONTROL ROOM ELECTRONICS AND CONSOLE
02.05	B-5	REACTOR FACILITY SURVEILLANCE (FUEL REMOVED)
02.08	B-6	EFFLUENT AND ENVIRONMENTAL MONITORING (EXTENSION OF A-8)
02.09	B-7	REPORT WRITING (EXTENSION OF A-9)
03	C	REMOVAL OF REACTOR INTERNAL STRUCTURES
03.01	C-1	REMOVAL OF ELECTRICAL GEAR FROM REACTOR BASEMENT
03.02	C-2	REMOVAL & DISPOSAL OF D20 PURIFICTION EQUIPMENT
03.03	C-3	CLEAN OUT PUMP ROOM AND REACTOR BASEMENT, INC. PRIMARY COOLING SYSTEM, PLUG COOLING SYSTEM, THERMAL SHIELD SYSTEM, HELIUM SYSTEM EMERGENCY COOLING SYSTEM, IRRADIATED AIR SYSTEM, SAMPLE TRANSFER (RABBIT) SYSTEM, SECONDARY COOLING SYSTEM.
03.04	C-4	REMOVE AND DISPOSE OF CORE TANK
03.05	C-5	SEAL THERMAL SHIELD TANK TO CONTAIN SHIELDING WATER
03.06	C-6	REMOVE, SEGMENT AND DISPOSE OF THERMAL SHIELD STEEL
03.07	C-7	REMOVE THERMAL COLUMN GRAPHITE & WATER CANS
03.08	C-8	DISPOSE OF REMOVABLE PARTS OF THERMAL SHIELD TANK

ALRR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - DECOMM CODE TABLE/INDEX 72B1102

FACILITY SYSTEM/COMPONENT	SYS/COMP. NUMBER	
03.09	C-9	REACTOR FACILITY SURVEILLANCE (SAME AS B-5)
03.10	C-10	EFFLUENT AND ENVIRONMENTAL MONITORING (CONTINUATION OF PREVIOUS PROGRAM)
03.11	C-11	REPORT WRITING AND GENERAL SUPERVISION (CONTINUATION OF PREVIOUS PROGRAM)
04	D	REACTOR DISMANTLEMENT AND FACILITY REPAIR
04.01	D-1	REMOVE ALUMINUM SHEETING FROM REACTOR PEDESTAL
04.02	D-2	REMOVE REACTOR PEDESTAL
04.03	D-3	REMOVE UN-NEEDED REACTOR EXHAUST SYSTEM
04.04	D-4	REMOVE REACTOR EXHAUST STACK
04.05	D-5	REPLACE REACTOR ROOM FLOOR, FILL IN AND COVER POOL
04.06	D-6	REMOVE HOT CELL
04.07	D-7	REMOVE HOT WASTE TANK AND LINES
04.08	D-8	DECONTAMINATE AND DISPOSE OF MISCELLANEOUS STORAGE AND TRANSFER CASKS
04.09	D-9	DECONTAMINATE AND DISPOSE OF REMAINING RESIDUE
04.10	D-10	ENVIRONMENTAL MONITORING AND HEALTH PHYSICS COVERAGE (EXTENSION OF C-10)
04.11	D-11	REACTOR FACILITY SURVEILLANCE (EXTENSION OF E-9)
04.12	D-12	REPORT WRITING (EXTENSION OF C-11)
04.13	D-13	DECOMMISSION REACTOR DRAIN LINES
04.14	D-14	DECOMMISSION STORAGE POOL
04.15	D-15	REMOVE AND DISPOSE OF ACOUSTIC CEILING MATERIAL

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.ALRR-DECON UNC DECOMMISSIONING DATA SYSTEM - SIGNIFICANT EVENT REPORT 7201106

*EVENT .SYS/COMP. * DATE	.NUMBER	SIGNIFICANT EVENT DESCRIPTION
	61	FACILITY CONSTRUCTION STARTED
	650101	FACILITY CONSTRUCTION COMPLETED
	650217	INITIAL CRITICALITY
	650712	INITIAL FULL POWER
	660615	INSTITUTION OF ROUTINE OPERATION
	741201	SHUTDOWN FOR MAJOR VALVE REPAIR OPERATIONS
	750301	RE-INSTITUTED ROUTINE OPERATION
	770501	REPAIRED MAJOR COOLANT LEAK RESULTING IN GROSS TRITIUM
*		CONTAMINATION OF INTERNAL REACTOR PEDESTAL VOLUME
	770601	INSTITUTED PRE-DECOMMISSIONING EFFORT INCLUDING DOCUMENTATION
*		REQUIRED BY DOE, AND ENGINEERING AND COST ESTIMATES
	771231	FINAL REACTOR SHUTDOWN AND INSTITUTION OF DECOMMISSIONING
*		PROJECT
	811001	COMPLETED DECOMMISSIONING PROJECT

PAGE NO. 1

.ALRR-DECON DECOMMISSIONING DATA SYSTEM - RADIONUCLIDE INVENTORY H1116

SYS/COMP. NUMBER	SOURCE MATERIAL DESCRIPTION	MEASUR./ELEMENT C.	DATE	NAME	CURIES	FT**3	100CM2
02.01	CONTROL RODS	A	DNA	CO 60	750	DNA	DNA
02.02	COLLIMATERS, PLUGS, MISC. METAL	A		CO 60	24.9		
02.02	PLUGS, SHUTTERS, STORAGE LINERS, MISC. REACTOR SYSTEMS EQUIPMENT	A		CO 60	0.01393		
				EU 152	0.0003		
				CS 137	0.00023		
				ZN 65	0.00014		
02.03	GUIDE TUBE ASSEMBLY (SUPPORTED FUEL ELEMENTS AND CONTROL RODS)	A		CO 60	14.286		
02.03	TOP PLUG, 2 SECTIONS	A		CO 60	0.029		
03.03	RABBIT TUBES, BEAM TUBES, EXPER. FACIL.	A		CO 60	33.1		
03.04	ALUMINUM CORE TANK	A		CO 60	450		
				ZN 65	50		
03.06	THERMAL SHIELD STAINLESS STEEL AND ASSOC. RESIDUE	A		FE 55	3573		
				CO 60	1162		
				NI 63	267		
				CD 109	11		
				AG 110	35		
04.02	REACTOR PEDESTAL CONCRETE AND ASSOC. RESIDUE	C		CO 60	145.198		
				H 3	64.0		
04.06	HOT CELL DEMOLITION RESIDUE & CO 60 SOURCE	A		FE 55	10.1		
				CO 60	21.7		
				TH 232	0.0026		
				NI 63	0.9		
04.09	NEUTRON GENERATOR EQUIP.	C		CO 60	0.6		
				CS 137	0.07		
				ZN 65	0.03		
				H 3	10.0		
04.14	STORAGE POOL DECOMM. RESIDUE	C		CO 60	0.107		
				CS 137	0.027		
04.15	ACOUSTIC MATERIAL, 60K LBS. (REMOVED FROM REACTOR CEILING)	C		CO 60	0.0002		
	REMAINING MISC. RADIONUCLIDE INVENTORY	A		CO 60	146.44		
				FE 55	52.30		
				ZN 65	10.46		

RADIONUCLIDE INVENTORY TOTALS

NAME	CURIES	NAME	CURIES
FE 55	3649.76	CD 109	11.0
CO 60	2734.094	H 3	74.0
NI 63	267.9	CS 137	0.097
ZN 65	60.49	TH 232	0.0026
AG 110	35.0	EU 152	0.0003

GRAND TOTAL-- 6832 CURIES

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.ALRR-DECON UNC DECOMMISSIONING DATA SYSTEM - PROJECT COST/EXPOSURE 74B1122

*ACTIVITY. *SPEC NO .	COST ITEM/ ACTIVITY	.SYS/COMP. NUMBER	.C. .A. .T.	.SCHED .START .DATE	.SCHED .COMPL .DATE	.ESTIM. .MAN .HOURS	.ESTIMTD. COST $	.ESTIM. .MAN .REM	.ACTUAL .START DATE	.ACTUAL .COMPL .DATE	.ACTUL. .MAN .HOURS	.ACTUL .ACTUAL COST $	.ACTUL .MAN .REM
								NOTE 1				NOTE 2	NOTE 3
01.01	DISPOSE OF FUEL		D	780730		37.5E3		0.665		780630		43.3E3	
01.02	DISPOSE OF COOLANTS		D	780530		17.4E3		0.485		780530		35.1E3	
01.03	INCLUDED IN A-2 DATA												
01.04	INCLUDED IN A-2 DATA												
01.05	REMOVE AND RELOCATE EXPERIMENTS		D	780530		83.5E3		0.275		780630		220.6E3	
01.06	DISPOSE OF ACTIVE PARTS & WASTE		D	781130		501.6E3		12.5		790930		476.9E3	
02.01	INCLUDED WITH 01.06												
02.02	INCLUDED WITH 01.06												
01.07	SECURITY		D			194.9E3						125.7E3	
01.08	HEALTH PHYSICS SERVICES, EQUIP.		D			596.5E3		NOTE 4				704.7E3	
01.09	REPORTS & SUPERVISION		D			494.2E3						510.3E3	
01.10	FABRICATE SPECIAL TOOLS		D			60.0E3						11.1E3	
01.11	REMOVE COOLING TOWER		D	780930		19.2E3				790630		17.9E3	
01.13	REMOVE WATER TOWER		D	80						780930		48.6E3	
01.14	ADD REACTOR ROOM ACCESS DOOR		D							790630		34.2E3	
01.12	CONSULTANT		D			90.7E3						46.2E3	
02.03	REMOVE TOP PLUG ASSEMBLY		D	790330		211.7E3		2.92	790525	790630		85.5E3	0.021
02.04	REMOVE ELECTRICAL SYSTEMS		D	781230		22.2E3		0.17		780530		225.8E3	
03.01	INCLUDED WITH 02.04												
02.05	RESTORE POOL VISIBILITY		D					0.38				45.0E3	
03.02	REMOVE D20 CLOSET		D	790830		27.5E3		0.27		800730		23.5E3	
03.03	CLEANOUT REACTOR ROOM, PUMP ROOM, BASEMENT		D	790830		326.0E3		0.48		790830		228.6E3	
03.04	REMOVE CORE TANK		D	790830	34944	82.4E3		1.004		790830	2246	87.4E3	0.75
03.05	SEAL THERMAL SHIELD TANK		D	790130		11.8E3		4.9		790630		16.7E3	
03.06	REMOVE, CUT, SHIP THERM. SHIELD STEEL	12900	D	791230		601.3E3		10.96	800101	800830	10400	226.6E3	7.13
03.07	REMOVE THERM. COLUMN GRAPHITE, 1ST HALF	10	D	790530		DNA		1.75		790525			
03.07	REMOVE THERM. COLUMN GRAPHITE, 2ND HALF		D	791230		121.6E3		3.8		800330		22.5E3	1.4

.ALRR-DECON UNC DECOMMISSIONING DATA SYSTEM - PROJECT COST/EXPOSURE 74B1122

ACTIVITY SPEC NO	COST ITEM/ ACTIVITY	SYS/COMP NUMBER	C.T	SCHED START DATE	SCHED COMPL DATE	ESTIM. MAN HOURS	ESTIMTD COST $	ESTIM. MAN REM	ACTUAL START DATE	ACTUAL COMPL DATE	ACTUL MAN HOURS	ACTUAL COST $	ACTUL MAN REM
03.08	REMOVE PEDESTAL, THERMAL SHIELD TANK		D	800730	3806		815.0E3	14.84	800728	801130	2766	564.0E3	11.77
04.01	INCLUDED IN 03.08												
04.02	INCLUDED IN 03.08												
04.03	REMOVE EXHAUST SYSTEM, STACK		D	801230			64.0E3	0.28		810630		55.8E3	
04.05	REPLACE FLOOR		D	800930	2333		20.0E3	0.94		810630	1664	75.8E3	0.80
04.06	REMOVE HOT CELL & STORAGE BUNKER		D	811230			85.5E3	0.28		800430		118.5E3	
04.07	REMOVE HOTWASTE TANK & LINES		D	801230			33.5E3	0.58		810930		77.0E3	
04.08	DISPOSE OF STORAGE CASKS		D	801230			32.0E3			800330		30.5E3	
04.09	DISPOSE OF RESIDUE		D	801230				9.611		810930			
04.13	DECOMMISSION REACTOR DRAIN LINES		D					0.38		810630		11.9E3	
04.14	DECOMMISSION STORAGE POOL		D					2.10	801110	810630		60.2E3	
04.15	REMOVE & DISPOSE OF ACOUSTIC MATERIAL		D							810330	1414	105.1E3	0.68

.NOTE 1- THE TOTAL TO BE OBTAINED FROM THIS COLUMN IS THE MEASURED PERSONNEL
. EXPOSURE TOTAL FOR THE ENTIRE DECOMMISSIONING PROJECT. ESTIMATION OF
. REACTOR EMPLOYEE EXPOSURE INFORMATION FOR INDIVIDUAL COST ITEMS WAS,
. HOWEVER, NECESSARY IN ORDER TO OBTAIN THAT TOTAL.
.NOTE 2- INFORMATION INCLUDED HERE REPRESENTS TOTALS FOR LISTED COST ITEMS,
. INCLUDING SALARIES, SUPPLIES AND OUTSIDE SERVICES, CONTRACTS,
. PACKAGING, SHIPPING AND DISPOSAL.
.NOTE 3- ACTUAL MAN-HOUR AND MAN-REM DATA SHOWN HERE INCLUDE ONLY CONTRACTOR
. INFORMATION FOR THE PERIOD OF TIME ENCOMPASSED BY THEIR CONTRACTS.
.NOTE 4- RADIATION EXPOSURES INCURRED BY HEALTH PHYSICS EMPLOYEES ARE NOT
. SHOWN HERE, BUT INCLUDED IN EXPOSURE INFORMATION PRESENTED FOR ACTUAL
. INDIVIDUAL COST ITEMS.
.

.ALRR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - DOSE RATE 7261114

*	MAP REFERENCE	BUILDING	ELEV FEET	MAP COORD.	SYS/COMP NUMBER	TYP.	R/HR LOWER	R/HR UPPER	DPM 100CM2 LOWER	DPM 100CM2 UPPER	MEASUR. EMENT DATE	COMMENT
*	N/A	REACTOR	N/A	N/A	01.06	CON		10.01	1200		DNA	HORIZ. TANGENTIAL FACILITY PLUG 6 IN. DIAM. COMPTON SCATTERING EXPERIMENT
*					01.06	CON		0.3				HORIZ. TANGENTIAL FACILITY PLUG, 4 IN. DIAM. REACTOR FACE NO. 3 (REMOVED EARLY)
					01.06	CON	7.0	75.0				DRUMS OF FUEL ELEMENT CUTOFFS (UNFUELED ENDS)
					01.06	CON		0.35				VERTICAL THIMBLE V-3, OLD,
					01.06	CON		2.0				GRAPHITE CAN FROM INNER END OF H-5 PLUG
					01.06	CON		90.0				HORIZ. BEAM PLUG H-5 7.5 IN. DIAM. (ORIGINAL)
*					01.06	CON		70.0				HORIZ. BEAM PLUG H-6 11 IN. DIAM (6R/HR @ 3') INCLUDES FINAL FISSION PRODUCT GENERATOR (FPG) HARDWARE
*					01.06	CON		50.0	500			HORIZ. BEAM PLUG H-6 11 IN DIAM. (ORIGINAL) INCLUDES SECOND FPG HARDWARE
					01.06	CON		31.0				HORIZ. BEAM PLUG H-6 11 IN. DIAM. (ORIGINAL)
					01.06	CON		18.0				VERTICAL PLUG&THIMBLE V-1, (ORIGINAL)
					02.01	CON		0.1		1.4E4		PLUGS AND SLEEVES, CONTROL ROD
					02.01	CON	2.5	7.0				DRIVE SHAFTS, CONTROL ROD
					02.01	CON		110.0				CONTROL ROD DRIVE PIECES, (CUTOFFS)
					02.01	CON		7.0E3				CONTROL ROD, ORIGINAL DESIGN, USED 6 YEARS
					02.01	CON		1.4E4				CONTROL ROD, RE-DESIGN IN USE AT SHUTDOWN
*					02.02	CON		1.0E3				HORIZ. BEAM PLUG H-7 4 IN. DIAM. INCLUDES ORIGINAL FPG HARDWARE (@1') (150R/HR @ 3')
*					02.02	CON		17.3				HORIZ. BEAM PLUG H-8 4 IN. DIAM. (0.2 R/HR @ 6')
*					02.02	CON		100.0	2.0E5			HORIZ. BEAM PLUG H-9 6 IN. DIAM. (BEAM COLLIMATOR)
*					02.02	CON		100.0				HORIZ. BEAM PLUG H-10 6 IN. DIAM. (BEAM COLLIMATOR)
*					02.02	CON		350.0				HORIZ. TANGENTIAL FACILITY PLUG, 4 IN. DIAM. REACTOR FACE NO. 9 (10 R/HR. @ 3')
*					02.02	CON		20.0				HORIZ. TANGENTIAL FACILITY PLUG 6 IN. DIAM. REACTOR FACE NO. 9 (0.25 R/HR @ 3')
					02.02	CON		0.3				VERTICAL PLUG V-3
					02.02	CON		2.5				VERTICAL PLUG V-5
					02.02	CON		50.0				HORIZ. TANGENTIAL FACILITY PLUG, 6 IN. DIAM. REACTOR FACE NO. 3 (1.4 R/HR. @ 3')
*					02.02	CON		15.0				HORIZ. LINER, H-2 6 IN. DIAM. (0.7 R/HR. @ 3')
*					02.02	CON		45.0				HORIZ. LINER, H-4 4 INC. DIAM. (0.7 R/HR @ 3')
*					02.02	CON		50.0				HORIZ. LINER, H-5 7.5 IN. DIAM. (1.5 R/HR. @ 3')
*					02.02	CON		65.0				HORIZ. LINER, H-6 11 IN. DIAM. (2 R/HR. @ 3')
*					02.02	CON		50.0				HORIZ. LINER H-7 4 IN. DIAM. (0.75 R/HR. @ 3')
*					02.02	CON		50.0				HORIZ. LINER H-8 4 IN. DIAM. (0.75 R/HR @ 3')

.ALRR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - DOSE RATE 72G1114

*	MAP REFERENCE	BUILDING	ELEV FEET	MAP COORD.	SYS/COMP NUMBER	TYP	R/HR LOWER	R/HR UPPER	DPM 100CM2 LOWER	DPM 100CM2 UPPER	MEASUR. EMENT DATE	COMMENT
					02.02	CON		65.0				HORIZ. LINER H-9 6 IN. DIAM. (1.5 R/HR.
*												@ 3')
					02.02	CON		50.0				HORIZ. LINER H-10 6 IN. DIAM. (1.0 R/HR.
*												@ 3')
					02.02	CON		70.0				HORIZ. TANGENTIAL LINER, 4 IN. DIAM.
*												(2.0R/HR @ 3')
					02.02	CON		25.0				HORIZ. TANGENTIAL LINER, 6 IN. DIAM.
*												(3.0R R/HR. @ 3')
					02.02	CON		70.0				HORIZ. BEAM PLUG H-2 IN DIAM. (15 R/HR @ 3')
*												(BEAM COLLIMATOR)
					02.02	CON		500.0				HORIZ. BEAM PLUG H-3 6 IN DIAM. (7. R/HR.
*												@ 3') (BEAM COLLIMATOR)
					02.02	CON		50.0				HORIZ. BEAM PLUG H-4 4 IN DIAM. (1.0R/HR
*												@ 3')
					02.02	CON		1.0E3				HORIZ. BEAM PLUG H-5 7.5 IN. DIAM. (AT 2')
*												STAINLESS STEEL CONSTRUCTION
					02.02	CON	7.0	35.0				VERTICAL LINER PIECES (CUTOFF)
					02.02	CON		0.1				HORIZONTAL PLUGS, THERMAL COLUMN, INNER ENDS
					02.02	CON		0.35				VERTICAL THIMBLES, SEVERAL
					02.02	CON		11.0				VERTICAL THIMBLE, V-5
					02.02	CON		11.0				VERTICAL LINER, V-3
					02.02	CON		20.0				VERTICAL LINER, V-5
					02.02	CON		10.0				VERTICAL LINER, V-8
					02.02	CON	0.6	1.0				FUEL ELEMENT HOLD-DOWN PLUGS
					02.03	CON	0.015	1.0		3000		SHIELD PLUG OVER CORE TANK, LOWER SURFACE OF
*												LOWER SECTION (0.13 R/HR @ 3')
					02.03	CON	200.0	300.0				GUIDE TUBE ASSEMBLY (SUPPORTS F.E.'S &
					02.04	CON		0.5				FISSION CHAMBER
					03.03	CON				1000		PNEUMATIC SAMPLE TRANSFER BLOWER
					03.03	CON		0.01				PIPING, PRIMARY COOLANT, REM. FROM PUMP RM.
												CEILING
*					03.03	GEN		0.85				PUMP ROOM BELOW CORE, SHINE THRU PENETRATIONS
					03.03	CON		50.0				PNEUMATIC SAMPLE SYSTEM LINER R-1, 1 IN.
*					03.03							DIAM. (2 R/HR @ 3')
					03.03	CON		150.0				PNEUMATIC SAMPLE SYSTEM LINER. R-3, 1 IN.
*												DIAM. (5.0 R/HR. 3')
					03.03	CON		45.0				PNEUMATIC SAMPLE SYSTEM LINER R-4, 2 IN.
*												DIAM. (0.8 R/HR. @ 3')
					03.04	CON		150.0				CORE TANK, OUTSIDE SURFACE
					03.04	CON		1.5E3				CORE TANK VOLUME CENTER, IN-PLACE, TAKEN THRU
*												PLUG
					03.04	CON		15.0				LARGE DIAMETER ALUMINUM CORE TANK SUPPORT
												RING
					03.06			108.0				THERM. SHIELD STAINLESS STEEL ASSEMBLY
*												(14 IN. FROM CONTACT)(60R/HR @ 4.5 FT)
					03.06			450.0				THERM. SHIELD STAINLESS STEEL CUT PIECE,
												TAKEN FROM MOST ACTIVE SECTION
					03.07	CON	0.025	1.3				GRAPHITE STRINGERS FROM THERMAL COLUMN

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.ALRR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - PROJECT LABOR 74F1132

*ACTIVITY. . . MAN .LABOR .MAN-.

*SPEC NO . DATE . LABOR CATEGORY .WEEKS .COST $.REM .

*========.======.======================.======.======.====.==========.

. PROJECT LABOR COSTS REPRESENT ONLY SERVICES OF REACTOR EMPLOYEES. ALL
. OTHER LABOR COSTS WERE INCLUDED IN SUBCONTRACTS AND IN SERVICE CHARGES
. BY OTHER AMES LABORATORY GROUPS.

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01.01	DNA	DISPOSE OF FUEL	DNA	1.3E4	DNA
01.02		DISPOSE OF PRIMARY COOLANT (D2O)		2.0E4	
01.03		DISPOSE OF THERMAL SHIELD COOLANT (H2O)		NOTE-1	
01.04		DISPOSE OF PLUG COOLANT (H2O)		NOTE-1	
01.05		REMOVE EXPER. EQUIP.		5.7E4	
01.06		DISPOSE OF ACTIVE PARTS		2.01E5	
02.01		CONTROL ROD DISPOSAL		NOTE-2	
02.02		PLUG & MISC. DISPOSAL		NOTE-2	
01.07		SECURITY		1.09E5	
01.08		HEALTH PHYSICS, MONITORING		5.57E5	
01.09		REPORTS & SUPV.		3.81E5	
01.10		FABRICATE TOOLS		1.5E3	
02.03		REMOVE TOP PLUG ASSM.		2.6E4	
02.04		REMOVE ELEC. SYS.		3.0E4	
03.01		CONTINUATION OF ABOVE		NOTE-3	
02.05		RESTORE POOL CLARITY		2.39E4	
03.02		REMOVE D20 CLOSET		1.15E4	
03.03		CLEAN OUT REACTOR ROOM,		1.57E5	
04.09		PUMP ROOM, BASEMENT		NOTE-4	
03.04		REMOVE CORE TANK		1.0E4	
03.05		SEAL THERM. SH. TANK		1.17E4	
03.06		DISPOSE OF THERMAL SHIELD PLATES(SS)		1.15E4	
03.07		REMOVE THERM. COLUMN GRAPHITE		7.5E3	
03.08		DISPOSE OF REMOVABLE PARTS OF THERMAL SHIELD TANK		1.8E4	
04.01		REMOVE PEDESTAL SKIN		NOTE-5	
04.02		REMOVE PEDESTAL		NOTE-5	
04.03		REMOVE/DECON EXHAUST SYSTEM		3.68E4	
04.05		REPLACE/REPAIR FLOOR		1.00E4	
04.06		REMOVE HOT CELL AND OUTSIDE STORAGE BUNKER		4.00E4	
04.07		REMOVE UNDERGROUND HOT WASTE TANK & LINES		2.50E4	
04.08		DISPOSE OF MISCELL. SHIELDED CASKS		2.0E4	
04.13		DECOMMISSION EMBEDDED HOT LINES		5.0E3	

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.ALRR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - PROJECT LABOR 74F1132

*ACTIVITY. SPEC NO .	DATE .	LABOR CATEGORY	. MAN .WEEKS	.LABOR .COST $.	.MAN-. REM .
04.14		DECOMMISSION STORAGE POOL		2.0E4	
04.15		REMOVE ACOUSTIC MATERIAL		2.0E4	

.NOTE 1- LABOR COSTS INCLUDED IN 01.02
.NOTE 2- LABOR COSTS INCLUDED IN 01.06
.NOTE 3- LABOR COSTS INCLUDED IN 02.04
.NOTE 4- LABOR COSTS INCLUDED IN 03.03
.NOTE 5- LABOR COSTS INCLUDED IN 03.08

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ALRR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - ALARA REPORT 72E1110

*									
*ACTIVITY	SYS/COMP.			ALARA	MAN-REM	INITIAL	FINAL	DOS. RED.	
*SPEC NO	NUMBER	DATE	ALARA COST ITEM	COST $	SAVED.	MR/HR	MR/HR	FCT.	ALARA EFFORT DESCRIPTION
N/A	N/A	DNA	CRANE MODIFICATION	DNA	DNA	DNA	DNA	DNA	CRANE PENDANT MODIFIED TO EXTEND CRANE TRAVEL FOR FIXED OPERATOR LOCATION
*			CONTAMINATION CONTROL						USED WATER SPRAY TO CONTROL AIRBORNE CONTAMINATION DURING REACTOR EQUIPMENT MANIPULATION
*			CONTAMINATION CONTROL						APPLIED LINSEED OIL SPRAY TO REMOTELY FIX CONTAMINATION ON ACTIVATED EQUIPMENT TO BE MANIPULATED
*			RADIATION EXPOSURE CONTROL						MODIFIED EXISTING 2 INCH LEAD SHADOW SHIELDS IN CONJUNCTION WITH LEAD GLASS WINDOWS TO PROVIDE SHIELDED ENCLOSURES FOR HI-RAD OPERATIONS
*			CCTV						UTILIZED CLOSED CIRCUIT TELEVISION FOR HI-RAD MANIPULATIONS, E.G., INSERTION OF LOADED LINERS INTO CASK
*			FLEX DUCT VENTILATION						UTILIZED HI-VELOCITY FILTERED VENTILATION SYSTEM FOR CUTTING AND WELDING ACTIVATED/ CONTAM. MATERIAL, APPLIED DIRECTLY TO WORK WITH FLEX-DUCT
*			UNDERWATER CUTTING						UTILIZED HYDRAULICALLY DRIVEN CUTTING EQUIPMENT FOR UNDERWATER CUTTING OF ACTIVATED MATERIAL
*			FORK LIFT MODIFICATION						FABRICATED BOOM EXTENSION FOR REMOTE MANIPULATION
*			RADIATION EXPOSURE CONTROL						UTILIZED LEAD SHOT BAGS FOR HOT-SPOT SHIELDING WHERE REMOTE MANIPULATION WAS NOT FEASIBLE
*			TRUCK ENTRY TO REACTOR ROOM						PROVIDED REACTOR ROOM ENTRY FOR REMOTE CRANE USAGE IN LOADING HI-LEVEL WASTE DIRECTLY INTO TRUCK-MOUNTED CASKS

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.ALRR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - SHIPMENT REPORT 74C1124

*	SHIP DATE	SHIP NUM	TRIP LEN MILES	MR/HR CONTCT	MR/HR 6 FEET	MR/HR CAB	RADIONUCLIDE NAME	ACTIVITY CURIES	WASTE SPEC NO	DESCRPTION	T. Y. P.	PHYS FORM	CHEMICAL FORM	DOT SHIP CLASS	<-- WASTE ---> CUBIC FEET	POUNDS
.COMMENT: THE DOCUMENTATION STATES THAT , WITH THE EXCEPTION OF ACTIVATED CARBON STEEL ITEMS, CO 60 IS THE GREATLY PREDOMINANT RADIONUCLIDE IN ALL WASTE. FISSION PRODUCT CONTAMINATION WAS VIRTUALLY NONEXISTANT.																
	780807	1	1100	DNA	DNA	DNA	CO 60	3.42	01.06	SHIELDED DRUMS	A			LSA	90.00	10402
*	780814	2	1100	DNA	DNA	DNA	CO 60	6.520	01.06	SHIELDED DRUMS	A			LSA	90.00	8496
*	780814	3	1100	DNA	DNA	DNA	CO 60	0.0146	01.06	DRUMS& SHIELD PIECES	A			LSA	424.67	27958
*	780816	4	1100	DNA	DNA	DNA	CO 60	250.0	01.06	CONTROL ROD PIECES	A			LSA	15.00	200
*	780821	5	1100	DNA	DNA	DNA	CO 60	.003	02.01	DRUMS& SHIELD PIECES	A			LSA	424.67	41120
*	780825	6	1100	DNA	DNA	DNA	CO 60	.022	01.06	DRUMS& SHIELD PIECES	A			LSA	15.00	36120
*	780906	7	1100	DNA	DNA	DNA	CO 60	500.0	02.01	CONTROL ROD PIECES	A			B	15.00	375
*	781211	8	1100	DNA	DNA	DNA	CO 60	.011	01.06	DRUMS& BOXES	C			LSA	576.00	24900
*	781218	9	1100	DNA	DNA	DNA	CO 60	10.118	01.06	DRUMS IN CASK	A			LSA	90.00	9680
*	790413	10	1100	DNA	DNA	DNA	CO 60	6.374	01.06	BOXES & SHIELDED BOXES	A			LSA	816.00	24950
*	790601	11	1100	6.0	3.0	.03	CO 60	14.286	02.03	GUIDE TUBE ASSEMBLY, (CASK)	A			LSA	77.90	400
*	790605	12	1100	40.0	0.3	.03	CO 60	0.005	02.03	TOP PLUG SECTION	A			LSA	251.00	56000
*	790608	13	1100	50.0	7.0	0.03	CO 60	0.024	02.03	TOP PLUG SECTION	A			LSA	177.00	55000
*	790710	14	1100	100.0	10.0	0.9	CO 60	32.5247		CONCRETE &PLYWD BOXES	C			LSA	538.20	39600
*	790723	15	1100	40.0	5.0	0.02	CO 60	0.040		BOXES (9)	C					
*	790810	16	1100	60.0	5.5	0.50	CO 60	500.000		CORE TANK	A					
*	790917	17	1500	100.0	13.0	0.13	CO 60	0.26488		DRUMS, BOXES	C C			LSA	861.50	38601
*	790921	18	1100	15.0	10.0	0.07	CO 60	33.100		CASKS (2)	A			LSA	25.10	
*	800222	19	1100	.07	0.03	0.03	CO 60	0.002		PLYWOOD BOXES (9)	C			LSA	846.00	39200
*	800321	20	1100	1.10	0.07	0.03	CO 60	0.003		PLYWOOD BOXES (9)	C			LSA	1161.0	30000

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.ALRR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - SHIPMENT REPORT 74C1124

SHIP DATE	SHIP NUM	TRIP LEN MILES	MR/HR CONTCT	MR/HR 6 FEET	MR/HR CAB	RADIONUCLIDE NAME	ACTIVITY CURIES	SPEC NO	WASTE DESCRPTION	T. Y. P.	PHYS FORM	CHEMICAL FORM	DOT SHIP CLASS	<-- WASTE ---> CUBIC FEET	POUNDS
800501	21	1100	35.00	5.00	0.13	CO 60	961.000	03.06	CASK (METAL)	A			LSA	126.00	9261
800505	22	1100	110.00	9.00	0.02	CO 60	10.661		BOXES (7) DRUMS (24)	C			LSA	1064.0	31317
800510	23	1100	35.00	7.00	0.05	CO 60	795.950	03.06	CASK	A			LSA	126.00	9400
800604	24	1100	5.00	0.30	0.03	CO 60	0.015		TANKS, BOXES, DRUMS	A			LSA	1126.1	38386
800707	25	1100	100.00	2.00	0.03	CO 60	2237.00	03.06	CASK STAINLESS STEEL	A			LSA	126.00	10500
800716	26	1100	13.00	2.00	0.06	CO 60	899.00	03.06	CASK- STAINLESS STEEL	A C			LSA	126.00	6500
800730	27	1100	40.00	DNA	0.06	FE 55	0.001		BOXES & DRUMS	A					
800808	28	1100	7.000	0.4	0.03	CO 60	100.0	03.06	CASK, STAINLESS STEEL	A			LSA	126.00	10000
800923	29	1500	1.80	0.4	0.04	CO 60	0.003		TANK (1), BOXES (4)	A			LSA	784.00	24800
800923	30	1500	100.00	7.0	0.04	CO 60	0.016		BOXES (11)	A			LSA	1047.5	36375
801003	31	1500	DNA	DNA	DNA	CO 60	50.000		CASK	A			LSA	103.00	4750
810119	32	1500	35.00	3.0	0.03	CO 60	0.162		DRUMS, BOXES	A			LSA	763.00	35592
810323	33	1500	31.00	4.0	0.15	CO 60	0.134		BOXES(10)	A			LSA	952.00	30650
810323	34	1500	0.04	0.04	0.04	CO 60	0.0001		BOXES(10)	A			LSA	1300.0	17100
810323	35	1500	0.04	0.04	0.04	CO 60	0.0001		BOXES(10)	A			LSA	1300.0	10600
810604	36	1500	25.00	0.75	0.05	CO 60	32.747		CASK (14 DRUMS)	A			LSA	200.00	12000
810611	37	1500	45.00	9.00	0.04	CO 60	0.768		BOXES (9) RESIN COLUMN(1)	C			LSA	857.00	27000
810910	38	1500	5.00	0.17	0.04	CO 60	.017		DRUMS(18) BOXES(9)	C			LSA	1079.0	33055
810918	39	1500				CO 60	0.149		DRUMS(24) BOXES(5) TANK, RES. COLUMN	C			LSA	940.0	32050
800818	101	1500	0.05	0.04	0.04	CO 60	0.240		RUBBLE, REBAR,TUBE	C	SOLID	ELEM/OX	LSA	320	38226
						H 3	0.1058								
800820	102	1500	0.05	0.03	0.03	CO 60	0.149		RUBBLE	C	SOLID	ELEM/OX	LSA	320	36312
						H 3	0.0656								
800820	103	1500	0.08	0.05	0.03	CO 60	0.233		RUBBLE, REBAR	C	SOLID	ELEM/OX	LSA	320	39980
						H 3	0.1027								
800822	104	1500	0.09	0.05	0.03	CO 60	0.256		RUBBLE, REBAR	C	SOLID	ELEM/OX	LSA	320	42502
						H 3	0.1128								
800825	105	1500	0.08	0.15	0.03	CO 60	0.276		RUBBLE, REBAR	C	SOLID	ELEM/OX	LSA	320	43600
						H 3	0.1217								

.ALRR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - SHIPMENT REPORT 74C1124

* SHIP DATE	SHIP NUM	TRIP LEN MILES	MR/HR CONTCT	MR/HR 6 FEET	MR/HR CAB	RADIONUCLIDE NAME	ACTIVITY CURIES	SPEC NO	WASTE DESCRPTION	T. Y. P.	PHYS FORM	CHEMICAL FORM	DOT SHIP CLASS	<-- WASTE ---> CUBIC FEET	POUNDS
800825	106	1500	0.15	0.08	0.04	CO 60	0.233		RUBBLE,	C	SOLID	ELEM/OX	LSA	320	38499
						H 3	0.1027		REBAR						
800828	107	1500	0.15	0.05	0.03	CO 60	0.263		RUBBLE,	C	SOLID	ELEM/OX	LSA	320	43622
						H 3	0.1159		REBAR						
800829	108	1500	0.70	0.12	0.04	CO 60	0.231		RUBBLE,	C	SOLID	ELEM/OX	LSA	480	43196
						H 3	0.1018		REBAR						
800904	109	1500	0.20	0.05	0.03	CO 60	0.248		RUBBLE,	C	SOLID	ELEM/OX	LSA	320	41402
						H 3	0.1093		REBAR						
800905	110	1500	0.05	0.04	0.04	CO 60	0.265		RUBBLE,	C	SOLID	ELEM/OX	LSA	352	43670
						H 3	0.1168		REBAR						
800905	111	1500	0.05	0.03	0.03	CO 60	0.257		RUBBLE,	C	SOLID	ELEM/OX	LSA	352	41559
						H 3	0.1133		REBAR						
800906	112	1500	0.06	0.04	0.04	CO 60	0.207		RUBBLE,	C	SOLID	ELEM/OX	LSA	384	42588
						H 3	0.0912		REBAR						
800906	113	1500	0.06	0.04	0.05	CO 60	0.240		RUBBLE,	C	SOLID	ELEM/OX	LSA	320	39662
						H 3	0.1058		REBAR						
800911	114	1500	0.15	0.07	0.04	CO 60	0.234		RUBBLE,	C	SOLID	ELEM/OX	LSA	448	43026
						H 3	0.1031		REBAR						
800916	115	1500	0.14	0.04	0.04	CO 60	0.265		RUBBLE,	C	SOLID	ELEM/OX	LSA	320	42296
						H 3	0.1168		REBAR						
800916	116	1500	0.80	0.07	0.04	CO 60	0.247		RUBBLE,	C	SOLID	ELEM/OX	LSA	480	41029
						H 3	0.1089		REBAR						
800916	117	1500	0.15	0.05	0.03	CO 60	0.259		RUBBLE,	C	SOLID	ELEM/OX	LSA	322	43004
						H 3	0.1142		REBAR						
800918	118	1500	1.30	0.07	0.03	CO 60	0.195		RUBBLE,	C	SOLID	ELEM/OX	LSA	496	41976
						H 3	0.0860		REBAR,						
*									ALUM.						
800920	119	1500	22.00	4.00	0.08	CO 60	9.946		RUBBLE,	C	SOLID	ELEM/OX	LSA	576	43491
						H 3	4.384		REBAR						
800924	120	1500	32.00	5.50	0.05	CO 60	8.191		RUBBLE,	C	SOLID	ELEM/OX	LSA	352	42724
						H 3	3.6104		REBAR						
800925	121	1500	50.00	9.00	0.07	CO 60	8.119		RUBBLE,	C	SOLID	ELEM/OX	LSA	672	44018
						H 3	3.5787		REBAR,						
*									ALUM.						
800925	122	1500	35.00	5.00	0.07	CO 60	4.365		RUBBLE,	C	SOLID	ELEM/OX	LSA	608	42440
						H 3	1.924		REBAR,						
*									ALUM.						
800926	123	1500	1.30	0.20	0.03	CO 60	0.112		RUBBLE,	C	SOLID	ELEM/OX	LSA	528	42826
						H 3	0.0494		REBAR,						
*									ALUM.						
800927	124	1500	10.00	1.90	0.03	CO 60	0.113		RUBBLE,	C	SOLID	ELEM/OX	LSA	560	39173
						H 3	0.0498		REBAR,						
*									ALUM.						
800927	125	1500	0.08	0.03	0.03	CO 60	0.028		RUBBLE,	C	SOLID	ELEM/OX	LSA	560	39218
						H 3	0.0123		REBAR,						
*									ALUM.						
801002	126	1500	27.00	4.50	0.15	CO 60	10.600		RUBBLE,	C	SOLID	ELEM/OX	LSA	384	44244
						H 3	4.6722		REBAR						

U.N.C. DECOMMISSIONING DATA SYSTEM - SHIPMENT REPORT 74C1124

SHIP DATE	SHIP NUM	TRIP LEN MILES	MR/HR CONTCT	MR/HR 6 FEET	MR/HR CAB	RADIONUCLIDE NAME	CURIES	ACTIVITY SPEC NO	WASTE DESCRPTION	T.Y.P.	PHYS FORM	CHEMICAL FORM	DOT SHIP CLASS	WASTE CUBIC FEET	WASTE POUNDS
801003	127	1500	15.00	3.00	0.30	CO 60	13.500		RUBBLE,	C	SOLID	ELEM/OX	LSA	320	43472
						H 3	5.9505		REBAR,						
*									ALUM.						
801003	128	1500	30.00	3.00	0.07	CO 60	4.220		RUBBLE,	C	SOLID	ELEM/OX	LSA	400	35696
						H 3	1.8601		REBAR,						
*									ALUM.						
801006	129	1500	28.00	4.50	0.17	CO 60	12.940		RUBBLE,	C	SOLID	ELEM/OX	LSA	496	43778
						H 3	5.7037		REBAR,						
*									ALUM.						
801006	130	1500	17.00	3.00	0.08	CO 60	11.110		RUBBLE,	C	SOLID	ELEM/OX	LSA	512	41866
						H 3	4.897		REBAR,						
*									ALUM.						
801007	131	1500	21.00	5.00	0.04	CO 60	11.400		RUBBLE,	C	SOLID	ELEM/OX	LSA	572	43302
						H 3	5.0249		REBAR,						
*									ALUM.						
801008	132	1500	20.00	5.00	0.09	CO 60	13.500		RUBBLE,	C	SOLID	ELEM/OX	LSA	560	43754
						H 3	5.9505		REBAR,						
*									ALUM.						
801013	133	1500	30.00	5.00	0.08	CO 60	14.300		RUBBLE,	C	SOLID	ELEM/OX	LSA	496	43504
						H 3	6.3031		REBAR,						
*									ALUM.						
801013	134	1500	5.00	0.60	0.12	CO 60	11.400		RUBBLE,	C	SOLID	ELEM/OX	LSA	496	42443
						H 3	5.0249		REBAR,						
*									ALUM.						
801014	135	1500	4.00	0.25	0.03	CO 60	0.240		RUBBLE,	C	SOLID	ELEM/OX	LSA	416	40260
						H 3	0.1058		REBAR						
801017	136	1500	0.30	0.09	0.03	CO 60	0.259		RUBBLE,	C	SOLID	ELEM/OX	LSA	512	42976
						H 3	0.1142		REBAR						
801020	137	1500	7.00	0.15	0.03	CO 60	0.268		RUBBLE,	C	SOLID	ELEM/OX	LSA	544	44126
*						H 3	0.1181		REBAR						
801025	138	1500	3.50	0.40	0.03	CO 60	1.746		RUBBLE,	C	SOLID	ELEM/OX	LSA	576	44702
						H 3	0.7696		REBAR,						
*									ALUM.						
801028	139	1500	15.00	1.00	0.03	CO 60	0.271		RUBBLE,	C	SOLID	ELEM/OX	LSA	528	44875
						H 3	0.1195		REBAR						
*									ALUM.						
801030	140	1500	75.00	7.00	0.04	CO 60	1.591		RUBBLE,	C	SOLID	ELEM/OX	LSA	592	43420
						H 3	0.7013		REBAR,						
*									ALUM.						
801031	141	1500	1.00	0.09	0.03	CO 60	NEG		RUBBLE,	C	SOLID	ELEM/OX	LSA	548	42866
						H 3	NEG		REBAR,						
*									ALUM.						
801110	142	1500	80.00	8.50	0.20	CO 60	1.891		RUBBLE,	C	SOLID	ELEM/OX	LSA	432	38682
						H 3	0.8335		ALUM.						
801111	143	1500	32.00	7.00	0.13	CO 60	0.232		RUBBLE,	C	SOLID	ELEM/OX	LSA	560	37404
						H 3	0.1023		REBAR,						
*									ALUM.						
801111	144	1500	75.00	8.00	0.14	CO 60	0.559		RUBBLE,RE-	C	SOLID	ELEM/OX	LSA	624	40624
						H 3	0.2464		BAR, ALUM.						

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.ALRR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - DISPOSAL COSTS 74D1126

SHIP DATE	SHIP NUM	DISP SITE	BURIAL CHARGES $ BASIC	CURIE	SP/HND	OTHER	TOTAL	SHIPPING COMPANY	TRANSPORTATION CHARGES $ BASIC	PERMIT	OTHER	TOTAL	CONTAINER TYPE	NO CONT	CONT COST	CONT RENT
780807	1	BARN	705.50				705.50	TRISTATE	2200			2200	SHIELDED DRUMS IN CASK	12	33	1160
*																
780814	2	BARN	705.50				705.50	TRISTATE	2200			2200	SHIELDED DRUMS IN CASK	12	33	1160
*																
780814	3	BARN	2028.3				2028.3	TRISTATE	2193.3			2193.3	DRUMS	84	231	
780816	4	BARN	2000.0				2000.0	TRISTATE	2590.0			2590.0	CASK LINER	1		867.5
780821	5	BARN	2028.3				2028.3	TRISTATE	2193.3			2193.3	CONCRETE-STEEL(19)			
780825	6	BARN	2028.3				2028.3	TRISTATE	2193.3			2193.3	CONCRETE-STEEL(21) BOXES(3)	3	390	
780906	7	BARN	2000.0				2000.0	TRISTATE	2590.0			2590.0	CASK LINER	1		867.5
781211	8	BARN	2200.0				2200.0	TRISTATE	2590.0			2590.0	DRUMS(31) BOXES(6)	37	865.2	
781218	9	BARN	2000.0				2000.0	TRISTATE	2590.0			2590.0	DRUMS IN CASK	12	33	2874
780413	10	BARN	3100.0				3100.0	TRISTATE	3080.0			3080.0	BOXES	10	1300	
790601	11	BARN	2500.0				2500.0	TRISTATE	2842.0			2842.0	CASK LINER	1		3158.
790605	12	BARN	4000.0				4000.0	TRISTATE	6100.0			6100.0	POLY FILM			
790608	13	BARN	4000.0				4000.0	TRISTATE	6100.0			6100.0	POLY FILM			
790710	14	BARN	2842.5				2842.5	TRISTATE	3711.0			3711.0	BOXES	9	1170	
790723	15	BARN	2842.5				2842.5	TRISTATE	3711.0			3711.0	BOXES	10	1300	
790810	16	BARN	2500.0				2500.0	TRISTATE	2510.0			2510.0	CASK LINER	1		3158
790917	17	RICH	3250.0				3250.0	TRISTATE	3842.0			3842.0	DRUMS(85) BOXES(7)	92	1144.	
790921	18	BARN	2510.0				2510.0	TRISTATE	6510.0			3842.0	CASK LINER (2)	2		2668
800222	19	BARN	7427.0				7427.0	TRISTATE	2071.0			2071.0	BOXES	9	1170	
800321	20	BARN	7427.0				7427.0	TRISTATE	2070.0			2070.0	BOXES	9	1170	
800501	21	BARN	2040.6				2040.6	SUPERIOR	2807.0			2807.0	CASK LINER	1		
800505	22	BARN	8666.0				8666.0	TRISTATE	2077.0			2077.0	BOXES(7) DRUMS(24)	41	1005.	
800510	23	BARN	2040.6				2040.6	TRISTATE	2807.0			2807.0	CASK LINER	1		
800604	24	BARN	8666.0				8666.0	TRISTATE	2077.0			2077.0	PACKAGES(9)DRUMS(10)	10	27.5	
800707	25	BARN	2040.6				2040.6	TRISTATE	2807.0			2807.0	CASK LINER	1		
800716	26	BARN	2040.6				2040.6	TRISTATE	2807.0			2807.0	CASK LINER	1		
800730	27	BARN	5744.0				5744.0	TRISTATE	2073.0			2073.0	BOXES	4	520	
800808	28	BARN	2040.6				2040.6	TRISTATE	2807.0			2807.0	CASK LINER	1		
800923	29	RHO	3129.0				3129.0	TRISTATE	2731.0			2731.0	BOXES	9	1170.	
800923	30	RHO	3129.0				3129.0	TRISTATE	2732.0			2731.0	BOXES, TANK, SEALED	6	780.0	
801003	31	RHO	2406.0				2406.0	TRISTATE	2686.0			2686.0	CASK LINER	1		24614
810119	32	RHO	3300.0				3300.0	TRISTATE	2686.0			2686.0	DRUMS(36) BOXES(2)	38	359.0	
810323	33	RHO	3724.0				3724.0	TRISTATE	2804.0			2804.0	BOXES	10	1300.	
810323	34	RHO	3724.0				3724.0	TRISTATE	2804.0			2804.0	BOXES	10	1300.	
810323	35	RHO	3724.0				3724.0	TRISTATE	2804.0			2804.0	BOXES	10	1300.	
810605	36	RHO	680.0				680.0	TRISTATE	2844.0			2844.0	LINER	1		14305
810618	37	RHO	3018.0				3018.0	TRISTATE	2844.0			2844.0	BOXES, RESIN COL, SEALED	9	1170.	
*																
810911	38	RHO	3776.0				3776.0	TRISTATE	2820.0			2820.0	BOXES(9) DRUMS (18)	27	1220.	
810918	39	RHO	3290.0				3290.0	TRISTATE	2820.0			2820.	BOXES(5) DRUMS (24)	29	716.0	
800818	NOTE	RHO	44300.				44300.		1.47E5			1.47E5	BOXES	418	54340	

.NOTE- A TOTAL OF 44 SHIPMENTS, NO'S. 101 THRU 144

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.ALKR-DECON U.N.C. DECOMMISSIONING DATA SYSTEM - DISPOSAL COSTS 74D1126

SHIP DATE	SHIP NUM	DISP SITE	BURIAL CHARGES $ BASIC	CURIE	SP/HND	OTHER	TOTAL	SHIPPING COMPANY	TRANSPORTATION CHARGES $ BASIC	PERMIT	OTHER	TOTAL	CONTAINER TYPE	NO CONT	CONT COST	CONT RENT

WASTE DISPOSAL COSTS*

BURIAL CHARGES	$169574
*TRANSPORT CHARGES	259055
*CONTAINER COSTS	74047
*CASK RENTAL	54832
*TOTAL	$557508

.* WASTE DISPOSAL CHARGES FOR TWO MAJOR CONTRACTS WERE INCLUDED AS PART OF THE CONTRACT COST, AND COULD NOT BE EXTRACTED FOR INCLUSION HERE.

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.ALRR-DECON U.N.C. DECOMMISSIONING DATA - SURVEILLANCE REPORT 74E1130

YEAR	MODE	M.	ITEM	FREQ.	REM	MAN-HOURS	COST $	EXPENDITURE ITEM DESCRIPTION
	S.			<------ ANNUAL ----->				
	DECOM	/.	EXPENDITUR.		MAN-	MAN-	COST	

. THE COST OF SURVEILLANCE ACTIVITIES REQUIRED SPECIFICALLY BECAUSE OF THE
. PAST EXISTANCE OF THE REACTOR IS ABSORBED IN THE COST OF OTHER SURVEILLANCE
. ACTIVITIES REQUIRED BY THE CONTINUING UTILIZATION OF RADIOACTIVE MATERIALS
. IN LABORATORIES AT THE FACILITY.
.
. MAINTENANCE COSTS ARE LIKEWISE ABSORBED. SECURITY ACTIVITIES IN AREAS WHICH
. WERE ORIGINALLY WERE REACTOR-ASSOCIATED ARE NO LONGER NECESSARY BECAUSE THOSE
. AREAS ARE ROUTINELY SECURED FROM CASUAL ENTRY.

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.ALRR-DECON UNC DECOMMISSIONING DATA SYSTEM - PUBLIC DOSE REPORT F3012
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AVAILABILITY OF APPROPRIATE DATA IS INSUFFICIENT FOR REPORT GENERATION.