LIBRARY COPY

ENTERED

U215
FFCA Report

AR 100
FY94 ANNUAL REPORT

Final

July 28, 1994

Submitted in partial fulfillment of the
requirements of the Federal Facility
Compliance Agreement addressing hazardous
and mixed waste under the Resource
Conservation and Recovery Act

Los Alamos Area Office
U. S. Department of Energy
528 35th Street
Los Alamos, New Mexico 87544

Los Alamos National Laboratory
P.O. Box 1663
Los Alamos, New Mexico 87545

1713

PREFACE

This *Annual Report* (AR 100) is being submitted to the U.S. Environmental Protection Agency (EPA) by the U.S. Department of Energy (DOE) and Los Alamos National Laboratory (LANL) in fulfillment of DOE's commitment to EPA under the Federal Facilities Compliance Agreement (FFCA) developed pursuant to the Land Disposal Restrictions (LDR) requirements of the Resource Conservation and Recovery Act (RCRA), as promulgated in 40 CFR Part 268. This report is provided in compliance with Milestone AR 100 in Appendix B of the FFCA. This annual report details and evaluates LANL's success in implementing and accomplishing the goals and requirements of the FFCA from March 1994 to July 1994.

The annual report discusses the following elements:

- The annual update of Attachment A of Appendix B of the FFCA (as specified in section II. A. 1 of Appendix B of the FFCA)
- The current status of the implementation of the Waste Minimization Plan and the accomplishment of its goals (as specified in Section II. C. 1. d of Appendix B of the FFCA)
- The evaluation of the availability and/or applicability of off-site treatment of low-level mixed waste (LLMW) (as specified in Section II. D. 1 of Appendix B of the FFCA)
- The status of skid development, design, and construction, with progress measured against ATS 100, the *Program Management Plan for Generic Skid Design* (as specified in Section II. D. 3 of Appendix B of the FFCA)

Another three sections were added to this report to facilitate the readers' understanding of all FFCA requirements at LANL. These sections are not spelled out in the agreement as a requirement and are for informational purposes only. The first of these documents the progress of all other FFCA milestones. The second (Appendix B) is a table of all LDR FFCA milestones and the nature of their interrelationships. The third is additional pollution prevention information (Appendix C).

The following summary discusses the LDR FFCA milestones that relate to AR 100 and the nature of their inter-relationship.

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
AR 100	ALL	The annual report on the LDR waste minimization work plan, the annual action plan for off site shipment of wastes, the annual update of off-site facilities capable and available for treatment of LLMW, the annual report on skid development and a brief report of the status of all other milestones will be included in the FFCA Annual Report.

CONTENTS

1.0 INTRODUCTION 1
2.0 WASTE MINIMIZATION 1
2.1 Reporting 1
2.1.1 Program Management 2
2.1.2 Process Waste Assessments 2
2.1.3 Site Specific Plans 3
2.1.4 Miscellaneous Technical 3
2.2 Recycling 4
2.3 Training and Pollution Prevention Awareness 5
2.4 Evaluation of New Waste Generation Activities 6
2.5 Waste Minimization Annual Work Plan 7
3.0 OFF-SITE TREATMENT 7
4.0 TREATMENT SKIDS 7
4.1 Treatment Skids Under Development 8
4.1.1 Reactive Metals Skid 8
4.1.2 Plating Waste Acids, and Bases Skids 8
4.1.3 DETOX Process Skid 9
4.2 Development of Additional Treatment Skids 9
5.0 STATUS OF OTHER FFCA MILESTONES 10
5.1 IFLL 100 10
5.2 IFLL 200 11
5.3 STRU 100 11
5.4 STRU 200 11
5.5 HLL 100 11
5.6 HLL 200 11
5.7 CAI 100 12
5.8 CAI 200 12
5.9 CAI 300 12
5.10 HW 100 12
5.11 HW 200 12
5.12 HW 300 12
5.13 HW 400 12
5.14 HW 500 13
5.15 HW 600 13
5.16 HW 700 13

CONTENTS
(continued)

5.17 HW 800 13
5.18 HW 900 13
5.19 LD 100 13
5.20 LD 200 13
5.21 TRU 100 14
5.22 GAS 100 14
5.23 CNC 100 14
Appendix A Update of Attachment A of Appendix B of the FFCA 15
Appendix B FFCA Milestone Interrelationships 16
Appendix C Pollution Prevention 17

LIST OF ACRONYMS

ACIS	Automated Chemical Inventory Systems
AET	Applied Environmental Technologies
ALARA	As Low As Reasonably Achievable
ATLAS	Advanced Testing for Actinide Separations
BAT	Best Available Technology
BDAT	Best Demonstrated Available Technology
BEJ	Best Engineering Judgment
BIF	Boiler and Industrial Furnace
CAI	Controlled-Air Incinerator
CAMs	Continuous Air Monitors
CFC	Chlorinated Solvents
CFR	Code of Federal Regulations
CLS	Analytical Chemistry Group
CWM	Chemical Waste Management, Inc.
CWDR	Chemical Waste Disposal Request
DOE	U.S. Department of Energy
DOE/AL	DOE Albuquerque Operations Office
DOT	Department of Transportation
DSSI	Diversified Scientific Services, Inc.
EPA	U.S. Environmental Protection Agency
ERC	Earth Resources Corporation
ES&H	Environment, Safety, and Health
FERC	Federal Energy Regulatory Commission
FFCA	Federal Facility Compliance Agreement
FY	Fiscal Year
GCP	Gas Cylider Project
GSA	General Services Administration
HEPA	High Efficiency Particulate Air Filter
HSWA	Hazardous and Solid Waste Amendments
HWFP	Hazardous Waste Facility Permit
HWTF	Hazardous Waste Treatment Facility
ICP	Inductively Coupled Plasma
IPC	Industrial Partnership Center
JCI	Johnson Control Incorporated
KOP	Knowledge of Process
LAMPF	Los Alamos Meson Physics Facility
LANL	Los Alamos National Laboratory
LAO	LANL Assessment Office
LDR	Land Disposal Restriction
LLMW	Low-Level Mixed Waste
LLW	Low-Level Radioactive Waste
LP	LANL Procedures
MSDS	Material Safety Data Sheet
MWRSF	Mixed Waste Receiving and Storage Facility
NEPA	National Environmental Policy Act
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NMED	New Mexico Environmental Department
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission

LIST OF ACRONYMS
(Continued)

PPAC	Pollution Prevention Awareness Campaign
PRD	Program Required Document
PTS	Project Tracking System
PWA	Process Waste Assessments
QA	Quality Assurance
QAP	Quality Assurance Plan
RCRA	Resource Conservation and Recovery Act
R&D	Research and Development
R&M	Redistribution and Marketing Center
RES	Rollins Environmental Services
RMMA	Radioactive Material Management Area
RSWD	Radioactive Solid Waste Disposal Record
SOP	Standard Operating Procedure
SSP	Site Specific Plans
SWDA	Solid Waste Disposal Act
TA	Technical Area
TCLP	Toxicity Characteristic Leaching Procedure
TRU	Transuranic
TSCA	Toxic Substance Control Act
TSDF	Treatment, Storage, or Disposal Facility
UBC	Uniform Building Code
UL	Underwriters Laboratories
ULISSES	Uranium Line for Special Separation Sciences
WAC	Waste Acceptance Criteria
WBS	Work Breakdown Structure
WIPP	Waste Isolation Pilot Plant
WMC	Waste Management Coordinator
WMPO	Waste Minimization Program Office
WPF	Waste Profile Form

AR 100
FY94 ANNUAL REPORT

1.0 INTRODUCTION

This *Annual Report* (AR 100) details and evaluates Los Alamos National Laboratory's (LANL's) success in implementing and accomplishing the goals and requirements of the Federal Facilities Compliance Agreement (FFCA) from March 1994 to July 1994. This *Annual Report* follows the format outlined in the FFCA. "Waste Minimization," Section 2.0, documents the implementation of the Waste Minimization Plan and accomplishment of its goals. "Off-Site Treatment," Section 3.0, documents and updates off-site facilities capable and available for treatment of low-level mixed waste (LLMW). "Treatment Skids," Section 4.0, details skid development progress. "Status of Other FFCA Milestones," Section 5.0, is not required as part of AR 100 by the FFCA, but is provided to document the progress of other FFCA milestones.

The annual update of Attachment A of Appendix B of the FFCA is provided as Appendix A of this report. It documents and updates waste types, estimated volume, category, waste codes, and other information that was reported in the original Attachment A of Appendix B of the FFCA. Appendix B summarizes the interrelationships among the FFCA milestones. Appendix C provides additional pollution prevention information.

2.0 WASTE MINIMIZATION

This section details and evaluates the success of the Pollution Prevention Program (formerly Waste Minimization Program) in implementing and accomplishing the goals of the *Waste Minimization Plan* (WM 100) and the FY94 *Waste Minimization Annual Work Plan* (WM 200) for mixed and hazardous waste at LANL during FY94. The *Waste Minimization Plan* was transmitted to the U.S. Environmental Protection Agency (EPA) in fulfillment of Milestone WM 100 of the FFCA. The first *Annual Report* (AR 100) submitted on April 14, 1994 outlined the process used to analyze waste generation problems, identified possible solutions, discussed the support efforts that augment the basic program, and addressed proposed funding solutions to facilitate the implementation of the program's goals.

This second annual report details the specific waste minimization actions that occurred from April to July in 1994. The status and accomplishments for the period are compiled under the general headings of "Reporting," "Recycling," "Training and Pollution Prevention Awareness," "Evaluation of New Waste Generation Activities," and "Waste Minimization Annual Work Plan."

The LANL Waste Minimization Program takes a process systems approach to identifying problems, identifying possible technically and economically sound solutions, implementing solutions, and evaluating results. Waste minimization is a cooperative effort between the LANL Pollution Prevention Program Office (P30) and LANL's waste generators.

2.1 Reporting

The P30 collects, analyzes, and collates relevant data on waste generation rates, process waste assessments (PWAs) and site-specific plans (SSPs), successes and problems with individual waste minimization efforts, and new program starts. The P30 also facilitates PWAs. The P30 reports monthly to LANL management and DOE on waste minimization program activities, as stated in the FFCA. In addition, P30 summarizes this information in an annual report that it provides to the DOE. Appendix C contains a sample of the Pollution Prevention Accomplishment Report as well as the Instructions for Completion of the Pollution Prevention Accomplishment Report Form. P30 also prepares the *Waste Minimization Annual Work Plan* (WM 200), as discussed in more detail in Section 2.5 of this report.

2.1.1 Program Management

The P30 completed "The Waste Minimization and Pollution Prevention Awareness Plan," required by DOE Order 5400.1, in May 1994. This plan defines the mandates and requirements for waste minimization, defines the resources and specific methodologies to implement waste minimization, and provides a plan to accommodate the specific issues for site-wide and generator-specific implementation at LANL.

2.1.2 Process Waste Assessments

A PWA is a systematic review of a process or operation to identify specific opportunities to prevent or minimize the release of hazardous or non-hazardous wastes to the air, water or land. The PWA consists of a careful review of a process' operations (including raw material input) and waste streams to identify how the process steps interact and how they contribute to waste generation. The results of a PWA provide a basis for identifying and prioritizing specific modifications to site and production processes. A graphical interface and waste-tracking algorithms are being tested on current waste stream data.
The 39 LLMW PWAs that were started during FY93 and continued in FY94 are

1. Analysis of TA-55 Plutonium and other samples
2. Waste Isolation Pilot Plant related programs (Bin-scale testing, development of mixed waste LANL standards)
3. Plutonium compounds chemistry
4. Magnetic plutonium separation
5. Metals separation
6. Surface contamination recovery on process residue
7. Firesafe pit process
8. Residues from scrap leaching, etc.
9. Metal forming
10. Metal from a vessel recovery campaign
11. Analyses of plutonium and Special Nuclear Material samples from the Processing Engineering Group
12. Analyses of uranium samples from the Materials Research and Processing Science Group
13. Analyses of SP-100 (space reactor) samples
14. Toxicity Leaching Characteristic Procedure of compositional/environmental samples
15. Analyses of waste management samples
16. Analyses of Waste Isolation Pilot Plant (WIPP) waste from TA-54 and other storage areas
17. Analyses of samples from Environmental Restoration programs
18. Mixed waste analyses Research and Development (R&D)
19. R&D on hazardous waste treatment options
20. R&D on alternative methods of analyses
21. Plutonium-238 programs
22. Radiochemistry analyses of actinide samples
23. Analysis of tritium containing samples
24. Analysis of Production and Surveillance samples for uranium program
25. Differential thermal analysis
26. Evaporator waste metal
27. Plutonium fluoride reduction
28. Plutonium oxide dissolution with nitric acid
29. Off-gas treatment
30. Volume reduction
31. Hot cells
32. Non aqueous chemistry

33. Plutonium chlorination
34. Aqueous chloride recovery
35. Thermochemistry
36. Hydroxide precipitation of chloride waste streams
37. Gas-solid reaction
38. Diagnostics development
39. Automated Retirement and Integrated Extraction System support

A process waste assessment was conducted for the Johnson Control Incorporated (JCI) Construction Services. The PWA identified several opportunities to reduce waste generation and improve material recovery. As a result of the PWA, JCI construction services has implemented procedures for material exchange, recovery, and recycling in their construction shops.

A pollution prevention opportunity assessment is being conducted on the design of the hazardous waste management units at the TA-63 Hazardous Waste Treatment Facility. The pollution prevention assessment will identify design requirements and best management practices that provide for pollution prevention, from the design phases through construction and operations. The assessment will also identify components of a Stormwater Pollution Prevention Plan.

In FY95, activities will focus on completion of the PWA's initiated in FY93 and FY94. During that period, all mixed waste processes that were tracked via waste management databases were identified and process descriptions were developed. These are the 39 most significant mixed waste generating processes at LANL. The completion of these PWA's will involve the identification and evaluation (when applicable) of pollution prevention opportunities. Completion of these PWA's is dependent upon implementation of a LANL recharge system to generate revenue from waste generators. (Note that DOE Pollution Prevention funding does not cover implementation; implementation must be funded by waste generators.)

2.1.3 Site Specific Plans

The Waste Minimization Program has completed 20 SSPs to date and has another 50 in progress. The 50 will be completed in FY95. The initial SSPs were reviewed against each other and the P30 criteria to create a comment matrix. The comment matrix is available for review at the P30 office.

2.1.4 Miscellaneous Technical Issues

This section will address aspects of the pollution prevention program that do not specifically fit into the PWA and SSP process scheme. These are technology transfer and administrative approaches.

Technology Transfer - LANL procedures are in place to exchange technical information through EPA/DOE-sponsored databases on waste minimization and pollution prevention technologies with other DOE sites, industrial and trade associations, educational institutions, private corporations and government agencies. These procedures are being developed through the LANL Industrial Partnership Center (IPC), DOE waste reduction workshops, and private companies.

Administrative Approaches - Administrative approaches to waste minimization and pollution prevention include the following:

- The P3O review of SOPs has been successful in increasing the awareness of Waste Minimization and Pollution Prevention (WMin/P2) in the planning process, however, the requirement for including and implementing WMin/P2 is difficult to enforce. SOP reviews during 1994 were targeted to provide the SOP authors with specific practices that could be included; where appropriate, written information and guidance was attached to the SOP with the review comments. Waste reduction successes

resulting from SOP reviews are difficult to assess because of the long turnaround time for SOP approval.

- P30 review of new projects, and of substantial changes to existing projects, through the LANL Environment, Safety and Health (ES&H) Questionnaire Committee, which reviews these projects for all regulatory and procedural concerns. The ES&H questionnaire is currently being revised to provide a mechanism to ensure that the project proponent has diligently pursued waste minimization opportunities.

- Purchasing discipline and good housekeeping to prevent mismanagement of materials. The LANL purchasing office has already implemented controls to ensure waste minimization is incorporated into operations; e.g. the Automated Chemical Inventory System (ACIS).

- The Radioactive Material Management Area (RMMA) Plan is being revised. Interim procedures are in place LANL-wide. This interim program includes the establishment of an outside review panel for evaluation of the LANL RMMA Program and future recommendations, and the development of a pilot program for RMMA implementation including the Waste Acceptance for Nonradioactive Disposal (WAND) project.

- A waste minimization working group has been established to address tritium and accelerator produced isotopes.

The Material Substitution Committee (MSC) met monthly, with the primary focus of distributing information on available substitutes for solvents and chlorofluorocarbons (CFCs). The committee developed a Waste Minimization/Materials Substitution Resource database which is available on computer and, in hard copy, in the Environmental Safety and Health (ESH) training center. The resource list has been advertised and distributed at Waste Management Coordinator (WMC) meetings. Pilot projects were identified by the MSC including: evaluating alternatives to antifreeze; alternatives to foam packing pellets; and coolant management and recycling.

P3O is supporting efforts to formalize the committee and expand its role to include material control emphasis.

P3O planned and facilitated quarterly meetings for WMC during 1993-1994. The meetings are used for information exchange and questions and answers to pollution prevention/waste minimization recycling and waste management. In January 1994, CST-7 Customer Service Office took lead responsibility for the WMC meetings, with P3O continuing to support the effort and actively participate in the meetings.

P3O representatives are supporting the Customer Service Office on a part time basis in an effort to promote pollution prevention/waste minimization and specifically answer phone calls from the coordinators or generators on WMin/P2.

2.2 Recycling

LANL has established many recycling activities throughout its facilities. These activities focus on areas where the greatest return can be obtained with the least amount of resources (see Appendix D for details of material and quantities). The recycling activities are

- Recycling all industrial metals through the JCI Redistribution and Marketing Center (R&M).

- Recycling all precious metals through precious metal banks.

- Recycling 75 percent of white paper through the JCI R&M Center.

- Recycling all lead-acid batteries through of the JCI R&M Center.

- Offering excess laboratory and industrial chemicals for exchange by distributing a list of available chemicals to potential end users within LANL . This chemical exchange process is being formalized and will be computer-automated in conjunction with the Automated Chemical Inventory System (ACIS).

- Developing procedures and contract mechanisms for economically recycling LANL chemicals outside of the facility. Recycling will be in compliance with EPA and U.S. Department of Transportation (DOT) regulatory requirements and has the potential of recycling 65 percent of the hazardous waste stream.

- P3O sponsored the expansion of the JCI waste oil recycling program; previously, JCI collected and transferred waste oil for recycling that was generated from JCI operations. The program was expanded to address all nonhazardous waste oils generated at LANL. An estimated volume of 9200 gallons of oil was recycled under this program in 1993.

- Recycling other oils through the JCI Environmental Division, which contracts with a local (off-site) recycling facility. The facility is routinely audited for compliance with EPA, DOT, and DOE requirements.

- Lead brick and shielding recycling (including both uncontaminated material as well as lead decontaminated in compliance with FFCA milestone LD 100), which includes a moratorium on purchasing new lead.

- The Recycle Task Force was formed to integrate and expand recycling services across LANL. The task force identified a single point of contact for recycling requests and developed a hit list of items currently recycled and those targeted for recycling.

The chemical exchange program continued to operate on an informal basis during 1994. The program was promoted at WMC quarterly meetings, and through the LANL *newsbulletin* and SOP reviews. A memo identifying excess chemicals available for exchange was distributed on a quarterly basis; an estimated 65 to 70 percent of chemicals advertised were successfully exchanged instead of disposed. The exchange program was expanded in 1994 to coordinate with CST-7 Customer Service Office so that unopened/unused chemicals could also be identified on the Chemical Waste Disposal Request (CWDR) form. These requests have been referred to P3O so that an exchange could be attempted before the disposal request was processed.

Steps were made to formalize the exchange program during FY94 so as to provide a more streamlined program including a storage warehouse for exchangeable material, tracking, improved advertising, and financial incentives to use the program. Procedures have been drafted to address the criteria for acceptance, packaging and transportation (P&T), and redistribution of chemicals. P3O coordinated extensively with BUS-6 to address packaging and transportation (P&T), which currently is a barrier to exchanging materials due to a higher cost to exchange than to dispose. The chemical exchange program is expected to go into service in FY95, including additional promotion and advertising.

2.3 Training and Pollution Prevention Awareness

The P30 established a pollution prevention awareness campaign (PPAC) that provides general waste minimization information to LANL employees and provides training support to the LANL Training Office. Initially, all employees receive waste minimization training as part of the LANL Training Office's

General Employee Training course. P30 also provides waste minimization training to all waste management coordinators (WMC) and provides updates during quarterly WMC meetings. The P30 has completed a waste minimization training package (including a pollution prevention video and handbook) that has been sent to all group offices and provides manager training per DOE Order 5480.20, *Personnel Selection, Qualifications, Training and Staffing Requirements at DOE Reactor and Non-Reactor Facilities.*

The P30 also provides a staff member who participates on the JCI Waste Minimization Committee to assist with technical direction and funding issues related to JCI waste minimization activities. The LANL-wide waste oil recycling program was initiated out of this committee and is recycling 9,000 gallons per year.

The PPAC also writes monthly articles in the LANL *Newsbulletin*, informational bills to the generators on their quarterly waste generation rates, and implements an incentive program that provides cash awards for employee suggestions on minimizing waste (see Appendix C for a sample of an article from the LANL *Newsbulletin* and awards given to employees). Suggestions are separated into large and small projects and then judged on creativity, applicability, cost savings, and minimization potential. The 1994 awards are scheduled to be presented in August, 1994.

Pollution Prevention Opportunity Assessment Program FY94 Accomplishments:

- Trained Waste Management Coordinators and other personnel on Pollution Prevention Opportunity Assessment Program (PPOA) tools. Evaluations showed that the Laboratory found the PPOA tools useful.

- Developed a Graphical Interface Prototype for PPOA

- Developed factors for the Cost Benefit Analysis module for the PPOA program

- Developed a Standard Laboratory Processes module for inclusion into the Best Available Technologies (BAT) data base

P3O representatives are active members in the DOE Waste Minimization Contractor Coordination Group (WMinCCG) which sponsors workshops for the DOE complex on Pollution Prevention and Waste Minimization. LANL P3O representatives have been workshop leaders and participants during the three WMinCCG workshops, including PWAs, procurement systems for waste minimization, waste minimization in fleet and plan maintenance, HVAC/CFC replacements, and pollution prevention in decontamination and decommissioning, and environmental restoration programs. Meeting highlights and proceedings from the workshops have been distributed to appropriate WMC and laboratory groups.

2.4 Evaluation of New Waste Generation Activities

The P30 reviews approximately 10 potential waste-generating programs each week through the LANL ES&H Questionnaire Committee and approximately 15 new and revised SOPs each week. All new potential waste generating projects, major modifications to existing projects, and SOPs are evaluated for waste minimization requirements. The P30 data management efforts facilitate:

- Waste generation tracking, particularly to provide generators with a quarterly report on their generation rates

- Cost accounting that provides accurate numbers on the cost of waste management

- Waste generation normalization that provides data comparing waste generation to the dynamic level of effort at LANL

2.5 Waste Minimization Annual Work Plan

The *Waste Minimization Annual Work Plan* (WM 200) is prepared annually. The second such work plan is submitted concurrently with this annual report. The work plan provides details on how LANL's *Waste Minimization Plan* (WM 100) will be implemented for the upcoming fiscal year. It identifies how waste minimization and pollution prevention priorities are developed and implemented to ensure that mixed waste streams are promptly identified, their PWAs and SSPs are completed on a timely basis, and corrective actions are completed or the necessary R&D activities are initiated to resolve identified problems.

3.0 OFF-SITE TREATMENT

LANL's initial effort to identify and evaluate off-site facilities under the terms of the FFCA was described in the *Feasibility of Treatment of Los Alamos National Laboratory Low-Level Mixed Waste at Diversified Scientific Services, Inc.* (milestone OSS 100). Additional facilities were reviewed in the *Gas Cylinder Work-Off Plan* (milestone GAS 100). LANL's efforts to identify appropriate facilities are ongoing, and results of these efforts will be reported to the EPA annually.

The first annual action plan to update information regarding off-site facilities capable of and available for treating LLMW is being submitted to EPA concurrently with this annual report as OSS 200, as specified by the FFCA in Appendix B (Section II.D.1). OSS 200 contains a description of how two off-site commercial facilities were selected for treatment and disposal of LLMW from LANL and how the LLMWs were selected for shipment for shipment to these facilities. The action plan contains an estimate of the volume of legacy LLMW suitable for disposal at Envirocare Inc. of Utah and DSSI, and presents the methodology used to determine candidate waste streams. OSS 200 also describes a plan of action which will include a schedule of off-site shipments.

During this fiscal year, the Laboratory has made great progress towards treating legacy nonradioactive hazardous waste offsite. Five containers of legacy dioxin waste (306 pounds of F027 waste) were shipped to the Aptus Incinerator in Coffeyville, Kansas. In addition, 16 containers of mercury waste, (a total of 117 lbs) were shipped off-site for treatment and disposal. As of this writing, there are no non-radioactive hazardous waste containers (excluding gas cylinders) that are in violation of the 1 year LDR storage requirement.

4.0 TREATMENT SKIDS

This section details the status of skid development, design, and construction, and evaluates the success of implementing and accomplishing the goals of ATS 100, the *Program Management Plan for Generic Skid Design,* for treatment skid development at LANL during March 1994 to July 1994. This portion of the annual report conforms to the format outlined in the program management plan and the FFCA Appendix B (Section II. D. 3). It outlines how the program analyzes LDR requirements through characterizing and prioritizing of waste, identifies the methodology of developing treatment technologies and equipment, and discusses the support efforts that augment the basic program. The status and accomplishments for the period are compiled under the general headings of "Treatment Skids Under Development" and "Development of Additional Treatment Skids."

4.1 Treatment Skids Under Development

The development of treatment processes, pilot studies, and design of several skids are currently under way. The following section summarizes the status of the development effort.

4.1.1 Reactive Metals Skid

Skid development is proceeding as scheduled. During FY94, the skid design will be completed and permitting will be initiated. The skid will treat reactive metal waste, including lithium hydride, sodium metal, and calcium metal, by reacting the waste with water in an inert atmosphere. The resulting hydroxide will then be neutralized. The neutralized solution, will be discharged to the radioactive waste-water treatment plant. The scope of bench-scale testing has been expanded to confirm the applicability of the process to other reactive metals (Na, Ca, and Mg). This testing will be conducted in parallel with skid design to address waste treatment applications at other DOE sites.

4.1.2 Plating Waste, Acids, and Bases Skid

The skid for treating plating waste, acids, and bases has been designed, and the National Environmental Policy Act (NEPA) documentation is in progress. A RCRA Part B permit application was submitted to the State of New Mexico on October 12, 1993. Safety documentation, operational documentation, and permitting documentation will be completed in FY94, and construction and cold testing of equipment with modifications will be initiated when permits are received. As of this writing, the State had not begun reviewing LANL's Part B application. The skid is capable of treating the following waste categories as given in FFCA Appendix A:

- Acids
- Bases
- Cyanide solutions including electroplating solutions
- Solutions contaminated with heavy metals
- Some non-wastewater contaminated with cyanide and heavy metals

The plating and pickling waste contains various acids, or cyanide and bases, and various metals. It is typically contaminated with low concentrations of depleted uranium (<1 g/L). The best demonstrated available technology (BDAT) for electroplating waste includes one or more of the following:

- Neutralization of acids
- Oxidation of cyanide and ammonia
- Reduction and precipitation of chromium
- Precipitation of metals

This treatment skid will also be available to perform neutralization and metals precipitation for other liquid waste. The skid is also potentially applicable to analytical laboratory wastes and other solutions contaminated with arsenic, cadmium, selenium, and any heavy metal that can be precipitated as a hydroxide or a sulfide, as well as contaminated photographic fixer. Treatment to BDAT levels may require substantial quantities of treatment reagents that will increase the residual volume of solution, which must be solidified if the waste is listed.. A pretreatment step using an electrode position technique is being bench-scale tested. It deposits as much metal as possible and oxidizes some cyanide before the conventional treatment step. If successful, the electrolytic approach will be combined with the established treatment scheme to reduce the final waste volume. Use of the skid to treat wastes it is potentially applicable to will be determined during bench-scale testing. Stabilization processes, including cementation and encapsulation, will be investigated as methods of treating the sludges and residues from the skid to prepare them for disposal.

4.1.3 DETOX Process Skid

The bench-scale test for the DETOX skid is currently in progress. The slip in the schedule is due to a change in scope of work. Information gained through implementation of the waste characterization plan for historical LLMW (HLL 100) identified the need for a batch processing scheme. The DETOX skid was originally designed for a continuous processing scheme. Optimization of the batch treatment scheme has required additional testing, and resulted in subsequent delays. The redesign effort has resulted in a nine-month slip in the schedule. During FY94 and early FY95, the bench-scale testing will be completed. The DETOX process is a liquid phase, iron-catalyzed, oxidation process being developed as an alternative to incineration for some wastes and as a treatment process for certain wastes that cannot be processed in the controlled air incinerator (CAI). In the latter category, waste includes vermiculite contaminated with organics and solvents containing elevated tritium and ^{14}C. Candidate wastes include ignitable liquids, metal-contaminated oils, and used solvents including chlorinated and fluorinated solvents. Reaction times for oxidizing rags and cellulose materials are too long to be practical. The process does not oxidize rubber or plastics.

The DETOX process uses Fe^{+3} in an acid solution as the primary oxidant, and the Fe^{+2} formed in the oxidation process is converted back to Fe^{+3} by a second, catalyzed reaction with oxygen. The primary benefit of the DETOX process is that it can oxidize organic constituents in a contained reactor up to 250°C and 40 psig. Bench-scale testing will be used to determine whether the process is a viable alternative to incineration, and is applicable to LANL waste. Further development of the process will be performed in accordance with the *Program Management Plan for Generic Skid Design* (ATS 100) for treatment skid development, as appropriate.

4.2 Development of Additional Treatment Skids

The total number of processes needed to treat LANL's LLMW using treatment skids cannot be defined at present because of the incompleteness of the waste characterization needed for process evaluation and design. In some cases, one skid may process more than one waste stream, while in other cases, more than one skid may be required for different waste properties or contaminant concentrations. The LDR requirements established and outlined in the *Characterization Plan for Historical LLMW* (HLL 100) and the *Formal Plan for Prioritizing LLMW Treatment* (HLL 200) will be used to plan and schedule skid development for wastes with no established treatment techniques. This process is further described in the DOE *Site Treatment Plan,* in accordance with the Federal Facility Compliance Act.

The methodology for the development of treatment technologies and equipment was established in parallel with the preparation of HLL 100. As stated in ATS 100 (*Program Management Plan for Generic Skid Design*), the following activities will be completed:

- Waste characterization
- Identification of available technologies (literature search)
- Evaluation of available technologies
- Selection of applicable technologies
- Bench-scale testing
- Preconceptual design
- Treatment skid design (Title I and Title II)
- Environmental permitting
- Document preparation (safety and operational)
- Nonradioactive testing
- Waste treatment

Cost/benefit analysis and risk analysis are addressed before skid development as part of HLL 200. Bench-scale testing will precede skid design to confirm that the treatment is appropriate and to generate design

data. While the hazardous components can be treated with available technologies identified in Attachment A of Appendix B in the FFCA, the varying quantities of radionuclides and the physical characteristics of individual waste streams may render standard techniques impractical. Every attempt will be made to use existing techniques as much as possible. However, safety concerns associated with the radioactive portion of the waste may require different approaches, even between wastes or in the same waste category in the matrix. While knowledge of process (KOP) is available, a more detailed analysis of both the radioactive and chemical contamination of the waste is needed before a safe and effective treatment option is determined. If bench-scale testing of a treatment process proves the approach unworkable, the remaining alternatives will be reevaluated and an alternate method selected. If no alternative is available, R&D will be applied.

As stipulated in Appendix B of the FFCA, two new treatment processes will be selected each year. Treatment of scrubbable compressed gases is one of the two new treatment processes that will be initiated in FY94. The second process is treatment of lead-contaminated soil and other materials that can not be decontaminated or sent to off-site treatment facility. Additionally, development has begun on a skid for in-drum solidification of treated wastes. The selection of the treatment processes to be undertaken uses the requirements established and outlined in the *Characterization Plan for Historical LLMW* (HLL 100) and the *LLMW Treatment Prioritization Plan* (HLL 200). The waste categories for which treatment skid technologies have not yet been selected include:

- Oxidizers
- Contaminated debris
- Contaminated scrap metal
- Process residues
- Decontamination waste
- Dewatered treatment sludges
- Non scrubbable compressed gases
- Contaminated metal
- Contaminated chemical products.

5.0 STATUS OF OTHER FFCA MILESTONES

This section details the status of all milestones that are not specifically addressed in Section 2.0, "Waste Minimization," Section 3.0, "Off-Site Treatment," and Section 4.0, "Treatment Skids" of this report. The information provided here is not a requirement of AR 100, but is provided to document the progress of other FFCA milestones. Some FFCA projects and milestones represent stand-alone projects, while others strongly depend upon each other for successful completion. A table summarizing the interrelationships among the FFCA milestones is provided as Attachment B to this report.

5.1 IFLL 100

The preconceptual study to identify options for interim LLMW storage facilities/upgrades was submitted to the EPA on April 14, 1994. The preconceptual study presents options for modifying current LLMW storage facilities to meet 40 CFR Part 264 requirements for permitted storage facilities in the near term. The information developed in the preconceptual study will be used in the RCRA Part B permit application for the facilities. The implementation schedule for final upgrades to the facilities will be provided to the EPA as deliverable IFLL 200, as specified in Appendix B of the FFCA. Discussions have been held with the State of New Mexico regarding construction of the storage dome for Liquid LLMW discussed in IFLL 100. The State provided its approval of this proposed structure on July 22, 1994.

5.2 IFLL 200

The implementation schedule for the final upgrades to the interim LLMW storage facilities will be submitted to the EPA one hundred and eighty (180) days after the FFCA effective date. The implementation schedule identifies upgrades and proposes a schedule for their implementation and for submitting any further notifications or permit applications to the New Mexico Environment Department (NMED).

5.3 STRU 100

This preconceptual study will identify any short- and long-term TRU storage facility modifications required to conform with 40 CFR Part 264 Subpart I requirements for the waste contained in Transuranic (TRU) Pads 1, 2, and 4 as well as other LANL TRU storage areas, and will be submitted to the EPA on September 30, 1994. The preconceptual study will also identify target dates for any new facilities that are required. Certification of compliance with 40 CFR Part 264 Subpart I will be provided to the EPA upon completion of the stipulated upgrades, of Pad 1, 2, and 4 wastes as deliverable STRU 200 in Appendix B of the FFCA.

5.4 STRU 200

Upon completing the upgrades specified in the STRU 100 report and in the Compliance Plan incorporated into the NMED consent agreement, a Certification of Compliance with RCRA's storage requirements under 40 CFR Part 264 Subpart I will be submitted to EPA. The due date is December 17, 2003, as specified by the NMED in its final consent agreement as amended with DOE and LANL.

5.5 HLL 100

This plan was submitted to the EPA in April 14, 1994. The characterization plan presents both the methodology and the schedule for characterizing LANL's legacy LLMW. As of this writing , 75 percent of the wastes have been characterized sufficiently to permit appropriate treatment methods to be selected. Characterization for the remaining 25 percent of the wastes is expected to be completed by September, 1994. A sampling and analysis plan will be completed by November, 1994 for those wastes which currently do not have sufficient data for characterization.

5.6 HLL 200

The *Treatment Prioritization Plan for Low-Level Mixed Waste* (LLMW) was submitted to EPA on May 31, 1994. The plan presents a formal procedure for prioritizing LLMW streams based on the risk associated with long-term storage of these wastes. Risk is estimated based on waste specific parameters such as chemical, physical and radiological characteristics, and the volume and number of containers in storage. Those LLMWs which present the greatest risk to public health and the environment, if released, will be given a higher ranking score.

The plan calls for a three-pronged approach for dealing with the LLMW streams: (1) any wastes for which off-site capacity is available (in the short term) will be shipped to that off-site treatment and disposal facility as soon as practicable, regardless of the ranking score; (2) LLMWs for which off-site capacity is not available will be evaluated for treatment the Controlled Air Incinerator (CAI); and (3) LLMWs which cannot be treated in the CAI will be evaluated for development of skid mounted treatment units. Those LLMWs presenting the highest risk according to the matrix will be given priority for treatment in the CAI and for development of skid mounted treatment units.

The programs for development of the *Controlled Air Incinerator LLMW Work-Off Plan* (CAI 300) and the *Hazardous Waste Treatment Facility, LLMW Work-Off Plan* (HW 600), and the program for future treatment skid development, will use the prioritization scheme as the basis of how waste treatment

initiatives are undertaken and which of these treatment alternatives will be selected for a given waste stream.

5.7 CAI 100

Hiring and training of CAI operating personnel continued throughout FY94. They have assisted with completion of facility upgrades and development of operating procedures in preparation for the trial burn. The notice that the operating personnel have been hired for the CAI was submitted to the EPA on 2/1/94.

5.8 CAI 200

CAI system upgrades, testing, staff checkout, and preparation of NEPA and safety documentation continued during FY94 in preparation for a trial burn. The notice that the trial burn has been completed will be submitted to the EPA on 2/13/95.

5.9 CAI 300

The CAI work-off plan for applicable LLMW will be submitted to the EPA on 9/30/95. Full-scale operations of the CAI will commence subsequent to approval of appropriate NEPA documentation and RCRA permitting. Hazardous waste treatment can be initiated after the RCRA trial burn under the existing RCRA Part B permit. LLMW can be treated when the LLMW permit modification is received, provided additional regulatory requirements are not imposed by NMED air quality regulations currently being developed for the incineration of radioactive waste. The CAI work-off plan will incorporate the prioritization of waste for treatment developed in HLL 200.

5.10 HW 100

This milestone has been completed. The notice of completion of Title I was submitted to the EPA on April 14, 1994.

5.11 HW 200

Waiver to start Title II engineering was received from DOE-headquarters on May 24, 1994. A contract was established with Holmes and Narver to begin Title II engineering on June 1, 1994. Also, supplemental Title I design work was started on May 18, 1994. The notice of completion of the definitive design (Title II) for the HWTF will be submitted to the EPA on 1/30/95.

5.12 HW 300

This milestone has been completed. The RCRA Part B permit application for the Hazardous Waste Treatment Facility (HWTF) was submitted to the New Mexico Environment Department (NMED) on October 12, 1993. The notice of submittal of the RCRA Part B application was sent to the EPA on April 14, 1994.

5.13 HW 400

This milestone calls for submission of a construction schedule for the HWTF. The definitive schedule for HW 500, HW 600, and HW 700 will be completed and submitted to the EPA on 4/30/95, assuming NMED approves of the RCRA Part B permit for this facility in time.

5.14 HW 500

The beginning of the HWTF construction is dependent on NMED approval of the RCRA Part B permit. A notice will be submitted to the EPA that construction has begun within three months after the effective date of the RCRA Part B permit.

5.15 HW 600

The LLMW work-off plan for the HWTF will be submitted to the EPA eleven months after construction of the HWTF begins.

5.16 HW 700

This milestone date is dependent on NMED approval of the RCRA Part B permit. The notice that construction on the HWTF has been completed will be submitted to the EPA within 20 months after construction begins.

5.17 HW 800

This milestone date is dependent on NMED approval of the RCRA Part B permit application. The notice that treatment operations have begun at the HWTF will be submitted to the EPA within 12 months after construction is completed.

5.18 HW 900

Completion of LLMW treatment in the HWTF pursuant to HW 600 will depend on data obtained from LLMW characterization and prioritization (HLL 100 and HLL 200) and the operating schedules for treatment skids constructed and operational at the time of HWTF startup. This milestone date is dependent on NMED approval of the RCRA Part B permit for the HWTF. The notice that the applicable LLMW work-off has been completed will be submitted to the EPA within 48 months after HWTF operations begin.

5.19 LD 100

This milestone has been completed . It called for commencement of LANL's project to use a mobile unit to decontaminate lead bricks previously used for shielding in various projects at LANL. Earlier drafts of the FFCA specified a due date of April 8, 1993. Although the FFCA was not in effect, DOE and LANL were complying with all milestones specified in the draft FFCA at that time.

The EPA Hazardous Waste Management Division was notified on April 15, 1993, and the Air, Pesticides, and Toxics Division was notified on April 21, 1993 that operations of the lead decontamination trailer began April 8, 1993.

Beginning on April 12, containers of lead bricks were retrieved from storage at TA 54, Area G a few at a time, and maintained just before processing in an interim status container storage area at TA-50-114, near the decontamination operation. Following decontamination, the lead bricks are being returned to service throughout LANL. Lead bricks are currently being processed in the decontamination unit at the rate of approximately 4 tons per month.

5.20 LD 200

This milestone calls for LANL to submit a notice of completion of decontamination operations for the applicable lead inventory on October 8, 1994. As of this writing, 42.34 tons of lead has been

decontaminated through the mobile unit. The original inventory listed a total of 60 tons in storage so the project is seventy percent complete with over 4 months remaining.

5.21 TRU 100

The TRU waste work-off plan will be submitted to the EPA within 26 months of issuing the WIPP waste acceptance criteria (WAC) for the operational phase. The date the WIPP operational phase will begin has not yet been established by EPA and DOE.

5.22 GAS 100

This milestone has been completed. The *Gas Cylinder Work-Off Plan* (GAS 100) was submitted to the EPA on April 14, 1994. The *Gas Cylinder Work-Off Plan* defines the approach and schedule for treatment of legacy gas cylinders. During fiscal year 1994, 545 RCRA-regulated gas cylinders have been shipped off-site for treatment, disposal, or recycling. The net volume reduction in gaseous mixed waste streams was from 808.99 ft^3 to 205.81 ft^3, a 603.18 ft^3 (or 74.56 percent) reduction in the inventory of gaseous mixed waste. Although there was a net volume reduction in the gaseous mixed waste streams, certain waste codes exhibited an increase in volume. In addition, new waste codes were added to the gaseous mixed waste inventory, as is the case for waste codes D003 and U135. The reason for these changes is that improved waste characterization information (generated as part of GAS 100) indicated that certain gaseous waste streams in storage should be reclassified. The reclassification of certain waste streams resulted in a net increase for certain waste codes and the addition of new waste codes in the inventory.

In addition, during fiscal year 1994, 190 legacy gas cylinders requiring characterization were sampled and analyzed on-site by a qualified subcontractor. The cylinders are being evaluated for their RCRA constituents and the database is being updated accordingly. Radioactive analyses for these cylinders are pending. The waste tables in Attachment A, Appendix B to the FFCA were reviewed to reflect the work-off and reclassification of these gas cylinders, as shown in Appendix A of this report.

As of June 1, 1994, all characterized legacy RCRA-regulated gas cylinders were shipped off-site with the exception of those cylinders which fall into one of the following three categories: (1) cylinders with added radioactivity, (2) non-DOT specification cylinders, and (3) cylinders which contain gases that are not approved for treatment at any available commercial off-site facility. LANL will continue to update the list of gas cylinders in storage and explore both internal and external treatment, disposal, and recycling options.

5.23 CNC 100

Certification will be submitted to the EPA within 90 days of the completion of all identified milestones and activities of the FFCA. The certification report will document that all milestones and activities outlined in the compliance plan have been completed and submitted for review.

Appendix A
Update of Attachment A of Appendix B of the FFCA

This is the first AR 100 to update information regarding Attachment A of Appendix B of the FFCA. This annual update addresses Table II, Low-Level Liquid and Gaseous Mixed Waste; and Table IV. These updates reflect changes in the applicable gas cylinder inventory, as discussed in Section 5.22 of this report. The waste types, estimated volumes, category, waste codes, and other information that is currently included in the tables will be updated to reflect new information as it becomes available to DOE and LANL.

In accordance with the Gas Cylinder Work-off Plan (GAS 100), gas cylinder waste streams were characterized, repackaged, and sent to an off-site TSD for treatment and disposal. The net volume reduction in gaseous mixed waste streams was from 808.99ft^3 to 205.81ft^3, a 603.18 ft^3 (or 74.56%) reduction in the inventory of gaseous mixed waste. Options to address the remaining volume are also identified in GAS 100.

Although there was a net volume reduction in the gaseous mixed waste streams, certain waste codes exhibited an increase in volume. In addition, new waste codes were added to the gaseous mixed waste inventory, as is the case for waste codes D003 and U135. The reason for these changes is that improved waste characterization information (generated as part of GAS 100) indicated that certain gaseous waste streams should be reclassified. The reclassification of certain waste streams resulted in a net increase for certain waste codes and the addition of new waste codes in the inventory.

Changes in the other mixed waste streams are expected as the Low-Level Mixed Waste Characterization plan (HLL 100) is completed and undergoes peer review and quality control review. As the schedule in HLL 100 indicates, the draft process knowledge characterization report will be submitted to LANL on August 2, 1994. The final process knowledge waste characterization report is due to LANL on September 30, 1994. For waste streams where process knowledge is inadequate for characterization, a sampling and analysis plan (SAP) will be prepared and submitted for LANL review October 3, 1994. The final SAP is due November 28, 1994.

APPENDIX B, ATTACHMENT A, TABLE 1 - LOW-LEVEL SOLID MIXED WASTES

Waste Category	Waste Code	Waste Component	Treatment Standards	Stored (ft^3)	Rate (ft^3/yr)	Subject to LDR (ft^3)	Storage Location	Treatment Selected	Treatment Available	Treatment Facility
1. Oxidizers	D001	nitrates and nitrated compounds	deactivation 3rd thirds	597.57	196.74	0.0	TA-54 Area G Bldg 49		11, 7	2
2. Reactive	D003	lithium, potassium, and sodium	deactivation 3rd thirds	399.07	41.67	0.0	TA-54 Area G Bldg 49	3, 5		2
3. Debris	D004	arsenic	5.0 mg/L 3rd thirds	7.35	2.45	0.0	TA-54 Area G Bldg 49		7	2
4. Debris	D005	barium	100.0 mg/L 3rd thirds	207.47	69.16	0.0	TA-54 Area G Bldg 49	6		2
5. Scrap metal	D006	cadmium	5.0 mg/L 3rd thirds	117.64	34.31	0.0	TA-54 Area G Bldg 49	8, 7		2
6. Process residues	D007	chromium	5.0 mg/L 3rd thirds	14.71	4.90	0.0	TA-54 Area G Bldg 49		10, 6, 7	2
7. Shielding	D008	lead	5.0 mg/L 3rd thirds 5767.15	5,767.15	1,717.20	0.0	TA-54 Area G Bldg 49	8, 7		3, 2
8. Decontamination waste	D009	mercury	0.2 mg/L 3rd thirds	74.87	17.60	0.0	TA-54 Area G Bldg 49		12, 6, 7	2
9. Dewatered treatment sludges	F001 F002 F005	1,1,1-trichloroethane trichloroethylene methylene chloride chlorinated fluorocarbons toluene	0.41 mg/L 0.091 mg/L 0.96 mg/L incineration 0.33 mg/L f-solv/dioxin	9529.54	0.00	4,733.01	TA-54 Area G Bldg 49		7, 9	5
10. Debris	F002	1,1,1-trichloroethane trichloroethylene	0.41 mg/L 0.091 mg/L incineration f-solv/dioxin	771.41	199.64	558.79	TA-54 Area G Bldg 49	4, 2		1, 2

APPENDIX B, ATTACHMENT A, TABLE 1 - LOW-LEVEL SOLID MIXED WASTES

Waste Category	Waste Code	Waste Component	Treatment Standards	Stored (ft^3)	Rate (ft^3/yr)	Subject to LDR (ft^3)	Storage Location	Treatment Selected	Treatment Available	Treatment Facility
11. Debris	F003	acetone methanol xylene	0.59 mg/L 0.75 mg/L 0.15 mg/L incineration f-solv/dioxin	71.54	21.40	32.09	TA-54 Area G Bldg 49	4, 2		1, 2

Key to Codes

A. Treatment Techniques

1. - Amalgamation
2. - DETOX (Chemical Oxidation)
3. - Deactivation
4. - Incineration
5. - Neutralization
6. - Chemical Precipitation
7. - Stabilization
8. - Decontamination
9 - Chemical Oxidation
10. - Chemical Reduction
11. - Biodegradation
12. - Leaching
13. - Macroencapsulation
14. - Thermal Treatment and Slagging
15. - Not Determined

B. Treatment Facility

1. - Controlled Air Incineration
2. - Hazardous Waste Treatment Facility
3. - Mobile Trailer
4. - Offsite Capabilities
5. - Not Determined

APPENDIX B, ATTACHMENT A, TABLE 2 - LOW-LEVEL LIQUID AND GASEOUS MIXED WASTES

Waste Category	Waste Code	Waste Component	Treatment Standards	Stored (ft^3)	Rate (ft^3/yr)	Subject to LDR (ft^3)	Storage Location	Treatment Selected	Treatment Available	Treatment Facility
1. Gas cylinders	D001	hydrogen	deactivation 3rd thirds	~~5.40~~ **21.08**	1.80	0.0	TA-54 Area L		4	1, 4
2. Gas cylinders	D001	ignitable gases	deactivation 3rd thirds	~~710.70~~ **63.43**	75.0	0.0	TA-54 Area L		4	1, 4
3. Ignitable liquids	D001	ignitable chemical reagents scintillation vials	deactivation 3rd thirds	2,800.54 2,760.44 40.10	619.72	0.0	TA-54-L TA-55-4	4, 2		1, 2, 4
4. Gas cylinders	D002	corrosive gases	deactivation 3rd thirds	~~8.82~~ **24.85**	3.0	0.0	TA-54 Area L		5	2, 4
5. Acids	D002	HNO3, HCL, H2SO4, HF, HP3O4, and acetic acid	deactivation California 3rd thirds	181.08	46.38	106.89	TA-54 Area L	5		2
6. Caustics	D002	hydroxide salts and solutions	deactivation 3rd thirds	41.71	16.52	0.0	TA-54 Area L	5		2
7. Gas cylinders	**D003**	**reactive gases**	**deactivation 3rd thirds**	**13.79**	**ND**	**ND**	**TA-54 Area L**	**ND**	**ND**	**ND**
8. Reactive	D003	cyanide and sulfide solutions	deactivation 3rd thirds	72.06	21.74	0.0	TA-54 Area L	9, 5, 6		2
9. Analytical laboratory waste	D004	arsenic	5.0 mg/L 3rd thirds	23.15	4.50	15.13	TA-54 Area L		6, 7	2
10. Analytical laboratory waste	D005	barium	100.0 mg/L California	89.47	28.43	0.0	TA-54 Area L	6		2
11. Analytical laboratory waste	D006	cadmium	1.0 mg/L California 3rd thirds	11.36	1.30	3.30	TA-54 Area L		6, 7	2
12. Analytical laboratory waste	D007	chromium	5.0 mg/L California 3rd thirds	162.16	5.42	102.09	TA-54 Area L	10, 6		2
13. Analytical laboratory waste	D008	lead	5.0 mg/L California 3rd thirds	281.30	81.39	218.75	TA-54 Area L	6		2

APPENDIX B, ATTACHMENT A, TABLE 2 - LOW-LEVEL LIQUID AND GASEOUS MIXED WASTES

Waste Category	Waste Code	Waste Component	Treatment Standards	Stored (ft^3)	Rate (ft^3/yr)	Subject to LDR (ft^3)	Storage Location	Treatment Selected	Treatment Available	Treatment Facility
14. Scrap metal	D009	mercury	0.2 mg/L California 3rd thirds	370.36	78.61	181.25	TA-54 Area L		1	2
15. Analytical laboratory waste	D010	selenium	1.0 mg/L California 3rd thirds	15.92	5.28	15.92	TA-54 Area L		6, 7	2
16. Photographic fixer	D011	silver	5.0 mg/L California 3rd thirds	18.88	5.56	0.0	TA-54 Area L		6, 7	2
17. Spent solvents	F001	1,1,1-trichloroethane trichloroethylene methylene chloride chlorinated fluorocarbons	0.41 mg/L 0.091 mg/L 0.96 mg/L incineration f-solv/dioxin	312.49	94.14	217.03	TA-54 Area L	4, 2		1, 2
18. Spent solvents	F002	1,1,1-trichloroethane trichloroethylene	0.41 mg/L 0.091 mg/L incineration f-solv/dioxin	449.21	130.53	160.20	TA-54 Area L	4, 2		1, 2
19. Spent solvents	F003	acetone methanol xylene	0.59 mg/L 0.75 mg/L 0.15 mg/L incineration f-solv/dioxin	570.59	148.75	272.61	TA-54 Area L	4, 2		1, 2
20. Spent solvents	F005	benzene pyridine toluene	incineration 0.33 mg/L 0.33 mg/L f-solv/dioxin	381.43	110.52	42.66	TA-54 Area L	4, 2		1, 2
21. Chemical products	P-wastes			30.48	10.12	0.0	TA-54 Area L			
	P012	arsenic oxide	5.6 mg/L	0.27					7	2
	P029	copper cyanide	100 mg/L	0.6					9	2
	P095	phosgene	incineration	29.41					4	5
	P098	potassium cyanide	110 mg/L	0.06					9	2
	P106	sodium cyanide	100 mg/L	0.04					9	2
	P113	thallium oxide	stabilization	trace					7	2
	P120	vanadium oxide	stabilization	0.04					7	2

APPENDIX B, ATTACHMENT A, TABLE 2 - LOW-LEVEL LIQUID AND GASEOUS MIXED WASTES

Waste Category	Waste Code	Waste Component	Treatment Standards	Stored (ft^3)	Rate (ft^3/yr)	Subject to LDR (ft^3)	Storage Location	Treatment Selected	Treatment Available	Treatment Facility
22. Chemical products	U-wastes			125.89	23.03	0.0	TA-54 Area L	4		1,4
	U002	acetone	160.0 mg/L	4.63						
	U012	aniline	14.0 mg/L	0.03						
	U044	chloroform	5.6 mg/L	0.02						
	U045	chloromethane	33.0 mg/L	0.02						
	U052	cresol	5.6 mg/L	0.02						
	U057	cyclohexanone	incineration	7.47						
	U075	dichlorodiflouromethane	7.2 mg/L	0.34					4, 2	5
	U077	1,2-dichloroethane	7.2 mg/L	0.46						
	U080	methylene chloride	33.0 mg/L	0.41						
	U112	ethyl acetate	33.0 mg/L	0.07						
	U117	ethyl ether	160.0 mg/L	4.01						
	U121	trichlorofluoromethane	33.0 mg/L	1.87					4, 2	5
	U122	formaldehyde	incineration	0.07						
	U123	formic acid	incineration	1.87						
	U131	hexachloroethane	28.0 mg/L	0.02						
	U133	hydrazine	0.025 mg/L	0.06					4, 9	5
	U144	lead acetate	0.5 mg/L	0.02					4	5
	U151	mercury	amalgamation	0.23					1	5
	U154	methanol	incineration	4.51						
	U160	methyl ethyl ketone peroxide	incineration	0.04						
	U165	napthalene	3.1 mg/L	trace						
	U188	phenol	6.2 mg/L	0.18						
	U190	phthalic anhydride	28.0 mg/L	0.04						
	U204	selenium dioxide	5.7 mg/L	0.02					6, 7	5
	U210	tetrachloroethylene	5.6 mg/L	0.01						
	U211	tetrachloromethane	5.6 mg/L	0.43						
	U213	tetrahydrofuran	incineration	0.04						
	U216	thallium chloride	stabilization	trace					7	5
	U218	thioacetamide	incineration	11.23						
	U219	thiourea	incineration	trace						
	U220	toluene	28.0 mg/L	0.15						
	U225	bromoform	15.0 mg/L	0.04					4, 2	5
	U226	1,1,1-trichloroethane	5.6 mg/L	57.41						
	U227	1,1,2-trichloroethane	5.6 mg/L	0.43						
	U228	trichloroethylene	5.6 mg/L	21.89						
	U239	xylene	28 mg/L	6.73						
	U246	cyanogen bromide	incineration	1.33					4	5
23. Gas cylinders	P-wastes			~~37.68~~ **20.09**	22.0	0.0	TA-54 Area L		4	1, 4
	P031	cyanogen	incineration	~~0.21~~ **0.0**						
	P056	fluorine	neutralization	~~2.01~~ **14.66**					5	2, 4
	P076	nitric oxide	incineration	~~19.72~~ **1.54**						
	P078	nitrogen dioxide	incineration	~~15.01~~ **0.21**						
	P095	carbonic dichloride	incineration	~~0.68~~ **3.68**						
	P096	phosphine	incineration	~~0.22~~ **0.0**						

APPENDIX B, ATTACHMENT A, TABLE 2 - LOW-LEVEL LIQUID AND GASEOUS MIXED WASTES

Waste Category	Waste Code	Waste Component	Treatment Standards	Stored (ft^3)	Rate (ft^3/yr)	Subject to LDR (ft^3)	Storage Location	Treatment Selected	Treatment Available	Treatment Facility
24. Gas cylinders	U-wastes			~~4.27~~ **21.24**	3.0	0.0	TA-54 Area L		4	1, 4
	U029	bromomethane	15.0 mg/kg	~~0.20~~ **0.16**						
	U075	dichlorodifluoromethane	7.2 mg/L	~~4.05~~ **5.73**						
	U134	hydrogen fluoride	neutralization	~~0.02~~ **1.56**					5	2, 4
	U135	**hydrogen sulfide**	neutralization	**13.79**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**

Key to Codes

A. Treatment Techniques

1. - Amalgamation
2. - DETOX (Chemical Oxidation)
3. - Deactivation
4. - Incineration
5. - Neutralization
6. - Chemical Precipitation
7. - Stabilization
8. - Decontamination
9 - Chemical Oxidation
10. - Chemical Reduction
11. - Biodegradation
12. - Leaching
13. - Macroencapsulation
14. - Thermal Treatment and Slagging
15. - Not Determined

B. Treatment Facility

1. - Controlled Air Incineration
2. - Hazardous Waste Treatment Facility
3. - Mobile Trailer
4. - Offsite Capabilities
5. - Not Determined

Note

Gas cylinders shown in 2, 4, **7**, 22, and 23 are currently considered 'suspect' mixed wastes as an administrative control to determine whether they contain radioactive components. The Department of Energy and the Los Alamos National Laboratory are currently assessing the probability of radioactivity contained in the respective gases. As these cylinders are deemed to be nonradioactive, they will be reclassified and sent to previously identified offsite commercial treatment facilities.

APPENDIX B, ATTACHMENT A, TABLE 3 - TRANSURANIC SOLID MIXED WASTES

Waste Category	Waste Code	Waste Component	Treatment Standards	Stored (ft^3)	Rate (ft^3/yr)	Subject to LDR (ft^3)	Storage Location	Treatment Selected	Treatment Available	Treatment Facility
1. Scrap metal	D003	sodium	deactivation 3rd thirds	3,886.34 1,313.72 2,572.62	21.57	0.0	TA-54 Area G Pad 2 Pad 4		3, 5, 7	5
2. Debris	D005	barium	100.0 mg/L	531.34 56.01 475.33	0.0	0.0	TA-54 Area G Pad 1 Pad 4	6		5
3. Process residues	D007	chromium	5.0 mg/L 3rd thirds	4,091.45 58.20 1,815.19 2,218.06	2.45	0.0	TA-54 Area G Pad 1 Pad 2 Pad 4		15	5
4. Shielding	D008	lead	5.0 mg/L 3rd thirds	72,412.72 41,196.68 6,110.67 11,232.04 9,373.33 4,500.00	2,146.61	0.0	TA-54 Area G Pad 1 Pad 2 Bldg 48 Pad 4 TA-55-4		13	5
5. Cemented process sludges	D008	lead	5.0 mg/L 3rd thirds	536.73 124.99 411.73	150.00	0.0	 TA-3-29 TA-55-4		15	5
6 Decontamination waste	F001 F002	1,1,1-trichloroethane trichloroethylene methylene chloride chlorinated fluorocarbons	0.41 mg/L 0.091 mg/L 0.06 mg/L incineration f-solv/dioxin	9,758.81 7.06 2,606.21 6,485.86 659.67	1,686.90	2,181.60	TA-54 Area G Pad 1 Pad 2 Bldg 48 Pad 4	4		1

APPENDIX B, ATTACHMENT A, TABLE 3 - TRANSURANIC SOLID MIXED WASTES

Waste Category	Waste Code	Waste Component	Treatment Standards	Stored (ft^3)	Rate (ft^3/yr)	Subject to LDR (ft^3)	Storage Location	Treatment Selected	Treatment Available	Treatment Facility
7 Cemented process sludges	D007 F001 F002 F005	chromium 1,1,1-trichloroethane trichloroethylene methylene chloride toluene incineration	deactivation 0.41 mg/L 0.091 mg/L 0.06 mg/L 0.33 mg/L incineration f-solv/dioxin 3rd thirds	6,493.86 2,679.66 1,069.68 1,086.98 1,561.96 73.52 22.06	270.38	161.68	TA-54 Area G Pad 1 Pad 2 Bldg 48 Pad 4 TA-3-29 TA-55-4		15	5
8 Dewatered treatment sludges	F001 F002 F005	1,1,1-trichloroethane trichloroethylene methylene chloride toluene incineration f-solv/dioxin	0.41 mg/L 0.091 mg/L 0.06 mg/L 0.33 mg/L	38,428.18 15,597.36 16,827.36 6,003.47	0.0	0.0	TA-54 Area G Pad 1 Pad 2 Pad 4		9, 7	5

Key to Codes

A. Treatment Techniques

1. - Amalgamation
2. - DETOX (Chemical Oxidation)
3. - Deactivation
4. - Incineration
5. - Neutralization
6. - Chemical Precipitation
7. - Stabilization
8. - Decontamination
9 - Chemical Oxidation
10. - Chemical Reduction
11. - Biodegradation
12. - Leaching
13. - Macroencapsulation
14. - Thermal Treatment and Slagging
15. - Not Determined

B. Treatment Facility

1. - Controlled Air Incineration
2. - Hazardous Waste Treatment Facility
3. - Mobile Trailer
4. - Offsite Capabilities
5. - Not Determined

APPENDIX B, ATTACHMENT A, TABLE 4 - HAZARDOUS WASTES

Waste Category	Waste Code	Waste Component	Treatment Standards	Stored (ft^3)	Rate (ft^3/yr)	Subject to LDR (ft^3)	Storage Location	Treatment Selected	Treatment Available	Treatment Facility
1. Spent chemical wastes	D009	mercurous acetate mercurous chloride	0.2 mg/L 3rd thirds	0.07	0.0	0.0	TA-54 Area L		6, 7	2, 4
2. Dioxins	F027	pentachlorophenol	0.01 mg/L incineration f-solv/dioxin	8.01	0.0	0.0	TA-54 Area L		4	1, 4

Key to Codes

A. Treatment Techniques

1. - Amalgamation
2. - DETOX (Chemical Oxidation)
3. - Deactivation
4. - Incineration
5. - Neutralization
6. - Chemical Precipitation
7. - Stabilization
8. - Decontamination
9 - Chemical Oxidation
10. - Chemical Reduction
11. - Biodegradation
12. - Leaching
13. - Macroencapsulation
14. - Thermal Treatment and Slagging
15. - Not Determined

B. Treatment Facility

1. - Controlled Air Incineration
2. - Hazardous Waste Treatment Facility
3. - Mobile Trailer
4. - Offsite Capabilities
5. - Not Determined

Note

The Los Alamos National Laboratory has been unable to locate commercial treatment capacity for these hazardous wastes.

Appendix B
FFCA Milestone Interrelationships

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
IFLL 100:	HLL 100	Waste characterization data developed from the characterization plan for historical LLMW will impact storage area types and storage area volumes in the required interim LLMW storage facilities/upgrades.
	HLL 200	The formal plan for prioritizing LLMW treatment will influence the length of time waste is stored and waste segregation configurations in the interim LLMW storage facilities/upgrades.
	IFLL 200	The LLMW storage facilities/upgrades must be included in the schedule.
IFLL 200	HLL 100	The schedule sequence must incorporate the information developed in the characterization plan pertaining to storage areas and storage volumes.
	HLL 200	The schedule must accommodate storage periods and segregation configurations required to meet the LLMW treatment prioritization scheme for LLMW storage facilities/upgrades.
	IFLL 100	The schedule will address the facilities/upgrades identified in the preconceptual study as approved by EPA.
STRU 100	HW 300	The RCRA MW permit application addressed the requirements of the NMED Compliance Order for remediating TRU Pads 1, 2, and 4. These requirements will be incorporated into the preconceptual study for short and long-term storage of TRU MW.
	TRU 100	Any waste characterization and segregation information developed for the preconceptual study will be used in the TRU work-off plan.
	STRU 200	Implementing recommendations from the preconceptual study will ensure compliance with 40 CFR Part 264 Subpart I for TRU MW for TRU Pads 1, 2, and 4 .
STRU 200	STRU 100	The preconceptual study will identify the activities necessary to bring storage of TRU Pads 1, 2, and 4 into compliance with 40 CFR Part 264 Subpart I.
WM 100	WM 200	Information developed from the waste minimization plan will provide the framework for developing and annually updating the LDR waste minimization work plan.

Appendix B
(Continued)
LDR FFCA Milestones

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
	HLL 100	The LLMW characterization plan will be used to ensure that disposal and treatment problems created by the generation of particular LDR or MW waste streams in the past are used as lessons learned for waste streams currently being generated and new waste streams.
	OSS 100	The report on the feasibility of treatment of LANL LLMW at off-site facilities will be reviewed to ensure that treatment and disposal problems created by the generation of particular LDR or MW waste streams are used as lessons learned for waste streams currently being generated and new waste streams.
	OSS 200	The annual report on off-site shipment of wastes will be reviewed to ensure that treatment and disposal problems created by the generation of particular LDR or MW waste streams are used as lessons learned for waste streams currently being generated and new waste streams.
	CAI 300	The CAI work-off plan will be reviewed to ensure that treatment problems created by generating particular LDR or MW waste streams are used as lessons learned for waste streams currently being generated and new waste streams.
	TRU 100	The TRU waste work-off plan will be reviewed to ensure that treatment and disposal problems created by generating particular LDR or MW waste streams are used as lessons learned for waste streams currently being generated and new waste streams.
WM 200	OSS 100	Information developed from the report on the feasibility of treatment of LANL LLMW at off-site facilities will be reviewed to ensure that treatment and disposal problems created by generating particular LDR or MW waste streams are used as lessons learned for waste streams currently being generated and new waste streams.
	OSS 200	Information developed from the annual report on off-site shipment of wastes will be reviewed to ensure that treatment and disposal problems created by generating particular LDR or MW waste streams are used as lessons learned for waste streams currently being generated and new waste streams.
	CAI 300	Information developed from the CAI work-off plan will be reviewed to ensure that treatment problems created by generating of particular LDR or MW waste streams are used as lessons learned for waste streams currently being generated and new waste streams.

Appendix B
(Continued)
LDR FFCA Milestones

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
	TRU 100	Information developed from the TRU waste work-off plan will be reviewed to ensure that treatment and disposal problems created by generating particular LDR or MW waste streams are used as lessons learned for waste streams currently being generated and new waste streams.
HLL 100	OSS 200	Information developed from the waste characterization plan will be reviewed for its applicability to selecting off-site treatment/disposal facilities and will be used to develop action plans for off-site shipment of wastes.
	CAI 200	Information developed from the waste characterization plan will be reviewed to support selection of wastes to be used for the RCRA trial burn.
	CAI 300	Information developed from the waste characterization plan will be reviewed for its applicability to the CAI work-off plan.
	ATS 100	Information developed from the waste characterization plan will be used to further develop and refine LLMW treatment skids and to support the selection of new skids for development (reported in AR 100).
	HW 200	Applicable information developed from the waste characterization plan will be incorporated into the definitive design (Title II) for the HWTF.
	HW 300	Information developed from the waste characterization plan will be reviewed to determine whether any modifications to the RCRA MW permit application to the NMED are required.
	HW 400	Applicable information developed from the waste characterization plan, such as waste segregation information, will be used to develop the schedule for bringing the HWTF into use.
	HW 500	Applicable information developed from the waste characterization plan, such as waste segregation information, will affect construction components of the HWTF.
	HW 600	Applicable information developed from the waste characterization plan will affect the LLMW work-off plan for the HWTF.
	HW 700	Applicable information developed from the waste characterization plan, such as waste segregation information, will affect construction components of the HWTF.
	HW 800	Applicable information developed from the waste characterization plan will affect treatment operations at the HWTF.

Appendix B
(Continued)
LDR FFCA Milestones

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
	HW 900	Applicable information developed from the waste characterization plan will affect information compiled for the LLMW work-off plan for the HWTF.
	HLL 200	Information developed from the waste characterization plan will be the basis for developing the formal plan for prioritizing LLMW treatment.
HLL 200	OSS 200	The formal plan for prioritizing LLMW treatment will incorporate applicable off-site treatment/disposal facilities and will be used to develop action plans for off-site shipment of wastes..
	CAI 200	The formal plan for prioritizing LLMW treatment will be reviewed to support selection of wastes to be used for the RCRA trial burn.
	CAI 300	The formal plan for prioritizing LLMW treatment will be reviewed for its applicability to the CAI work-off plan.
	ATS 100	The formal plan for prioritizing LLMW treatment will be used to further develop and refine LLMW treatment skids and to support the selection of new skids for development (reported in AR 100).
	HW 200	Applicable information from the waste prioritization plan will be incorporated into the definitive design (Title II) for the HWTF.
	HW 300	The formal plan for prioritizing LLMW treatment will be reviewed for its applicability to the RCRA MW permit application to the NMED.
	HW 400	Applicable information developed from the waste prioritization plan such as waste segregation information will be used to develop the schedule for bringing the HWTF into use.
	HW 500	Applicable information developed from the waste prioritization plan such as waste segregation information will affect construction components of the HWTF.
	HW 600	Applicable information developed from the waste plan will affect the LLMW work-off plan for the HWTF.
	HW 700	Applicable information developed from the waste plan, such as waste segregation information, will affect treatment operations at the HWTF.
	HW 800	Applicable information developed from the waste plan will affect treatment operations at the HWTF.
	HW 900	Applicable information developed from the waste plan will affect information compiled for the LLMW work-off plan for the HWTF.

Appendix B
(Continued)
LDR FFCA Milestones

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
	GAS 100	The schedule and sequence for treatment of certain gas cylinders identified in the gas cylinder work-off plan may need to be included in the LLMW prioritization plan.
	HLL 100	Information developed from the waste characterization plan will be the basis for developing the formal plan for prioritizing LLMW treatment.
OSS 100	HLL 100	Decisions on waste shipments to the off-site treatment/disposal facilities identified in this report will use applicable information collected pursuant to the waste characterization plan.
	HLL 200	Information developed in the feasibility report will be reviewed for applicability to prioritizing LLMW treatment.
	HW 300	Information developed in the report on the feasibility of treatment of waste at off-site treatment/disposal facilities will be reviewed to determine whether any modifications to the RCRA MW permit application are required.
	OSS 200	The report on the feasibility of treatment of waste at off-site treatment/disposal facilities will provide the basis for developing the annual action plan for off-site shipment of wastes.
OSS 200	HLL 100	Action plans for off-site shipment of wastes will incorporate information developed from the implementation of the waste characterization plan.
	HLL 200	Action plans for off-site shipment of wastes will incorporate applicable information from this formal plan for prioritizing LLMW treatment.
	HW 300	Action plans for off-site shipment of wastes will provide valuable information on required storage periods of waste, potential problem waste streams, untreatable waste streams, etc., to determine if modifications to the RCRA MW permit application are required.
	HW 600	Wastes not addressed in action plans for off-site shipment of wastes must be addressed in the LLMW work-off plan for the HWTF and/or the CAI.
	OSS 100	The annual action plans for off-site shipment of wastes will use the information developed in the report on the feasibility of treatment of waste at off-site treatment/disposal facilities.
	CAI 300	Wastes not addressed in action plans for off-site shipment of wastes must be addressed in the LLMW work-off plan for the CAI and /or the HWTF.

Appendix B
(Continued)
LDR FFCA Milestones

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
CAI 100	CAI 200	Staffing must be completed for the CAI operations before beginning work on the RCRA trial burn.
	CAI 300	Staffing must be completed for the CAI operations before beginning work on the work-off plan for applicable LLMW.
CAI 200	HLL 100	During preparations for the CAI's RCRA trial burn, information developed from the waste characterization plan will be reviewed.
	HLL 200	During preparations for the CAI's RCRA trial burn, the formal plan for prioritizing LLMW treatment will be reviewed.
	TRU 100	Information developed during the CAI's RCRA trial burn will be incorporated into the TRU waste work-off plan specifically for combustible TRU waste.
	CAI 100	The CAI's RCRA trial burn will not be completed until the staffing of the CAI is completed.
	CAI 300	The CAI's RCRA trial burn will be completed before developing the work-off plan for applicable LLMW .
CAI 300	HLL 100	Developing the CAI work-off plan will include reviewing the information developed from the waste characterization plan for its applicability to the CAI plan.
	HLL 200	Development of the CAI work-off plan will include reviewing the information developed for the formal plan for prioritizing LLMW treatment for its applicability to the CAI work-off plan.
	HW 600	Applicable information developed for the CAI work-off plan for applicable LLMW will be reviewed during developing the LLMW work-off plan for the HWTF.
	CAI 100	Developing the CAI work-off plan will not be completed until the staffing is completed for the CAI.
	CAI 200	Developing the CAI work-off plan will not be begun until the RCRA trial burn is completed.
	OSS 200	Wastes not addressed in action plans for off-site shipment of wastes must be addressed in the LLMW work-off plan for the CAI and /or the HWTF.
ATS 100	HLL 100	The program management plan for the LLMW treatment skids will address developing additional information from the waste characterization plan that will likely be applicable to the development of future treatment skids.

Appendix B
(Continued)
LDR FFCA Milestones

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
	HLL 200	The program management plan for the LLMW treatment skids will address developing additional information from the formal plan for prioritizing LLMW treatment that will likely be applicable to developing future treatment skids.
	HW 100	The program management plan for the LLMW treatment skids will provide information necessary to completing the Preliminary Design Summary Report (Title I) for the HWTF.
	HW 200	The program management plan for the LLMW treatment skids will provide information necessary to completing the definitive design (Title II).
	HW 300	The program management plan for the LLMW treatment skids will provide information to be incorporated into the RCRA MW permit application.
	HW 400	The program management plan for the LLMW treatment skids will provide information to be incorporated into the time line for completing the HWTF.
	HW 500	The program management plan for the LLMW treatment skids will provide information to be used in the construction of the HWTF.
	HW 600	The program management plan for the LLMW treatment skids will provide information to be incorporated in the LLMW work-off plan for the HWTF.
	HW 700	The program management plan for the LLMW treatment skids will provide information to be used in the construction of the HWTF.
	HW 800	The program management plan for the LLMW treatment skids will provide information to be incorporated in the plans for operating the HWTF.
	HW 900	The program management plan for the LLMW treatment skids will provide information to be used during the implementation of the LLMW work-off plan for the HWTF.
HW 100		
	HW 200	The definitive design (Title II) will incorporate the Preliminary Design Summary Report (Title I).
	HW 300	Information from the Title I report will be incorporated into the RCRA mixed waste permit application or subsequent modifications of the application.

Appendix B
(Continued)
LDR FFCA Milestones

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
	HW 400	Information from the Title I report will contribute to developing the schedule for completion of subsequent milestones.
	HW 500	Information developed for the Title I report will be incorporated in the construction of the HWTF.
	HW 700	Information developed for the Title I report will be incorporated in the construction of the HWTF.
HW 200	HLL 200	Applicable information developed from the waste prioritization plan will be incorporated into the definitive design (Title II) for the HWTF.
	ATS 100	Information developed from the program management plan for the LLMW treatment skids will be reviewed for applicability to the Title II design elements.
	HW 100	The definitive design (Title II) will incorporate information developed in the Preliminary Design Summary Report (Title I).
	HW 300	Information from the Title I report will be incorporated into the RCRA mixed waste permit application or subsequent modifications of the application.
	HW 400	Information from the Title I report will contribute to developing the schedule for completion of subsequent milestones.
	HW 500	Information developed for the Title II report will be used in the construction of the HWTF.
	HW 700	Information developed for the Title II report will be used in the construction of the HWTF.
HW 300		
	HLL 100	Information developed from the waste characterization plan will be reviewed to determine whether any modifications to the RCRA MW permit application to the NMED are required.
	HLL 200	The formal plan for prioritizing LLMW treatment will be reviewed for its applicability to the RCRA MW permit application to the NMED.
	OSS 200	Action plans for off-site shipment of wastes will provide valuable information on required storage periods of waste, potential problem waste streams, untreatable waste streams, etc., to determine if modifications to the RCRA MW permit application are required.

Appendix B
(Continued)
LDR FFCA Milestones

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
	ATS 100	The program management plan for the LLMW treatment skids will provide information to be incorporated into the RCRA MW permit application.
	HW 100	Information from the Title I report will be incorporated into the RCRA MW permit application or subsequent modifications of the application.
	HW 200	Information from the Title II report will be incorporated into the RCRA MW permit application or subsequent modifications of the application.
	HW 500	The RCRA MW permit application must be approved and a permit issued before activities beginning construction.
	HW 800	The RCRA mixed waste permit must be approved before beginning treatment.
HW 400		
	ATS 100	The program management plan for the LLMW treatment skids will provide information to be incorporated into the time line for completing the HWTF.
	HW 100	Information from the Title I report will contribute to developing the schedule for completing subsequent milestones.
	HW 200	Information from the Title II report will contribute to developing the schedule for completing subsequent milestones.
	HW 500	The schedule has a definitive time line for beginning construction.
	HW 600	The schedule has a definitive time line for completing the LLMW work-off plan for the HWTF.
	HW 700	The schedule has a definitive time line for completing construction.
HW 500		
	ATS 100	The program management plan for the LLMW treatment skids will provide information to be used in constructing the HWTF.
	HW 100	Information developed for the Title I report will be used in constructing the HWTF.
	HW 200	Information developed for the Title II report will be used in constructing the HWTF.

Appendix B
(Continued)
LDR FFCA Milestones

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
	HW 300	The RCRA mixed waste permit application must be approved and a permit issued before construction begins.
	HW 400	The schedule has a definitive time line for starting construction.
	HW 700	The construction must begin before it can be completed.
	HW 800	The construction of the facility must be completed before treatment can begin.
HW 600	HLL 100	Applicable information developed from the waste characterization plan will affect the LLMW work-off plan for the HWTF.
	HLL 200	Applicable information developed from the waste prioritization plan will affect the LLMW work-off plan for the HWTF.
	OSS 200	Wastes not addressed in action plans for off-site shipment of wastes must be addressed in the LLMW work-off plan for the HWTF and/or the CAI.
	CAI 300	Applicable information developed from the CAI work-off plan for applicable LLMW will be reviewed while developing the LLMW work-off plan for the HWTF.
	ATS 100	The program management plan for the LLMW treatment skids will provide information to be incorporated in the LLMW work-off plan for the HWTF.
	HW 400	The schedule has a definitive time line for completing the LLMW work-off plan for the HWTF.
	HW 800	The LLMW work-off plan for the HWTF must be completed before beginning treatment of the waste.
	HW 900	The LLMW work-off plan must be completed before the waste can be worked off.
	GAS 100	Information developed from implementing the gas cylinder work-off plan may need to be incorporated into the LLMW work-off plan for the HWTF.
HW 700		
	ATS 100	The program management plan for the LLMW treatment skids will provide information to be used in constructing the HWTF.
	HW 100	Information developed for the Title I report will be used in constructing the HWTF.

Appendix B
(Continued)
LDR FFCA Milestones

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
	HW 200	Information developed for the Title II report will be used in constructing the HWTF.
	HW 400	The schedule has a definitive time line for completing construction.
	HW 500	The construction must begin before it can be completed.
	HW 800	The construction must be completed before operation may begin.
HW 800	HLL 100	Applicable information developed from the waste characterization plan will affect treatment operations at the HWTF.
	HLL 200	Applicable information developed from the waste prioritization plan will affect treatment operations at the HWTF.
	ATS 100	The program management plan for the LLMW treatment skids will provide information to be incorporated in the plans for operation of the HWTF.
	HW 300	The RCRA MW permit must be approved before beginning treatment.
	HW 500	The facility must be constructed before treatment can begin.
	HW 600	The LLMW work-off plan for the HWTF must be completed before beginning treatment of the waste.
	HW 700	The construction must be completed before operation may begin.
	HW 900	Treatment operations must begin before waste work-off may be completed.
HW 900		
	ATS 100	The program management plan for the LLMW treatment skids will provide information to be incorporated while implementing the LLMW work-off plan for the HWTF.
	HW 800	Treatment operations must begin before waste work-off may be completed.
LD 100	LD 200	Operation of the lead decontamination trailer must be begun before it can be completed.
LD 200	LD 100	Operation of the lead decontamination trailer must be begun before it can be completed.

Appendix B
(Continued)
LDR FFCA Milestones

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
TRU 100	STRU 100	Any waste characterization and segregation information developed for the preconceptual study will be used in the TRU work-off plan.
	CAI 200	Information developed during the CAI's RCRA trial burn will be incorporated into the TRU waste work-off plan specifically for combustible TRU waste.
GAS 100		
	HLL 200	The schedule and sequence for treatment of certain gas cylinders identified in the gas cylinder work-off plan may need to be included in the LLMW prioritization plan.
	HW 600	Information developed from the implementation of the gas cylinder work-off plan may be incorporated into the LLMW work-off plan for the HWTF.
AR 100	ALL	The annual report on the LDR waste minimization work plan, the annual action plan for off-site shipment of wastes, the annual update of off-site facilities capable of and available for treating LLMW, the annual report on skid development, and a brief report of the status of all other milestones will be included in the FFCA annual report.
CNC	ALL	The certification of compliance will be completed and submitted when all other milestones have been completed.

Appendix C
Pollution Prevention

POLLUTION PREVENTION ACCOMPLISHMENT REPORT

1 Site Name	2 Report Year	3 Process Name	4 Waste, Emission, or Effluent Type	5 Waste, Emission or Effluent Description	6 Waste Stream	7 Source Reduction Codes	7 Comments	8 Recycling Codes	8 Comments	9 Activity ID Method Codes	9 Comments	10 Amount Reduced	11 Amount Recycled
LANL	1994	Elemental Analysis (Laboratory)	RHAZ	Inorganic mercury solutions				R30		T06			30-40 g Hg
LANL	1992	Voluntary Paper Recycling	SAN			W19		R99		T01			336 tons of paper
LANL	1993	Scrap Metal Recycle				W13,58	Containers are being designed that will further enhance this operation by improving the collection and segregation of the metals	R30		T01,02			758,449 lbs
LANL	1993	Lead and Lead Acid/Alkaline Batteries	SAN							T01			2,325 lbs raw lead/10,025 lbs acid alkaline batteries
LANL	1993	Used Oil Recycling	OHAZ		N/A	W25		R99		T01			9,200 gal
LANL	1993	Radioactive Waste Minimization in the Medical Radioisotope Production Program											
LANL/Tech 48	1993	Alpha Spec for PU	LLW	Liquid HDENP di-2-ethylhexyl orthophospheric acid in n-heptane BHQ .02 in solution of 2.5-dittertiary buylhydrofulnone in 2-ethyl-l-hexanol	mixed waste	7.1 W19/7.3 W39/7.5 W58		T01, T11			Tiger Team		
LANL/Tech 48	1993	Alpha Spec for PU	LLW	Acid 6m HCL		7.1 W19/7.3 W39/7.5 W58				T01	Tiger Team		
LANL/TA-55	1994	Plutonium Processing Conveyor System	LLW/TRU	TRU Plastic	Plutonium	W52				T04		570 kg/m3 (50%)	n/a
LANL/Sigma Complex	1993	Electroplating/Surface Finishing	RHAZ/MLLW	F019, F006 (Rinse discharges from Electroplating operations)		7.1 W19/7.5 W51,52/7.7 W74/7.6 61,63,67,68,71		R11		T01, T02		150 Kg/m3	All
LANL/CST-1	1994	Elemental Analysis (laboratory)	RHAZ	Inorganic mercury solutions				R30		T06			30-40g Hg

1 Site Name	2 Report Year	3 Process Name	4 Waste, Emission, or Effluent Type	5 Waste, Emission or Effluent Description	6 Waste Stream	7 Source Reduction Codes	7 Comments	8 Recycling Codes	8 Comments	9 Activity ID Method Codes	9 Comments	10 Amount Reduced	11 Amount Recycled
LANL/TA-54	CY 93	Recycling	OHAZ	Photographic solutions, Mercury, Gas cylinders, oil, Diesel, Solvents, Paints	Various	7.2 W29	Recycling of various materials thru several offsite recyclers	R11, R13, R14, R19, R26, R27		T01, T02, T10		143325.82 Kg	143325.82 Kg
LANL, Group CST-1	1994	Analytical Laboratory Analysis	RHAZ	Organic solvents (Isopropanol, Hexane, Tetrahydrofuran, Chloroform, Diethylether, Methylene Chloride) used in analytical chemistry procedures for characterization	N/A	7.5 W51		R11		T05			About 200 liters
LANL, Group CST-1	1994	Analytical Laboratory Analysis	MTRU	Chloroform in combination with plutonium	N/A	7.1 W19	Changed analysis procedure		N/A (material substitution)	T05		About 12 liters	N/A
LANL, Group CST-1	1994	Analytical Laboratory Analysis	MTRU	Lead reductor column in contact with plutonium	N/A	7.1 W19	Changed analysis procedure	N/A	N/A (Material Substitution)	T05		About 500 grams	N/A
LANL, Group CST-1	1994	Analytical Laboratory Analysis	MTRU	0.027M Dichromate solution in combination with plutonium	N/A	7.1 W19	Changed analysis procedure		N/A (Material Substitution)	T05		About 6 liters	N/A
LANL, Group CST-1	1994	Analytical Laboratory Analysis	MTRU	Tri butyl phosphate in carbon tetra chloride in contact with plutonium	N/A	7.1 W19	Changed analysis procedure		N/A Material Substitution	T05		About 5 liters	N/A

Instructions for Completion of the Pollution Prevention Accomplishments Report Form

This form is provided as a guideline to assist you in pulling together relevant information for the DP Accomplishments Database. The form consists of two parts. The first part requests documentation, by process, on source reduction and recycling successes of waste, air emissions and water effluents. The second part of the form requests information on costs savings. DP realizes that this information is difficult to assess with any accuracy, therefore, this section is optional. However, if any portion of the cost worksheet can be estimated, please attempt to provide this information and feel free to note the margin of error associated with the estimates.

The purpose of this data collection is to not document every single process at the DOE site but, to collect information on categories of like processes. For example, metal parts cleaning is a process that probably takes place at many locations within a given site and a common pollution prevention application is substituting less hazardous solvents used to clean parts. In this case, all the parts cleaning processes where alternative solvents are used should be reported as one source reduction activity (i.e., the total solvent reduction figure should be the rolled-up number from each parts cleaning activity around the site).

Section by Section Instructions:

1.0 Site Name - DOE site name.

2.0 Report Year - Indicate the calendar year the source reduction or recycling accomplishment was implemented. Use a separate form for each year that the source reduction or recycling activity was implemented, if you have more than one year of data. Report for every year that appropriate source reduction and recycling records were kept.

3.0 Process Name - Indicate the process name. You may combine information on many equivalent processes, as appropriate, to reduce the number of forms completed as long as all sections of the form are equivalent. For example, one report could cover all aqueous solvent replacements of hazardous solvents at many different equipment maintenance operations.

Examples of process names from previous waste reduction reports include:

Cleaning	Degreasing
Equipment Maintenance	Facility Maintenance
Laboratory Analysis	Machining
Painting	Plating
Shielding	Vehicle Maintenance

4.0 Waste, Emission, or Effluent Type - Indicate one type. Complete a form for each type if more than one were affected by the implementation of source reduction and recycling.

LLW	Low-Level Waste	OHAZ	State Regulated and Other Hazardous Waste
MLLW	Mixed Low-Level Waste	SAN	Solid Sanitary Waste
TRU	Transuranic Waste	AIR	Air Emission
MTRU	Mixed Transuranic Waste	EFF	Other Effluent (e.g., POTW or NPDES)
HLW	High-Level Waste		
RHAZ	RCRA Regulated Hazardous Waste		

5.0 Waste, Emission, or Effluent Description - Provide a short description, including the hazardous characteristic if appropriate. Example wastes from previous waste reduction reports include:

Lead based paint	Trichloroethylene solvent	Tools	Plastic
Freon 113 Refrigerant	Scintillation Fluids	Debris	
Personnel Protective Equipment	Sampling and Analysis Items	White Paper	

Emission examples include VOCs, heavy metals, particulates, etc.

Effluent examples include POTW, NPDES, waste water discharge, etc.

6.0 Waste Minimization Management Group Waste Stream Name - This section is intended to indicate connections to WMMG efforts. Select the appropriate WMMG Waste Stream Name, or leave blank if this waste stream was not a WMMG waste stream.

Electroplating	Energetic Material
Miscellaneous	Mixed Waste
Polymer	Plutonium
Solvent	Tritium
Uranium	

7.0 Source Reduction Codes - Complete all appropriate source reduction codes. These codes are from the Toxic Chemical Release Inventory Reporting Form R and Instructions, U. S. EPA, January 1993. Provide an explanation for "Other" code in the comments section.

7.1 Good Operating Practices

W13 Improved maintenance scheduling, recordkeeping, or procedures
W14 Changed production schedule to minimize equipment and feedstock changeovers
W19 Other changes in operating practices

7.2 Inventory Control

W21 Instituted procedures to ensure that materials do not stay in inventory beyond shelf-life
W22 Began to test outdated material--continue to use if still effective
W23 Eliminated shelf-life requirements for stable materials
W24 Instituted better labeling procedures
W25 Instituted clearinghouse to exchange materials that would otherwise be discarded
W29 Other changes in inventory control

7.3 Spill and Leak Prevention

W31 Improved storage or stacking procedures
W32 Improved procedures for loading, unloading, and transfer operations
W33 Installed overflow alarms or automatic shutoff valves
W35 Installed vapor recovery systems
W36 Implemented inspection or monitoring program of potential spill or leak sources
W39 Other spill and leak prevention

7.0 Source Reduction Codes, continued

7.4 Raw Material Modifications

W41 Increased purity of raw materials
W42 Substituted raw materials
W49 Other raw material modifications

7.5 Process Modifications

W51 Instituted recirculation within a process
W52 Modified equipment, layout, or piping
W53 Use of a different process catalyst
W54 Instituted better controls on operation bulk containers to minimize discarding of empty containers
W55 Changed from small volume containers to bulk containers to minimize discarding of empty containers
W58 Other process modifications

7.6 Cleaning and Degreasing

W59 Modified stripping/cleaning equipment
W60 Changed to mechanical stripping/cleaning devices (from solvents or other materials)
W61 Changed to aqueous cleaners (from solvents or other materials)
W63 Modified containment procedures for cleaning units
W64 Improved draining procedures
W65 Redesigned parts racks to reduce dragout
W66 Modified or installed rinse systems
W67 Improved rinse equipment design
W68 Improved rinse equipment operation
W71 Other cleaning and degreasing modifications

7.7 Surface Preparation and Finishing

W72 Modified spray systems or equipment
W73 Substituted coating materials used
W74 Improved application techniques
W75 Changed from spray to other system
W78 Other surface preparation and finishing modifications

7.8 Product Modifications

W81 Changed product specifications
W82 Modified design or composition
W83 Modified packaging
W89 Other product modifications

8.0 Recycling Codes - Complete all appropriate recycling codes. These codes are from the Toxic Chemical Release Inventory Reporting Form R and Instructions, U. S. EPA, January 1993. Provide an explanation for "Other" code in the comments section.

R11 Solvents/Organics Recovery--Batch Still Distillation
R12 Solvents/Organics Recovery--Thin-Film Evaporation
R13 Solvents/Organics Recovery--Fractionation
R14 Solvents/Organics Recovery--Solvent Extraction
R19 Solvents/Organics Recovery--Other
R21 Metals Recovery--Electrolytic
R22 Metals Recovery--Ion Exchange
R23 Metals Recovery--Acid Leaching
R24 Metals Recovery--Reverse Osmosis
R26 Metals Recovery--Solvent Extraction
R27 Metals Recovery--High Temperature
R28 Metals Recovery--Retorting
R29 Metals Recovery--Secondary Smelting
R30 Metals Recovery--Other
R40 Acid Regeneration
R99 Other Reuse or Recovery

9.0 Activity Identification Method Codes - Complete appropriate codes. These codes are from the Toxic Chemical Release Inventory Reporting Form R and Instructions, U. S. EPA, January 1993. Provide an explanation for "Other" code in the comments section.

T01 Internal Pollution Prevention Opportunity Audit(s)
T02 External Pollution Prevention Opportunity Audit(s)
T03 Materials Balance Audits
T04 Participative Team Management
T05 Employee Recommendation (independent of a formal company program)
T06 Employee Recommendation (under a formal company program)
T07 State Government Technical Assistance Program
T08 Federal Government Technical Assistance Program
T09 Trade Association/Industry Technical Assistance Program
T10 Vendor Assistance
T11 Other

10.0 Amount Reduced - Report the amount of waste, emissions, or effluents that were reduced within this calendar year. Indicate unit of measure in kilograms or cubic meters.

11.0 Amount Recycled - Report the amount of waste, emissions, or effluents that were recycled within this calendar year. Indicate unit of measure in kilograms or cubic meters.

12.0 Cost Estimates - Completion of this section is optional and dependant upon whether cost estimates have been performed at the facility. Report costs of and savings from implementing the source reduction or recycling activity. It is understood that these are cost estimates with a high margin of error. Attach additional information and calculations as desired.

Process costs include:

P1 Equipment
P2 Labor
P3 Energy
P4 Raw Materials/Supplies
P5 Regulatory Compliance
P6 Operation and Maintenance
P7 Insurance/Special Taxes
P8 Sampling and Analysis (In-Process)

Waste management cost definitions are from the EM 352 Draft Waste Cost Avoidance Model Interim Report, November 23, 1993, and include:

Generation:

WG1 Packaging - costs associated with packaging the waste.
WG2 Characterization - Costs associated with sampling and analyzing the waste and determining the disposition of the waste.
WG3 Lag Storage - Costs associated with interim storage of waste after it leaves the generation step, but before it is received by the next step. For example, hazardous waste may require satellite accumulation areas and temporary accumulation areas before disposal.
WG4 Transport to Next Step - costs associated with transporting the packaged waste to either treatment or storage.

Treatment:

WT1 Operating Costs - Costs associated with operation of a waste treatment facility, including labor and preventive maintenance. Labor should be fully burdened.
WT2 Materials - cost of materials required for treatment of the waste, including packaging and consumables.
WT3 Lag Storage - Costs associated with interim storage of waste after it leaves the treatment step, but before it is received for storage or disposal.
WT4 Transportation to the Next Step - costs associated with transporting the packaged waste to storage.

12.0 Cost Estimates, continued.

Storage:

WS1 Emplacement Cost - Cost associated with receiving the waste and placing it in storage. Costs can include inspection, documentation, and transport to the storage location.

WS2 Continuity of Operations - Costs associated with the monitoring of waste, upkeep of the facility, and ensuring that compliance issues are met.

WS3 Transportation to Next Step - costs associated with transporting the packaged waste to treatment.

Disposal:

WD1 Handling Costs - Costs associated with transportation to the disposal facility, receiving and documenting the waste, and the disposal fee.

WD2 Transportation - Costs associated with transportation of the waste received at the disposal, but prior to disposal.

13.0 Amount Saved - Calculate the total savings from Section 12.0 and report the estimated dollar value saved this calendar year through source reduction or recycling. Indicate operational savings. Use Section 14.0 to report any cost savings estimates that were determined by means other than Section 12.0.

14.0 Additional Information - Use this Section to provide additional details, clarification, or comments. Use Section numbers for easy reference.

15.0 Point(s) of Contact - Indicate person who completed this form and any other key personnel associated with implementing source reduction, recycling, or cost estimating on this process.

LIST OF CURRENTLY RECYCLED ITEMS

- Acids (some)
- Combustible liquids (primarily oils contaminated w/ hydrocarbons)
- Gas cylinders
- Lead acid batteries
- Metals
    - Aluminum
    - Aluminum shavings
    - Brass
    - Copper
    - Lead
    - Silver turnings
    - Stainless steel
    - Scrap steel
- Mercury
    - metallic
    - some mercury salts
- Mercury batteries
- Nicked batteries
- Oil
- Paper
- Phone books
- Photo chemicals- silver recovery
- Solvents
    - for fuel blending
    - for recovery
- Silver recovery
- Scrap film
- Tires

OFFSITE SHIPMENTS TO RECYCLING FACILITIES FOR CY93

Facility	Month	Weight (Pounds)	Volume (Gallons)
ETICAM	Mar	34447.8	3540.0
	May	23743.5	2780.0
	Aug.	16858.2	1832.1
	Total	**75049.4**	**8152.1**
Bethlehem Apparat.	Jan.	540.1	110.0
	Total	**540.1**	**110.0**
MG Industries	Nov.	12925.4	1582.5
	Total	**12925.4**	**1582.5**
OSCO	Jan.	7438.4	965.0
	Feb.	36006.8	1000.0
		4997.9	620.0
	Apr.	11630.2	1735.0
		12452.3	1500.0
	May	11259.1	1570.0
	Jun.	55609.6	4940.0
	Jul.	17774.3	2527.5
	Aug.	32712.1	4430.0
	Oct.	15705.0	2285.0
		21216.0	2885.0
	Total	**226801.8**	**24457.4**
	GRAND TOTAL	**315316.8**	**34302.0**

Facility capability and waste types:

ETICAM: Aqueous photographic solutions, e.g. fixers and developers containing silver, ferric chloride solutions, various metal-bearing caustic and acidic solutions.

Bethlehem Apparatus: Mercury batteries, mercury debris, mercury light bulbs, mercury salts.

MG Industries: Certain gas cylinders including hydrogen sulfide, nitric oxide, hydrogen chloride, etc.

OSCO: Liquid organic waste, e.g. vacuum pump oil, diesel fuel, acetone, toluene, paint, machine oil, etc.

Johnson Controls World Services Inc.
FY 93 Recycle Items and Volumes

Item	Volume
Aluminum Shavings	7,268 lbs.
Aluminum Solid	1,222 lbs.
Brass	454 lbs.
Copper	30,300 lbs.
Electrical Cable	37,660 lbs.
Film	2,200 lbs.
Lead Acid Batteries	10,025 lbs.
Lead	2,325 lbs.
Paper	774,000 lbs.
Phone Books	14,000 lbs.
Scrap Steel	670,735 lbs.
Stainless Steel	10,810 lbs.
Tires	25,700 lbs.
Waste Oil	9,220 gal.

It's called supply and demand

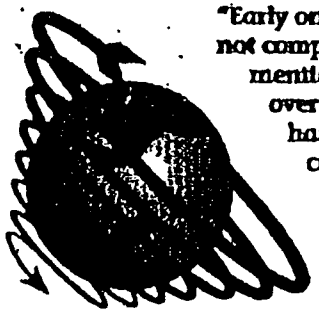
Without a demand for products made from recycled material, manufacturers have no need for previously-used products and the effort to recycle becomes not only a waste of resources, but a waste of time. Purchase of products with a recycled content is a critical step in the recycling process.

To encourage a market for products with recycled content, former President Bush signed Executive Order 12780 in Oct. 1991 that encourages federal facilities, the Lab included, to purchase items with a recovered content.

While most products with recycled content are paper products such as legal pads, messages pads, copier paper and file folders, other products are increasingly made from materials that in the past would have ended up in a landfill. Most are identified in supply catalogs with the three arrows, either in a triangle or circle, that indicate recycled and recyclable products, said Dee Dee McInroy, acting group leader with Customer Service/JIT/Express Small Purchase (MAT-5).

Don Sandoval, president of Sierra Vista Office Products, a Lab supplier, said he sees the movement toward labeling products with recycled content increasing. Some office products now contain recycled materials, such as filing supplies made with recycled paper, but are not currently identified as such. He also sees and distributes an increasing number of office products such as plastic desk trays, diskette holders and staplers made from recycled plastic.

Not only are there more products today that use recycled materials, but their quality is rivaling those made of new, or virgin, materials, said McInroy. As a result of better quality and a growing awareness of the need to purchase such products, the Laboratory's purchase of recycled products has increased from almost $500,000 worth in 1990 to more than $950,000 in 1993.



WASTE MINIMIZATION PROGRAM

"Early on, the quality of recycled paper did not compare with virgin paper, not to mention it was a lot more expensive. But, over the past three years, the quality has increased while the price has come down. Now, the price and quality are becoming more in line with paper with no recycled content," McInroy said.

Ultimately, it's up to organizations ordering supplies to help build demand for recycled products. It's only with the purchase of products with a recycled content that manufacturers have a reason to not only continue to carry those products, but to carry new lines of recycled products and complete the process, said McInroy.

—Linda Anderman

Less waste means more money

Waste minimization ideas net employees cash prizes

A process as simple as distributing a form on computer rather than on paper is reducing the Lab's waste by 2.4 million sheets of paper a year, or the equivalent of 30 cubic yards of landfill. The International Technology (IT) Division, received a $1,000 award last week for the plan as a result of the new Waste Minimization Awards Program.

Reducing waste is vital for the Lab and the country because of the tremendous disposal and cleanup costs, Lab Director Sig Hecker at the awards presentation last Wednesday. Seven Lab employees and IT Division received cash awards and certificates for developing ways to reduce the amount of waste generated at the Lab.

Hecker pointed out reductions in nuclear waste generation are particularly important, because disposal of this type of waste has both economic and social costs.

Besides reducing the amount of waste generated, employee suggestions also tend to lead to more efficient processes, he said.

"Looking at waste minimization makes you think about the processes involved. When you look at the processes, you end up making all the procedures better. You reduce waste, improve efficiency and increase worker safety," said Hecker.

The Waste Minimization Awards Program began last year as a way to help motivate employees and bring attention to the need to minimize waste in all the Lab's operations.

While only in its first year, the program received roughly 50 plans to reduce waste, said Al Tiedman, associate director for operations (ADO). Tiedman added that he would like to see 300 entries next year because of the program's positive impact on waste reduction at the Lab.

Checks and framed certificates were awarded to individuals and team members in amounts from $500 to $2,000, depending on the relative impact of the various plans.

IT Division leader Terry Hawkins said in his division's case, the $1,000 it received will be used to provide medical support for Russian children.

The awards, supported by Department of Energy funds, are given in three categories: large-scale, which require more than $5,000 to implement; small-scale, requiring less than $5,000 to implement; and administrative, which require only changes in operations.

Judging is done by a committee consisting of representatives from various Lab directorates. The committee is chaired by a member of the Waste Minimization Program Office in the Environmental Management (EM) Division. Criteria for selecting winners included the potential, or realized, benefits of the plan; feasibility; ease in implementation; cost; and impact on waste minimization.

The program is open to any individual or team of employees whose job is unrelated to waste reduction. Senior managers are not eligible. Entries can be submitted from Oct. 1 through the following August. Award amounts vary from $50 to a maximum of $2,000. The yearly limit on the awards is $10,000.

For more information about the award program and entry process, consult the Employee Awards section of the Administrative Policies and Procedures Manual (AM 619.32 to .41) or contact Hilary Noskin at 5-8289.

Large-scale waste minimization awards

Waste Minimization by Producing Anhydrous Plutonium Trichloride from Plutonium Chloride Solutions — $2,000 to Jerry Foropoulos and Eddie Trujillo of Actinide Materials Chemistry (NMT-6) and Larry Avens with Nuclear Materials/Chloride Systems (NMT-3). This process eliminates the use of some hazardous chemicals in plutonium processing, removes plutonium from the waste, makes the by-product recyclable and removes the chemical phosgene from the effluent.

Substitution of a Carbon-saturation Process as an Alternative to Current Crucible Oxidation Process — $1,000 to Keith Axler and Peter Lopez of Nuclear Materials Processing/Chloride System (NMT-3). By making changes in the materials and processes used to extract americium from plutonium, equipment life is extended, radioactive dust is eliminated and less landfill space is needed.

Modified Cell Head Design for High Temperature Furnace Tubes — $500 to Peter Lopez of Nuclear Materials Processing/Chloride Systems (NMT-3). This change in equipment for plutonium processing reduces operator exposure to radiation, eliminates parts for replacement and reduces radioactive waste by more than 20 cubic feet a year.

Small-scale awards

Computerized Information Retrieval System — $1,000 to the International Technology (IT) Division. Making information from two widely distributed reports available through computers is reducing paper use by 2.4 million sheets a year, the equivalent of 30 cubic yards of landfill.

Minimize Cardboard and Packaging Material Through Re-use — $500 to Eric Van Deveer of Sensor Systems and Robotics (MEE-3). This pilot program is investigating recycling and re-using boxes and cartons used to deliver goods to the Lab.

Administrative category

Replacement of Halogenated Solvents with Non-halogenated Solvents — $500 to John Joseph of Electronic Materials and Device Research (MEE-11). Keeping hazardous halogenated solvents separate from non-halogenated solvents before disposal reduces the amount of material that must be treated as hazardous waste.

—*Linda Anderman*

Shown from top to bottom — Jerry Foropoulos, Eddie Trujillo, Larry Avens, Peter Lopez, Terry Hawkins, Eric Van Deveer, John Joseph. Not pictured is Keith Axler.

Spring cleaning may be hazardous to the environment — and you

Spring cleaning may not sound like a killer, but using household cleaners the wrong way could make it hazardous for you or your family. In 1991 alone more than 91,000 people were admitted to U.S. emergency rooms because of accidents with household chemicals and cleaning agents, according to Consumer Product Safety Commission statistics. While cleaning is part of life, safer cleaning alternatives are available, said Jay Stimmel, a member of the Lab's Materials Substitution Committee and an employee of Explosives Technology and Safety (DX-16).

"It's important, whether at home or at work, that people look for the safest materials possible. In many cases there are safer alternatives, you just need to look for them. Spring cleaning is an ideal time to start the material substitution habit," said Stimmel. Most people are unaware of just how potentially harmful their cleaners are, said Stimmel. Ammonia and chlorine bleach are just two common cleaners that are less than benign, he said.

"Both cleaners separately can cause skin irritation or damage if they get in the eyes or are ingested. Mixed together they become chloramine gas — a deadly chemical combination," he said.

Medical accidents represent just one problem associated with hazardous household cleaners, said Stimmel.

"Most people don't realize the costs associated with harsh cleaners, not just the obvious ones such as direct physical harm, but also with their safe disposal and potential impact on the environment, Stimmel said. Household hazardous waste is exempt from the strict regulations of industry, but when you add up what everyone is throwing away it can present a real problem at the landfill. Also, once a landfill is at capacity, opening up a new one is a problem because of such issues as expense, complex regulations and siting problems. Reducing hazardous materials disposal could be a real benefit to everyone."

If people have potentially hazardous cleaners, the first thing they should do is use them according to the manufacturers' instructions. If they don't have a use for them, they should try to find someone who does, said Stimmel.

"One problem is most people buy more than they need — paint for instance — because they want to 'save money' because a larger container means a lower unit cost," he said. "But, if they've bought more than they need, not only did they not save money, but now they also have a potentially hazardous material to dispose of."

Spring is also the time people start to work in the garden. Again, said Stimmel, there are ways around using expensive and hazardous pesticides and fertilizers. Composting is one alternative.

"Composting is a natural way to improve a garden. And a healthy garden is less likely to need chemical fertilizers or pesticides," he said. "Integrated pest management is an excellent way to avoid the use of hazardous pesticides. The county extension service is a good source of information about composting and integrated pest management."

For more information on work-related material substitution, contact the Pollution Prevention Program Office at 5-8293.

—*Linda Anderman*

WASTE MINIMIZATION

What to use instead

For	Try instead
Air freshners/deodorizers	Set out a dish of vinegar Simmer spices or set out potpourri Baking soda
Batteries	Use rechargeables
Chlorine bleaches	Use oxygen bleaches or borax Cut bleach use in half and add one-quarter to one-half cup baking soda
General household cleaners	Use one-half cup vinegar mixed with one quart warm water Try soap and water, baking soda, lemon juice or salt
Window cleaner	Use two tablespoons of vinegar with one quart water; store mixture in a spray bottle
Chrome cleaner	Use a paste of baking soda and water. Let the paste set for a few minutes, then rise and wipe dry with a soft cloth
Disinfectants	Use two cups of boiling water over thyme leaves, cover, let steep 10 minutes, strain, let cool
Drain cleaner	Use one-half cup of borax in one gallon of hot water Pour one-half cup of borax in the drain and follow with two cups of boiling water
Chemical fertilizers	Try composting your organic waste for a natural fertilizer
Mothballs or crystals	Try cedar chips in cotton sachets Use dried tansy, dried lavender or peppercorns
Furniture waxes or polishes	Use a mixture of one tablespoon lemon oil and one pint mineral oil Use a mixture of three parts olive oil to one part white vinegar

Household hints courtesy of Turning the Tide on Toxics in the Home: A Guide to Safer Alternatives and Proper Disposal of Hazardous Household Products, Washington State Department of Ecology

Los Alamos Monitor

Vol. 30, No. 230 Thursday, November 18, 1993 Two sections, 26 pages 35¢

LANL reducing radioactive waste at source

By STEPHEN T. SHANKLAND
Monitor Staff Writer

Los Alamos National Laboratory researchers are working to recover all the traces of radionuclides from the waste streams of LANL's Plutonium Facility, researcher K.K.S. Pillay said.

Pillay, manager of waste minimization programs in LANL's Nuclear Materials Technology Division, was to speak this morning in San Francisco at a meeting of the American Nuclear Society. He spoke on a paper titled "An Environmentally Benign Plutonium Processing Future at Los Alamos."

"Any human activity produces some amount of waste. What we can do, by investing a decent percentage of money, is recycle wastes back into the system instead of releasing them into the environment," Pillay said.

Pillay said LANL has eliminated all radionuclides from the gas exhausts at the Plutonium Facility, plans to do the same with liquid waste streams within two or three years, and hopes to remove the radionuclides from solid waste streams after that.

Pillay estimated that installing new controls on the liquid waste streams that come from LANL's Plutonium Facility would add only a small percentage to the cost of handling radioactive materials.

Pillay said LANL had about a dozen people working to identify technologies to incorporate these radionuclide recovery technologies.

The lab already has reduced plutonium waste by 95 percent using ATLAS — Advanced Testing Line for Actinide Separations (plutonium is an actinide element), he said. This technique combines several different waste treatment technologies.

However, the last 5 percent is the hard part, he said. There are other treatment techniques available, but applying them in practice instead of just in the laboratory is difficult, he said.

For solid wastes, he said, LANL initially is taking a two-pronged approach: cutting down on the amount of waste that is generated, and sorting out genuinely contaminated waste from innocuous waste.

Pillay said that if LANL sifted Plutonium Facility trash, 60 percent of trash probably could be sent to an ordinary dump.

If waste comes from a suspect area, "The easiest thing to do is to mark everything as radioactive waste," Pillay said. But if the trash is "sorted very carefully, we can reduce waste treatment by 60 or 70 percent."

Pillay said the lab also has begun "emphasizing reduction at generation point rather than cleanup."

The Technical Area 50 Controlled Air Incinerator also could reduce waste dramatically — transforming half of a truckload of waste into the volume of a tin can, he said.

The lab is legally bound to cut down on emissions, but in addition, the lab is committed to do so in order to be a good neighbor, he added.

"When Clinton came, we told him that we have a very active program to clean up our technologies to make them environmentally benign. He was pleased that we had a program like that," Pillay added.

"Operations involving Laboratory-generated radioactive, hazardous, and/or mixed waste shall be performed so as to ...

- *minimize generation of waste, wherever and whenever possible;*
- *recycle waste that cannot be eliminated at the source...; and*
- *give prime consideration to reducing or eliminating waste over the treatment, storage, and disposal of waste."*

Director's Policy on Hazardous and Radioactive Waste Management and Minimization, Los Alamos National Laboratory, DP-105, August 1992. Dr. Sig Hecker, Laboratory Director.

WASTE MINIMIZATION PROGRAM

For more information on the Waste Minimization Video or the programs discussed in this brochure, please contact the Pollution Prevention Program Office, Los Alamos National Laboratory, 505/665-8293.

Los Alamos National Laboratory
Waste Minimization Video
13:51 minutes

Produced by Los Alamos National Laboratory, Pollution Prevention Program Office, Environmental Management Division; Environment Safety and Health Training Group; and Video Production Group, Computing, Information, and Communications Division.

Produced with funds from the United States Department of Energy.

WASTE MINIMIZATION

VIDEO & HANDBOOK

Pollution Prevention Program Office, Environmental Management Division, Los Alamos National Laboratory

WASTE MINIMIZATION VIDEO

"It is time to bring technology and the environment together into one single work practice to protect ourselves, our homes and our environment..."

Waste Minimization Video,
Los Alamos National Laboratory, 1993.

The Los Alamos National Laboratory Pollution Prevention Program Office (P^3O) has produced a waste minimization video and handbook. The 14-minute video provides a general orientation to pollution prevention and waste minimization (P2/WMin) emphasizing that the best way to handle waste is to not generate it in the first place.

The goals of the video are to

- promote awareness of the Laboratory's P2/WMin program, and
- encourage employees to take an active role in reducing waste from their own operations.

Four major approaches to prevent or minimize waste are discussed in the video: *Material Management, Process Modification, Material Substitution,* and *Reuse and Reclamation.* Specific examples of these practices currently in place at the Laboratory are highlighted and employees are encouraged to share their own ideas and successes related to P2/WMin.

A companion handbook is available for use as a note-taking and study guide while viewing the video and may also be used as a future reference on the Laboratory's waste minimization program and resources.

The video and handbook are currently used in the Laboratory's *General Employee Training* program and the *Waste Management Coordinator* and *Waste Generator Training* programs. In the future, the video will be used in partnership with the Public Affairs Office to increase community awareness of the Laboratory's efforts to prevent pollution, to reuse, and to recycle, and further protect the environment in and around the city of Los Alamos.

Think Ahead - anticipate and plan to

- ***eliminate or minimize waste before generating it,***
- ***reuse or recycle waste that can not be eliminated, and***
- ***share your ideas and successes!***

P2/WMin Practices Used at the Laboratory

Material Management includes inventory controls, purchasing controls, and proper segregation. The video stresses the importance of segregation practices to minimize the generation of radioactive mixed wastes, which are the most expensive and difficult wastes to handle.

Process Modifications are changes to equipment, materials, or procedures that will eliminate waste generation at the source or reduce waste volume or toxicity. For example:

- The Laboratory's electroplating shop installed rinse water spray guns, reducing the volume of hazardous waste-water by 75% from previous years.
- In the plutonium processing area, an employee suggested an equipment design change that reduced worker exposure to radiation and reduced the amount of radioactive waste generated by 20 cu. ft. per year.

Material Substitution is the replacement of a hazardous material with a non- or less-hazardous material. The Laboratory's machine shops now use a non-toxic cleaning solvent in their operations, avoiding the generation of an estimated 19,000 gallons of hazardous and mixed waste per year. The shop also replaced their hazardous cutting oils with a non-hazardous product, further eliminating the generation of hazardous waste and allowing the metal cuttings to be recycled.

Reuse and Reclamation practices allow waste material to be used again for its original purpose or other beneficial purpose. For example:

- The P^3O sponsors a chemical exchange program to advertise and distribute excess chemicals to other users at the Laboratory.
- The Redistribution and Marketing Center recycles paper, tires, and scrap metal and redistributes equipment that is no longer needed by the original purchaser.
- Waste streams that have potential recycle value, such as photo-processing waste or spent solvents, are identified by the Laboratory's Waste Management Group and sent to approved off-site recycling facilities.

During 1993, these recycling and redistribution efforts avoided the disposal of an estimated 700,000 lbs of scrap metal, 500 lbs of mercury wastes, 774,000 lbs of paper, and 8000 gallons of photo-processing wastes.

Process Waste Assessments are used extensively by the Laboratory to identify specific waste reduction opportunities and practices that may apply to an operation. The assessment is a systematic analysis of a process including its input materials and waste outputs; it may be a simple assessment conducted by the operator or it may be a more detailed engineering review, mass balance evaluation and cost analysis.

The Laboratory's *Waste Minimization Awards Program* provides cash awards to employees who identify or implement a practice that prevents or reduces the generation of waste, reduces worker exposure, and/or reduces hazardous emissions to the environment. Employees are encouraged to share their P2/WMin ideas and successes with Laboratory management and the P^3O.

The video and handbook are available for viewing or check-out by contacting the Laboratory's Environment, Safety and Health Training Center, 505/665-7939.