Draft

Site Treatment Plan

for

Mixed Waste

Sandia National Laboratories/ New Mexico

August 19, 1994
(Revision 1)

Waste Management and Regulatory Projects Department

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EXECUTIVE SUMMARY

Sandia National Laboratories, New Mexico (SNL/NM) is a research and development facility operated for the U.S. Department of Energy (DOE) by Sandia Corporation, a subsidiary of Martin Marietta Corporation. For each DOE facility that generates or stores mixed waste, the Federal Facility Compliance Act (FFCAct) of October 6, 1992, requires DOE to prepare a plan to treat mixed waste to the standards of the Land Disposal Restrictions (LDRs). Upon approval of the Site Treatment Plan by the regulator, the New Mexico Environment Department (NMED), a Compliance Order requiring compliance with the approved plan will be issued.

This Draft Site Treatment Plan (DSTP) comprises two volumes: the Background Volume contains detailed discussion of the waste streams and the preferred treatment options, which is provided for informational purposes only; and a Compliance Plan Volume that proposes overall schedules with target dates for achieving compliance with the LDRs. The DSTP will be the forerunner to the Final Proposed Site Treatment Plan, which will be issued to the states in February, 1995. That Plan will be the basis for negotiation of a Compliance Plan and the Consent Order that will be issued for enforcement purposes by the NMED.

Unique tests and experimental programs at SNL/NM have generated low volumes of a broad variety of mixed wastes. Approximately 150 waste streams have been accumulated since 1989 with a current volume of 62 cubic meters in storage. The waste streams have been combined into ten treatability groups, each with a preferred treatment option, as shown in Table ES-1.

Table ES-1 Summary of SNL/NM Mixed Waste and Preferred Treatment Options

Treatability Group # and Volume	TG Description	Preferred Treatment Option	Treatment Site and Facility
TG 1 2.4 m^3	Inorganic Debris w/ Explosive	Chemical Deactivation	On-site
TG 2 0.04 m^3	Inorganic Debris w/ Water Reactive	Chemical Deactivation	On-site
TG 3 0.02 m^3	Reactive Metals	Chemical Deactivation	On-site
TG 4 0.007 m^3	Elemental Lead	Macroencapsulation	On-site using Pantex Mobile Treatment Unit
TG 5 0.01 m^3	Aqueous Liquids	Neutralization and Stabilization	On-site
TG 6 30 ml	Elemental Mercury	Amalgamation	On-site using Pinellas Mobile Treatment Unit
TG 7 0.01 m^3	Organic Liquids	Incineration	Off-Site Commercial
TG 8 28 m^3	Organic Debris	Thermal Desorption	On-site using GJPO Mobile Treatment Unit
TG 9 5 m^3	Inorganic Debris w/ TCLP Metals	Macroencapsulation	On-site using Pantex Mobile Treatment Unit
TG 10 26 m^3	Heterogeneous Debris	Sort/Reclassify into TG8 or TG9	On-site

The mixed waste treatment plan at SNL/NM is heavily integrated with the work at other DOE sites that are tasked with developing mobile treatment units for use at multiple sites. This development involves proving-in new applications of technologies that are currently available but will require testing through treatability studies, as allowed by the RCRA regulations for assuring that the treatments are appropriate for the specific waste streams and to develop operating procedures and health and safety plans that protect the workers and the environment.

Other waste streams are being studied for on-site treatment by SNL/NM investigated methods because of the material's unique nature or handling requirements, such as for explosives, or for development of treatment procedures that will facilitate eventual disposal, such as those required by the Nevada Operations Office for disposal at the Nevada Test Site. Off-site commercial treatment and disposal is an option for a small volume of scintillation cocktails and for waste that may not be treatable to meet the waste acceptance criteria of the Nevada Test Site.

Proposed timeframes for commencing treatment and prerequisite activities are included in the Compliance Plan Volume, based on the activities specified in the FFCAct for which schedules will be required in the Site Treatment Plan. Target dates for activities required for treatment of waste at SNL reflect the integrated approach of the DOE sites of the Albuquerque Operations Office complex. The management of the integrated mixed waste treatment program is assigned to the Grand Junction Projects Office, Colorado, for coordination of development and deployment of the mobile treatment units. Permitting of the mobile units is being addressed through a DOE working group in coordination with the National Governors Association.

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ACRONYMS

AEA	Atomic Energy Act
BDAT	Best Demonstrated Available Technology
CCW	constituent concentration in the waste
CCWE	constituent concentration in the waste extract
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIS	Chemical Information System
CSTP	Conceptual Site Treatment Plan
CY	calendar year
D&D	decontamination and decommissioning
DOE	Department of Energy
DOE/AL	DOE/Albuquerque
DOE/HQ	DOE/Headquarters
DOE/KAO	DOE/Kirtland Area Office
DOE/NVO	DOE/Nevada Operations
DOT	Department of Transportation
DR	Disposal Request
DSSI	Diversified Scientific Services, Inc.
DSTP	Draft Site Treatment Plan
EA	Environment Assessment
ECRAs	ER corrective actions
EM	Office of Environmental Restoration and Waste Management
EMAB	Environmental Management Advisory Board
EM PEIS	Environmental Management Programmatic Environmental Impact Statement
EPA	Environmental Protection Agency
ER	Environmental Restoration
FADD	Facility assessment, decontamination, and demolition
fb	followed-by
FFCAct	Federal Facility Compliance Act
FR	Federal Register
FSUBS	Fuel Substitution (See 40 CFR 268.42, Table 1)
FY	fiscal year
GJPO	Grand Junction Project Office
HLW	high-level waste
HSWA	Hazardous and Solid Waste Amendments
INCIN	Incineration (See 40 CFR 268.42, Table 1)
KAFB	Kirtland Air Force Base
KCP	Kansas City Plant

ACRONYMS (continued)

LANL	Los Alamos National Laboratories
LDR	Land Disposal Restriction
LLW	low-level radioactive waste
MACRO	Macroencapsulation (See 40 CFR 268.42, Table 1)
MLLW	Mixed low-level waste
MWIR	Mixed Waste Inventory Report
NEPA	National Environmental Policy Act
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NGs	Neutron Generators
NGA	National Governor's Association
NMED	New Mexico Environment Department
NTS	Nevada Test Site
PEIS	Programmatic Environmental Impact Statement
PPE	personal protective equipment
PWAs	process waste assessments
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFIs	RCRA Facility Investigations
RMWMF	Radioactive and Mixed Waste Management Facility
RTHRM	Thermal recovery of metals or inorganics from nonwastewaters (See 40 CFR 268.42, Table 1)
RORGs	Recovery of organics (see 40 CFR 268.42, Table 1)
SA	Safety Assessment
S&A	Sampling and Analysis
SAR	Safety Analysis Report
SEG	Scientific Ecology Group
SER	SNL/NM Engineering Reactor
SMO	Sample Management Office
SNL/NM	Sandia National Laboratories/New Mexico
STPs	site treatment plans
TBD	to be determined
TCLP	Toxicity Characteristic Leaching Procedure
TG	Treatability Group
TOC	Total Organic Carbon
TRU	transuranic
TST	Treatment Selection Team (DOE/AL)
WAC	Waste Acceptance Criteria
WIPP	Waste Isolation Pilot Plant

BACKGROUND VOLUME

1

1.0 INTRODUCTION

1.1 Purpose and Scope

The Department of Energy (DOE) is required by section 3021(b) of the Resource Conservation and Recovery Act (RCRA), as amended by the Federal Facility Compliance Act (FFCAct), to prepare site treatment plans (STPs or plans) describing the development of treatment capacities and technologies for treating mixed waste, which is waste that contains both radioactive and hazardous components. The plans will be submitted to the New Mexico Environment Department (NMED) or U.S. Environmental Protection Agency (EPA) for approval, approval with modification, or disapproval. The Sandia National Laboratories/New Mexico (SNL/NM) Draft Site Treatment Plan (Draft STP or Draft Plan) is the intermediate version of the STP and is being provided to NMED, EPA, and others for review.

In addition to aiding SNL/NM in formulating its final STP (with input from the NMED and the EPA), DOE/Albuquerque (DOE/AL) Operations Office developed a Treatment Selection Team that visited other DOE/AL sites to identify common technology needs and potential options for treating low-level mixed wastes within the DOE/AL Complex. The DOE/AL Complex includes nine sites:

- Grand Junction Projects Office (GJPO); Grand Junction, Colorado
- Inhalation Toxicology Research Institute; Albuquerque, New Mexico
- Kansas City Plant; Kansas City, Missouri
- Los Alamos National Laboratories; Los Alamos, New Mexico
- Mound Plant; Miamisburg, Ohio
- Pantex Plant; Amarillo, Texas
- Pinellas Plant, Pinellas County, Florida
- Sandia National Laboratories; Albuquerque, New Mexico
- Sandia National Laboratories; Livermore, California.

STPs are required for facilities at which the DOE generates or stores mixed waste, defined by the FFCAct as waste containing both a hazardous waste subject to RCRA, and a source, special nuclear or by-product material subject to the Atomic Energy Act of 1954 (42 U.S.C. 2011 *et seq.*). On April 6, 1993, DOE published a Federal Register notice (58 FR 17875) describing its proposed process for developing the STP in three phases, including a Conceptual STP, a Draft STP, and a Final Proposed STP. The purpose of this Draft Plan is to identify the currently preferred options for treating the mixed wastes at SNL/NM or for developing treatment technologies where technologies do not exist or need modification. The Draft Plan reflects the site-specific preferred options, developed with the States' input and based on existing available information. The options reflect the "bottoms-up" approach and have not been completely evaluated for impacts on other DOE sites and impacts to the overall DOE program. Therefore, changes in the preferred option and associated schedules are possible between the Draft Plan, the Final Proposed Plan, and final approval and issuance of the Order as evaluation of DOE-wide impacts and State-to-State discussions progress.

To the extent possible, the Draft Plan identifies specific treatment facilities for treating the mixed waste and proposes schedules as set forth in the FFCAct. When not possible, schedules for alternative activities such as waste characterization and technology assessment are provided as appropriate. All schedule information presented is preliminary and is subject to change. For new facilities, the schedule is heavily dependent upon decisions made during the design phase and is contingent on funding availability. Assumptions and professional judgments related to the type of treatment technology, location of the treatment facility, contracting mechanism, project approval process, cost, etc. were used to develop the estimated schedule. Any variation from these assumptions will impact the estimated schedule. In addition, cost data used in developing options and schedules and provided in the Draft Plan are planning estimates only and do not reflect a commitment of budgetary resources.

Emerging or new technologies not yet considered may be identified in the future that provide opportunities to manage waste more safely, effectively, and at lower cost than the current technologies identified in the Draft Plan. Working closely with regulators and other interested parties during the implementation of the Draft Plan, DOE will continue to evaluate and develop technologies that offer potential advantages in the areas of public acceptance, risk abatement, and performance and life cycle cost. Should more promising technologies be identified, DOE may request a modification of its treatment plan in accordance with provisions of the Final STP and/or the Order.

The Draft Plan reflects the results of discussion among NMED and other state agencies, EPA, and others based on the Conceptual Site Treatment Plan submitted to the NMED and EPA in October 1993. The Conceptual Plan presented all known treatment needs, capabilities, and preliminary options for treating the mixed waste. The Conceptual Plan is available at the DOE reading rooms of the National Atomic Museum on Kirtland Air Force Base in Albuquerque, New Mexico and at the TV-I Main Campus Library in Albuquerque, New Mexico.

This "Background Volume" is one of two volumes that constitute the Draft Site Treatment Plan. It provides a detailed discussion of the preferred option or options, identifies the waste streams the option addresses, and gives explanatory information for the "Compliance Plan Volume." The Compliance Plan Volume identifies the capacity to be developed and associated schedules as required by the FFCAct.

1.2 Site History and Mission

Sandia National Laboratories in Albuquerque, New Mexico (SNL/NM), provides service to the U.S. Government for national security and energy projects. Its primary mission is focused on national security needs, emphasizing design and related testing of nonnuclear components of nuclear bombs and warheads, particularly safety, reliability, and survivability of such weapon systems. Technology development for verification of treaty requirements and nonproliferation agreements is a growing area of Sandia's defense programs.

Another major ongoing program area is nuclear reactor safety for the Nuclear Regulatory Commission. Environmental research and technology development programs include development of safe transport and storage systems for special nuclear materials and radioactive waste and risk and performance assessments of radioactive waste repositories such as the Waste Isolation Pilot Plant (WIPP) and the Yucca Mountain Project. Energy research is also a major area of the Laboratories' mission. It includes pulsed power research, thermonuclear fusion studies, solar energy research, vertical axis wind turbine research, and fossil fuel and geothermal energy research.

SNL was operated as a subsidiary of AT&T from 1949 to 1993. Since October 1, 1993, it has been operated by Martin Marietta Corporation. The mission of the Laboratories has not changed

with the change in operator, although the Laboratories have adjusted and will continue to adjust to the changing needs of the nation's defense strategies and national initiatives in energy and environmental research.

Organizationally, SNL/NM is divided into sectors. Three sectors are focused directly on external customers: Defense Programs, Energy and Environment, and Work for Others. Support sectors include Core Competencies, Core Support and Product Development, Laboratory Development, and Laboratory Directed Research and Development. Physically, the complex of laboratories and testing facilities consists of five main Technical Areas and several remote test areas, all located within Kirtland Air Force Base (KAFB), Albuquerque.

SNL/NM operates in compliance with environmental requirements established by federal and state statutes and regulations, executive orders, and the DOE. Compliance with the various environmental requirements is enforced by Region VI of the EPA, the NMED, the County of Bernalillo, and the City of Albuquerque. The State of New Mexico was granted regulatory authority for mixed waste under RCRA on July 25, 1990. In August 1990, SNL/NM submitted to NMED a Part A permit application for Interim Status for the storage and treatment of mixed waste.

In November 1992, SNL/NM submitted a Part B permit application for mixed waste. This application and the Part A application were amended in an August 1993 submittal to NMED. Treatments in the combined application now include compaction, stabilization/solidification, shredding/baling, decontamination/waste segregation, pH neutralization, encapsulation, chemical stripping/dissolution, destruction, chemical precipitation, ion exchange, reverse osmosis, demineralization, and hazard separation.

The Waste Management and Environmental Restoration Programs at SNL/NM are managed by the Environmental Operations Center, within the Laboratories Services Division. The Waste Management and Regulatory Projects Department is the organization within the Environmental Operations Center that is responsible for applying for mixed waste permits and for developing programs for complying with applicable regulations. Also within the Environmental Operations Center, the Environmental Restoration Departments (I, II, III, and IV) are responsible for evaluating and remediating the sites identified on KAFB.

Presently, the Waste Operations Department operates the Technical Area III Interim Storage Site, located in Technical Area III, which is SNL/NM's main storage facility for mixed waste. There are 17 units described in the current application for a RCRA Mixed Waste Part B permit, as amended August 1993. The other storage areas are all located within KAFB, although not all are within SNL/NM Technical Areas. Some are in special locations because of the hazardous nature of the materials that can be stored there (for example, explosives). The number of units will decrease in the next amendment, which is scheduled for submission to the NMED in December 1994.

The Waste Management and Regulatory Projects Department is responsible for developing long-term facilities planning for waste management. The Radioactive and Mixed Waste Management Facility (RMWMF) has been built and has an approved Environmental Assessment (EA) with a Finding of No Significant Impact. SNL/NM has submitted a Safety Assessment and is proceeding with the final stages of construction necessary to meet the requirements of DOE Order 5481.1B. This will be a primary facility for many of the treatments that can be applied to the waste streams identified.

1.3 Framework For Developing DOE's Site Treatment Plans

Figure 1-1 illustrates the relationships among requirements that led to the process DOE is following to prepare the STPs. The key components of the framework for the plans are described below.

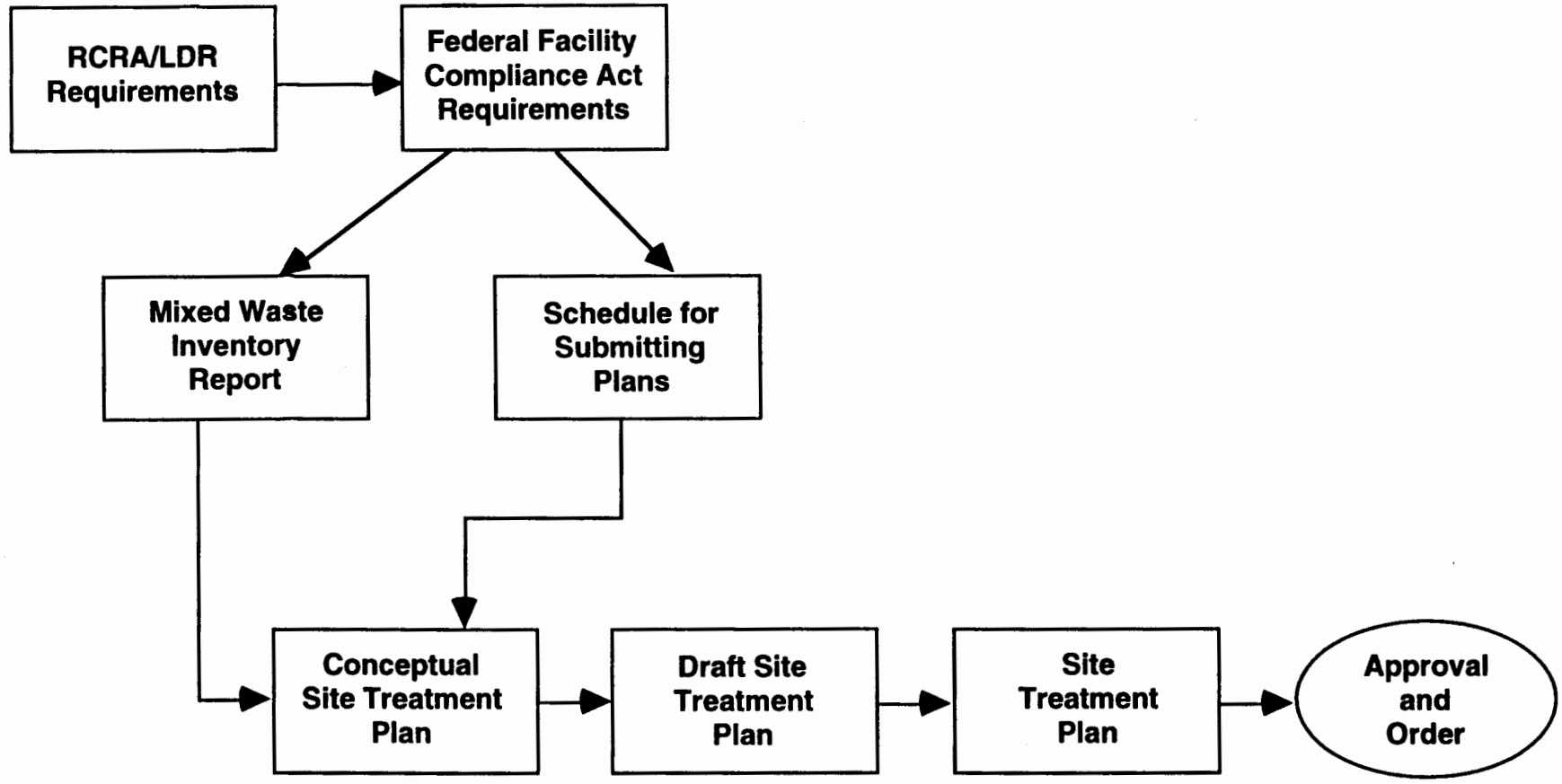

Figure 1-1 Framework for Developing DOE's Site Treatment Plans.

RCRA Land Disposal Restriction (LDR) Requirements require the treatment of hazardous waste (including the hazardous component of mixed waste) to certain standards before the waste can be land disposed, and prohibit storage of hazardous wastes that do not meet LDR standards, except for the purposes of accumulating sufficient quantities to facilitate proper recovery, treatment, or disposal of the waste. DOE is currently storing mixed waste inconsistent with the LDR provisions because the treatment capacity for such wastes, either at DOE sites or in the commercial sector, is not adequate or is unavailable at this time.

The Federal Facility Compliance Act, signed on October 6, 1992, waives sovereign immunity for fines and penalties for RCRA violations at Federal facilities. However, the FFCAct postpones the waiver for three years for LDR storage prohibition violations for DOE's mixed wastes and requires DOE to prepare plans for developing the required treatment capacity for its mixed waste at each site at which it stores or generates mixed waste. Each plan must be approved by the State or EPA, after consultation with other affected states and consideration of public comment, and an order issued by the regulatory agency requiring compliance with the plan. The FFCAct further provides that DOE will not be subject to fines and penalties for LDR storage prohibition violations for mixed waste as long as it is compliance with an approved plan and order.

The FFCAct requires the plans to contain schedules for developing capacity for mixed waste for which identified treatment technologies exist, and, for mixed waste without an identified existing treatment technology, schedules for identifying and developing technologies. The FFCAct also requires the plan to provide certain information where radionuclide separation is proposed. The FFCAct states that the plans may provide for centralized, regional or on-site treatment of mixed waste, or any combination thereof, and requires the States to consider the need for regional treatment facilities in reviewing the plans.

The Mixed Waste Inventory Report (MWIR), required by the FFCAct, provides an inventory of all mixed waste stored or generated or expected to be generated over the next five years at each DOE site and an inventory of treatment capacities and technologies. The Interim MWIR, published by DOE in April 1993 (DOE, 1993b), provided information on a waste-stream by waste-stream basis for each DOE site that generates or stores mixed waste. The final report is being prepared to reflect comments received on the interim report and improvements in the data. Phase I of the Final MWIR included the data for SNL/NM and was released in April 1994 (DOE, 1994b). The waste stream and technology information contained in the MWIR serves as the basis for the DSTPs.

The "Schedule for Submitting Plans for the Treatment of Mixed Waste Generated or Stored at Each Site" was published April 6, 1993, in the Federal Register (58 FR 17875). In the Notice, DOE committed to providing the site treatment plans in three phases: a "conceptual plan" completed in October 1993, a "draft plan" no later than August 1994, and a "final proposed plan" no later than February 1995. This process provides opportunity for early involvement by the States and other stakeholders to discuss technical and equity issues associated with the plans.

The *Conceptual Plan* submitted last October, focused on identifying treatment needs, capabilities, and options for treating the site's mixed waste. This *Draft Plan* focuses on identifying preferred options for treating the site's mixed wastes, wherever possible, as well as proposed schedules for constructing capacity. The options presented represent the site's best judgment of the available information and the States' preferences, and should be viewed as a starting point for discussion leading to the development of the *Final Proposed Plan*, which will be submitted to the regulatory agency for review and approval, approval with modification, or disapproval, as required by the FFCAct. Each version of the Plan will reflect discussions among states, as well as site-specific input from the individual regulatory agency and other interested parties on the previous submittal. It is DOE's intent that this iterative process, with ample opportunity for input and discussion, will

facilitate *approval of the Site Treatment Plan and issuance of the compliance order* required by the FFCAct. DOE's goal is to have all plans and orders in place by October 1995.

1.4 Draft Site Treatment Plan Organization

SNL/NM's Draft Plan follows the same format as the Draft Plans of other DOE sites to facilitate cross-site comparisons. The Draft Plan is organized in two separate, but integrated volumes. The *Background Volume* provides the detailed discussion of the options: it contains information on the waste streams and treatability groups a particular treatment option or options would address and describes uncertainties associated with that option, as well as the budget status of the option, and regulator and stakeholder input. The *Compliance Plan Volume* is a short, focused document containing the preferred options and schedules for implementing the options and is intended to contain all the information required by the FFCAct. The Compliance Plan Volume also contains a mechanism to implement the Plan and establish milestones that will be enforced by the Order. It references, but does not duplicate, details on the options in the Background Volume.

Section 1.0 and 2.0 in both Volumes contain introductory material relevant to the purpose of the Volume. The Background Volume contains general information on the Draft Plan and the site in section 1.0 and provides top-level assumptions and a description of the process used to determine the preferred options in section 2.0.

Sections 1.0 and 2.0 of the Compliance Plan Volume propose certain administrative provisions appropriate for implementing the Plan when finalized. These include provisions such as the approach to setting milestones, updates to the Plan, additions or removals to waste streams covered by the Plan, and funding considerations. These section are intended to initiate discussion; it is expected that the specific language will be developed in conjunction with the regulatory agency and may eventually be expanded to address other administrative provisions or incorporated into a separate consent order.

Sections 3.0 through 5.0 discuss the preferred option or options for low-level mixed waste, mixed transuranic waste, and mixed high-level waste, and each volume discusses the same waste streams and options in parallel sections. The Background Volume discusses the waste streams, technology needs, and uncertainties and other details on the preferred options. In the Compliance Plan Volume, the sections include proposed schedules, to the extent feasible, as required under the FFCAct.

The Background Volume includes three additional sections that are not included in the Compliance Plan Volume because they are not required by the FFCAct and are not compliance-related. *Section 6.0* discusses mixed wastes expected to be generated in the future to assist in anticipating treatment needs. These waste streams will be incorporated into the Compliance Plan Volume, and treatment approaches and schedules developed, when the wastes are generated. *Section 7.0* discusses storage capacity needs and how compliant storage will be provided for SNL/NM's mixed wastes pending treatment.

Section 8.0 describes a process being followed by DOE and the states for evaluating options for disposal of mixed waste treatment residues. Although the FFCAct does not require disposal to be covered in the Plans, DOE is including disposal information to be responsive to the states' request that disposal be addressed and to support state discussions. Section 8.0 identifies whether SNL/NM is being further considered as a disposal site and explains why or why not.

The Draft Plan also discusses the options selection process in *Attachment 1* of this Background Volume, which is from the DOE/AL Mixed Waste Treatment Plan (DOE, 1994a). For each option, the Attachment 1 describes how options from the nine DOE/AL sites were evaluated and why the

preferred option or options were selected. *Attachment 2* contains cost information developed by DOE/AL to support the options analysis. *Attachment 1* contains logic diagrams for each treatability group identified in the Draft Plan, that outline the overall process that will be followed for identifying and implementing mixed waste treatment.

1.5 Related Documents

Other DOE efforts are closely linked to STP development. These include the MWIR; activities conducted pursuant to the National Environmental Policy Act (NEPA); compliance and cleanup agreements containing commitments relevant to mixed waste; the Programmatic Environmental Impact Statement (PEIS) for DOE's Assistant Secretary for Environmental Restoration and Waste Management (EM); and the Mixed Waste RCRA permit process.

Mixed Waste Inventory Report

The MWIR, required by the FFCAct, provides an inventory of mixed waste currently stored or generated, or expected to be generated over the next five years, at each DOE site and an inventory of treatment capacities and technologies. The Interim MWIR, published by DOE in April of 1993, provided information on a waste stream-by-waste stream basis for each DOE site that generates or stores mixed waste. DOE made updated waste stream and technology data available to the States and EPA in May 1994 and is preparing an Updated Mixed Waste Inventory Summary. The Report represents the best record of DOE's mixed waste inventory at the beginning of 1994. Since data is constantly being refined, waste stream information in SNL/NM's Draft Plan may differ somewhat from the most recent Inventory Report. Any changes in waste stream information are explained in the Background Volume.

Site Specific NEPA Activities

There is an existing Environmental Impact Assessment applicable to SNL/NM that was prepared in May 1977 for the Energy Research and Development Administration (DOE EIA/MA 77-1). This document does not address waste management because it predates much of the existing Federal, State and local environmental regulations (DOE, 1977). DOE currently has no firm schedule for revising this assessment.

An EA was prepared for the proposed completion of construction and operation of the RMWMF at SNL/NM. The RMWMF is designed to receive, store, characterize, repackage, certify, and conduct limited bench-scale treatment of radioactive and mixed waste. A Finding of No Significant Impact for the proposed action was issued in April 1993 (DOE, 1993a).

The mixed waste treatment activities included in the RMWMF EA were waste compaction and bench-scale stabilization, solidification, and pH neutralization. Upon compliance with NEPA, additional treatment may be added as necessary.

The Programmatic Environmental Impact Statement for Environmental Restoration and Waste Management

DOE is preparing a Programmatic Environmental Impact Statement (PEIS) to support complex-wide integration of environmental management activities. The PEIS is intended to present to the public, states, EPA, and DOE an understanding of impacts to human health and the environment together with the costs associated with a wide range of alternative strategies for managing the DOE's environmental program. The PEIS is examining all waste types and activities, including mixed waste treatment also being addressed by the STP process.

Development of the Environmental Management (EM) PEIS is being coordinated with the preparation of the Plans under the Federal Facility Compliance Act. Information being generated to support the PEIS (e.g., hypothetical configurations, preliminary risk analyses, and cost studies) is shared with states to support Plan discussions. The Draft PEIS will not identify a preferred alternative (i.e., configuration) for mixed waste facilities since this will be evolving in consultation with the states and EPA through the STP process. However, the PEIS analyses of potential environmental risks and costs associated with a range of possible waste management configurations will provide valuable insight as the public, states, and DOE discuss using existing facilities and constructing new mixed waste facilities to treat mixed waste.

The Draft PEIS is scheduled to be published in the fourth quarter of 1994. The Final PEIS will be issued after a public comment period, at or near the time of submission of the Final Proposed STPs to the states or EPA for approval. To remain flexible and accommodate potential changes after submitting the Final STPs to the states and EPA, the PEIS Record of Decision for mixed waste will be issued after the appropriate regulatory agency approves the Plans.

Compliance Agreements

There are currently no compliance agreements in place that are applicable to the treatment of mixed waste at SNL/NM.

Mixed Waste RCRA Permit

SNL/NM is applying for a hazardous waste permit under RCRA, as amended, to allow for the storage and treatment of mixed radioactive and hazardous wastes. In August 1990, SNL/NM submitted a RCRA Part A permit application (interim status) to the NMED for the storage and limited treatment of mixed waste. In October 1992, a permitting strategy in the form of a Letter Agreement was submitted to the NMED for the SNL/NM mixed waste Part B permit application. The Part B permit application was submitted to the NMED on November 8, 1992 and amended on August 25, 1993. An additional amended application will be submitted in 1994.

The 1994 permit application amendment will add any necessary additional treatment processes identified in this DSTP that will ensure a comprehensive coverage of all mixed wastes expected to be managed at SNL/NM.

DOE/AL Mixed Waste Treatment Plan

DOE/AL developed a plan that uses the resources of nine sites within the AL complex to implement an effective program for treating mixed waste that minimizes time and cost. Specifically, this plan offers resources outside those of individual sites that can be used to create treatment capacity through the use of portable treatment units, off-site treatment capacity, and the ability to survey some of the waste out of the radioactive designation. The preferred options identified in this Draft Plan are a part of the DOE/AL Mixed Waste Treatment Plan.

2.0 METHODOLOGY

The following sections discuss the approach that SNL/NM has adopted for identifying mixed waste treatability groups, prioritizing waste streams, and performing a preliminary screening of the options. Because SNL/NM is a research and development facility, the mixed waste streams generated are small and highly variable. Therefore, the process of identifying treatment requirements and implementing mixed waste treatment will be an ongoing process. Additional options may be identified and evaluated as treatment facilities come on-line, as new technologies become available, and as additional waste streams or treatability groups are generated.

2.1 Assumptions

All sites used the following assumptions to provide for a degree of consistency in the preparation of the Draft STPs. The assumptions were developed as a part of the "Draft Site Treatment Plan Development Framework" and reflect review and comment from the states and EPA.

1. High-level waste will continue to be managed according to current plans at each site (i.e., Hanford, West Valley, Savannah River, INEL). Primarily due to potential safety concerns, HLW will not be transported off-site except as a treated, stable waste that is ready for disposal. The DSTPs will not change management strategies for HLW.

2. Regarding defense related TRU Waste, the DSTPs will reflect DOE's current strategy that the Waste Isolation Pilot Project (WIPP) will open for disposal and receive a No Migration Variance. The DSTPs should identify characterization, processing, and treatment of TRU waste to meet the WIPP Waste Acceptance Criteria. Consistent with this policy, treatment of mixed TRU waste to meet Land Disposal Restriction (LDR) standards will not be included in the DSTPs at this time.

   However, the STPs will recognize that DOE's policy regarding WIPP is under review and may change in the future. As such, the STPs will provide for the flexibility to modify activities and milestones regarding TRU waste to reflect potential future changes in DOE policy.

   Under current DOE policy, non-defense related TRU waste will not be disposed at WIPP. As such, the DSTPs should reflect LDR treatment of non-defense mixed TRU waste.

3. DOE recognizes some states' preference for treatment of all wastes on-site. Where appropriate, existing on-site capacity will be utilized before new facilities are constructed. When on-site treatment or use of commercial or mobile facilities is not practicable, the use of existing off-site capacity, as well as the construction of new facilities, will be considered.

4. Sites in the same state will investigate the practicality of consolidated treatment facilities.

5. Mixed waste resulting from Environmental Restoration (ER) and Decontamination and Decommissioning (D&D) activities will be factored into planning activities and equity discussions, particularly where utilization of facilities identified in the DSTPs are being considered for managing ER and D&D waste.

6. The DSTP will address all wastes in the updated Mixed Waste Inventory Report (MWIR). Any changes/corrections to the MWIR waste stream and treatment facility information will be explained in the DSTP.

7. On a volume basis, the large majority of DOE's mixed waste will be treated on-site. Because of transportation concerns and costs, this generally includes process waste water, and some explosives and remote-handled wastes. In addition, other large volume waste streams will generally be treated on-site. At a minimum, Richland (RL), Oak Ridge (OR), Idaho (ID) and Savannah River (SR) will have on-site facilities to treat the majority of their wastes.

8. The Environmental Management Programmatic Environmental Impact Statement (PEIS) is being prepared in parallel with the development of the STPs. The DSTP process will provide information to the PEIS. Each site will prepare any necessary specific NEPA documentation before proceeding with a given project or facility ordered by the State or EPA as a result of the STP process.

9. In support of DOE's cradle-to-grave waste management philosophy, disposal site location and criteria will be factored into state equity discussions, waste treatment facility designs, and the characteristics of the final waste forms.

Specific assumptions and activities or processes that apply to the SNL/NM mixed waste treatment program and this DSTP include the following:

1. Efforts will be made to obtain on-site treatment if possible. SNL/NM will also perform a number of treatability studies to identify potential on-site treatment technologies. The performance of these treatability studies include SNL/NM developing treatment capability and expertise for those wastes that cannot be shipped off-site (e.g., radioactive explosive wastes). An evaluation will then be performed to identify permitting and facility requirements for on-site treatments. However, because a number of the SNL/NM mixed waste streams are very small in volume and may not be generated again (e.g., explosives and pyrophoric radioactive wastes), full-scale treatment may not be necessary for all waste streams or treatability groups. The results of the treatability studies will then be available for application to future waste streams at SNL/NM or other DOE sites.

2. Technology options have been identified in this plan based on whether they can be used to treat the waste to standards required by the RCRA LDR requirements provided in 40 CFR 268. However, the primary goals for treatment of SNL/NM's mixed waste are (1) removal of the waste from RCRA regulation through destruction of hazardous constituents, removal of the hazardous characteristic, or treatment to below the levels specified for the Toxicity Characteristic Leaching Procedure (TCLP) constituents and (2) reduction of waste volume. For inherently hazardous waste, such as elemental mercury, the primary goal will be achieving compliance with LDR.

3. Waste streams included in this plan are the same as those included in Phase I of the Final MWIR (DOE, 1994b). However, a description of the waste matrix (physical form) has been added to facilitate the identification of treatability groups. Changes to the MWIR waste stream data are explained in Section 3.0.

4. Mixed waste generated by the ER Program activities will be managed in a manner that is consistent with enforceable cleanup agreements. The SNL/NM ER Program is being performed under a Hazardous and Solid Waste Amendments (HSWA) permit that will outline the corrective action or cleanup processes at specific sites at SNL/NM. Therefore, this plan will not address treatment technologies for ER-generated waste until the program progresses and additional information is available concerning the types and quantities of waste that will be generated.

5. There are no existing compliance agreements related to the treatment of mixed waste at SNL/NM.

6. Multiple technology options are not identified for every waste stream or treatability group. For example, the treatment requirement for elemental mercury is technology-based amalgamation, so additional options have not been identified.

7. Off-site treatment facilities that are operational have been identified as off-site facility options.

8. Waste management activities will comply with all applicable Federal and State of New Mexico regulations (that is, DOE Orders, NEPA, National Emissions Standards for Hazardous Air Pollutants, and so forth). Variances, exemptions, and waivers provided for in regulations are available when regulatory criteria are met.

9. SNL/NM will be able to use available commercial facilities.

10. This plan was prepared based on currently available information. Any additional characterization data that becomes available or new waste streams generated will be presented in subsequent treatment plans. The STPs will be updated periodically to reflect treatment needs of newly generated or characterized waste.

11. This plan was prepared based upon the DOE/AL Mixed Waste Treatment Plan (DOE, 1994a), which outlines the preferred treatment option for each waste stream within the DOE/AL complex and the treatment assignments for each site. The DOE/AL Mixed Waste Treatment Plan requires that sites work with and depend on one another for meeting schedules to develop and implement treatment technology. The responsibility for the liability associated with the DOE/AL plan and this DSTP will be with the DOE/AL Operations Office.

2.2 Preferred Option Selection Process

The DOE/AL Operations Office used DOE/Headquarters (DOE/HQ) framework of selecting mobile and commercial treatments as preferred options and therefore did not have to do further analysis (see Attachment 1 of this Background Volume). To accomplish this, the Field Office created the Treatment Selection Team (TST) to augment site resources. This framework establishes a recommended methodology for narrowing the alternatives presented in the CSTPs to the preferred options in the DSTPs. Waste streams are identified so that state agencies and DOE can readily agree on a preferred treatment option. These would presumably include use of existing on-site facilities, cost effective treatment of low volume waste streams by using bench scale or mobile treatment units, and use of commercial facilities.

The remaining waste streams were then analyzed for both on-site and off-site treatment scenarios. These are the waste streams that are expected to be the focus of equity discussions and negotiations with the States. This process balanced technical performance and cost considerations with less quantifiable characteristics, like equity and regulator/public acceptance.

The TST, made up of representatives from throughout the DOE/AL, prepared a plan. The standard general engineering approach was used to develop the plan:

- define the problem,
- determine what is given to work with,

- determine a basis for solution, and
- solve the problem.

The team visited all nine DOE/AL sites to collect information on waste and site capabilities. Waste data was recorded, and the waste was categorized according to common treatment approaches. Information also was gathered on off-site treatment capacity, treatment technologies, and regulations affecting treatment. Each site is responsible for negotiating an STP with its State agencies.

The wastes were first separated into waste categories: gases, aqueous liquids, organic liquids, solids, and mercury wastes. The waste categories were then subdivided into waste streams based on characteristics that impact treatment. The waste streams were further subdivided into substreams. Finally, the substreams were grouped based on a common base treatment, creating the treatability groups. These appear in Table 2-1. Each treatability group identified in Table 2-1 is contact handled (CH), low-level wastes (LLW). Until additional characterization data is available, it is assumed that the level of alpha activity is less than 10 nCi/g for each of these treatability groups.

Alternate treatment options were rated for each waste group using the following criteria. The treatment option should:

- meet LDR standards and all other regulations, be permittable, and be acceptable to the public;
- be safe to workers, the public, and the environment;
- minimize risk and show high potential for being implemented in a timely, cost-effective manner;
- be simple, reliable, and easy to implement and operate;
- be scalable to meet expected volumes;
- minimize volume and toxicity of secondary waste and not preclude treatment for final disposition.

Treatment options that rated highly, or for which there were no practical alternatives, were used to formulate the plan of action to create sufficient treatment capacity for the waste. The methodology resulted in the selection of sound technologies with wide applications. Individual sites were given the actions to bring those treatment technologies on line, thus creating interdependence among the sites to achieve mixed waste treatment. The Draft Site Treatment Plan Cost Estimate (Attachment 2) provides a level of consistency in the cost information by providing common cost assumptions for those selected treatment technologies.

2.3 Coordination with Regulatory Agencies and Other Stakeholders

The FFCAct offers an opportunity for DOE and the state and EPA regulators who will be approving the Plans to work cooperatively toward defining mixed waste treatment plans. As requested by the states, DOE signed a cooperative agreement in August 1993 with the National Governor's Association (NGA) to facilitate the DOE-to-State interactions. To date, the NGA has sponsored several national meetings between DOE, the states, EPA, and the Indian Nations to discuss the development of the STPs. Two working groups have been formed to discuss technical

Table 2-1 SNL/NM Mixed Waste Treatability Groups

Treatability Group	*RCRA Codes*[a]	*Examples*[b]
Inorganic Debris (with an explosive component)	D003, D008, D011	Neutron generators, thermal batteries.
Inorganic Debris (with a water reactive constituent)	D003, D011	Lithium batteries, activated metallic sodium.
Reactive Metals	D001, D003, D007	Pyrophoric metal powders.
Elemental Lead	D008	Lead shielding, bricks, or pigs.
Aqueous Liquids	D002	Liquid acids or bases (pH ≤ 2.0 or ≥ 12.5).
Liquid Mercury	D009	Tritium-contaminated mercury from temperature and altitude chambers.
Organic Liquids	D001	Hazardous scintillation cocktails.
Organic Debris	D001, D002, D007, D008, F001, F003	Swipes, wipes, PPE, etc., contaminated with solvents or metals.
Inorganic Debris (with TCLP metals)	D002, D004-D009, D011, F001	Cadmium sheets or rods, circuit boards with lead or silver solder, batteries, cables, electronic devices, weapons components.
Heterogeneous Debris	F001, F003, D003, D008, D011, U144, U218	Contains both organic (combustible) and inorganic (non-combustible) debris.

a RCRA codes were identified based on information in Phase I of the Final MWIR (DOE, 1994b). Additional codes may be added or deleted in the future as additional information is obtained.

b Example wastes were identified based on information in Phase I of the Final MWIR (DOE, 1994b).

PPE = Personal Protective Equipment
RCRA = Resource Conservation and Recovery Act
TCLP = Toxicity Characteristic Leaching Procedure

issues related to treatment and disposal of mixed waste. NGA and the states have also reviewed and provided comment on the guidance documents discussed in Section 2.2.

The FFCAct requires the states and EPA to provide for public involvement after the Final Proposed Plans are submitted in February, 1995. DOE has provided additional opportunities for public input into the development of Draft STP through existing public involvement mechanisms at the site.

SNL/NM waste management staff, management, and DOE/Kirtland Area Office (DOE/KAO) and DOE/AL Operations Office staff have met with the NMED to review, discuss, and receive comments on the SNL/NM CSTP (SNL/NM 1993), the DOE/AL Mixed Waste Treatment Plan (DOE 1994a), and the DSTP Annotated Outline and preliminary SNL/NM Mixed Waste Treatment Plan preferred options summary. The comments received from the NMED on the CSTP were very positive and supportive of the outlined strategies. During subsequent discussions, NMED expressed concerns related to the off-site shipment of mixed waste for treatment and disposal at other DOE sites or commercial facilities, the use of treatability studies that are not required to be permitted, and the reliance on portable treatment units, for which there is presently no process for permitting or no permit reciprocity for units permitted in other states. These issues are being addressed within SNL/NM waste management planning and through DOE working groups.

Additionally, NMED expressed concern that the national program for treatment of mixed transuranic (TRU) waste is focused on treatment that meets the WIPP WAC, which, for the most part, presently follows the requirements of the Department of Transportation rather than those for RCRA LDR. This focus is consistent with the WIPP strategy for potential disposal in a deep geologic repository to be permitted as a miscellaneous unit with a "no migration" variance. This issue will not be addressed in this DSTP because it is of national significance and because it will have virtually no impact on SNL/NM's plans for treatment of mixed waste.

There were representatives of several other stakeholder groups included in informative sessions presented by representatives of the DOE/AL TST to the other DOE/AL sites and their regulators, DOE Headquarters, the NGA, and the Western Governors Association.

At the National level, DOE has presented information on the development of the STPs to the Environmental Management Advisory Board (EMAB) and will continue to provide information to the EMAB and other national stakeholder groups as the STPs are developed. Other national level stakeholder involvement may be conducted after submission of the Draft STPs.

2.4 Characterization of Mixed Wastes

2.4.1 Characterization Overview

Mixed waste that is currently generated at SNL/NM is characterized as it is generated, using sampling and analysis or relying on knowledge of the process, as appropriate. Planned facilities at SNL/NM for waste sampling include the RMWMF, which is expected to be operational in FY95. Limited on-site characterization consisting of nondestructive testing will be performed at the Waste Assay Facility, which is also scheduled for operation in FY95. Samples for radiochemical analysis are measured at on-site laboratories or are sent to contract laboratories. Samples for chemical analyses are sent to contract laboratories.

The characterization information available for the mixed waste addressed by this plan is generally based on knowledge of process with limited use of sampling and analysis for RCRA characterization. Because additional characterization may be required before the planned on-site facilities described above are available, characterization needs will be assessed for individual waste streams before the waste is shipped to off-site treatment facilities or before on-site treatability

studies are performed. It is anticipated that the information required to proceed with the activities described in this plan will consist primarily of specific radionuclide activity concentrations. This data will be obtained by utilizing existing on-site equipment, such as drum counters for the identification of beta- and gamma-emitting radionuclides and their associated concentrations, or by sampling wastes for off-site analysis at contract laboratories. When required, waste containers may be opened and sampled either at an existing SNL/NM facility or in portable, vendor-owned and operated structures.

It is planned that during FY95, a comprehensive review of the mixed waste inventory at SNL/NM will be performed. This review will begin with an administrative check of the Disposal Requests (DRs) that were submitted with the waste by the waste generator. The administrative check will include review for completeness, appropriateness, and accuracy of the DR information. Since most of the waste referred to by this Plan was generated and placed in storage in the 1989-1992 timeframe (before treatability groups were assigned), it is not physically identified by treatability groups, either by tagging or segregated storage, except where segregation was required for compatibility (e.g., explosives, liquids, etc.). The administrative check will be followed by a verification process that will require some physical sorting of the waste. It is hoped that repackaging of the waste (i.e., handling of the waste that requires opening waste packages) can be minimized by the comprehensive administrative check, thereby also minimizing personal exposure to radioactive waste. During the sorting process, it is expected that some wastes will be identified as not mixed. Verified mixed waste will be identified by treatability group consistent with this Plan. Waste that is verified as radioactive-only, hazardous-only, or solid waste will be managed appropriately. Waste streams or portions of waste streams that are deleted from the mixed waste inventory will be noted in future versions of the STPs.

Specific Sampling and Analysis Activities

Because of the variability of the waste generated and the desire not to produce additional mixed waste through extensive sampling and analysis, process knowledge is the primary method for characterizing mixed waste at SNL/NM. The chemical and radiological components of mixed waste that are well defined through Material Safety Data Sheets, manufacturers' data, in-house design or construction of components, written experimental procedures, or documented experimental results can be characterized by process knowledge. Process knowledge is obtained by applying knowledge of hazardous and/or radiological characteristics of the waste in light of the materials or the processes used. The federal regulations at Title 40 Code of Federal Regulations (CFR) 264.13 (a)(2) and 265.13(a)(2) allow for the use of existing published or documented data on hazardous waste or on hazardous waste generated from similar processes in waste characterization. SNL/NM requires that a written description of the mixed waste be certified as true and correct by an individual familiar with the specific process or through documentation of the experimental procedure that generated the waste. If process knowledge and existing data are inadequate to characterize a mixed waste, sampling and analysis of the hazardous and/or radiological component of the waste stream may be required.

Radiological, physical, and/or chemical waste analyses are performed on mixed low-level waste (1) to obtain waste composition data if a generating process changes or is suspected to have changed, (2) to determine the composition of an unknown waste, (3) to perform verification of process knowledge waste profiles, or (4) to certify that waste subject to RCRA LDRs meets the applicable treatment standards as established within the operating permit of the facility designated to receive the waste.

The Sampling and Analysis (S&A) process is initiated by the on-site waste generator with an S&A request form. The Sampling Team collects the samples, documents the collection, then transports the samples to the on-site laboratory for radiological screening. After the screening is complete,

the team packages and ships the samples to an off-site analytical laboratory for isotopic and/or chemical analyses.

All sampling performed in support of mixed waste management at SNL/NM is consistent with guidance found in Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition (EPA, 1986). The methods contained in SW-846 are applicable to the characterization of low-level mixed waste at SNL/NM. These methods, or the currently EPA-approved methods, are used to analyze mixed waste generated at SNL/NM.

The Sample Management Office (SMO) is the liaison between the on-site radiological laboratory, the Sampling Team, and the off-site analytical laboratory. The SMO receives data packages from the laboratory. After the SMO verifies and validates the data package, it is transmitted to the Project Leader for interpretation. The data package is then delivered to the Records Administrator for input to the S&A data base and to the Records Manager for storage.

2.4.2 Data Quality

The two major factors of the SNL/NM program that determine the degree of data reliability are documentation to ensure that analyses are traceable to the contents of specific waste containers and a Quality Assurance (QA) program that mandates the performance and documentation of laboratory analysis precision and accuracy.

The SNL/NM procedures for mixed waste sample collection ensure that analytical results can be attributed to specific containers of waste or specific sampling sites. The procedures used by SNL/NM for sample labeling, collection logs, and chain-of-custody are equivalent to those provided in EPA SW-846 (Test Methods of Evaluating Solid Waste, Physical/Chemical Methods). Adherence to these procedures is evaluated through QA and technical self-assessments. Pollution Prevention Department personnel are also trained on requirements defined in QA documents.

The QA/Quality Control (QC) program for laboratory analyses of mixed waste is designed to maintain high standards for the accuracy and precision of waste sample analysis. After the user determines the level of confidence that is required for the data, the performance, precision, and accuracy are adjusted to satisfy that confidence level. In addition, adherence to the QA/QC program provides the information needed to document the quality of the performance of the analytical systems, procedures, and personnel in the laboratory.

2.5 Waste Minimization

A formal waste minimization and pollution prevention awareness program was initiated at SNL/NM in 1989 to comply further with EPA regulations and DOE orders. This program addresses nonhazardous, hazardous, mixed, and radioactive wastes and aims to foster a cradle-to-grave philosophy to conserve resources and create a minimum of waste and pollution.

A Waste Minimization and Pollution Prevention Awareness Plan was completed in December 1991 and updated in December 1992 and May 1994. The plan addresses goals, activities, and methods that will be used to reduce the quantity and toxicity of waste and materials at all SNL/NM sites. Key elements of the Program are Chemical Information System (CIS) and the Cradle-to-Grave Tracking System. The CIS is a joint SNL/NM-SNL/California initiative to track all chemical purchases from the point of order to their arrival into and transfer from a chemical area. The cradle-to-grave tracking system links chemical purchase information with chemical usage and disposal information. Both of these systems allow assessment of the chemical usage at SNL and identification of laboratory-wide waste generation that could be minimized.

Specific to mixed wastes, SNL/NM has a process in place that requires all activities, projects, and programs that generate waste to obtain prior approval to generate radioactive or mixed waste if there is any possibility of generating radioactive or mixed waste. Each waste generator is responsible for planning and implementing waste minimization efforts that include the prevention or minimization of the waste generation rate or the amount, hazard, or radioactivity of the waste (materials substitution, good operating practices, etc.), as appropriate.

As a result of these waste minimization activities, it is anticipated that the base generation rates for 1993-1997 will be greatly reduced. For example, the generation rate for treatability group 10, Heterogeneous Debris, is expected to be minimized as a result of SNL/NM's waste minimization plan that requires the development of a waste management plan (per DOE order 5820.2A) and the proper sorting of waste materials prior to placement into containers.

In addition to SNL/NM's formal program for waste minimization, this DSTP identifies possible preferred options for recycling/reclaiming certain mixed waste treatability groups in place of mixed waste treatment options. This includes decontaminating radioactive lead solids and placing the decontaminated lead into SNL/NM's Lead Bank program for reuse and also, the possible triple distillation of SNL/NM's elemental mercury using a bench-top unit at LANL and eventually reusing the mercury within the DOE complex. These options allow for the reuse of the mixed waste streams as opposed to treating and eventual disposal of the mixed wastes.

3.0 MIXED LOW-LEVEL WASTE STREAMS

The mixed low-level wastes (MLLW) in the CSTP were identified based upon information submitted in the Interim MWIR (DOE, 1993b) using waste stream numbers from the Interim MWIR and waste inventories as of October 31, 1992. The MLLW identified in this DSTP are based upon data reported in Phase I of the Final MWIR (DOE, 1994b) using new waste stream numbers and for waste inventories as of December 31, 1992. In addition to the updated inventory numbers from October to December 1992, this DSTP reflects inventory changes as a result of a mixed waste shipment to Envirocare of Utah, Inc. for disposal in 1994. Therefore, Table 3-1 provides a summary of these changes, a correlation between the CSTP waste stream numbers and the DSTP waste stream numbers, and reported volumes by treatability group (TG). The total volume reported within this section by treatability group is reflected in the last line of each treatability group, under Adjusted DSTP Volume. Table 3-1 also provides a summary of the 1993 mixed waste inventory by volume and waste stream number that will be added to the DSTP at a later date. (This 1993 inventory information was not included in the Phase I update to the MWIR.)

3.1 Mixed Waste Streams for Which Technology Exists

Although there are currently no operational on-site mixed low-level waste treatment facilities at SNL/NM, plans are underway to develop some limited capabilities to ensure mixed low-level wastes can be treated to meet the LDR treatment standards using existing technologies. This development will proceed in two phases.

Phase I includes performing specific treatability studies in accordance with 40 CFR 261.4 (e) and (f), in which small volumes of SNL/NM's mixed wastes will be subject to the preferred treatment option(s) to determine:

- whether the mixed waste is amenable to the treatment process,
- what pretreatment may be required,
- the optimal process conditions needed to achieve the desired treatment standard,
- the efficiency of the treatment process, and/or
- the characteristics and volume of residues from a particular process and the available disposal capacity for a specific residue.

The results of these treatability studies will be shared with other DOE sites to determine the applicability of a specific technology to similar mixed waste streams. In addition, the results will be evaluated for long-term applicability to future generated mixed wastes at SNL/NM and the possibility of permitting such treatment options on-site.

Phase II includes participation in the DOE/AL Mixed Waste Treatment Plan (DOE, 1994a) to make use of portable treatment units developed by various DOE/AL sites for long-term applicability to mixed wastes that are generated at SNL/NM. The DOE/AL treatment plan also identifies the capability to survey and sort for radioactivity some of the wastes and thus determine if they can be appropriately removed from the mixed low-level waste inventory, using criteria from DOE Order 5400.5. In addition, participation in the DOE/AL treatment plan will include SNL/NM as the project manager to bring both the steam reforming and mercury retorting treatment capacities on-line as portable treatment units for waste streams within the DOE/AL complex.

Table 3-1. Summary Table
Mixed Waste Inventory

Note: DSTP Adjusted Volumes do not reflect 1993 waste streams since these waste streams were not reported in the MWIR. A six to seven digit number that begins with a year (900104-1) is SNL/NM's Disposal Request (DR) number, which is used for waste stream tracking.

Treatability Groups (TG)	CSTP & IMWIR Waste Stream Numbers (10/31/92)	MWIR Waste Stream Numbers (12/31/92)	April 1994 Envirocare Shipment	1993 Waste Stream Numbers
Inorganic Debris (with an explosive component) TG 1	2171 (900131-1)	W048	900131-1	None
	2141 (890052-1, 890053-1, 890054-1)	W018	890052-1, 890053-1, 890054-1	
	2174 (900174-1)	W051	900174-1	
	2189 (910065-1)	W066	910065-1	
	2205 (910156-1)	W081		
	2209 (910198-1)	W085		
	2214 (910255-1)	W090		
	2224 (910270-1, -2)	W100		
	2229 (910402-1)	W105		
	2260 (Neutron Generators in Manzanos)	W136		
Reported Volumes:	3.8 m^3 (including 2260)	3.8 m^3	1.4 m^3	0.0 m^3
Adjusted DSTP Volume:	2.4 m^3			
Inorganic Debris (with a water reactive constituent) TG 2	2165 (900104-1)	W042	900104-1	None
	2215 (910260-1)	W091	910260-1	
	2240 (920060-1)	W116	920060-1	
	2253 (920130-1)	W129		
	2210 (910223-1)	W086	910223-1	
	2198 (910113-1, -2)[a]	W075		
	2190 (910067-1)	W067	910067-1	
	2161 (900061-1)	W038		
[a]This waste stream was removed from inventory as a result of prematurely and incorrectly declaring the material a waste.				
Reported Volumes:	0.6 m^3 (including 2198)	0.6 m^3	0.56 m^3	0.0 m^3
Adjusted DSTP Volume:	0.04 m^3			

Table 3-1. Summary Table
Mixed Waste Inventory (continued)

Treatability Groups	CSTP & IMWIR Waste Stream Numbers (10/31/92)	MWIR Waste Stream Numbers (12/31/92)	April 1994 Envirocare Shipment	1993 Waste Stream Numbers
Reactive Metals TG 3	2197 (910110-1) 2200 (910124-1) 2254 (920150-1) 2223 (910265-1) 2202 (910151-1)	W074 W077 W130 W099 W079 W137 (920152-1) W138 (920154-1)		930293 930466 930467
Reported Volumes: Adjusted DSTP Volume:	0.02 m^3 0.02 m^3	0.02 m^3	0.0 m^3	0.01 m^3
Elemental Lead TG 4	2185 (910021-1) 2255 (920151-1) 2186 (910035-1)	W062 W131 W063		930162-1 930341-1
Reported Volumes: Adjusted DSTP Volume:	0.007 m^3 0.007 m^3	0.007 m^3	0.0 m^3	0.03 m^3
Aqueous Liquids TG 5	2195 (910106-1) 2228 (910304-1)	W072 W104		930022-1
Reported Volumes: Adjusted DSTP Volume:	0.01 m^3 0.01 m^3	0.01 m^3	0.0 m^3	0.01 m^3

Table 3-1. Summary Table
Mixed Waste Inventory (continued)

Treatability Groups	CSTP & IMWIR Waste Stream Numbers (10/31/92)	MWIR Waste Stream Numbers (12/31/92)	April 1994 Envirocare Shipment	1993 Waste Stream Numbers
Liquid Mercury TG 6	2194 (910103-1)	W071		None
Reported Volumes: Adjusted DSTP Volume:	30 ml 30 ml	30 ml	0.0 m^3	0.0 m^3
Organic Liquids TG 7	2130 (890014-1)	W007		930023-1 930024-1 930025-1 930026-1
Reported Volumes: Adjusted DSTP Volume:	0.01 m^3 0.01 m^3	0.01 m^3	0.0 m^3	0.02 m^3
Organic Debris TG 8	2152 (890107-1) 2150 (890104-1) 2136 (890035-1) 2162 (900062-1) 2183 (910015-1) 2188 (910048-1) 2138 (890037-1) 2125 (890002-1) 2172 (900144-1) 2133 (890018-1) 2256 (920305-1) 2193 (910097-1) 2160 (900060-2) 2173 (900154-1) 2126 (890006-1) 2137 (890036-1)	W029 W027 W013 W039 W060 W065 W015 W002 W049 W010 W132 W070 W037 W050 W003 W014		

Table 3-1. Summary Table
Mixed Waste Inventory (continued)

Treatability Groups	CSTP & IMWIR Waste Stream Numbers (10/31/92)	MWIR Waste Stream Numbers (12/31/92)	April 1994 Envirocare Shipment	1993 Waste Stream Numbers
Organic Debris (cont.)	2153 (890108-1)	W030		
	2149 (890103-1)	W026		
	2139 (890039-1)	W016		
	2177 (900186-2)	W054		
	2179 (900301-1)	W056		
	2180 (900302-1)	W057		
	2181 (900309-1)	W058		
	2182 (900312-1)	W059		
	2191 (910093-1, -2)	W068		
	2226 (910274-1)	W102		
	2227 (910303-1)	W103		
	2233 (920010-1)	W109	920010-1	
	2236 (920023-1)	W112		
	2238 (920024-2)	W114	920024-2[b]	
	2239 (920051-1)[c]	W115		
	2250 (920112-1)	W126	920112-1	
	2257 (920308-1)	W133		
	2148 (890101-1)	W025		
	2213 (910254-1)	W089	910254-1	
		W146 (920274-1)	920274-1	
				930278-1[d]
				930171-1
				930194-1
				930294-1[d]
				930192-1
Reported Volumes:	29 m^3	29.03 m^3	1.0 m^3	0.07 m^3
Adjusted DSTP Volume:	28 m^3			

b Only a portion of this waste stream was shipped to Envirocare of Utah, Inc.
c This waste stream was re-entered into the database with a new number 940061.
d These waste streams were shipped to Envirocare of Utah, Inc.

Table 3-1. Summary Table
Mixed Waste Inventory (continued)

Treatability Groups	CSTP & IMWIR Waste Stream Numbers (10/31/92)	MWIR Waste Stream Numbers (12/31/92)	April 1994 Envirocare Shipment	1993 Waste Stream Numbers
Inorganic Debris (with TCLP metals) TG 9	2163 (900063-1)	W040	900063-1	
	2154 (900011-1)	W031	900011-1	
	2142 (890067-1)	W019	890067-1	
	2132 (890016-1)	W009	890016-1	
	2199 (910115-1)	W076		
	2206 (910171-1)	W082		
	2207 (910172-1)	W083	910172-1	
	2208 (910193-1)	W084	910193-1	
	2231 (920001-1)	W107	920001-1	
	2243 (920084-1)	W119		
	2244 (920085-1)	W120		
	2234 (920015-1)	W110		
	2245 (920106-1)	W121		
	2246 (920106-2)	W122		
	2167 (900119-1)	W044	900119-1	
	2166 (900118-1)	W043		
	2164 (900097-1)	W041	900097-1	
	2143 (890074-1)	W020		
	2145 (890085-1)	W022		
	2146 (890086-1)	W023	890086-1	
	2147 (890093-1)	W024	890093-1	
	2159 (900060-1)	W036		
	2157 (900041-1)	W034	900041-1	
	2158 (900047-1)	W035	900047-1	
	2155 (900036-1)	W032	900036-1[e]	
	2170 (900128-3)	W047		
	2169 (900128-2)	W046		
	2168 (900128-1)	W045	900128-1[e]	
	2127 (890007-1)[l]	W004	890007-1	
	2175 (900179-1)	W052	900179-1	
	2176 (900186-1)	W053		
	2178 (900186-3)	W055		
	2187 (910041-1)	W064	910041-1	

Table 3-1. Summary Table
Mixed Waste Inventory (continued)

Treatability Groups	CSTP & IMWIR Waste Stream Numbers (10/31/92)	MWIR Waste Stream Numbers (12/31/92)	April 1994 Envirocare Shipment	1993 Waste Stream Numbers
Inorganic Debris (with TCLP metals) TG 9 (cont.)	2201 (910141-1)	W078	910141-1	
	2204 (910154-1)	W080		
	2211 (910240-1)	W087	910240-1	
	2212 (910244-1, 245-1)	W088	910244-1	
	2216 (910261-1)	W092		
	2217 (910261-2)	W093		
	2218 (910262-1, -2, -11, 910264-1)	W094		
	2219 (910262-3)	W095		
	2220 (910262-4)	W096		
	2221 (910262-5, -6, -7, -8, -10, -12)	W097		
	2222 (910262-9)	W098		
	2225 (910272-1)	W101		
	2230 (910406-1)	W106		
	2235 (920021-1)	W111	920021-1[e]	
	2237 (920024-1)	W113	920024-1[e]	
	2196 (910109-1)	W073		
	2241 (920065-1, -2, -3)	W117		
	2242 (920066-1)	W118	920066-1	
	2251 (920124-1, 125-1, 126-1, 127-1)	W127	920124-1, 125-1, 126-1, 127-1	
	2252 (920128-1, 129-1)	W128	920128-1, 129-1	
	2232 (920009-1, 12-1, 13-1)	W108	920009-1, 12-1[e], 13-1	
	2248 (920106-4)	W124		
	2249 (920106-5)	W125		
	2247 (920106-3)	W123		
	2192 (910095-1)	W069	910095-1[e]	
		W139 (920175-1)		
		W140 (920220-1)	920220-1	
		W141 (920236-1)		
		W142 (920237-1)	920237-1	
		W143 (920239-1, 240-1, 242-1, 243-1, 244-1)		

Table 3-1. Summary Table
Mixed Waste Inventory (continued)

Treatability Groups	CSTP & IMWIR Waste Stream Numbers (10/31/92)	MWIR Waste Stream Numbers (12/31/92)	April 1994 Envirocare Shipment	1993 Waste Stream Numbers
Inorganic Debris (with TCLP metals) TG 9 (cont.)		W144 (920241-1) W145 (920273-1) W148 (920432-1)	920273-1	
				930133-1[f] 930134-1[e] 930136-1[f] 930137-1[f] 930138-1[f] 930141-1[f] 930142-1[f] 930169-1 930277-1 930279-1 930280-1[f] 930302-1[e] 930304-1 930305-1[e] 930349-1 930372-1 930373-1[e] 930438-1[e] 930524-1 930526-1 930528-1[f]
Reported Volumes:	7 m^3	7.2 m^3	2.2 m^3	2.0 m^3
Adjusted DSTP Volume:	5.0 m^3			

e Only a portion of these waste streams were shipped to Envirocare of Utah, Inc.
f These waste streams were shipped to Envirocare of Utah, Inc.

Table 3-1. Summary Table
Mixed Waste Inventory (continued)

Treatability Groups	CSTP & IMWIR Waste Stream Numbers (10/31/92)	MWIR Waste Stream Numbers (12/31/92)	April 1994 Envirocare Shipment	1993 Waste Stream Numbers
Heterogeneous Debris TG 10	2156 (900036-2) 2151 (890106-1) 2144 (890083-1) 2140 (890040-1) 2135 (890020-1) 2134 (890019-1) 2131 (890015-1) 2128 (890008-1, 9-1, 10-1) 2129 (890011-1) 2184 (910017-1)	W033 W028 W021 W017 W012 W011 W008 W005 W006 W061 W147 (920428-1)	900036-2[g] 890083-1	None
[g] Only a portion of this waste stream was shipped to Envirocare of Utah, Inc.				
Reported Volumes: Adjusted DSTP Volume:	28 m^3 26 m^3	28 m^3	2.0 m^3	0.0 m^3
Soils, < 50% Debris				930113-1 930114-1
Reported Volume:	0.0 m^3	0.0 m^3	0.0 m^3	0.4 m^3
Miscellaneous Liquid Lab Chemical				930021-1
Reported Volume:	0.0 m3	0.0 m3	0.0 m^3	0.002 m^3
Inorganic Particulates with TCLP metals				930209-1 930258-1 930535-1 930401-1
Reported Volume:	0.0 m^3	0.0 m^3	0.0 m^3	0.0001 m^3

This approach provides SNL/NM with the flexibility both to address the immediate need to identify and implement, where appropriate, treatment for the mixed wastes that are currently in storage and to have access to and to participate in the development of long-term treatment capacity. The cooperative efforts among the DOE/AL sites will minimize the time and costs associated with each site developing its own treatment capacity for its mixed wastes.

The following sections discuss SNL/NM's mixed waste treatability groups and the preferred option for treating the waste in each treatability group. The preferred treatment options SNL/NM has identified in the following sections for mixed waste in storage as of December 31, 1992, were selected both from a treatment technology standpoint and from the facility or location standpoint. The primary on-site treatment facility that was identified is the RMWMF, which is expected to be operational in FY95. Treatments included in the EA for this facility are compaction, solidification of liquids, stabilization of powders and particulates, and pH neutralization (DOE, 1993a). Other RCRA permitted locations may be considered if special needs are identified, such as in Operating Procedures or Health and Safety Plans that will be products of treatability studies in progress or planned.

With the exception of the compactors, no treatment equipment has been purchased or installed at the RMWMF, and no capacities for LDR-driven treatments are currently available. (Because of this, the RMWMF was not included as an existing facility in Table 8.2 of the CSTP.) SNL/NM anticipates that equipment needs will be identified once the treatability studies for inorganic debris with an explosive component, aqueous liquids, and reactive metals are concluded. In addition to equipment purchases, it will be necessary to perform the following steps before the RMWMF can operate:

- Title II design for the RMWMF construction upgrades will need to be completed.
- A National Emissions Standards for Hazardous Air Pollutants (NESHAPs) analysis will have to be performed and a permit obtained, if necessary.
- An Operational Safety Review will need to be performed.
- The Safety Assessment (SA) will need final approval.

The characterization information available for these mixed wastes is generally based on knowledge of process, with the exception of radioactivity level (contact-handled or remote-handled), which is measured using hand-held survey instruments wherever appropriate. In general, this information is adequate for identifying treatment options because the treatability groupings were based in part on the physical/chemical matrix of the individual waste streams. SNL/NM's knowledge of the components of the waste streams is often derived from the on-site design and/or construction of the components. However, additional characterization information may be required to satisfy the WAC at individual disposal sites. These information needs will be considered during the implementation of treatability studies or treatments.

The following SNL/NM mixed waste treatability groups are discussed in Sections 3.1.1 through 3.1.10, respectively. Each Section includes the preferred option for treating each treatability group.

3.1.1 TG1: Inorganic debris (with an explosive component)

3.1.2 TG2: Inorganic debris (with a water reactive constituent)

3.1.3 TG3: Reactive metals

3.1.4 TG4: Elemental lead

3.1.5 TG5: Aqueous liquids

3.1.6 TG6: Elemental mercury

3.1.7 TG7: Organic liquids

3.1.8 TG8: Organic debris

3.1.9 TG9: Inorganic debris (with TCLP metals)

3.1.10 TG10: Heterogeneous debris

For treatability groups 8 and 9, specifically Sections 3.1.8 and 3.1.9, the preferred treatment options are based on the "debris rule," per EPA's hazardous debris regulations under 40 CFR 268.45. This approach allows SNL/NM the choice of treating to the waste specific treatment standards (shown in Tables 3-18 and 3-20) **or** to use a debris rule technology (i.e., extraction, destruction, or immobilization type technologies) as identified by EPA. In addition, by following the LDR treatment standards for hazardous debris and using an extraction technology (thermal desorption on organic debris treatability group 9), the treated waste would no longer be regulated as a mixed waste but as a low-level radioactive waste. This approach would therefore reduce the overall cost of mixed waste disposal to the cost of low-level radioactive waste disposal.

In developing the capability to treat mixed wastes, SNL/NM may include the use of the following types of facilities:

- existing off-site facilities to perform treatability studies,
- existing on-site facilities to perform treatability studies,
- commercial facilities for treatment and/or disposal,
- on-site facilities in the construction stage but not yet operating and on-site facilities being brought into operational status, and
- on-site facilities to be upgraded as necessary to accommodate portable treatment units.

Table 3-2 shows a summary of the SNL/NM treatability groups and the plan for the preferred treatment options, pretreatment, treatment facilities, and treatability studies or characterization as may be necessary.

3.1.1 Treatability Group 1: Inorganic Debris (with an Explosive Component)

Table 3-3 presents the waste streams as reported in the Final MWIR that make up the inorganic debris (with an explosive component) treatability group and identifies the volume and RCRA hazardous waste codes currently associated with each waste stream.

It is anticipated that additional process knowledge characterization of the waste addressed by this treatability group will identify a small portion of the waste streams as other than mixed, either because they are not radioactive or because they do not contain hazardous contaminants regulated under RCRA. Those wastes will be recharacterized as either hazardous or radioactive only and will not be considered for treatment under this plan as mixed waste.

Table 3-2. SNL/NM Mixed Waste Preferred Treatments

Treatability Group #	Description	Volume* (m^3)	Preferred Treatment Option	Pretreatment On-Site	On-Site Treatment Teams	Off-Site Location	Treatability Study or to Characterize
#1	Inorganic Debris (with an explosive component): Neutron generators, thermal batteries	2.4 (including 2.0 for neutron generators)	Chemical Deactivate	Separation-NGs	TBD		On-Site FY94
#2	Inorganic Debris (with a water reactive constituent): Lithium batteries, activated metallic sodium	0.04	Chemical Deactivate	Sort, Survey, and Decon	TBD SNL/SEG and GJPO Team		On-Site/TBD
#3	Reactive Metals: Pyrophoric metal powders	0.02	Chemical Deactivate		LANL U Chips Skid		On-Site FY94
#4	Elemental Lead: Lead shielding, bricks, or pigs	0.007	Macroencapsulate	Lead Program Decon Skid	Pantex Skid SNL LANL		SNL/TBD
#5	Aqueous Liquids: Liquid acids or bases (pH $\leq$ 2.0 or $\geq$ 12.5)	0.01	Neutralization and Stabilization		SNL		On-Site FY94
#6	Elemental Mercury: Tritium-contaminated mercury from temperature and altitude chambers	0.00003 (30 ml)	Amalgamate	Triple Distillation/ Recycle	Pinellas Skid	LANL Bench-Top unit	On-Site Vendor to characterize/TBD
#7	Organic Liquids: Hazardous scintillation cocktails	0.01	Incineration	Bulking		DSSI	
#8	Organic Debris: Swipes, wipes, PPE, etc. Contaminated with solvents or metals	28.0	Thermal Desorption Steam Reform		GJPO Skid or SNL SNL		GJPO/FY94 or SNL SNL

Continued on next page

Table 3-2. SNL/NM Mixed Waste Preferred Treatments (Concluded)

Treatability Group #	Description	Volume* (m^3)	Preferred Treatment Option	Pretreatment On-Site	On-Site Treatment Teams	Off-Site Location	Treatability Study or to Characterize
#9	Inorganic Debris (with TCLP metals): Cadmium sheets or rods, circuit boards with lead or silver solder, batteries, cables, electronic devices, weapons components	5.0	Macroencapsulate	Sort, Survey, and Decon	Pantex Skid or On-Site Vendor SNL/SEG or GJPO Team	Envirocare	Envirocare SNL or On-Site Vendor
#10	Heterogeneous Debris: Contains both organic (combustible) and inorganic (non-combustible) debris	26.0		Sort/Reclassify into treatability groups, such as TG8 or TG9			SNL or On-Site Vendor

*Based on Mixed Waste Inventory Report, Phase 1 and Shipment of wastes for disposal at Envirocare of Utah, Inc.

Table 3-3. Treatability Group 1: Inorganic Debris (with an Explosive Component)

MWIR Waste Stream Number[a]	RCRA Waste Code	Volume
W081	D003, D008, D011	0.06 m^3
W085	D003, D008, D011	0.13 m^3
W090	D003, D008, D011	0.03 m^3
W100	D003, D008, D011	0.002 m^3
W105	D003, D008	0.14 m^3
W136[b]	D003	2.0 m^3

Total Volume = 2.4 m^3
(Total Mass[c] = 50 kg)

a Waste streams W048, W018, W051, and W066 were previously reported in the MWIR and in the CSTP. These waste streams were disposed of at Envirocare of Utah, Inc. in April 1994 and therefore have been removed from this inventory.

b Neutron generators currently stored in the Manzanos. Mass value is not available for this waste stream and is not included in the total.

c The total mass does not include the mass for W136, since this value is not available.

3.1.1.1 Description of Technology and Capacity Needs

Table 3-3 includes the volumes associated with the inorganic debris (with an explosive component) treatability group in inventory as of December 31, 1992 at SNL/NM. The LDR treatment standards for the hazardous waste codes associated with this treatability group are a combination of concentration-based standards and required technology for nonwastewater forms of this treatability group.

The rate of generation for waste streams that fit into this treatability group in 1992 and 1993 was 0 m^3/yr. Based upon the changing mission at SNL/NM, an anticipated rate of generation per year that can be associated with a needed treatment capacity cannot be calculated. The total volume of this treatability group in storage, accumulated from 1989-1992, was 3.8 m^3 before the April 1994 shipment of 1.4 m^3 for disposal, which reduced the storage volume to 2.4 m^3, as identified in Table 3.3. Therefore, considering generation rates since 1989, the treatment capacity needed to treat this treatability group is less than 1.0 m^3/yr.

Based upon the identified LDR treatment standards identified in Table 3-4, this treatability group has one required technology, which is deactivation of the explosive component of the wastes. The preferred option for deactivating this treatability group is discussed in Section 3.1.1.2.

The LDR treatment standards for the metal portion (D008 and D011) of this treatability group are concentration-based standards, and the technology used to treat this portion of the waste must demonstrate compliance with the 5.0 mg/l constituent concentration in the waste extract (CCWE). The preferred treatment option for this portion of the waste will be addressed under Section 3.1.9 with the treatability group inorganic debris (with TCLP metals). Treatment for the metal constituents of this waste will be performed on the residue after the waste is deactivated.

For a portion of this treatability group, which is the neutron generators (MWIR waste stream number W136, 2.0 m^3), only a pretreatment of the neutron generators is anticipated; therefore no mixed waste treatment has been identified in Section 3.1.1.2 or in the projected treatment capacity needed for this treatability group. Currently, neutron generators stored as a single component are managed as a mixed waste because of the presence of tritium and an explosive component. The preferred option associated with neutron generators currently stored at SNL/NM is to perform a mechanical pretreatment process to separate physically the explosive portion of the unit from the radioactive portion, using a machine that is being built at SNL/NM. Each portion of the neutron generator will then be managed separately as either a low-level waste or as hazardous waste.

Table 3-4. LDR Treatment Standards and Technologies for Inorganic Debris (with an Explosive Component)

RCRA Code	LDR Treatment Standard*	Type of Technology
D003 (Reactive)	Technology-based	Deactivation (other than dilution)
D008 (Lead)	Concentration-based (5.0 mg/l CCWE)	BDAT is Stabilization
D011 (Silver)	Concentration-based (5.0 mg/l CCWE)	BDAT is Stabilization

BDAT: Best Demonstrated Available Technology
CCWE: Constituent Concentration in the Waste Extract
* Per 40 CFR Part 268, Subpart D

3.1.1.2 Preferred Treatment Option – Chemically Deactivate

The preferred treatment option associated with this treatability group, in inventory as of December 31, 1992 at SNL/NM, is to deactivate the explosive component chemically. A treatability study was initiated in FY94 involving a bench-scale study that is being performed in an available laboratory at SNL/NM. The purpose of the treatability study is to explore a mechanism for inerting the energetic materials and determine the optimal process conditions in order that the residual radioactive material can be handled in safe manner. There is currently no treatment capacity available for treating explosive radioactive mixed waste.

The destruction of the materials of concern will be carried out in a high temperature oven capable of achieving a temperature of ~340°C. The energetic materials are to be destroyed by inducing thermal reactions in the materials while they are fully contained within a purged heavywall vessel. It is expected that the results of this study will be available in FY95. The performance of this study includes preparing Operating Procedures, characterizing the waste as necessary, addressing NEPA issues, notifying NMED of the planned study, preparing a Health and Safety Plan, performing the study, and evaluating the results.

The long-term treatment of this treatability group will be addressed based upon the results of the study. It is expected that SNL/NM's Permission to Generate process should limit future generation of this waste stream until adequate treatment facilities can be located. It is anticipated that the technology used to treat this treatability group will be implementable at the RMWMF. However, it is necessary to complete the treatability study and to evaluate the results to identify

health and safety requirements and equipment needs. Therefore, a facility appropriate for the long-term treatment of these types of wastes will not be identified until the treatability study is completed.

The budget status of the treatability study is at a level to maintain work in progress through FY94. Continued funding for this activity in FY95 is not certain. The study results will be reviewed at the end of FY94. If there is work scope required in order to achieve confident results, the study will receive priority consideration for FY95.

3.1.2 Treatability Group 2: Inorganic Debris (with a Water Reactive Constituent)

Table 3-5 presents the waste streams as reported in the Final MWIR that make up the inorganic debris (with a water reactive constituent) treatability group and identifies the volume and RCRA hazardous waste codes currently associated with each waste stream.

Table 3-5. Treatability Group 2: Inorganic Debris (with a Water Reactive Constituent)

MWIR Waste Stream Number[a]	RCRA Waste Code	Volume	
W129	D003	0.008	m^3
W038	D003, D011	0.03	m^3
		Total Volume = 0.04 m^3	
		Mass = 47 kg	

[a] Waste streams W042, W091, W116, W086, and W067 were previously reported in the MWIR and in the CSTP. These waste streams were disposed of at Envirocare of Utah, Inc. in April 1994 and therefore have been removed from this inventory. Waste stream W075 was also previously reported as a mixed waste in the MWIR and CSTP. This waste stream has been removed from this inventory because it was prematurely and incorrectly declared a waste.

This treatability group currently contains two waste streams that consist of thermal batteries, activated metallic sodium, and other metal pieces including silver foil and lead solder. The thermal batteries may have surface contamination and contain three components that classify the battery as a flammable solid under the Department of Transportation (DOT) regulations and as a reactive hazardous waste under RCRA. The three components include an anode, heat powder pellets, and heat paper. Once the battery is fired or used, the heat powder pellets and heat paper are expended and are no longer reactive hazardous wastes. However, the anode still contains lithium after the battery is fired and is thus considered a reactive hazardous waste.

SNL/NM's knowledge of the physical/chemical matrix of these waste streams is derived from on-site design and/or construction and from performing a variety of engineering tests using these components, specifically the thermal batteries. However, additional process knowledge characterization information may be required to satisfy the WAC at individual disposal sites. These additional information needs will be considered during the implementation of treatability studies or treatments.

It is anticipated that additional process knowledge and radioactive surveying characterization of the waste addressed by this treatability group will identify some waste streams as other than mixed waste, either because they are not radioactive or because they do not contain hazardous contaminants regulated under RCRA. Those wastes will be recharacterized as either hazardous or radioactive only and will not be considered for treatment under this plan as mixed waste.

3.1.2.1 Description of Technology and Capacity Needs

Table 3-5 includes the volumes associated with the inorganic debris (with a water reactive constituent) treatability group in inventory as of December 31, 1992, at SNL/NM. The LDR treatment standards for the hazardous waste codes associated with this treatability group are a combination of concentration-based standards and required technology for nonwastewater forms of this treatability group.

The generation rate for waste streams that fit into this treatability group was approximately 0.01 m^3/yr in 1992 and 0 m^3/yr in 1993. The total volume of this treatability group in storage, accumulated from 1989-1992 was 0.6 m^3 before the April 1994 shipment of 0.56 m^3 for disposal, which reduced the storage volume to 0.04 m^3, as identified in Table 3-5. Therefore, considering generation rates since 1989, the treatment capacity needed for this treatability group is much less than 1.0 m^3/yr.

Based upon the LDR treatment standards identified in Table 3-6, this treatability group has one required technology, which is deactivation of the reactive component of the wastes. The preferred option for deactivating this treatability group is discussed in Section 3.1.2.2.

Table 3-6. LDR Treatment Standards and Technologies for Inorganic Debris (with a Water Reactive Constituent)

RCRA Code	LDR Treatment Standard*	Type of Technology
D003 (Reactive-Water)	Technology-based	Deactivation (other than dilution)
D011 (Silver)	Concentration-based (5.0 mg/l CCWE)	BDAT is Stabilization

CCWE: Constituent Concentration in the Waste Extract
* Per 40 CFR Part 268, Subpart D

For a portion of this treatability group, which is thermal batteries with radioactive surface contamination (MWIR waste stream number W129), no required mixed waste treatment is anticipated and has not been identified under Section 3.1.2.2, because the radioactive portion may be decontaminated. Therefore, the first activity associated with this treatability group will be to sort the various waste streams and to determine the radioactivity level of each waste by using hand-held survey instruments. Based upon the results of this survey, certain wastes will be decontaminated to remove their radioactive portions and then managed as hazardous wastes. This activity will be performed on the wastes using on-site existing laboratory space and equipment.

The LDR treatment standard for the metal portion (D011) of this treatability group (waste stream W038, 0.03 m^3) is a concentration-based standard, and the technology used to treat this portion of

the waste must demonstrate compliance with the 5.0 mg/l CCWE. The preferred treatment option for this portion of the waste will be addressed under Section 3.1.9 with the treatability group 9 inorganic debris (with TCLP metals). Treatment for the metal constituents of this waste will be performed on the residue after the waste is deactivated.

3.1.2.2 Preferred Treatment Option – Deactivate

The preferred treatment option associated with this treatability group, in storage as of December 31, 1992 at SNL/NM, is to deactivate the metallic sodium associated with waste stream W038. A treatability study, based upon the volume of this treatability group, is planned on-site in FY95 using existing laboratory space and equipment and will result in a bench-scale treatment. The purpose of this treatability study will be to determine what treatment process is amenable to deactivate the water reactive component in thermal batteries and/or other sodium contaminated wastes.

The long-term treatment of this treatability group will be based upon the results of the study. It is expected that SNL/NM's Permission to Generate process should limit future generation of this waste stream until adequate treatment facilities can be located. It is anticipated that the technology used to treat this treatability group will be implementable at the RMWMF, including technologies developed under the DOE/AL Mixed Waste Treatment Plan (DOE, 1994a), in Attachment 1. However, it is necessary to complete the treatability study and to evaluate the results to identify health and safety requirements and equipment needs. Therefore, a facility appropriate for the long-term treatment of these types of wastes will not be identified until the treatability study is completed.

The budget status of this treatability group is at a level to initiate sort, survey, and possible decontamination work in FY94. Continued funding for this activity in FY95 is not certain but is expected. A treatability study may be necessary to determine the accessibility of the reactive portions of sealed components that are included in this treatability group. Results will be reviewed at the end of FY94. If there is work scope required in order to achieve confident results, the study will receive priority consideration for FY95. It is expected that results of this study will lead to implementable treatment options and operating procedures appropriate for the RMWMF. Modifications to the RCRA permit may be necessary before this treatability group can be treated on-site. Scheduling of such permit modifications is uncertain but can be expected to take up to several years.

3.1.3 Treatability Group 3: Reactive Metals

Table 3-7 presents the waste streams as reported in the Final MWIR that make up the Reactive Metals treatability group and identifies the volume and RCRA hazardous waste codes currently associated with each waste stream.

This treatability group currently contains seven reactive metal waste streams that consist of pyrophoric metal powders from five different experiments and two dry solid oxidizing powders, each stored in a separate container.

It is anticipated that additional characterization of the waste addressed by this treatability group will identify a small portion of these waste streams as other than mixed waste, either because they are not radioactive or because they do not contain hazardous contaminants regulated under RCRA. Those wastes will be recharacterized as either hazardous or radioactive only and will not be considered for treatment under this plan as mixed waste.

Table 3-7. Treatability Group 3: Reactive Metals

MWIR Waste Stream Number	RCRA Waste Code	Volume
W074	D003	0.0001 m^3
W077	D001, D003	0.0001 m^3
W130	D003	0.0003 m^3
W099	D001, D007	0.014 m^3
W079	D003	0.0002 m^3
W137	D001	0.0001 m^3
W138	D001	0.0001 m^3
		Total Volume = 0.02 m^3
		Mass = 6 kg

3.1.3.1 Description of Technology and Capacity Needs

Table 3-7 includes the volumes associated with the reactive metals treatability group in inventory as of December 31, 1992 at SNL/NM. The LDR treatment standards for the hazardous waste codes associated with this treatability group are a combination of concentration-based standards and required technology for nonwastewater forms of this treatability group.

The generation rate for waste streams that fit into this treatability group was 0.00004 m^3 in 1992 and was 0.0 m^3 in 1993. The total volume of this treatability group in storage, accumulated from 1989-1992, is 0.02 m^3, is identified in Table 3-7. Therefore, considering generation rates since 1989, the treatment capacity needed for this treatability group is much less than 1.0 m^3/yr.

Based upon the LDR treatment standards identified in Table 3-8, this treatability group has one required technology, which is deactivation of the reactive and ignitable components of the waste, as well as meeting the F039 concentration-based standards for those hazardous constituents reasonably expected to be present in the waste. The preferred option for deactivating this treatability group is discussed in Section 3.1.3.2.

The LDR treatment standard for the metal portion (D007) of this treatability group is a concentration-based standard, and the technology used to treat this portion of the waste must demonstrate compliance with the 5.0 mg/l CCWE. The preferred treatment option for this portion of the waste will be addressed under Section 3.1.9 with the treatability group inorganic debris (with TCLP metals). Treatment for the metal constituents of this waste will be performed on the residue after the waste is deactivated.

3.1.3.2 Preferred Treatment Option – Deactivation

The preferred treatment option associated with this treatability group, in storage as of December 31, 1992 at SNL/NM, is to deactivate the pyrophoric and oxidizing portion of the wastes. A treatability study was initiated in FY94 involving a bench-scale study that is being performed in an available laboratory at SNL/NM. The purpose of this treatability study is to determine the efficiency of this treatment process as well as determine the characteristics and volumes of residuals from the treatment process. This treatment process includes air oxidation of the Uranium Hydride and the Uranium deuteride powders; slurrifying the oxide and uranium powders and the

Table 3-8. LDR Treatment Standards and Technologies for Reactive Metals

RCRA Code	LDR Treatment Standard*	Type of Technology
D001 (Ignitable-Reactives)	Technology-based	Deactivation (other than dilution) and meet F039; or FSUBS, RORGS, or INCIN.
D003 (Reactive-Other)	Technology-based	Deactivation (other than dilution)
D007 (Chromium-total)	Concentration-based (5.0 mg/l CCWE)	BDAT is Stabilization

CCWE: Constituent Concentration in the Waste Extract
BDAT: Best Demonstrated Available Technology
FSUBS: Fuel Substitution
RORGS: Recovery of Organics
INCIN: Incineration
* Per 40 CFR Part 268, Subpart D

Aluminum/Chromium powders and dissolving the uranyl perchlorite in water; then solidification of the slurries and uranium solutions with a Fluid Tech Solidification agent. It is expected that the results of this particular study will be available in FY95. The performance of this study includes preparing Operating Procedures, characterizing the waste as necessary, addressing NEPA issues, notifying NMED of the planned study, preparing a Health and Safety Plan, performing the study, and evaluating the results.

The long-term treatment of this treatability group will be addressed based upon the results of the study. In addition to the treatability study SNL/NM has in progress for this treatability group, Los Alamos National Laboratories (LANL) in New Mexico has completed design on a uranium chips skid that will be fabricated in 1994 (see Attachment 1). It is still to be determined if the LANL uranium chips skid will be suitable for treating the waste currently inventoried in this treatability group. Specifically, the chemistry may not be suitable for the variety of these wastes, and the processing may not be suitable for the very small volumes of waste on hand. Therefore, it is anticipated that the technology used in the long-term treatment of this treatability group, either a technology developed by SNL/NM or the uranium chips skid developed by LANL, will be implementable at the RMWMF.

The budget status of the treatability study is at a level to maintain work in progress through FY94. Continued funding for this activity in FY95 is not certain. The study results will be reviewed at the end of FY94. If there is work scope required in order to achieve confident results, the study will receive priority consideration for FY95. It is expected that results of this study will lead to implementable treatment options and operating procedures appropriate for the RMWMF. Modifications to the RCRA permit may be necessary before this treatability group can be treated on-site. Scheduling of such permit modifications is uncertain but can be expected to take up to several years.

In addition to the treatability study, the DOE/AL Mixed Waste Treatment Plan (DOE, 1994a), (Attachment 1), identifies LANL as developing the capability of delivering a portable treatment skid

for treatment of pyrophorics. The funding, schedule, and permitting requirements for that task are still to be determined. That information is expected to be available in late FY94 from the DOE/AL Operations Office.

3.1.4 Treatability Group 4: Elemental Lead

Table 3-9 presents the waste streams as reported in the Final MWIR that make up the Elemental Lead treatability group and identifies the volume and RCRA hazardous waste code currently associated with each waste stream.

Table 3-9. Treatability Group 4: Elemental Lead

MWIR Waste Stream Number	RCRA Waste Code	Volume
W062	D008	0.003 m^3
W131	D008	0.003 m^3
W063	D008	0.001 m^3
		Total Volume = 0.007 m^3
		Mass = 63 kg

This treatability group currently contains three elemental lead waste streams that consist of shielding, bricks, and pigs.

It is anticipated that additional process knowledge and surveying characterization of the waste addressed by this treatability group will identify some waste streams that are not actually mixed waste, either because they are not radioactive or because they do not contain hazardous contaminants regulated under RCRA. Those wastes will be recharacterized as either hazardous or radioactive only and will not be considered for treatment under this plan as mixed waste.

3.1.4.1 Description of Technology and Capacity Needs

Table 3-9 includes the volumes associated with the elemental lead treatability group in inventory as of December 31, 1992, at SNL/NM. The LDR treatment standard for the hazardous waste code associated with this treatability group is a required technology for radioactive lead solids.

The generation rate for radioactive lead solids was 0.003 m^3 in 1992 and 0.003 m^3 in 1993. The total volume of this treatability group in storage, accumulated from 1989-1992, is 0.007 m^3, is identified in Table 3-9. Therefore, considering generation rates since 1989, the treatment capacity needed for this treatability group is less than 1.0 m^3/yr.

Based upon the LDR treatment standard identified in Table 3-10, this treatability group requires one technology, which is to macroencapsulate the elemental lead waste streams. However, for a portion of this treatability group, no required mixed waste treatment is anticipated because some of the lead solids may be decontaminated.

Table 3-10. LDR Treatment Standards and Technologies for Elemental Lead

RCRA Code	LDR Treatment Standard*	Type of Technology
D008 (Lead-Radioactive Lead Solids Subcategory)	Technology-based	Macroencapsulation

* Per 40 CFR Part 268, Subpart D, Table 3.

Additional work to be performed in order to decontaminate the lead includes the characterization of the lead waste to determine if the type of radionuclide contamination is amenable to decontamination. In addition, regulatory issues, such as those involving NEPA and safety concerns, will have to be addressed before decontamination can be performed at SNL/NM. It will be necessary to identify a customer for the decontaminated lead to ensure that the decontamination activity qualifies as recycling/reuse of the lead solids, an activity that would not require a RCRA permit. If it is determined that all or a portion of the radioactive lead solids in storage at SNL/NM could be decontaminated, it is anticipated that this activity would occur on-site at the RMWMF. The lead waste that is not amenable to decontamination and recycling/reuse will be treated using the preferred option identified in Section 3.1.4.2.

3.1.4.2 Preferred Treatment Option – Macroencapsulation

The preferred treatment option associated with this treatability group for material that cannot be decontaminated and is in storage as of December 31, 1992 at SNL/NM is to macroencapsulate the lead solids using a portable process to be developed by Pantex Plant, Texas (see Attachment 1). The use of this preferred option will be based on the results of the decontamination activities discussed in Section 3.1.4.1. It is anticipated that the macroencapsulation technology developed by Pantex will be implementable at the RMWMF.

The budget status of this treatability group is at a level to maintain the existing Lead Bank Program. It is possible under existing funding to initiate additional sort, survey, and possible decontamination work in FY94. Continued funding for this activity in FY95 is expected.

If RCRA treatment is required, the DOE/AL Operations Office has tasked Pantex for the development of a portable unit for macroencapsulation. A treatability study that would lead to an implementable treatment option and operating procedures appropriate for the RMWMF as the proposed primary treatment location may be necessary. Funding for such a study is uncertain for FY95 but is expected to receive priority consideration. Modifications to the RCRA permit may be necessary before this treatability group can be treated on-site. Scheduling of such permit modifications is uncertain but can be expected to take up to several years.

3.1.5 Treatability Group 5: Aqueous Liquids

Table 3-11 presents the waste streams as reported in the Final MWIR that make up the aqueous liquids treatability group and identifies the volume and RCRA hazardous waste codes currently associated with each waste stream.

Table 3-11. Treatability Group 5: Aqueous Liquids

MWIR Waste Stream Number	RCRA Waste Code	Volume
W072[a]	D002	0.008 m^3
W104	D002	0.002 m^3
		Total Volume = 0.01 m^3
		Mass = 1.8 kg

[a] Mass value is not available on this waste stream and is not included in the total.

This treatability group consists of two aqueous liquid waste streams generated from cleaning radioactive parts from two separate areas at SNL/NM. One of the waste streams may contain depleted uranium dissolved within approximately 8 liters of water/perchloric acid solution. The second waste stream consists of approximately 2 liters of water/nitric acid solution.

It is anticipated, based upon the information regarding the processes that generated these wastes, that these two waste streams may also contain TCLP metal constituents.

3.1.5.1 Description of Technology and Capacity Needs

Table 3-11 includes the volumes associated with the aqueous liquids treatability group in inventory as of December 31, 1992 at SNL/NM. The LDR treatment standard for the hazardous waste code associated with this treatability group is a required technology for a wastewater form of this treatability group.

The generation rate for aqueous liquids was 0.01 m^3 in 1993 and the total volume of this treatability group in storage, accumulated from 1989-1992, is 0.01 m^3, as identified in Table 3-11. Therefore, considering generation rates and the total volume in inventory the treatment capacity needed for this treatability group is less than 1.0 m^3/yr.

Based upon the LDR treatment standard identified in Table 3-12, this treatability group has one required technology, which is deactivation of the corrosive component of the wastes. It is also necessary to meet the RCRA code F039 concentration-based standards for those hazardous constituents reasonably expected to be present in the waste, such as small amounts of methanol and possibly metal constituents. The preferred option for deactivating this treatability group is discussed in Section 3.1.5.2. In addition, based upon the knowledge of the process that generated these waste streams, stabilization may also be required for metal constituents that may be present. Therefore, the neutralization of the liquids will be followed by stabilization.

3.1.5.2 Preferred Treatment Option - Neutralization and Stabilization

The preferred treatment option associated with this treatability group, in storage as of December 31, 1992 at SNL/NM, is to neutralize the corrosive component in the waste streams and then to stabilize the liquid using an organic- and inorganic-compatible material to treat the methanol component and any metal components that may be present.

Table 3-12. LDR Treatment Standards and Technologies for Aqueous Liquids

RCRA Code	LDR Treatment Standard*	Type of Technology
D002 (Corrosive-acid subcategory)	Technology-based	Deactivation (other than dilution) and meet RCRA code F039.

* Per 40 CFR Part 268, Subpart D

Currently, SNL/NM cannot accept mixed aqueous liquids for storage in some of the mixed waste interim states storage areas. By performing a treatability study to ensure aqueous liquids are amenable to a specific treatment process, SNL/NM will be developing the capability for better managing aqueous liquids in the future from their on-site generators. A treatability study was initiated in FY94 involving a bench-scale study that is being performed in an available laboratory at SNL/NM. The purpose of this treatability study is to determine the characteristics and volumes of residual from the treatment process, and whether the waste is amenable to the treatment process. This treatability study is designed to ensure that the treated aqueous liquids, once stabilized, will meet the WAC for disposal at the NTS, as well as meet these applicable RCRA code F039 treatment standards. It is expected that the results of this particular study will be available in FY95. The performance of this study includes identifying successful materials, preparing Operating Procedures specific to those materials, characterizing the waste as necessary, addressing NEPA issues, notifying NMED of the planned study, preparing a Health and Safety Plan, performing the study, and evaluating the results. The long-term treatment of this treatability group will be addressed based upon the results of this and other applicable studies.

In addition to the treatability study SNL/NM has in progress for this treatability group, the Kansas City Plant (KCP) in Missouri will be designing and building a bench-scale plating waste treatment unit to treat aqueous inorganic liquids (see Attachment 1). This unit should provide oxidation/reduction and neutralization chemistry suitable for treatment of small volumes of aqueous waste. However, SNL/NM's aqueous liquids are not plating wastes; therefore, testing of the unit on SNL/NM's aqueous wastes would have to be performed before this unit can be identified as a preferred option. The results of SNL/NM's treatability study on stabilization would also apply to the effluent from the KCP unit if it is determined to be a preferred option.

In addition to the KCP treatment unit, the Grand Junction Project Office (GJPO), in Colorado, will be performing treatability studies using an evaporative oxidation pilot unit available from the Clemson Technical Center to treat organic waste waters (see Attachment 1). Based upon the results of the treatability study, GJPO will design and build a skid-sized portable unit for use at other sites within the DOE/AL complex. Therefore, it is anticipated that the technology used in the long-term treatment of this treatability group, either a technology developed by SNL/NM or the portable treatment units developed by KCP or GJPO, will be implementable at the RMWMF.

The budget status of the treatability study in progress is at a level to maintain work in progress through FY94. Continued funding for this activity in FY95 is not certain. The study results will be reviewed at the end of FY94. If there is work scope required in order to achieve confident results, the study will receive priority consideration for FY95. It is expected that results of this study will lead to implementable treatment options and operating procedures appropriate for the RMWMF. The current application for the RCRA permit identifies neutralization and stabilization as treatments to be performed on-site.

3.1.6 Treatability Group 6: Elemental Mercury

Table 3-13 presents the waste stream as reported in the Final MWIR that makes up the Elemental Mercury treatability group and identifies the volume and RCRA hazardous waste code currently associated with this waste stream.

Table 3-13. Treatability Group 6: Elemental Mercury

MWIR Waste Stream Number	RCRA Waste Code	Volume
W071	D009	30 ml
		Total Volume = 30 ml Mass = 0.4 kg

This treatability group currently contains one waste stream that consists of 30 ml of elemental mercury from a Tennymite temperature and altitude chamber.

It is anticipated that additional radioactive characterization of the waste addressed by this treatability group may identify this waste stream as not actually mixed waste if the mercury is not radioactive. If it is determined that the elemental mercury is not a mixed waste, it will be recharacterized as a hazardous only waste and will not be considered for treatment under this plan as mixed waste.

3.1.6.1 Description of Technology and Capacity Needs

Table 3-13 includes the volume associated with the Liquid Elemental treatability group in inventory as of December 31, 1992, at SNL/NM. The LDR treatment standard for the hazardous waste code associated with this waste stream is identified in Table 3-14.

Table 3-14. LDR Treatment Standards and Technologies for Elemental Mercury

RCRA Code	LDR Treatment Standard*	Type of Technology
D009 (Mercury-Radioactive Contaminated Elemental Mercury)	Technology-based	Amalgamation

* Per 40 CFR Part 268, Subpart D

The generation rate for elemental mercury in 1992 and in 1993 was 0.0 m^3/yr. Based upon the types of activities conducted at SNL/NM, a rate of generation per year that can be associated with a needed treatment capacity cannot be calculated. The total volume of this treatability group in storage, accumulated from 1989-1992, is 30 ml, is identified in Table 3-13. Therefore, considering generation rates since 1989, the treatment capacity needed to treat this treatability group is approximately 10 ml/yr.

Based upon the LDR treatment standards identified in Table 3-14, this treatability group has one required technology, which is amalgamation of the elemental mercury. However, a triple distillation process for mercury does exist at LANL, where the mercury may be recycled for use elsewhere within the DOE complex. If a user for the recycled mercury can be identified, this waste stream will not require amalgamation and the mercury will be recycled at LANL. If triple distillation is determined not to be an option for this treatability group, then the preferred option for treating this treatability group will be that discussed in Section 3.1.6.2.

3.1.6.2 Preferred Treatment Option - Amalgamation

The preferred treatment option associated with this treatability group, in storage as of December 31, 1992 at SNL/NM, is amalgamation. However, no mixed waste treatment may be required if the elemental mercury can be reclaimed by using a triple distillation process and an end use for the mercury can be found. The DOE/AL Treatment Plan (DOE 1994a), Attachment 1, has assigned the development of mercury triple distillation and amalgamation to LANL and Pinellas Plant in Florida, respectively. These developments will be considered for long-term plans and future waste streams. It is anticipated that the technology used to treat future generated waste streams within this treatability group will be implementable at the RMWMF, including technologies developed under the DOE/AL Mixed Waste Treatment Plan.

The budget status of this treatability group is at a level to initiate a survey for better characterization of the radioactive contamination of this waste and possible decontamination work in FY94. Continued funding for this activity in FY95 is not certain. Results of activities for treatment of this waste will be reviewed at the end of FY94. If there is work scope required for FY95, the task will receive priority consideration. If it is anticipated that treatment options for this waste are necessary, the DOE/AL Mixed Waste Treatment Plan options will be pursued. That Plan tasks Pinellas Plant in Florida with the development of a portable treatment unit for the amalgamation of mercury. Modifications to the RCRA permit may be necessary before this treatability group can be treated on-site. If transfer of this waste to LANL for distillation followed by reuse is determined to be environmentally less hazardous and more cost-effective, a permit modification may be required for LANL to accept this material from SNL/NM. Scheduling of such permit modifications is uncertain but can be expected to take up to several years.

3.1.7 Treatability Group 7: Organic Liquids

Table 3-15 presents the waste stream as reported in the Final MWIR that makes up the organic liquids treatability group and identifies the volume and RCRA hazardous waste code currently associated with this waste stream.

This treatability group currently contains one organic liquid waste stream that consists of scintillation cocktails in glass vials. Adequate process knowledge and analytical data exist to characterize this waste stream. The radioactivity level of this waste stream will be obtained from the results of the radioactivity counted in the scintillation fluids.

3.1.7.1 Description of Technology and Capacity Needs

Table 3-15 includes the volumes associated with the Organic Liquids treatability group in inventory as of December 31, 1992 at SNL/NM. The LDR treatment standard for the hazardous waste code associated with this treatability group is a technology-based standard for the nonwastewater form of this treatability group.

Table 3-15. Treatability Group 7: Organic Liquids

MWIR Waste Stream Number	RCRA Waste Code	Volume
W007	D001	0.01 m^3
		Total Volume = 0.01 m^3 Mass = 0.4 kg

The generation rate for organic liquids was 0.0 m^3 in 1992 and 0.02 m^3 in 1993. The total volume of organic liquids in storage, accumulated from 1989-1992, is 0.01 m^3, is identified in Table 3-15. Therefore, considering generation rates since 1989, the treatment capacity needed to treat this treatability group is much less than 1.0 m^3/yr.

Based upon the LDR treatment standard identified in Table 3-16, this treatability group has a technology-based treatment standard that can be achieved by performing fuel substitution, recovering the organics, or incinerating the waste stream. The preferred option for treating this treatability group is discussed in Section 3.1.7.2.

Table 3-16. LDR Treatment Standards and Technologies for Organic Liquids

RCRA Code	LDR Treatment Standard*	Type of Technology
D001 (Ignitable-High TOC)	Technology-based	Deactivation (other than dilution) and meet F039; or FSUBS; RORGS; or INCIN

TOC: Total Organic Carbon
FSUBS: Fuel substitution
RORGS: Recovery of organics
INCIN: Incineration
* Per 40 CFR Part 268, Subpart D

3.1.7.2 Preferred Treatment Option – Incineration

The preferred treatment option associated with this treatability group, in storage as of December 31, 1992, at SNL/NM, is to ship this waste off-site to Diversified Scientific Services, Inc. (DSSI) in Tennessee for incineration. DSSI accepts scintillation fluids that contain any isotopes with atomic numbers 1-83. SNL/NM has made preliminary inquiries concerning the use of this commercial incinerator for treatment of the organic liquids currently in storage. It is anticipated that a contract process for this treatment will be established in FY94. To meet the waste acceptance criteria of DSSI, the scintillation fluids will be bulked prior to shipping the wastes off-site. If scintillation cocktails that contain radionuclides other than isotopes with atomic numbers 1-83 are produced in the future, a separate contract may be required with a different treatment facility, such as Quadrex, which is located in Florida.

The budget status of this activity is at a level to maintain work in progress through FY94. Continued funding for this activity in FY95 is expected, if necessary. A contract with DSSI for incineration of this waste is expected to be in place in FY95.

Treatment and disposal by DSSI would require approval of an exemption from DOE Order 5820.2A. Development of an exemption package is an activity that is expected to be funded, although scheduling of this activity is to be determined through the DOE/AL Operations Office.

3.1.8 Treatability Group 8: Organic Debris

Table 3-17 presents the waste streams as reported in the Final MWIR that make up the Organic Debris treatability group and identifies the volume and RCRA hazardous waste codes currently associated with each waste stream.

It is anticipated that additional characterization of the waste addressed by this treatability group will identify a small portion of these waste streams as other than mixed waste, either because they are not radioactive or because they do not contain hazardous contaminants regulated under RCRA. Those wastes will be recharacterized as either hazardous or radioactive only and will not be considered for treatment under this plan as mixed waste. However, depending upon the quantity (very small), it may be more cost effective to treat wastes, then to try and gather additional characterization information.

3.1.8.1 Description of Technology and Capacity Needs

Table 3-17 includes the volumes associated with the Organic Debris treatability group in inventory as of December 31, 1992, at SNL/NM. The LDR treatment standards for the hazardous waste codes associated with this treatability group are a combination of concentration-based standards and required technology for nonwastewater forms of this treatability group.

The generation rate for organic debris was 1.6 m^3 in 1992 and 0.1 m^3 in 1993. The total volume of this treatability group in storage, accumulated from 1989-1992 was 2.9 m^3 before the April 1994 shipment of 1 m^3 for disposal, which reduced the storage volume to 2.8 m^3, as is identified in Table 3-17. Therefore, the treatment capacity needed for this treatability group, based on an average annual generation rate, is approximately 7 m^3/yr.

Based upon the LDR treatment standards identified in Table 3-18, this treatability group has one required technology, which is deactivation of the ignitable and corrosive components of this treatability group. The preferred option for deactivating this treatability group is discussed in Section 3.1.8.2.

The LDR treatment standards for the solvent portion (RCRA codes F001-F003) and for the metal portion (RCRA codes D007 and D008) of this treatability group are concentration-based standards, and the technology used to treat this portion of the waste must demonstrate compliance with the constituent concentration in the waste (CCW) and in the waste extract (CCWE) in 40 CFR Part 268, Subpart D. However, in lieu of treating this treatability group to meet these waste code specific treatment standards, the preferred treatment option will be based upon the hazardous debris rule as discussed in Section 3.1 to treat for the organic contaminants. For a portion of this treatability group, which is organic debris that is contaminated with a metal constituent, these waste streams will be sorted and evaluated for the necessity of additional treatment for the metals, such as macroencapsulation. The preferred treatment option for this portion of the waste is also addressed in Section 3.1.9.2.

Table 3-17. Treatability Group 8: Organic Debris

MWIR Waste Stream Number[a]	RCRA Waste Code	Volume	
W029	F003	0.5	m^3
W027	F003	1.12	m^3
W013	F003	0.0001	m^3
W039	F003	0.8	m^3
W060	F003	0.06	m^3
W065	D001, F003	0.003	m^3
W015	F003	1.7	m^3
W002	F003	0.03	m^3
W049	F003	0.03	m^3
W010	F003	0.3	m^3
W132	D001, F003	0.3	m^3
W070	D001, F003	0.03	m^3
W037	D001, F003	0.08	m^3
W050	D001, F003	0.2	m^3
W003	D001, F003	0.2	m^3
W014	D001, F003	1.7	m^3
W030	F001	1.0	m^3
W026	F001	2.4	m^3
W016	F001, F003	8.2	m^3
W054	D008	0.014	m^3
W056	F001	1.4	m^3
W057	F001	3.2	m^3
W058	F001	1.8	m^3
W059	F001	0.5	m^3
W068	F001	0.1	m^3
W102	F003	0.06	m^3
W103	F001	0.6	m^3
W112	F001	0.8	m^3
W114	D008	0.4	m^3
W115	D002, D007	0.0001	m^3
W133	F001	0.03	m^3
W025	F001	0.7	m^3

Total Volume = 28 m^3
(Total Mass = 1,103 kg)

a Waste streams W109, W126, W146, and W089 were previously reported in the MWIR and the CSTP. These waste streams were disposed of at Envirocare of Utah, Inc. in April 1994. Therefore, these waste streams have been removed from this inventory.

Table 3-18. LDR Treatment Standards and Technologies for Organic Debris

RCRA Code	LDR Treatment Standard*	Type of Technology
D001 (Ignitable)	Technology-based	Deactivation (other than dilution) and meet F039; FSUBS; RORGS; or INCIN.
D002 (Corrosive)	Technology-based	Deactivation (other than dilution) and meet F039.
D007 (Chromium)	Concentration-based (5.0 mg/l CCWE)	BDAT is Chemical Reduction fb precipitation
D008 (Lead)	Concentration-based (5.0 mg/l CCWE)	BDAT is Stabilization
F001 (Freon)	Concentration-based (28 or 33 mg/kg CCW)	BDAT is INCIN
F001 (Trichloroethane)	Concentration-based (5.6 or 7.6 mg/kg CCW)	BDAT is INCIN or FSUBS
F003 (alcohol[a])	Concentration-based (0.75 mg/l CCWE)	BDAT is INCIN
F003 (Acetone)	Concentration-based (160 mg/kg CCW)	BDAT is INCIN

[a] Alcohol for this particular treatability group is assumed to be methanol until further information is collected to support this assumption.
BDAT: Best Demonstrated Available Technology
CCW: Constituent Concentration in the Waste
fb: followed-by
CCWE: Constituent Concentration in the Waste Extract
FSUBS: Fuel Substitution
INCIN: Incineration
RORGS: Recovery of organics
* Per 40 CFR Part 268, Subpart D

3.1.8.2 Preferred Treatment Option – Thermal Desorption

The preferred treatment option associated with this treatability group, in storage as of December 31, 1992, at SNL/NM, is to use an extraction technology thermal desorption. It is anticipated that this preferred option will be supported by the data generated in performing three separate treatability studies. Two of the studies will be performed in available laboratory space at SNL/NM using a steam reforming unit. Plans are underway to perform treatability studies on organic debris by operating the steam reforming unit as a steam reformer and as a thermal desorption unit. The third treatability study planned for organic debris will be performed by the GJPO using a pilot thermal desorption unit from the Clemson Technical Center (see Attachment 1).

It is anticipated that these treatability studies will be initiated in FY95. It is expected that the results of these particular studies will be available in FY95. The performance of SNL/NM's studies include preparing Operating Procedures, characterizing the waste as necessary, addressing NEPA issues, notifying NMED of the planned study, preparing a Health and Safety Plan, performing the study, and evaluating the results.

The long-term treatment of this treatability group will be addressed based upon the results of the treatability studies. It is anticipated that the technology used to treat this treatability group will be implementable at the RMWMF. However, it is necessary to complete the treatability studies and to evaluate the results of the studies to identify health and safety requirements and equipment needs for this facility. Therefore, a facility appropriate for the long-term treatment of these types of wastes will not be identified until the treatability studies are completed.

The budget status of the treatability studies both planned and in progress is at a level to maintain work in progress through FY94. Continued funding for this activity in FY95 is expected. It is expected that results of these studies will lead to implementable treatment options and operating procedures appropriate for the RMWMF. Modifications to the RCRA permit and other permits may be necessary before this treatability group can be treated on-site. Scheduling of such permit modifications is uncertain but can be expected to take up to several years.

The DOE/AL Mixed Waste Treatment Plan (DOE, 1994c), Attachment 1, tasks the GJPO with developing the capability of delivering a portable treatment skid for thermal desorption treatment of organic debris and tasks SNL/NM with developing steam reforming as an alternative treatment option. The funding, schedule, and permitting requirements for these tasks are still to be determined. That information is expected to be available in late FY94 from the DOE/AL Operations Office.

3.1.9 Treatability Group 9: Inorganic Debris (with TCLP Metals)

Table 3-19 presents the waste streams as reported in the Final MWIR that make up the Inorganic Debris (with TCLP metals) treatability group and identifies the volume and RCRA hazardous waste codes currently associated with each waste stream.

It is anticipated that additional characterization of the waste addressed by this treatability group will identify a large portion of these waste streams as other than mixed waste, either because they are not radioactive or because they do not contain hazardous contaminants regulated under RCRA. These wastes will be recharacterized as either hazardous or radioactive only and will not be considered for treatment under this plan as mixed waste.

3.1.9.1 Description of Technology and Capacity Needs

Table 3-19 includes the volumes associated with the inorganic debris (with TCLP metals) treatability group in inventory as of December 31, 1992 at SNL/NM. The LDR treatment standards for the hazardous waste codes associated with this treatability group are a combination of concentration-based standards and a required technology for nonwastewater forms of this treatability group.

The generation rate for waste streams within this treatability group is 4.0 m^3 in 1992 and 2.0 m^3 in 1993. The total amount of this treatability group in storage, accumulated from 1989-1992, was 7 m^3 before the April 1994 shipment of 2.2 m^3 for disposal, which reduced the storage volume to approximately 5 m^3 as identified in Table 3-19. Therefore, the treatment capacity needed for this treatability group, based upon an average annual generation rate, is approximately 3 m^3/yr.

Table 3-19. Treatability Group 9: Inorganic Debris (with TCLP Metals)

MWIR Waste Stream Number[a]	RCRA Waste Code	Volume	
W076	D011	0.01	m^3
W082	D002, D011	0.03	m^3
W119	F001	0.01	m^3
W120[b]	D004	0.003	m^3
W110	D009	0.06	m^3
W121	D002	0.02	m^3
W122	D002	0.0001	m^3
W043	D008	0.003	m^3
W020	D008	0.003	m^3
W022	D008	0.001	m^3
W032[c]	D008, D009	0.1	m^3
W036	D008	0.1	m^3
W045[c]	D008	0.0001	m^3
W046	D008	0.006	m^3
W047	D008	0.03	m^3
W053	D008	0.006	m^3
W055[b]	D008	0.06	m^3
W080	D006, D008	0.7	m^3
W088[c]	D008	0.02	m^3
W092[b]	TBD	0.03	m^3
W093[b]	TBD	0.03	m^3
W094[b]	TBD (Classified)	0.03	m^3
W095[b]	TBD (Classified)	0.002	m^3
W096[b]	TBD (Classified)	0.003	m^3
W097[b]	TBD (Classified)	0.1	m^3
W098[b]	TBD (Classified)	0.002	m^3
W101	D005, D006, D007, D008	0.2	m^3
W106	D008, D011	0.02	m^3
W111[c]	D008	2.0	m^3
W113[c]	D008	0.2	m^3
W073	D008	0.7	m^3
W117	D008	0.006	m^3
W108[c]	D008	0.1	m^3
W124 (batteries)[d]	D002, D006	0.002	m^3
W125 (batteries)[d]	D002, D008	0.03	m^3
W123	D002, D009	0.0004	m^3
W069[c]	D002, D006, D008, D009	0.05	m^3
W139	D009	0.1	m^3
W141	D008, D009, D011	0.0001	m^3
W143	D008, D011	0.001	m^3
W144	D006, D008, D011	0.001	m^3
W148	D008	0.001	m^3

Table 3-19. Treatability Group 9: Inorganic Debris (with TCLP Metals) ***(continued)***

MWIR Waste Stream Number[a]	RCRA Waste Code	Volume
TG1[e]	D008, D011	0.4 m^3
TG2 (W038)[e]	D011	0.03 m^3
TG3[e]	D007	0.02 m^3
TG8[e]	D007, D008	TBD m^3
		Total Volume = 5.0 m^3 (Total Mass = 1,015 kg)

a Waste streams W040, W031, W019, W009, W083, W084, W107, W044, W041, W023, W024, W034, W035, W004, W052, W064, W078, W087, W118, W127, W128, W140, W142, and W145 were previously reported in the MWIR and in the CSTP. These waste streams were disposed of at Envirocare in April 1994 and therefore have been removed from this inventory.

b No mass is available on these waste streams.

c A portion of these waste streams was shipped to Envirocare of Utah, Inc. for disposal, and the volumes have been reduced to reflect this change.

d Lead acid and cadmium batteries that cannot be reclaimed due to activation in neutron fields are included in the inorganic debris treatability group.

e These are waste streams from treatability groups 1, 2, 3, and 8 that will require further treatment due to the presence of metal constituents. The volumes of these wastes are estimated and will depend on the actual volume of the residue after the primary treatment for these treatability groups. No mass is provided in the total.

TBD: to be determined

Based upon the LDR treatment standards identified in Table 3-20, this treatability group has one portion (corrosive) associated with a technology-based standard, which is deactivation of the corrosive component of this treatability group. However, the corrosivity characteristic and the deactivation requirement is only associated with a specific waste stream within this treatability group, which is batteries. There are currently five different types of batteries within this treatability group:

- silver zinc batteries,
- spent alkaline batteries from radiation monitoring equipment,
- nickel-cadmium batteries,
- lead acid batteries, and
- 5.4 volt mercury batteries from radiation monitoring equipment.

It is anticipated that no mixed waste treatment will be required for these batteries because they are expected to have only radioactive surface contamination. Therefore, the first activity associated with this treatability group will be to sort out the various batteries and to determine the radioactivity level of each battery, using hand-held survey instruments. Additional wastes within this

Table 3-20. LDR Treatment Standards and Technologies for Inorganic Debris (with TCLP metals)

RCRA Code	LDR Treatment Standard*	Type of Technology
D002 (Corrosive)	Technology-based	Deactivation (other than dilution), and meet F039.
D004 (Arsenic)	Concentration-based (5.0 mg/l CCWE)	BDAT is Vitrification
D005 (Barium)	Concentration-based (100 mg/l CCWE)	BDAT is Precipitation or Stabilization
D006 (Cadmium)	Concentration-based (1.0 mg/l CCWE)	BDAT is Stabilization
D007 (Chromium)	Concentration-based (5.0 mg/l CCWE)	BDAT is Chemical Reduction fb precipitation
D008 (Lead)	Concentration-based (5.0 mg/l CCWE)	BDAT is Stabilization
D009 (Low Mercury Subcategory)	Concentration-based (0.20 mg/l CCWE)	BDAT is RTHRM; Acid Leaching; Stabilization; or INCIN
D011 (Silver)	Concentration-based (5.0 mg/l CCWE)B	BDAT is Stabilization
F001 (Freon)	Concentration-based (28 or 33 mg/kg CCW)	BDAT is INCIN

BDAT: Best Demonstrated Available Technology
CCW: Constituent Concentration in Waste
CCWE: Constituent Concentration in the Waste Extract
fb: followed-by
INCIN: Incineration
RTHRM: Thermal Recovery of Metals
* Per 40 CFR Part 268, Subpart D

treatability group also may be surveyed depending upon any supporting data that may be necessary to perform the preferred treatment option. Based upon the results of this survey, certain batteries will be decontaminated to remove the radioactive portion and then managed as hazardous wastes. This activity will be performed on-site using existing laboratory space and equipment.

For those lead acid batteries or nickel-cadmium batteries that cannot be decontaminated, the required LDR treatment of thermal recovery will not be available due to the radioactive portion of the batteries. Therefore, an alternate but equivalent technology will be proposed to NMED such as a chelating agent for removal of the lead or macroencapsulation. Other batteries will meet the regulated concentration-based standard that would be applicable to those wastes using similar technology as that described for the lead-acid and nickel-cadmium batteries.

The LDR treatment standard for the solvent portion (RCRA code F001) of this treatability group is a concentration-based standard. The F001 waste code is associated with one waste stream within this treatability group, which is crushed emptied freon cans. Based upon the information currently available for this waste stream, the F001 waste code has been incorrectly identified for this waste stream. Therefore, additional information will be collected to support the removal of this waste code from the Disposal Request for this waste stream. This waste stream will then be managed as a low-level radioactive waste with possible final disposal at NTS.

The LDR treatment standards for the metal portion (RCRA codes D004, D005, D006, D007, D008, D009 and D011) of this treatability group are concentration-based standards, and the technology used to treat this portion of the waste must demonstrate compliance with the CCWE. However, in lieu of treating this treatability group to meet these waste code specific treatment standards, the preferred treatment option for this portion of the waste is based upon the hazardous debris rule as discussed in Section 3.1.

3.1.9.2 Preferred Treatment Option-Macroencapsulation

The preferred treatment option associated with this treatability group is to macroencapsulate (immobilization technology) the inorganic debris waste streams using a portable treatment process developed by Pantex Plant, Texas (see Attachment 1). It is anticipated that the technology used to treat this treatability group will be implementable at the RMWMF.

The budget status of this treatability group is at a level to initiate sort, survey, and possible decontamination work in FY94. Continued funding for this activity in FY95 is not certain but is expected. A treatability study may be necessary to determine the accessibility of the hazardous portions of sealed components that are included in this treatability group. Need for this study will be reviewed at the end of FY94 for extension of the schedule into FY95. It is expected that results of this study will lead to implementable treatment options and operating procedures appropriate for the RMWMF or possible treatment and disposal at Envirocare of Utah, Inc.

On-site treatment would utilize the portable treatment unit for macroencapsulation to be developed by Pantex. Modifications to the RCRA permit may be necessary before this treatability group can be treated on-site. Scheduling of such permit modifications is uncertain but can be expected to take up to several years.

Treatment and disposal at Envirocare of Utah, Inc. would require approval of an exemption from DOE Order 5820.2A. Development of an exemption package is an activity that is expected to be funded, although scheduling of this activity is to be determined through the DOE/AL Operations Office.

3.1.10 Treatability Group 10: Heterogeneous Debris

Table 3-21 presents the waste streams as reported in the Final MWIR that make up the Heterogeneous Debris treatability group and identifies the volume and RCRA hazardous waste codes currently associated with each waste stream. This treatability group currently contains 10 heterogeneous debris waste streams that consist of a mixture of organic debris and inorganic debris.

It is anticipated that additional characterization of the waste addressed by this treatability group will identify a large portion of these waste streams as other than mixed waste, either because they are not radioactive or because they do not contain hazardous contaminants regulated under RCRA. The waste will be recharacterized as either hazardous or radioactive only and will not be considered for treatment under this plan as mixed waste.

Table 3-21. Treatability Group 10: Heterogeneous Debris

MWIR Waste Stream Number[a]	RCRA Waste Code	Volume	
W033[b]	D008, F003	2.0	m^3
W028	F001	1.0	m^3
W017	F001, F003	1.4	m^3
W012	F003	0.1	m^3
W011	F003	0.1	m^3
W008	F003	4.0	m^3
W005	D008, F003	16.0	m^3
W006	F003	0.5	m^3
W061	F003	0.5	m^3
W147	D003, D008, D011, U144, U218	0.1	m^3

Total Volume = 26.0 m^3
Mass = 552 kg

a Waste stream W021 was previously reported in the MWIR and in the CSTP. This waste stream was disposed of at Envirocare of Utah, Inc. in April 1994 and therefore has been removed from this inventory.

b A portion of this waste stream was shipped to Envirocare of Utah, Inc. for disposal, and the volume has been reduced to reflect this change.

3.1.10.1 Description of Technology and Capacity Needs

Table 3-21 includes the volumes associated with the heterogeneous debris treatability group in inventory as of December 31, 1992, at SNL/NM. The LDR treatment standards for the hazardous waste codes associated with this treatability group are a combination of concentration-based standards and technology-based standards for nonwastewater forms of this treatability group.

The generation rate for this treatability group was approximately 7 m^3/yr, based upon the accumulation of 28 m^3 from 1989-1992. Although SNL/NM will be sorting material into other treatability groups, capacity for treatment of the accumulated material will be needed for approximately 5 m^3/yr for five years to work off the waste on hand.

Based upon the LDR treatment standards identified in Table 3-22, this treatability group has concentration-based standards, and the technology used to treat these waste streams must demonstrate compliance with these standards for both organic and inorganic constituents. In addition, this treatability group has two technology-based or required standards, which are deactivation of the reactive component and incineration for the waste stream that contains thioacetamide. Because this treatability group contains a heterogeneous assortment of debris waste streams, the first activity associated with this treatability group will be to sort the various wastes within this treatability group into organic and inorganic waste streams. During the sorting process, the radioactivity level of each waste will be determined, using hand-held survey instruments. Based upon the results of this survey, some waste streams may be decontaminated to remove the radioactive contamination and then managed as hazardous wastes. Other waste streams will be sorted into the appropriate organic or inorganic debris treatability groups. This activity will be performed on-site using existing laboratory space and equipment.

Table 3-22. LDR Treatment Standards and Technologies for Heterogeneous Debris

RCRA Code	LDR Treatment Standard*	Type of Technology
D003	Technology-based	Deactivation (other than dilution)
D004 (Arsenic)	Concentration-based (5.0 mg/l CCWE)	BDAT is Vitrification
D008 (Lead)	Concentration-based (5.0 mg/l CCWE)	BDAT is Stabilization
D011 (Silver)	Concentration-based (5.0 mg/l CCWE)	BDAT is Stabilization
F001 (Freon)	Concentration-based (28 or 33 mg/kg CCW)	BDAT is INCIN
F003 (Acetone)	Concentration-based (160 mg/kg CCW)	BDAT is INCIN
F003 (Methanol)	Concentration-based (0.75 mg/l CCWE)	BDAT is INCIN
U144 (Lead Acetate)	Concentration-based (0.51 mg/l CCWE)	BDAT is INCIN fb Stabilization
U218 (Thioacetamide)	Technology-based	INCIN

CCW: Constituent Concentration in the Waste
CCWE: Constituent Concentration in the Waste Extract
BDAT: Best Demonstrated Available Technology
INCIN: Incineration
fb: followed-by
* Per 40 CFR Part 268, Subpart D

Because this treatability group will go through a sort, survey, and decontamination process and each waste stream will be placed within an existing treatability group in which a preferred treatment option has been selected based on the hazardous debris rule treatment standards (or has been determined not to be a mixed waste), a preferred treatment option for heterogeneous debris has not been selected for Section 3.1.10.2.

3.1.10.2 Preferred Treatment Option

See the preferred treatment options for organic debris in Section 3.1.8.2 (Thermal Desorption) and inorganic debris in Section 3.1.9.2 (Macroencapsulation) as appropriate. For each of these treatability groups, the preferred treatment options are based upon treating the wastes in accordance with the hazardous debris rule. Therefore, heterogeneous debris will also be treated in the same manner, and compliance with the waste code specific treatment standards identified in Table 3-22 will not be required.

3.2 Mixed Waste Streams for Which Technology Requires Adaptation or for Which No Technology Exists

The information currently available concerning most of the SNL/NM low-level mixed waste streams indicates that existing technologies can be utilized for treatment with only minor technical modifications. However, as additional characterization data is obtained and treatability studies are performed, the preferred treatment options identified in Section 3.1 may require changes. For example, if a treatability study indicates that the performance of a specific treatment technology is time consuming and may result in unacceptable personnel exposure to radiation, then a second technology that requires less time may be selected for long-term application. Because of this possibility, characterization and treatability studies will play important roles in the implementation of treatment technologies. In addition, because SNL/NM is a research and development laboratory, future waste streams may be generated that do not fit existing treatability groups or are not amenable to existing treatments. Again, treatability studies will be utilized to confirm the applicability of technologies already evaluated or to assess the applicability of additional technologies.

3.3 Mixed Waste Streams Requiring Further Characterization or for Which Technology Assessment Has Not Been Done

The characterization information currently available concerning the SNL/NM mixed wastes in the current inventory is adequate to identify preferred treatment technologies for the purpose of this plan. However, additional characterization may be required to satisfy the WAC at individual disposal sites. Any additional characterization requirements will be identified in conjunction with the disposal sites as part of the treatability studies.

SNL/NM has a number of legacy materials stored in the Manzano bunkers that are not currently considered to be waste. Most of these items were produced as part of old research and development activities, and many contain accountable nuclear material. As required by DOE, SNL/NM is in the process of assessing these items to determine their status in terms of recoverable nuclear material and possible reuse within the DOE complex. Once this process is completed, some of these items may be declared to be waste. If this occurs, additional characterization may be required, because many of the items were produced before current environmental regulations, such as the LDR, were established. For items that are declared to be waste, SNL/NM will evaluate the wastes using an approach similar to the one used for the mixed wastes addressed in the STPs as follows:

- characterize the waste,
- screen treatment technologies based on established criteria,
- identify candidate technologies for treatability studies and potential off-site facilities,
- perform the necessary treatability studies,
- select technologies for long-term treatment, and
- implement full-scale treatment as necessary.

4.0 MIXED TRANSURANIC WASTE

4.1 TRU Wastes Expected to Go to WIPP

SNL/NM has a small quantity (approximately 1 m^3) of suspect mixed TRU waste currently stored in a RCRA-permitted area. The identification number assigned to this waste in the Final MWIR is W134. This suspect mixed TRU waste has been tentatively characterized as containing lead, silver, and cadmium.

The suspect mixed TRU waste also includes components that must be remote-handled because of the potential high level of radioactivity. Sampling and laboratory analysis to confirm RCRA characteristics is thus not currently feasible. Therefore, SNL/NM will use process knowledge to characterize this waste. In addition, a radiological survey is planned to be performed in FY95 to verify if all the wastes identified within this waste stream are remote-handled.

In addition to reviewing and evaluating the process knowledge, future plans for management of the suspect mixed TRU waste include identification of individual waste streams and possible shipment of waste to WIPP. Mixed TRU waste destined for disposal at WIPP must meet the WIPP WAC. Available process knowledge does not indicate any reason that this waste would not meet the WIPP WAC. The waste is solid material, non-explosive and can be packaged into barrels appropriate for shipment in TRUPACT-II containers. As part of this management, the need for facilities for managing TRU waste will be evaluated as additional information is obtained.

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5.0 HIGH-LEVEL MIXED WASTE STREAMS

5.1 Description of Waste Streams

SNL/NM has no high-level mixed waste streams at this time. There are no projections of developing high-level mixed waste streams in the foreseeable future. The fuel materials that are used at SNL/NM are sent off-site for reprocessing and are considered valuable material that can be reapplied. No liquid waste resulting from the first cycle of reprocessing spent nuclear fuel is generated at SNL/NM.

5.2 Strategy for Managing High-Level Mixed Waste

Because SNL/NM does not generate or store high-level mixed waste streams, there has been no need to generate a strategy for its management.

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6.0 FUTURE GENERATION OF MIXED WASTE

This chapter addresses wastes expected to be generated within the next five years, e.g., ER wastes and wastes resulting from decontamination and decommissioning (D&D) activities and from the evaluation and excessing of legacy materials.

Regarding these types of wastes, discussion of potential, projected, or estimated mixed waste generation within the next five years, for which RCRA LDR treatment may be required, is provided below for general planning purposes.

Due to the uncertainty of how ER, D&D, and legacy material evaluation projects will be managed, their inclusion into the Compliance Plan Volume of this STP (and therefore the specification of how and when they will be treated) will not occur until a final cleanup decision or approved management process and implementation plan are in place. Final decisions will be made in compliance with applicable regulatory requirements and the procedures for adding waste streams, as described in the Compliance Plan Volume.

6.1 Environmental Restoration Waste

Mixed waste generated by the ER program activities will be managed in a manner that is consistent with enforceable cleanup agreements. The ER program is being performed under a HSWA permit that will outline the corrective action or cleanup processes at specific sites. Therefore, this Plan will not address treatment technologies for ER-generated waste until the program progresses and additional information is available concerning the types and quantities of waste that will be generated.

It is likely that the SNL/NM ER program will generate some mixed waste during corrective action activities such as RCRA closures, RCRA Facility Investigations, Corrective Measures Studies, and the implementation of selected corrective measures. The possible waste forms include soil and soil cuttings from drilling and excavation; excavated material such as discarded equipment, contaminated groundwater, decontamination liquid from the cleaning of drilling, and sampling equipment; and dry waste (e.g., PPE). Some of these wastes would fit into the presently identified treatability groups, but others, such as soils, would not. New waste streams and treatability groups will be added to the STP as appropriate as described in the Compliance Plan Volume.

6.2 Decontamination and Decommissioning Waste

The goal of the SNL decontamination and decommissioning (D&D) program is to assess and decommission surplus facilities and to decontaminate these facilities where necessary. SNL/NM has established a formal facility assessment, decontamination, and demolition (FADD) process to accomplish this goal.

The FADD process has been established at SNL/NM to ensure that the facilities intended for demolition are managed in a manner that protects human health and the environment. This process provides a mechanism such that, upon transfer of these facilities to DOE's Office of Environmental Restoration (EM-40), ensures the requirements described in the "Decontamination and Decommissioning Guidance Document" (DOE, 1994c) will have been met. Thus it provides for the continued surveillance and maintenance of vacated facilities until their decontamination or demolition, and it ensures that these facilities are characterized with respect to radioactive, hazardous, and toxic material contamination. The FADD process also ensures that waste generated during D&D is managed and disposed of safely and in accordance with DOE, federal, state, local, and SNL/NM requirements.

Approximately 60 buildings at SNL/NM have been declared surplus facilities that are likely candidates for D&D. Currently the SNL/NM Engineering Reactor (SER) is the only facility to date with a formalized schedule for surveillance and maintenance (Activity Data Sheet #1292, used for DOE budgeting and planning). This facility is housed in a structure with two other active reactors and a hot cell facility. D&D of the SER will be planned when these other facilities are assumed as surplus and are also scheduled for D&D.

6.3 Other Waste

In addition to mixed waste generated as a result of the ER Program (Section 6.1) and D&D (Section 6.2), SNL/NM expects to generate small quantities of mixed waste as a result of routine research and development activities. Table 6-1 presents an estimate of the quantities that will be generated during 1993-1997, the five years following the cutoff date (December 31, 1992) of the Final MWIR. However, because SNL/NM is a research and development facility, the types and quantities of mixed waste generated vary depending on the specific projects performed and are difficult to predict with any accuracy. Regardless of the projects undertaken, SNL/NM will continue to pursue a vigorous waste minimization program that limits the production of mixed waste.

The estimates provided in Table 6-1 differ from the five-year estimates provided in the Interim MWIR (DOE, 1993b), which calculated the five-year generation rates for individual waste streams based on the generation rate from May 8 through December 1992. These dates coincide with the mixed waste moratorium at SNL/NM, when little mixed waste generation was permitted. Thus, the rates may not be representative of laboratory activities. The five-year projections presented in Table 6-1 were calculated for each treatability group using the following general assumptions:

1. The 1992 and 1993 inventories are more reliable indicators of the next five years than the MWIR. It is assumed that the waste included in the Interim MWIR was generated over a four-year period from 1989 through 1992. This starting date coincides with the cessation of on-site disposal of radioactive and mixed waste at SNL/NM. Since that time, the waste that is being generated has been stored. A start date of 1989 for all treatability groups is a conservative assumption because some waste types, such as TG1, inorganic debris containing explosives, were not acceptable for on-site disposal and have been accumulating for a much longer period than four years.

2. It is assumed that waste minimization activities at SNL/NM will reduce the 1993-1997 generation rates.

Where applicable, footnotes are provided in Table 6-1 to describe specific assumptions that have been made in estimating the five-year generation rates. The estimates provided in Table 6-1 are for the purposes of this treatment plan only.

SNL/NM has a large number of items in storage for historical retention and training purposes and from unique experiments. Recently these items have been inventoried at approximately 3,000 items. This material is being evaluated through the Economic Discard Limit Process for Accountable Nuclear Material to determine its usefulness and recoverability. It is expected that some of the material will eventually be declared as having No Defined Use or value and become discardable. Some of the material is presently classified and would be processed through appropriate demilitarization and sanitization procedures.

Table 6-1. Projection of Mixed Waste Production at SNL/NM for 1993-1997[a]

Treatability Group	Projected Generation 1993-1997 Volume (m^3)
TG1, Inorganic Debris (with an explosive component)	<1
TG2, Inorganic Debris (with a water reactive constituent)	<1
TG3, Reactive Metals	<1
TG4, Elemental Lead[b]	<1
TG5, Aqueous Liquids	<1
TG6, Elemental Mercury[c]	0
TG7, Organic Liquids[d]	0
TG8, Organic Debris[e]	1
TG9, Inorganic Debris[f] (with TCLP metals)	15
TG10, Heterogeneous Debris[g]	0
--Soils and Soils/Debris	NA
--Suspect Mixed TRU[h]	0

a The quantities presented in this table are rough estimates only.

b The generation rate for lead solids may change significantly as the Lead Bank Program progresses.

c The only elemental mercury in the inventory addressed by this plan is from a temperature and altitude chamber excessed from Technical Area II. Although additional chambers will be excessed in the next few years, none are known to contain elemental mercury.

d Because of the use of nonhazardous scintillation cocktails, it is assumed that no organic liquid mixed waste will be generated in the next five years. If characteristic used oil (hazardous) is produced, this estimate will change.

e The generation rate of mixed waste organic debris may greatly decrease because of the reduction of hazardous solvents.

f It is assumed that the generation of mixed waste inorganic debris will remain comparable to the current rate.

g It is assumed that heterogenous debris will no longer be generated because the generators are required to separate combustible and noncombustible waste.

h It is assumed that no TRU waste will be generated an SNL/NM in the next five years. New projects and the excessing of legacy materials may require a revision of this estimate.

TCLP = Toxicity Characteristic Leaching Procedure
TRU = Transuranic
NA = not available

A small portion of the discardable material may be identified as mixed waste. This material would most probably belong to the TG9, Inorganic Debris with TCLP Metals treatability group, for which the preferred treatment option is macroencapsulation. The other possible treatability group is Soils with Debris, for which a preferred treatment option has not yet been identified. New waste streams and preferred treatment options will be added to the STP as needed according to the procedure described in the Compliance Plan Volume.

Other material that can be expected to be generated as mixed waste in the next five years is elemental lead now in the SNL/NM Lead Bank Program. This program evaluates lead for its

possible reapplication. This material would be included in the Elemental Lead treatability group (TG4), with macroencapsulation as the preferred treatment option.

It is anticipated that most of the mixed waste that will be generated at SNL/NM in the future will fall into one of the existing treatability groups. Treatment of this waste will then be implemented using the approach and options given in Section 3.1. Because the waste generated at SNL/NM will continue to be small and highly variable, the use of treatability studies to confirm the applicability of the previously successful technologies will continue to play an important role in SNL/NM's mixed waste treatment program.

7.0 STORAGE REPORT

DOE is committed to storing waste in compliance with RCRA storage requirements in 40 CFR 264 or 40 CFR 265 pending the development of the mixed waste treatment capacity and the implementation of the STPs.

Mixed waste that will be shipped off-site for treatment will be stored before and after treatment. This storage will be analyzed on a case-by-case basis between the shipping and receiving sites, in consultation with the affected states. Factors such as inadequate compliant storage capacity at the shipping site and the need to facilitate closure of the shipping site will be considered when proposing shipping schedules.

Currently, mixed waste storage at SNL/NM is managed through the Waste Operations Department of the Environmental Operations Center. There are 17 mixed waste storage units identified in the RCRA Part B Permit Application, as amended August 1993. These units are currently operated under 40 CFR 265 as interim status units. This number will decrease in the next amendment, which is scheduled for submission to the NMED in December 1994. It is anticipated that seven Manzano bankers, the RMWMF, and Building 6596 will be the main areas for mixed waste storage in the future and that no additional storage capacity will be needed based upon future generation rates. Most of these units are within the Sandia Technical Areas. Explosives are stored in the Manzano bunkers, a specially designated area of KAFB.

SNL/NM intends to continue to store mixed waste that is generated by the activities associated with its mission. The strategy for permitting mixed waste storage is being developed in consultation with NMED. It is not expected that a Part B Permit could be issued before FY96, when it is planned that the Consent Order from the negotiated STP will be in place. The RCRA Permit Application amendments, however, will continue to reflect the planning developed through the STPs.

1

8.0 PROCESS FOR EVALUATING DISPOSAL ISSUES IN SUPPORT OF THE STP DISCUSSIONS

8.1 Introduction

This section discusses the overall process developed by DOE for evaluating issues related to the disposal of residues from the treatment of MLLW subject to the FFCAct. SNL/NM is among the sites being analyzed further under this process for potential development as a disposal site for residues from the treatment of MLLW subject to the FFCAct.

The Federal Facilities Compliance Act requires only that DOE develop a plan for the treatment of mixed wastes. The FFCAct does not impose any similar requirement for the disposal of mixed wastes. DOE recognizes, however, the need to address this final phase of mixed waste management. The following process reflects DOE's current strategy for evaluating the potential options for disposal and, consistent with the purpose of this Background Volume, is provided for informational purposes only.

It is important to note that the ultimate identification of sites that may host mixed waste disposal activities will follow state and federal regulations for siting and permitting and will include public involvement in the decision-making and preparation of the appropriate environmental impact analyses in accordance with NEPA. Moreover, any recommendations concerning removal of sites from further evaluation under this process do not affect environmental restoration decisions by DOE under CERCLA concerning remediation activities.

Mixed waste subject to the FFCAct includes high-level waste (HLW) and mixed-transuranic waste (mixed TRU). However, established processes are already being implemented for studying, designing, constructing, and ultimately operating disposal facilities for these wastes (e.g., HLW repository, Waste Isolation Pilot Project). Currently, however, there are no active permitted disposal facilities operated by DOE for residues from the treatment of MLLW.

Previously, the DOE planning baseline included the development of MLLW disposal facilities at the six DOE sites currently disposing of low-level waste (Hanford Site, Savannah River Site, Oak Ridge, Idaho, Nevada, and Los Alamos). Plans for the development of these facilities are currently on hold pending the results of this process and the Environmental Management Programmatic Environmental Impact Statement (EM PEIS) currently being prepared by DOE. Once the process of acquiring permits for these sites is initiated, along with associated design and radiological performance assessment efforts, some sites may be found to be not desirable for disposal activities. Additionally, some sites that have not been before considered for disposal activities may be suitable for the disposal of some MLLW residues.

Pursuant to discussions between DOE and the States, DOE developed a process for evaluating the potential options for disposal of the residues from treatment of mixed waste subject to the FFCAct. The sites subject to this evaluation are the 49 sites reported to Congress by DOE in the Mixed Waste Inventory Report, April 1993, as currently storing or expected to generate mixed waste.

This chapter outlines the process developed by DOE, in consultation with the States, for evaluating potential options for the disposal of residues from the treatment of MLLW. Importantly, because MLLW disposal sites are not currently being developed by DOE, preferred alternatives or final destinations for disposal of treatment residues may not be known at the time final proposed Site Treatment Plans are submitted to the States and EPA in February 1995. The results of this process are intended to be considered during the discussions about development of the FFCAct Site Treatment Plans, both between DOE and States and among States themselves.

8.2 Disposal Site Evaluation Process to Date

Although the FFCAct does not specifically address disposal of treated mixed wastes, both DOE and the States have recognized that disposal issues are an integral part of treatment discussions. A process was established to evaluate and discuss the issues related with potential disposal of the residues from the treatment of DOE MLLW at the sites subject to the FFCAct. The focus of this process has been to identify, from among the sites currently storing or expected to generate mixed waste, sites that are suitable for further evaluation regarding their disposal capability. Sites determined to have marginal or no potential for disposal activities will be removed or postponed from further evaluation under this process. Remaining sites will be evaluated more extensively. Ultimately, a number of sites are expected to be technically acceptable for disposal activities.

Site Grouping

The initial step in this process was to examine each of the 49 sites to determine which sites, while individually listed in the MWIR, were in such geographic proximity that further analysis could address them as a single site. This grouping reduced the number of sites to 44, as follows:

- The Idaho National Engineering Laboratory and Argonne National Laboratory (West) are located within several miles of each other on a single Federally-owned reservation in Idaho Falls, Idaho, and were considered a single site for further analysis;

- The Sandia National Laboratory, Livermore, and Lawrence Livermore National Laboratory are located on adjoining properties in Livermore, California, and were considered a single site for further analysis;

- The Inhalation Toxicology Research Institute and Sandia National Laboratory, Albuquerque, New Mexico, are located on the same Federally-owned reservation within several miles of each other, and were considered a single site for further analysis; and

- The Oak Ridge National Laboratory, Oak Ridge K-25 Site, and Oak Ridge Y-12 are all located within the Federally-owned Oak Ridge Reservation, in Oak Ridge, Tennessee, and were considered a single site for further analysis.

Initial Site Screening

The remaining 44 sites were screened against three exclusionary criteria. These criteria were developed by reviewing Federal and State laws regarding the siting of waste treatment, storage, and disposal facilities to determine whether any criteria existed that could be considered exclusionary minimum requirements for hosting disposal activities and that could be applied uniformly across sites. It was agreed at a joint DOE/States meeting in Tucson, Arizona, on March 3-4, 1994, that in order to be further evaluated for potential disposal activities, a site:

- must not be located within a 100-year floodplain;

- must not be located within 61 meters (200 feet) of an active fault; and

- must have sufficient area to accommodate a 100-meter buffer zone.

Two of the criteria (100-year floodplain and active fault) are derived from regulatory requirements under the Resource Conservation and Recovery Act which restrict the location of waste treatment, storage, and disposal facilities. The third criteria (sufficient area for 100-meter buffer) is derived from guidance from the U.S. Environmental Protection Agency, U.S. Nuclear Regulatory

Commission, and U.S. Department of Energy concerning the area required to properly operate such facilities.

Application of the three exclusionary criteria identified 18 sites which did not meet the criteria (see Table 8-1). The results were presented at a March 30-31, 1994, joint DOE/States meeting in Dallas, Texas. At the meeting, it was agreed to remove the 18 sites from further evaluation and that DOE would collect additional site-specific information on the remaining 26 sites to identify the strengths and weaknesses of the remaining sites for the purpose of disposal activities (see Table 8-2). It was also agreed that DOE and any affected States may propose additional sites for elimination from further evaluation after review of the site-specific information and further discussions.

26 Site Evaluation

DOE and the States met on July 26-27, 1994, in Denver, Colorado, to discuss the site specific information on the 26 sites and to consider proposals for elimination of sites from further evaluation. The focus of these discussions was to identify sites suitable for further evaluation regarding their disposal capability. It was agreed that sites determined to have marginal or no potential for disposal activities would be removed or postponed from further evaluation under this process. As a result of the meeting, DOE and the States agreed that the following sites would be eliminated from further evaluation due to their limited potential for disposal activities:

1. Energy Technology Engineering Center, California
2. General Atomics, California
3. General Electric Vallecitos Nuclear Center, California
4. Pinellas Plant, Florida
5. Site A/Plot M, Illinois

Additionally, DOE and the States agreed that due to its geographic proximity, the Knolls Atomic Power Laboratory at Niskayuna, New York, would be merged with the Knolls Atomic Power Laboratory at Kesselring, New York, for further analysis. DOE and the States also agreed that the following sites, while not eliminated from further evaluation, would be given a lower priority for further evaluation:

1. Weldon Spring Remedial Action Project, Missouri
2. Brookhaven National Laboratory, New York
3. Mound Plant, Ohio
4. Bettis Atomic Power Laboratory, Pennsylvania

Sites assigned a lower priority for further evaluation had issues that required further consideration, including whether the technical abilities of the site were adequately known, the volume of mixed waste that may be generated by the site, and whether other arrangements for disposal of the sites' mixed waste were adequate. DOE and the States agreed to further evaluate these sites in terms of their ability to dispose of their own mixed waste on-site only if no other options for disposal of their wastes could be identified through the disposal evaluation process. In no case would these sites be considered as a disposal option for wastes from other sites, and they could be eliminated from further analysis if sufficient information suggests that their potential for disposal activities is too limited.

Table 8-1. Sites Eliminated in Initial Screening

SITE	EXCLUSIONARY CRITERIA		
	100 meter buffer	100-Year Floodplain	Active Fault
California			
Lawrence Berkeley Laboratory	•		
Laboratory for Energy-Related Health Research	•		
Mare Island Naval Shipyard (a)		•	
Colorado			
Grand Junction Project Office		•	
Connecticut			
Knolls Atomic Power Laboratory, Windsor	•		
Hawaii			
Pearl Harbor Naval Shipyard (a)		•	
Iowa			
Ames Laboratory	•		
Maine			
Portsmouth Naval Shipyard (a)		•	
Missouri			
Kansas City Plant		•	
University of Missouri	•		
New Jersey			
Middlesex Sampling Plant	•		
Princeton Plasma Physics Laboratory	•		
New York			
Colonie Interim Storage Site	•		
Ohio			
Battelle Columbus Laboratory	•		
RMI Titanium, Inc.	•		
South Carolina			
Charleston Naval Shipyard (a)		•	
Virginia			
Norfolk Naval Shipyard (a)		•	
Washington			
Puget Sound Naval Shipyard (a)		•	
• = Site fails Criteria (a) = Site Potentially in Coastal High-Hazard Area			

Table 8-2. 26 Sites Remaining After Initial Screening

California
Energy Technology Engineering Center
General Atomics
General Electric Vallecitos Nuclear Center
Lawrence Livermore National Laboratory, Site 300
Colorado
Rocky Flats Plant
Florida
Pinellas Plant
Idaho
Idaho National Engineering Laboratory
Illinois
Argonne National Laboratory
Site A/Plot M
Kentucky
Paducah Gaseous Diffusion Plant
Missouri
Weldon Spring Remedial Action Project
Nevada
Nevada Test Site
New Mexico
Los Alamos National Laboratory
Sandia National Laboratory
New York
Brookhaven National Laboratory
Knolls Atomic Power Laboratory - Kesselring
Knolls Atomic Power Laboratory - Niskayuna
West Valley Demonstration Project
Ohio
Fernald Environmental Management Project
Mound Plant
Portsmouth Gaseous Diffusion Plant
Pennsylvania
Bettis Atomic Power Laboratory
South Carolina
Savannah River Site
Tennessee
Oak Ridge Reservation
Texas
Pantex Plant
Washington
Hanford Site

8.3 Next Steps in Disposal Site Evaluation Process

For the sites not eliminated from further evaluation or assigned a lower priority for evaluation, a more technically detailed performance evaluation will be conducted to increase the understanding of the strengths and weaknesses of a site's potential for disposal activities and to better identify what types of disposal activities could or could not occur at a site. A configuration analysis (risk, cost, transportation) will also be prepared, and a final set of sites will be identified as disposal options that will be technically capable of disposing of some waste. DOE officials, in concert with the public and pursuant to the National Environmental Policy Act, will then identify those sites that will be further evaluated for potential development as disposal sites. Permitting and preparation of performance assessments in accordance with radioactive waste management regulations will then be undertaken collaboratively with States and regulators.

Performance Evaluation

The performance evaluation to be conducted for each of the remaining sites will entail the collection of site-specific data related to the natural surroundings, geotechnical setting, groundwater and surface water characteristics, and other factors related to the disposal capabilities of each site. This information will then be used to evaluate the sites and determine what types and quantities of waste may be able to be disposed at a given site. The performance evaluations will be initiated in August, 1994, and will be completed by February, 1995. The 16 sites being carried forward for this analysis are:

1. Lawrence Livermore National Laboratory, Site 300, California
2. Rocky Flats Plant, Colorado
3. Idaho National Engineering Laboratory, Idaho
4. Argonne National Laboratory, Illinois
5. Paducah Gaseous Diffusion Plant, Kentucky
6. Nevada Test Site, Nevada
7. Los Alamos National Laboratory, New Mexico
8. Sandia National Laboratory, New Mexico
9. Knolls Atomic Power Laboratory - Kesselring, New York
10. West Valley Demonstration Project, New York
11. Fernald Environmental Management Project, Ohio
12. Portsmouth Gaseous Diffusion Plant, Ohio
13. Savannah River Site, South Carolina
14. Oak Ridge Reservation, Tennessee
15. Pantex Plant, Texas
16. Hanford Site, Washington

Configuration Analysis

Through the Draft EM PEIS currently being prepared by DOE, the potential cost, risks, transportation, and other environmental impacts of using each of the remaining 16 sites for some

level of disposal activity will be analyzed. This analysis is currently scheduled to be released for public review and comment in Late 1994/early 1995.

Site Limitations Analysis

Following public comment on the Draft EM PEIS and completion of the performance evaluations on the remaining 16 sites, DOE will work with the States and public to develop estimates of the quantities and types of waste that could be disposed at the 16 sites. It is expected that the results of these two analyses may indicate that some of the remaining 16 sites are not suitable for further analysis.

Final EM PEIS

While the final proposed Site Treatment Plans are being prepared, and following their submission by DOE to the States and other regulators, it is expected that individual States and DOE will enter discussions concerning what wastes will be treated at which sites. It is also expected that as a part of these discussions, some arrangements may be established between DOE sites and States as to how any future disposal activities will be handled. DOE expects that the information supplied throughout this process will be used in those discussions. Likewise, DOE expects that the Final EM PEIS analyses will encompass the range of discussions and arrangements under consideration.

Post-Compliance Order Activities

It is expected that by October, 1995, when Compliance Orders are expected to be issued under the FFCAct, discussions among States and DOE sites concerning disposal of the residues from the treatment of mixed waste may not completed. It is therefore expected that a Record of Decision under the EM PEIS relative to disposal activities may be delayed somewhat to allow discussions to continue further. When a Record of Decision is issued, it will identify preferred sites to be recommended for further development as disposal facilities.

Post-Record of Decision Activities

Following the issuance of a Record of Decision under the EM PEIS on disposal activities, DOE sites will, as appropriate, initiate site-specific Environmental Impact Statements on the proposed disposal facilities, initiate performance assessment processes in accordance with radioactive waste management regulations, and collaboratively with the States and other regulators initiate processes for permitting of disposal facilities.

9.0 SITE SPECIFIC DISPOSAL PROCESS

The SNL/NM site is one of the 26 sites being evaluated as a potential low level mixed waste disposal site as discussed in Section 8.0. Because this evaluation process is in the early stages, it is currently planned that the mixed waste generated by or in storage at SNL/NM will be disposed of after treatment either at other DOE or commercial sites.

SNL/NM submitted an application to DOE/Nevada Operations (DOE/NVO) in March 1994 according to the prescribed process of NVO-325 (DOE, 1992) for disposal of low level radioactive-only waste at the Nevada Test Site (NTS). An audit by NVO of procedures, controls, etc., at SNL/NM on the first radioactive-only waste stream is expected in early FY95, and disposal is anticipated to begin in FY95. Presently, the NTS does not accept any mixed waste for disposal but still is working with its regulatory agencies to obtain a permit for mixed waste disposal and possibly mixed waste treatment. A schedule has not yet been set, but these changes are not expected before FY97.

It is expected that, after sorting some of the mixed waste treatability groups, there will be a moderate portion of waste that is not mixed waste because it does not contain RCRA hazardous constituents or does not exhibit RCRA characteristics. That waste will likely be eligible for disposal at the NTS after amendment of the application. Also, waste that is treated by methods that destroy RCRA hazardous constituents (e.g., chemical deactivation and thermal desorption) or that remove the hazardous characteristic (e.g., neutralization) may also become eligible for disposal at the NTS.

Under the LDR program of RCRA (40 CFR 268.35(e)(2)), the last day that mixed radioactive hazardous debris contaminated with characteristic waste could be disposed of without being treated to meet the LDR treatment standards was May 8, 1994. Therefore, SNL/NM has disposed of mixed waste at Envirocare of Utah, Inc., in accordance with this requirement. SNL/NM plans to continue to dispose of mixed wastes at Envirocare of Utah, Inc. as appropriate. Any waste disposed of at this site will be treated certifiably before disposal.

The organic liquids treatability group is likely to be disposed at a commercial facility such as DSSI in Tennessee, or Quadrex in Florida. These facilities use incineration to destroy the hazardous constituents before disposal of radioactive residue.

Use of commercial facilities requires the approval of an exemption to DOE Order 5820.2A. This exemption can be granted by the DOE/AL Operations Office.

1

Compliance Plan Volume

1.0 PURPOSE AND SCOPE OF THE COMPLIANCE PLAN VOLUME

For each facility at which the Department of Energy (DOE) generates or stores mixed waste, section 3021(b) of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6721, as amended by section 105(a) of the Federal Facility Compliance Act, Public Law 102-386 (the FFCAct), requires DOE to prepare a plan for developing treatment capacities and technologies to treat mixed waste to the standards promulgated by the U.S. Environmental Protection Agency (EPA) pursuant to section 3004(m) of RCRA. Upon submission of a plan to the appropriate regulatory agency, the FFCAct requires the recipient agency to solicit and consider public comments, and approve, approve with modification, or disapprove the plan within six months. The agency is to consult with EPA and any State in which a facility affected by the plan is located. Upon approval of a plan, the agency shall issue an Order requiring compliance with the approved plan.

DOE has prepared this Draft Site Treatment Plan (Draft Plan) for mixed waste at Sandia National Laboratories/New Mexico (SNL/NM) in accordance with the schedule published in the April 6, 1993, Federal Register notice for submitting the site treatment plans for facilities at which the Department generates or stores mixed waste (58 FR 17875). The purpose of this Draft Plan is to identify the currently preferred options for treating the mixed wastes at SNL/NM or for developing treatment technologies where technologies do not exist or where they need modification. The Draft Plan reflects the site-specific preferred options, developed with the States' input and based on existing available information. The options reflect the "bottoms-up" approach and have not been completely evaluated for impacts on other DOE sites and impacts to the overall DOE program. Therefore, changes in the preferred option and associated schedules are possible between the Draft Plan, the Final Proposed Plan and final approval and issuance of the Order as evaluation of DOE-wide impacts and State-to-State discussions progress.

To the extent possible, the Draft Plan identifies specific treatment facilities for treating the mixed waste and proposes schedules as set forth in the FFCAct. When not possible, schedules for alternative activities such as for waste characterization and technology assessment are provided as appropriate. All schedule information presented is preliminary and is subject to change. For new facilities, the schedule is heavily dependent upon decisions made during the design phase and is contingent on funding availability. Assumptions and professional judgments related to the type of treatment technology, location of the treatment facility, contracting mechanism, project approval process, cost, etc. were used to develop the estimated schedule. Any variation of these assumptions will impact the estimated schedule. In addition, cost data used in developing options and schedules are planning estimates only and do not reflect a commitment of budgetary resources.

Emerging or new technologies not yet considered may be identified in the future that provide opportunities to manage waste more safely, effectively, and at lower cost than the current technologies identified in the Draft Plan. Working closely with regulators and other interest parties during the implementation of the Draft Plan, DOE will continue to evaluate and develop technologies that offer potential advantages in the areas of public acceptance, risk abatement, performance, and life cycle cost. Should more promising technologies be identified, DOE may request a modification of its treatment plan in accordance with provisions of the Final Site Treatment Plan and/or the Order.

The Draft Site Treatment Plan is comprised of two volumes: this Compliance Plan Volume and the Background Volume. The Compliance Plan Volume proposes overall schedules with target dates for achieving compliance with the land disposal restrictions (LDR) and procedures for converting these target dates into milestones to be enforced under the Order. The more detailed discussion of the options contained in the Background Volume is provided for information purposes only.

When finalized, the Site Treatment Plan will satisfy DOE's obligation under the FFCAct to develop and submit a treatment plan for SNL/NM. In addition, inasmuch as the Plan is intended to provide DOE's plans for achieving compliance with the LDR requirements of 3004(j) of RCRA at SNL/NM, it is understood that no further civil enforcement action, administrative or judicial, will be initiated for violations of RCRA section 3004(j) arising from storage of mixed waste covered by the approved Plan for so long as DOE is in compliance with the requirements of the approved Plan and the Order issued, which requires compliance with the Plan. This will include all mixed waste and suspect mixed waste in storage at SNL/NM and identified in the approved Plan, as well as future mixed waste generated and incorporated into the Plan in accordance with the provisions of the Plan, and any mixed waste received from off-site which is being accumulated to facilitate the treatment of such waste at SNL/NM and which is covered in another site's treatment plan approved by the appropriate regulatory agency after consultation with the State of New Mexico.

2.0 IMPLEMENTATION OF THE PLAN

Section 2.0 describes certain provisions DOE proposes to include in the Final Site Treatment Plan for SNL/NM to facilitate implementation of the Plan. This Draft Plan provides a general description of what these provisions would intend to achieve and the approach DOE proposes; it is expected that the specific language to be used in the Final Plan and Order, as well as specific milestones, will be developed in conjunction with the State of New Mexico or EPA. As discussions on the Final Plan and Order progress, the Plan for some sites may eventually be expanded to address other administrative provisions, or, alternatively, some or all of these provisions may be incorporated into the Order.

This Plan utilizes the assignment and schedules that resulted from the DOE/AL Mixed Waste Treatment Plan, which integrates the resources of nine DOE sites to implement a time- and cost-effective program for treating mixed waste. The DOE/AL Treatment Plan offers resources outside those of SNL/NM's that can be used in performing the treatment described in the STP. Therefore, the schedules and milestones identified within this Plan Volume are contingent upon the other DOE/AL sites developing the necessary treatment capacity to treat SNL/NM's low-level mixed wastes as well as working together to ensure successful adherence to these schedules.

2.1 Approach to Setting Milestones

This Section of the Final Plan would establish a process for committing to milestones for specific activities based on the target dates in the schedules provided in Section 3.0 through 4.0 of the Compliance Plan Volume. Milestones would be defined as fixed, enforceable near-term dates on which a specified activity must be completed. Target dates would mark the anticipated completion of longer-term tasks and would not be enforceable until converted to milestones.

Activities to be proposed as milestones and target dates for SNL/NM would generally be the activities identified in the FFCAct for wastes with existing treatment technology. However, other closely related activities, such as completion of design or characterization activities, may be proposed as milestones and target dates as well.

Target dates would be converted into milestones as the Plan is implemented according to procedures established in Section 2.0. DOE proposes establishing milestones for long-term projects such as those that will be covered by the Plan on a gradual basis because such projects are subject to significant uncertainties. This would allow DOE and the NMED to establish commitments as technical and funding information becomes known. It also provides the NMED, with input from the public as appropriate, to play a significant role in establishing work priorities at the site. Possible approaches to establishing milestones include:

- Establishing milestones on an annual basis for near-term activities. Milestones would be proposed for approval for activities that will take place in the ensuing one year period, with target dates covering longer-term activities.

- Establishing milestones in a phased approach that correspond to the activities identified in the FFCAct. A milestone would be established for the current phase of each project (e.g., initiating construction of a treatment facility), and the target date for the next phase (e.g., commencing facility testing) would be converted to a milestone when the previous phase was achieved and when there is a good technical understanding of the work involved in carrying out the next phase.

For mixed waste to be shipped off-site, the final milestone and target date associated with the wastes would be the date of shipment. Other milestones and target dates for on-site activities

related to preparing wastes for shipment could be proposed. When the intended treatment site is a DOE site, the Section would recognize that the development and availability of such off-site capacity is pursuant to the Site Treatment Plan and Order at that site.

The Section would reference procedures for setting new milestones and for modifying milestones and target dates when necessary. Generally, where practical, new milestones and changes to target dates would be achieved through Section 2.2, "Annual Site Treatment Plan Update." Modifications to current milestones would be governed by procedures in Section 2.5, "Modifications/Extensions or Revisions to the Plan."

2.2 Annual Site Treatment Plan Update

This Section of the Final Plan would provide for submission of an Annual Site Treatment Plan Update intended to communicate information on progress in implementing the Plan and to provide a mechanism for establishing new milestones, amending wastes covered by the Plan, and updating the Plan, as well as proposing revisions to the Plan when necessary. These latter actions may be accomplished through other mechanisms as described in other Sections of this Plan, but the Annual Update provides a coordinated mechanism to effect such changes on a routine basis. DOE proposes that all sites with a Site Treatment Plan provide Annual Updates in the same time frame to facilitate necessary site and State interactions and to facilitate tracking progress across the DOE complex in developing treatment capacity and treating mixed waste.

The Annual Update would amend the Background Volume as necessary, identifying changes to mixed wastes covered by the Plan, including volumes; new waste streams and waste streams no longer covered by the Plan; and progress on activities undertaken to carry out the Plan.

The Annual Update would also update the Compliance Plan Volume. It would contain proposals for new milestones, identify any changes to target dates, and propose revisions to the Plan in accordance with Section 2.5, "Modifications/ Extensions or Revisions to the Plan."

The Annual Update would be submitted to the NMED for review and comment or approval, as appropriate, and made publicly available as defined in this Section and in accordance with the procedures in 2.8, "Submittal, Review and Approval of Deliverables." After the appropriate procedures are followed, the Compliance Plan Volume would be considered amended.

It is intended that the Annual Update be done in a way that minimizes unnecessary paperwork to the extent practical through page changes, etc. If there are no changes that require updates to the Compliance Plan and Background Volumes in a given year, a letter notifying the NMED to that effect could be provided as an Annual Update.

2.3 Inclusion of New Waste Streams

This Section of the Final Plan would establish procedures for incorporating newly identified and newly generated or stored waste streams into the Site Treatment Plan and for developing a plan and schedules for providing treatment capacity.

It would establish procedures for notifying the NMED of a new waste stream as soon as possible. The notification would describe the waste code, volume, current and expected generation rate, and technology needs to the extent possible and would include the waste as a covered waste.

The next Annual Update would incorporate the new waste streams and propose a plan for treatment and associated schedules where possible, or schedules for developing a treatment plan as required by the FFCAct if necessary.

2.4 Duration of the Plan and Deletion of Wastes

This Section of the Final Plan would establish that the approved Plan will terminate when the site's mixed waste, regardless of the time it was generated, is in compliance with the storage prohibition in RCRA 3004(j). This will occur: 1) when there is no longer any mixed waste stored or generated at the site that does not meet land disposal restriction requirements, or 2) when the mixed waste currently being stored or generated at the site, or that will be stored or generated, is being stored solely for the purposes of accumulating sufficient quantities as are necessary to facilitate proper treatment, recovery, or disposal.

Similarly, it would also establish that a specific waste would be deleted from the Plan when the waste is no longer being stored or generated at the site, or when the waste meets land disposal restriction standards or is being accumulated solely for the purposes of facilitating proper treatment, recovery, or disposal. This could occur, for example, when the last scheduled milestone under the Site Treatment Plan for treating the waste is completed, when the waste is shipped off-site, or when the characterization of the waste demonstrates it meets RCRA land disposal standards.

The Section would allow DOE and the NMED to agree to terminate the Plan or to keep the Plan in effect, e.g., in anticipation of waste to be generated in the future, for reasons other than those provided above.

The Section would provide for notification of the NMED and other procedures as appropriate for terminating the Plan and for deleting waste streams.

2.5 Modifications/Extensions or Revisions to the Plan

This Section of the Final Plan would establish procedures to enable DOE to seek adjustments to milestones when events cause or may cause delays, and would define the circumstances which justify a delay. It would require DOE to notify the NMED, provide an explanation for the delay, and set procedures for reviewing and approving/disapproving alternative milestones.

It would also define and establish procedures for those revisions to the Plan that would require the NMED to follow procedures in Section 3021(b)(2) and (3) of RCRA, as amended by the FFCAct, including providing the proposed revision to the public and consulting with other affected States and EPA. The Annual Update described in Section 2.2 would generally be used to propose and approve a revision, unless the revision would become effective before it could be addressed in the regularly scheduled Annual Update.

DOE proposes that all Site Treatment Plans consistently define what constitutes a "revision" to the Plan that is subject to Sections 3021(b)(2) and (3) of the FFCAct, since such a revision may often require the involvement of other affected States. Revisions would include addition of treatment capacity, technology development or use of radionuclide separation not previously included in the Compliance Plan Volume of the Site Treatment Plan or extensions to milestones for a period greater than one year. Inclusion of new waste streams would not constitute a revision but may result in a revision if inclusion of the new waste results in a change to the Site Treatment Plan that meets one of the above criteria. Other types of modifications to the Site Treatment Plan such as milestone changes of less than one year, although not a "revision," would require approval as described in Section 2.8.

2.6 Funding Considerations

This Section would describe DOE's obligations to seek the funding necessary to accomplish the activities in the Final Site Treatment Plan. It would also confirm DOE's authority over its budget

and funding level submissions and its responsibilities under the Anti-Deficiency Act, 31 U.S.C. Section 1341, as amended.

2.7 Disputes

This Section would provide procedures to address disputes concerning scheduling under Section 2.1, modifications/extensions or revisions to the Plan under Section 2.5, review and submittal of Deliverables in Section 2.8, and other circumstances agreed to by DOE and the NMED. The Section would establish timeframes to resolve a dispute and a process that would elevate the dispute when agreement cannot be reached.

2.8 Submittal, Review and Approval of Deliverables

This Section would establish a process and timeframes for review, comment, response to comments, and approval as appropriate by the DOE and the NMED of such deliverables as the Annual Update, notices signifying completion of milestones and identification of new wastes, and other deliverables.

3.0 LOW-LEVEL MIXED WASTE TREATMENT PLAN AND SCHEDULES

3.1 Mixed Waste Streams For Which Technology Exists

It is expected that the preferred treatment technology options identified within the Background Volume and in Sections 3.1.1 through 3.1.10 below will be implemented at the SNL/NM Radioactive and Mixed Waste Management Facility (RMWMF) or another of the RCRA permitted units on-site. Planning for implementation of treatment is based in part on the assumptions listed below.

For preferred treatment option applications being developed by SNL/NM, assumptions 1- 7 apply; for preferred treatment option applications being developed as mobile treatment units by other DOE sites, assumptions 3-5 (marked with * to indicate their dual application) and 8-10 apply:

1. The DOE/AL Mixed Waste Treatment Plan does not currently adequately address the treatment of some of SNL/NM's specific waste types (as discussed in the Background Volume) and is not expected to include or address in updates the treatment of SNL/NM waste streams in:

   Treatability Group 1 - Inorganic Debris (with an Explosive Component),
   Treatability Group 2 - Inorganic Debris (with a Water Reactive Component), and
   Treatability Group 3 - Reactive Metals.

   Therefore, SNL/NM assumes responsibility for developing its own on-site application methods of Treatment Technologies suitable for these waste streams.

2. The treatability studies that are in progress or planned will result in Operating Procedures and Health and Safety Plans appropriate for implementation at SNL/NM of treatment technologies that adequately meet the LDRs.

3.* The treated waste that was RCRA regulated due to one or more hazardous characteristics that were eliminated by treatment will not be RCRA regulated and therefore may be eligible for consideration for disposal at the Nevada Test Site (NTS) through the NVO-325 application.

4.* New radioactive-only waste streams that result from the mixed waste treatment can be adequately documented and considered for disposal at the NTS through the NVO-325 application.

5.* Treated waste that fails the WAC for disposal at the NTS can be considered for disposal at Envirocare of Utah, Inc.

6. The RMWMF or other appropriate on-site RCRA permitted units will be available for these treatment processes.

7. On-site treatment will be allowable under SNL/NM's mixed waste RCRA permit.

Planning for implementation of mobile treatment units developed through the DOE/AL Mixed Waste Treatment Plan relies on the RMWMF as the primary on-site treatment facility and is based upon the following assumptions:

8. The RMWMF will accommodate mobile treatment units designed and developed through the DOE/AL Mixed Waste Treatment Plan.

9. Permits for mobile treatment units will be compatible with the RMWMF.

10. Operating Procedures and Health and Safety Plans for mobile treatment units will be compatible with the RMWMF.

3.1.1 Target Dates for Treatment of Treatability Group 1, Inorganic Debris with Explosive Component, by Chemical Deactivation

The preferred treatment technology option for this treatability group is identified in the DSTP Background Volume, Section 3.1.1.2, as Chemical Deactivation.

A. Submit RCRA Permit Application Amendment or Modification, if necessary
   1QFY96
B. Procure Contracts
   Not applicable (Work will be performed by SNL/NM.)
C. Initiate Construction
   Not applicable (No construction required.)
D. Commence Systems Testing
   Not applicable (Will be addressed by treatability study.)
E. Commence Operation
   End of first quarter after approval of RCRA Permit Amendment or Modification, or 2QFY96, if permit amendment or modification is not necessary.
F. Establish Schedule for Processing Backlog
   End of first quarter after commencing operations.

3.1.2 Target Dates for Treatment of Treatability Group 2, Inorganic Debris with a Water Reactive Component, by Chemical Deactivation

The preferred treatment technology option for this treatability group is identified in the DSTP Background Volume, Section 3.1.2.2, as Chemical Deactivation.

A. Submit RCRA Permit Application Amendment or Modification, if necessary
   1QFY96
B. Procure Contracts
   Not applicable (Work will be performed by SNL/NM.)
C. Initiate Construction
   Not applicable (No construction required.)
D. Commence Systems Testing
   Not applicable (Will be addressed by treatability study.)
E. Commence Operation
   End of first quarter after approval of RCRA Permit Amendment or Modification, or 2QFY96, if permit amendment or modification is not necessary.
F. Establish Schedule for Processing Backlog
   End of first quarter after commencing operations.

3.1.3 Target Dates for Treatment of Treatability Group 3, Reactive Metals, by Chemical Deactivation

The preferred treatment technology option for this treatability group is identified in the DSTP Background Volume, Section 3.1.3.2, as Chemical Deactivation.

A. Submit RCRA Permit Application Amendment or Modification, if necessary
   1QFY96
B. Procure Contracts
   Not applicable (Work will be performed by SNL/NM.)
C. Initiate Construction
   Not applicable (No construction required.)
D. Commence Systems Testing
   Not applicable (Will be addressed by treatability study.)
E. Commence Operation
   End of first quarter after approval of RCRA Permit Amendment or Modification, or 2QFY96, if permit amendment or modification is not necessary.
F. Establish Schedule for Processing Backlog
   End of first quarter after commencing operations.

3.1.4 Target Dates for Treatment of Treatability Group 4, Elemental Lead, by Macroencapsulation

The preferred treatment technology option for this treatability group is identified in the DSTP Background Volume, Section 3.1.4.2, as Macroencapsulation. It is assumed that Macroencapsulation will be developed according to the DOE/AL Mixed Waste Treatment Plan by Pantex Plant, Texas, as a mobile treatment unit. The Grand Junction Project Office (GJPO) schedule for developing and implementing this unit is expected to be available in FY95.

A. Submit RCRA Permit Application Amendment or Modification
   TBD if applicable for SNL/NM, pending outcome of the DOE Permitting Working Group.
B. Procure Contracts
   TBD
C. Initiate Construction
   Not applicable for SNL/NM. TBD by DOE Permitting Working Group, and the GJPO Mixed Waste Treatment Program Manager.
D. Commence Systems Testing
   Not applicable for SNL/NM. TBD by DOE Permitting Working Group, and the GJPO Mixed Waste Treatment Program Manager.
E. Commence Operation
   Estimated to be within two years after deployment of mobile treatment unit, now scheduled for 1QFY97 by the GJPO.
F. Establish Schedule for Processing Backlog
   TBD

3.1.5 Target Dates for Treatment of Treatability Group 5, Aqueous Liquids, by Neutralization and Stabilization

The preferred treatment technology option for this treatability group is identified in the DSTP Background Volume, Section 3.1.5.2, as Neutralization and Stabilization.

A. Submit RCRA Permit Application Amendment or Modification, if necessary
   1QFY96
B. Procure Contracts
   Not applicable (Work will be performed by SNL/NM.)
C. Initiate Construction
   Not applicable (No construction required.)

D. Commence Systems Testing
   Not applicable (Will be addressed by treatability study.)
E. Commence Operation
   End of first quarter after approval of RCRA Permit Amendment or Modification, or 2QFY96, if permit amendment or modification is not necessary
F. Establish Schedule for Processing Backlog
   End of first quarter after commencing operations

3.1.6 Target Dates for Treatment of Treatability Group 6, Elemental Mercury, by Amalgamation

The preferred treatment technology option for this treatability group is identified in the DSTP Background Volume, Section 3.1.6.2, as Amalgamation. It is assumed that Amalgamation will be developed according to the DOE/AL Mixed Waste Treatment Plan by Pinellas Plant, Florida, as a mobile treatment unit. The GJPO schedule for developing and implementing this unit expected is to be available in FY95.

A. Submit RCRA Permit Application Amendment or Modification
   TBD if applicable for SNL/NM, pending outcome of the DOE Permitting Working Group.
B. Procure Contracts
   TBD
C. Initiate Construction
   Not applicable for SNL/NM. TBD by DOE Permitting Working Group, and the GJPO Mixed Waste Treatment Program Manager.
D. Commence Systems Testing
   Not applicable for SNL/NM. TBD by DOE Permitting Working Group, and the GJPO Mixed Waste Treatment Program Manager.
E. Commence Operation
   Estimated to be within two years after deployment of mobile treatment unit, now scheduled for 1QFY97 by the GJPO.
F. Establish Schedule for Processing Backlog
   TBD

3.1.7 Target Dates for Treatment of Treatability Group 7, Organic Liquids, by Incineration

The preferred treatment technology option for this treatability group is identified in the DSTP Background Volume, Section 3.1.7.2, as Incineration.

A. Submit RCRA Permit Application
   Not applicable
B. Procure Contracts
   3QFY96
C. Initiate Construction
   Not applicable
D. Commence Systems Testing
   Not applicable
E. Commence Operation
   Shipment date - 4QFY96
F. Establish Schedule for Processing Backlog
   Not applicable

3.1.8 Target Dates for Treatment of Treatability Group 8, Organic Debris, by Thermal Desorption

The preferred treatment technology option for this treatability group is identified in the DSTP Background Volume, Section 3.1.8.2, as Thermal Desorption. It is assumed that Thermal Desorption will be developed according to the DOE/AL Mixed Waste Treatment Plan by GJPO, as a mobile treatment unit. The GJPO schedule for developing and implementing this unit is expected to be available in FY95.

A. Submit RCRA Permit Application Amendment or Modification
   TBD if applicable for SNL/NM, pending outcome of the DOE Permitting Working Group.
B. Procure Contracts
   TBD
C. Initiate Construction
   Not applicable for SNL/NM. TBD by DOE Permitting Working Group, and the GJPO Mixed Waste Treatment Program Manager.
D. Commence Systems Testing
   Not applicable for SNL/NM. TBD by DOE Permitting Working Group, and the GJPO Mixed Waste Treatment Program Manager.
E. Commence Operation
   Estimated to be within two years of initial deployment of mobile treatment unit, now scheduled for 3QFY97
F. Establish Schedule for Processing Backlog
   TBD

3.1.9 Target Dates for Treatment of Treatability Group 9, Inorganic Debris with TCLP Metals, by Macroencapsulation

The preferred treatment technology option for this treatability group is identified in the DSTP Background Volume, Section 3.1.9.2, as Macroencapsulation. It is assumed that Macroencapsulation will be developed according to the DOE/AL Mixed Waste Treatment Plan by Pantex Plant, Texas, as a mobile treatment unit. The schedule being developed by the GJPO for developing and implementing this unit is expected to be available in FY95.

A. Submit RCRA Permit Application Amendment or Modification
   TBD if applicable for SNL/NM, pending outcome of the DOE Permitting Working Group.
B. Procure Contracts
   TBD
C. Initiate Construction
   Not applicable for SNL/NM. TBD by DOE Permitting Working Group, and the GJPO Mixed Waste Treatment Program Manager.
D. Commence Systems Testing
   Not applicable for SNL/NM. TBD by DOE Permitting Working Group, and the GJPO Mixed Waste Treatment Program Manager.
E. Commence Operation
   Estimated to be within two years after initial deployment of mobile treatment unit, now scheduled for 1QFY97.
F. Establish Schedule for Processing Backlog
   TBD

3.1.10 Target Dates for Management of Treatability Group 10, Heterogeneous Debris, by Sorting and Reclassifying into other Treatability Groups

This treatability group contains a heterogeneous assortment of debris waste streams. Therefore, the first activity associated with this treatability group will be pretreatment to sort the various waste streams into organic and inorganic debris treatability groups (TG8 and TG9, or otherwise as appropriate) for which preferred treatment options have been selected. Therefore, a preferred treatment option for heterogeneous debris will not be selected.

A. Submit RCRA Permit Application
   Not applicable
B. Procure Contracts
   Not applicable
C. Initiate Construction
   Not applicable
D. Commence Systems Testing
   Not applicable
E. Commence Operation
   Not applicable
F. Establish Schedule for Processing Backlog
   1QFY96, if needed

3.2 Mixed Waste Streams for which Technology Requires Adaptation or for Which No Technology Exists

Based upon currently available information of the waste in the current inventory, there are no waste streams at SNL/NM that require adaptation of an existing treatment technology or for which no treatment technology exists.

3.3 Mixed Waste Streams Requiring Further Characterization or for Which Technology Assessment Has Not Been Done

The characterization information currently available for the SNL/NM mixed waste in the current inventory is adequate for correct storage and for identifying preferred treatment technologies for the purpose of this plan. Additional characterization may be needed to satisfy other requirements such as the WAC at individual disposal sites. Any additional characterization requirements will be identified in conjunction with the disposal sites as part of the treatability studies.

4.0 TRU MIXED WASTE STREAMS

4.1 TRU Mixed Wastes Expected To Go To WIPP

A small quantity (approximately 1 m^3) of suspect TRU mixed waste is described in the Background Volume, Section 4.1. Before it can be shipped to the WIPP, it will need to be characterized according to the WIPP WAC. Initial characterization by radiological survey to determine the appropriate handling method (i.e., contact or remote handling) is planned to be performed by 4QFY95.

The preferred option associated with this waste stream is to review and evaluate the process knowledge used for characterization to ensure this waste meets the WIPP WAC. This evaluation is planned to be available for certification within 90 days after the radiological survey, 1QFY96.

5.0 HIGH LEVEL WASTE STREAMS

SNL/NM has no high-level mixed waste streams at this time, and because there are no projections of developing high-level mixed waste streams, there are no activities requiring target dates.

REFERENCES

IT Corporation, 1994. *Decontamination and Decommissioning Project Plan for Sandia National Laboratories/New Mexico*, April 1994. IT Corporation: Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico, 1993. *Conceptual Site Treatment Plan for Mixed Waste – Sandia National Laboratories/New Mexico*. Albuquerque, NM.

U.S. Department of Energy (DOE), 1977. *Environmental Impact Assessment, Sandia National Laboratories, Albuquerque, New Mexico*. EIA/MA 77-1. Energy Research and Development Administration, Division of Military Application. Washington, D.C.: U.S. Department of Energy.

U.S. Department of Energy (DOE) and Reynolds Electrical & Engineering Co., Inc., 1992. *Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements*, NVO-325, Rev. 1, June 1992. Nevada Field Office, Las Vegas, Nevada: U.S. Department of Energy.

U.S. Department of Energy (DOE), 1993a. *Environmental Assessment for the Radioactive and Mixed Waste Management Facility, Sandia National Laboratories/New Mexico*. DOE/EA-0466. Albuquerque, NM: Albuquerque Field Office.

U.S. Department of Energy (DOE), 1993b. *U.S. Department of Energy Interim Mixed Waste Inventory Report: Waste Streams, Treatment Capacities, and Technologies*. Washington, D.C.: U.S. Department of Energy.

U.S. Department of Energy (DOE), 1994a. *DOE/AL Mixed Waste Treatment Plan*. March 1994. Albuquerque, NM: U.S. Department of Energy.

U.S. Department of Energy (DOE), 1994b. *U.S. Department of Energy Final Mixed Waste Inventory Report, Phase I, April 1994: Waste Streams, Treatment Capacities, and Technologies*. Washington, D.C.: U.S. Department of Energy.

U.S. Department of Energy (DOE), 1994c. *Decontamination and Decommissioning Guidance Document*, U.S. Department of Energy Office of Environmental Restoration, Washington, D.C.: U.S. Department of Energy.

U.S. Environmental Protection Agency (EPA), 1986, as amended by final update No. 1; July 1992. *Test Methods of Evaluating Solid Waste, Physical/Chemical Methods*. SW-846, Third Edition. Washington, D.C.: U.S. Environmental Protection Agency.

1

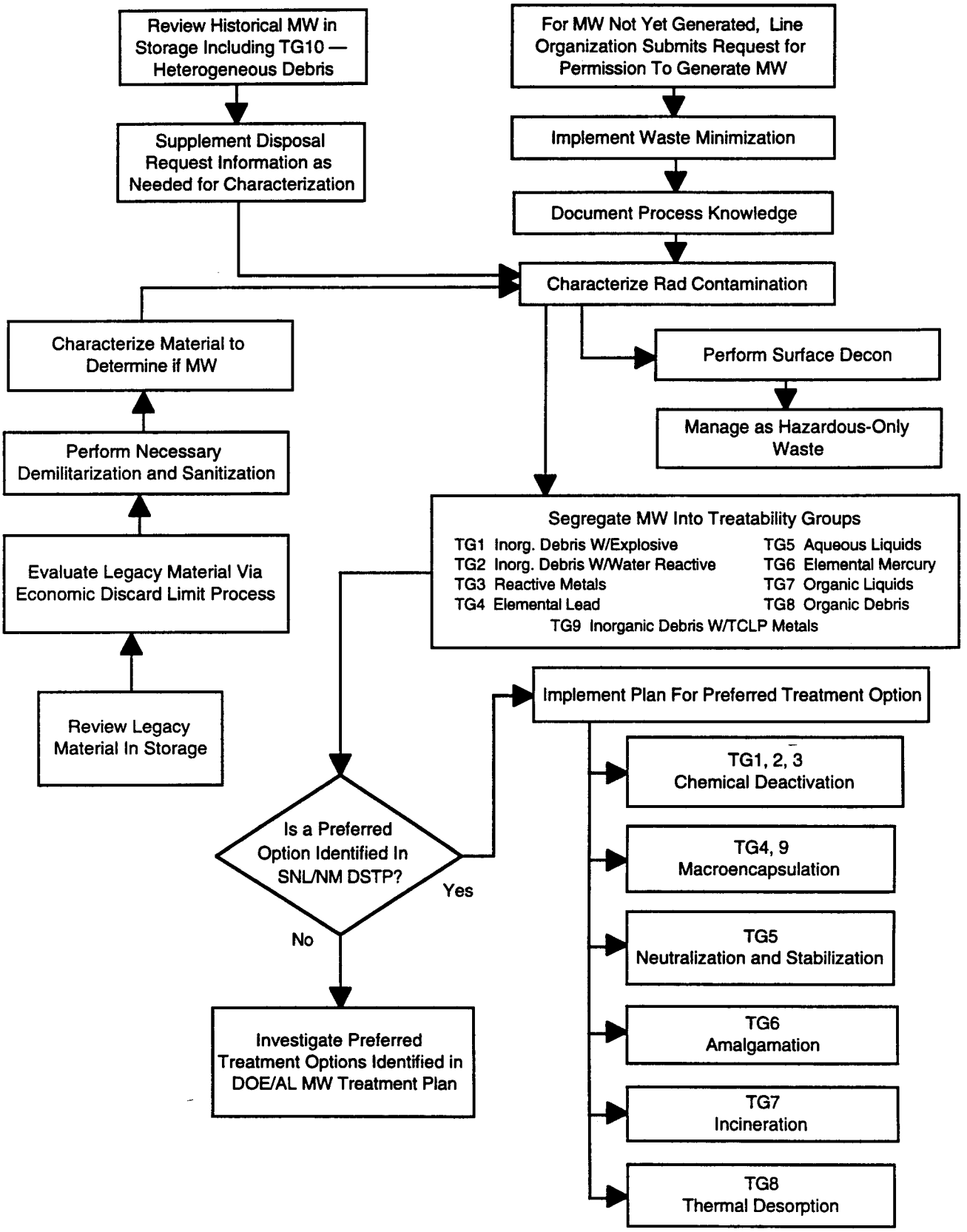
APPENDIX A

TREATMENT FLOW DIAGRAMS

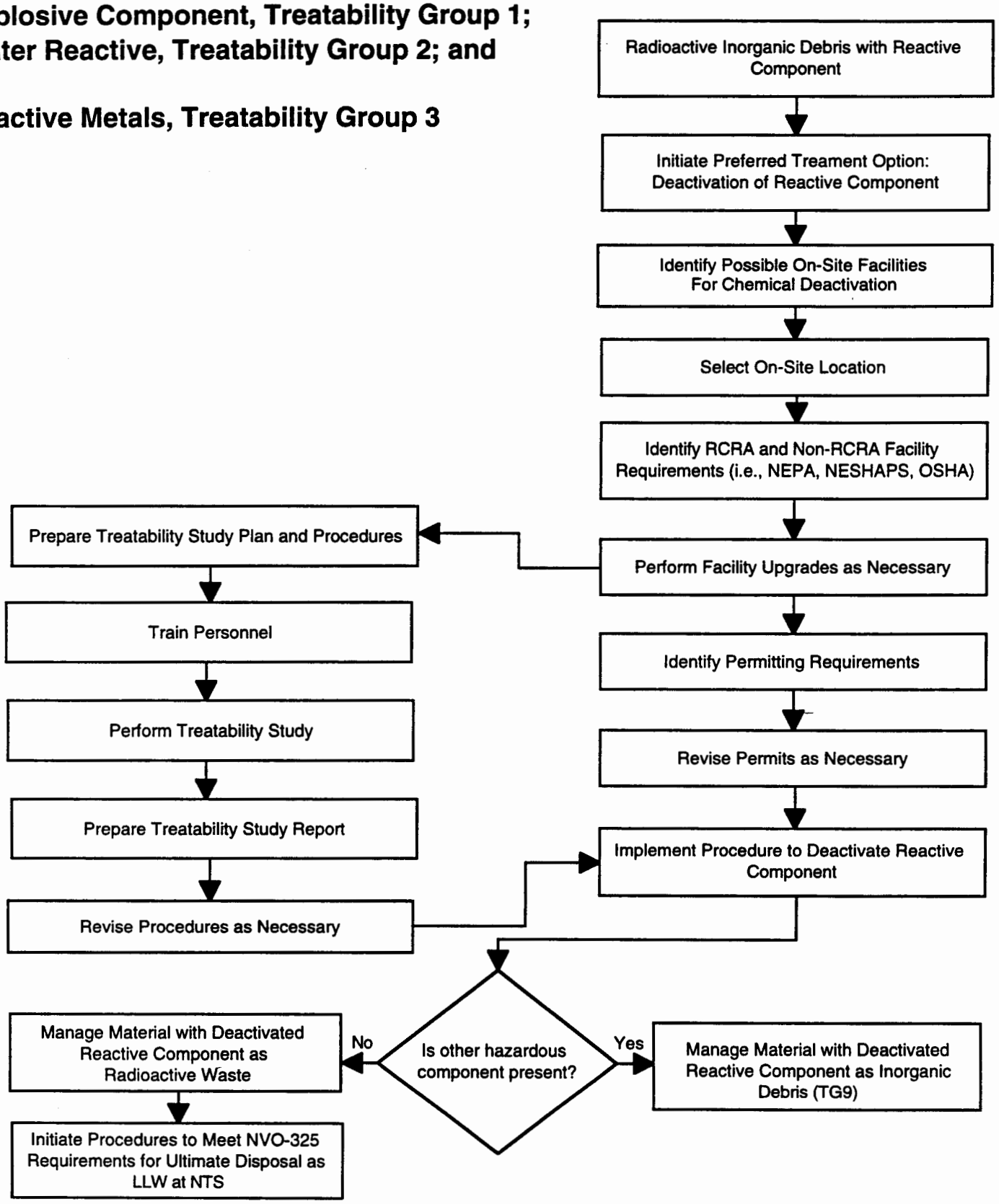
ACRONYMS

CFR	Code of Federal Regulations
Decon	Decontamination
DOE/AL	Department of Energy/Albuquerque
DOT	Department of Transportation
DSSI	Diversified Scientific Services, Inc.
DSTP	Draft Site Treatment Plan
LDR	Land Disposal Restrictions
LLW	Low-Level Waste
MLLW	Mixed Low-Level Waste
MTU	Mobile Treatment Unit
MW	Mixed Waste
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards Hazardous Air Pollutants
NTS	Nevada Test Site
NVO	Nevada Operations
OSHA	Occupational Safety and Health Act
Rad	Radioactive
RCRA	Resource Conservation and Recovery Act
RMWMF	Radioactive and Mixed Waste Management Facility
SNL/NM	Sandia National Laboratories/New Mexico
TCLP	Toxicity Characteristic Leaching Procedure
TG	Treatability Groups
WAC	Waste Acceptance Criteria

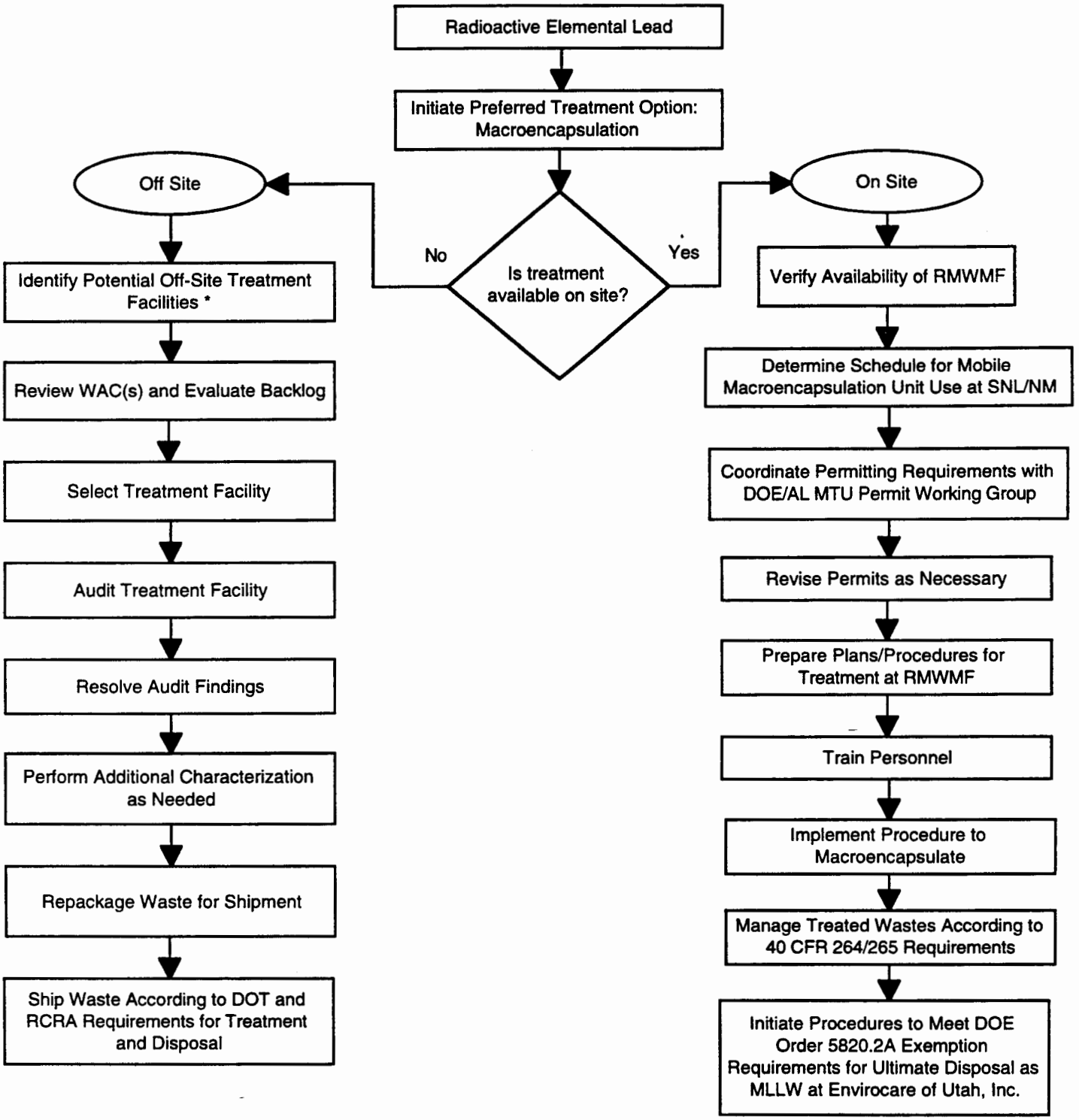
SNL/NM Mixed Waste Treatment Strategy



Inorganic Debris With:
Explosive Component, Treatability Group 1;
Water Reactive, Treatability Group 2; and
Reactive Metals, Treatability Group 3

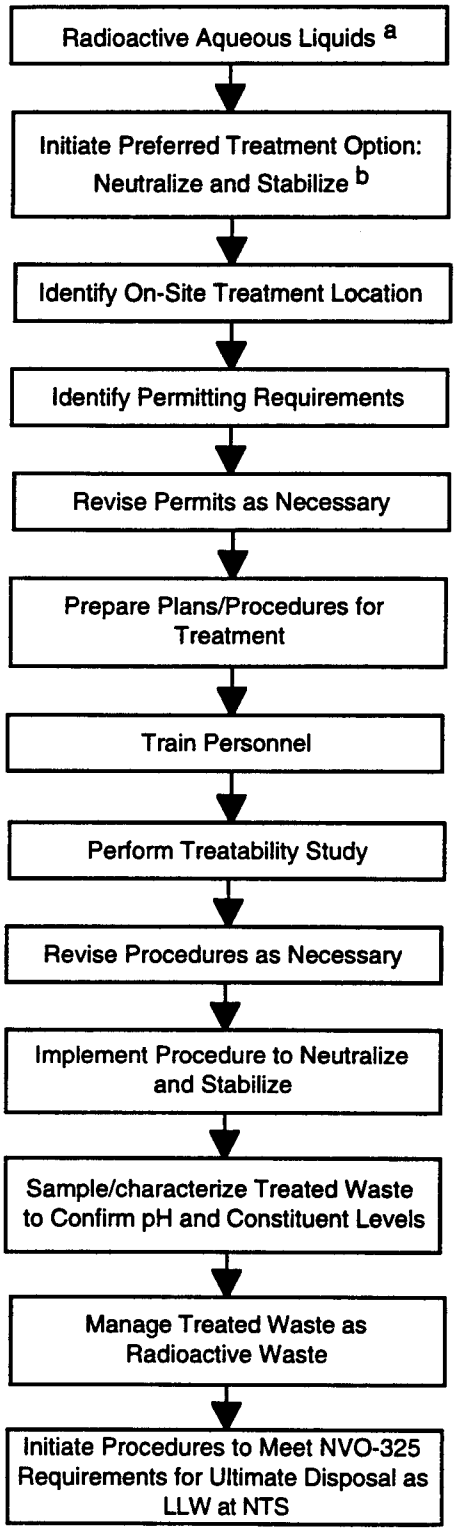


Elemental Lead
Treatability Group 4



* Assume off-site treatment facility will also be disposal facility. If commercial disposal facility is used, an exemption to DOE Order 5820.2A is assumed.

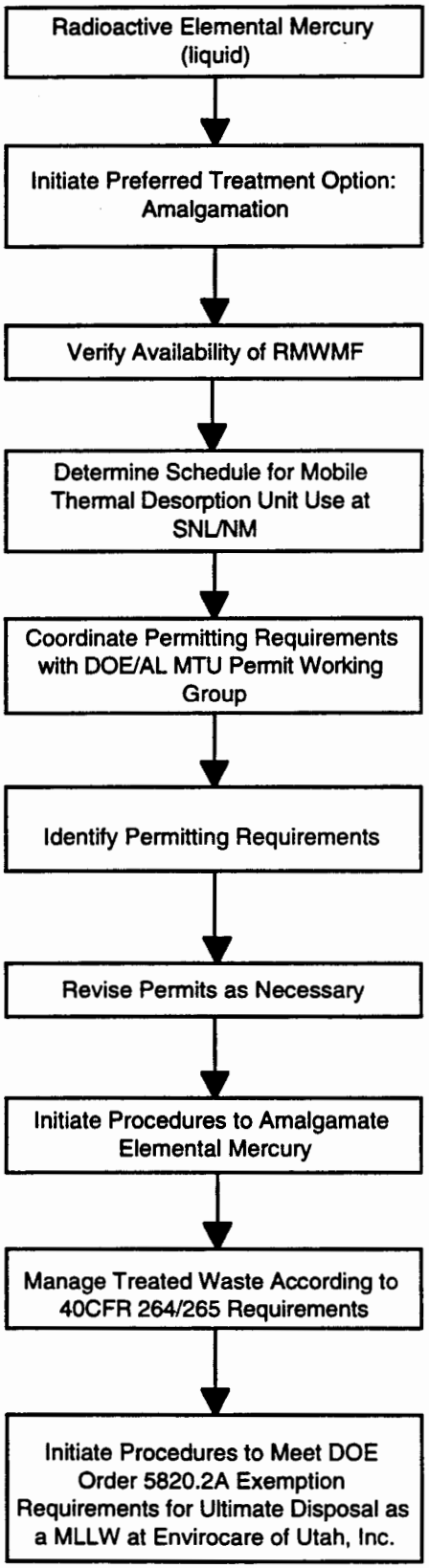
Aqueous Liquids Treatability Group 5



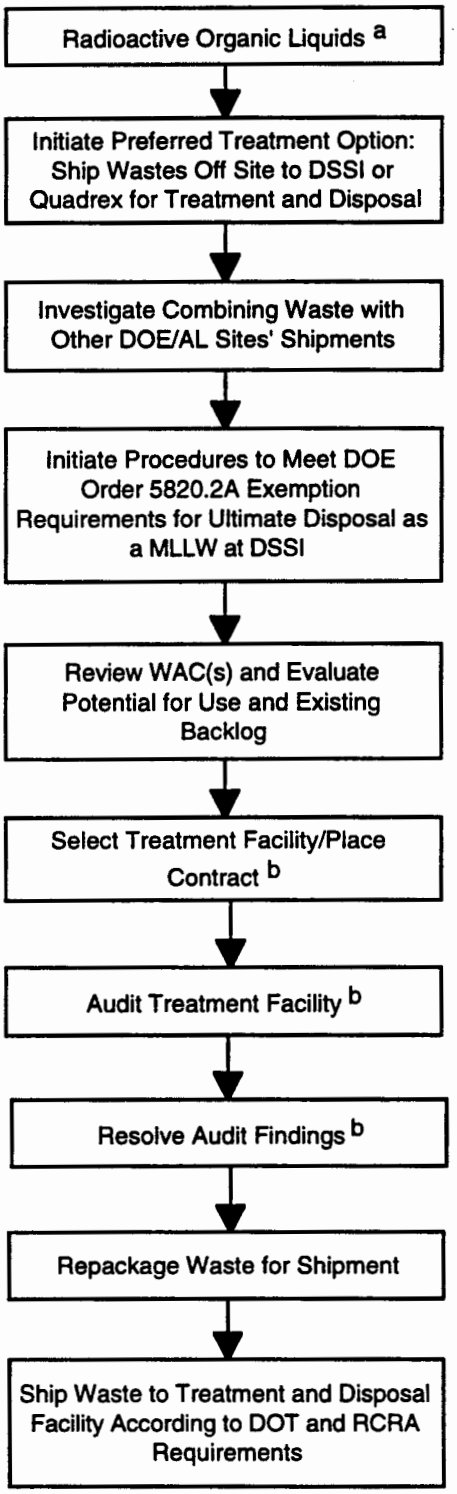
Assumptions: a This treatability group is for corrosive liquids with low concentrations of metal contaminants, as well as low levels of F039 constituents, which would have to be reviewed on a case-by-case basis.

b Stabilization will treat concentrations of hazardous constituents to below LDR levels.

Elemental Mercury Treatability Group 6



Organic Liquids Treatability Group 7

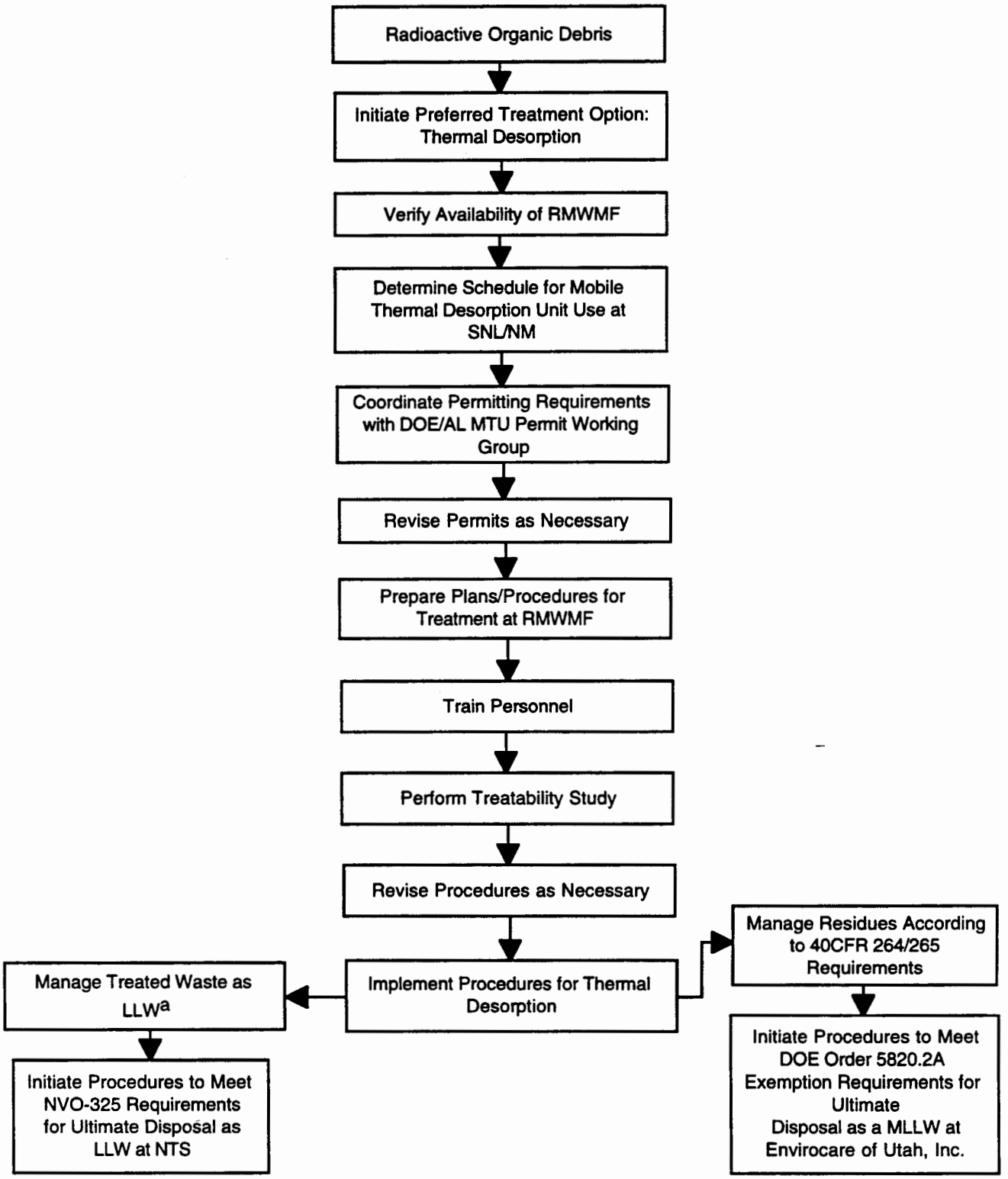


Assumptions:

a This treatability group is defined as those organic liquids that meet the Waste Acceptance Criteria (WAC) for either DSSI in Tennessee or Quadrex in Florida.

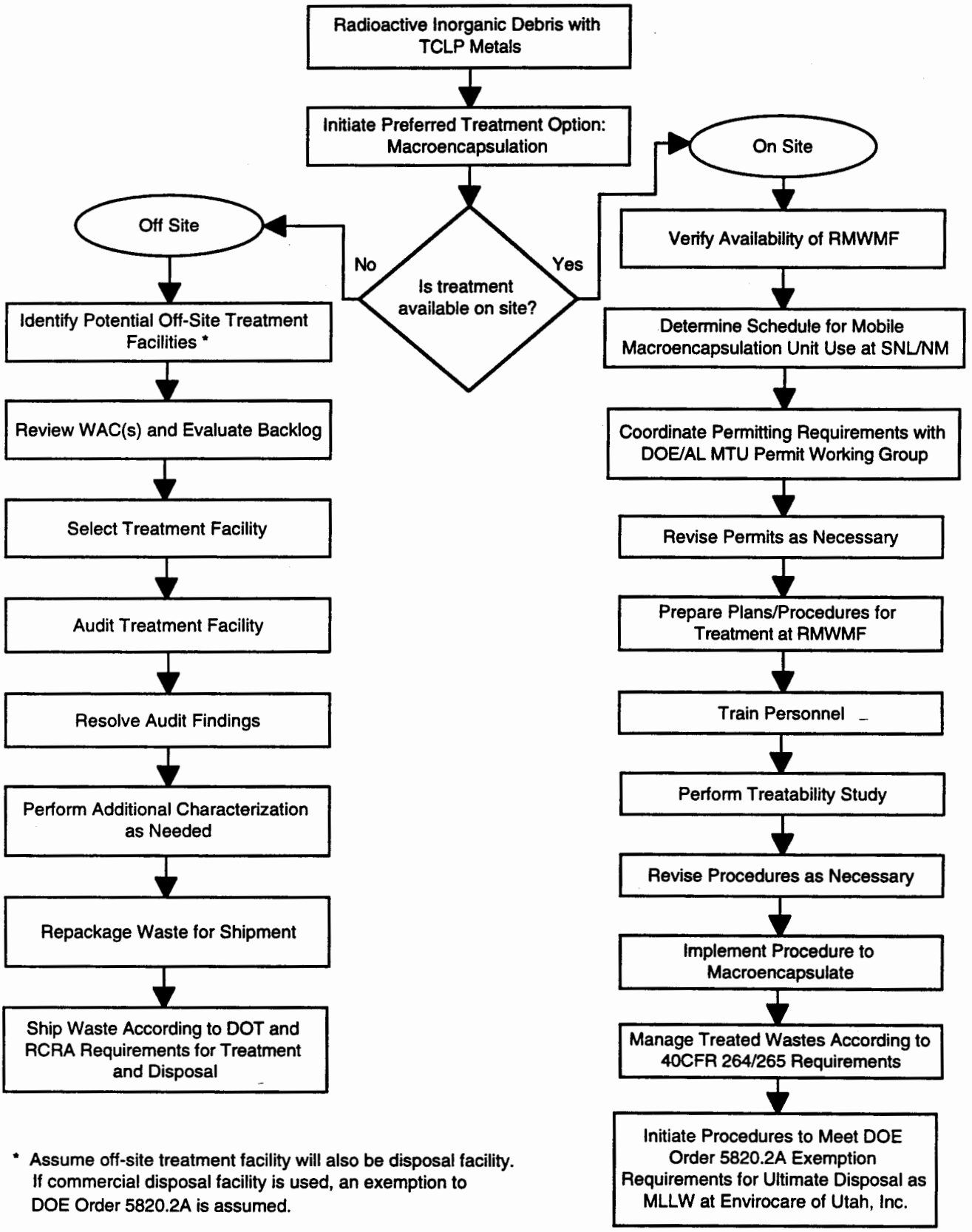
b These activities may be perfomed by or with the other DOE/AL sites for a combined shipment of wastes to the treatment facility.

Organic Debris Treatability Group 8



Assumptions: [a] Organic Debris prior to treatment will have low levels of metal constituents to be reviewed on a case-by-case basis to meet the WAC.

Inorganic Debris with TCLP Metals
Treatability Group 9



* Assume off-site treatment facility will also be disposal facility. If commercial disposal facility is used, an exemption to DOE Order 5820.2A is assumed.

ATTACHMENT 1

EVALUATION OF TREATMENT OPTIONS

Methodology and Options Evaluation Process
From the
DOE/AL Mixed Waste Treatment Plan, March 1994

Mixed Waste Treatment Plan
Introduction

The Problem

Congress passed the Federal Facilities Compliance Act (FFCAct) in 1992. The act was born out of Congress's frustration with the lack of progress the Department of Energy (DOE) was making in treating and disposing of mixed waste in accordance with the Resource Conservation and Recovery Act (RCRA). Mixed wastes are wastes that have a hazardous component as defined in the RCRA regulations and a radioactive component. The FFCAct requires each DOE facility to negotiate a site treatment plan (STP) with the state in which the site is located. The STP must specify how and when mixed waste will be treated. Negotiation of the STP must be completed by October 1995.

Adequate treatment capacity does not exist to treat mixed waste. Treatment methods are available for the hazardous component, but the radioactive component complicates the application of these methods. Treatment processes used for mixed waste must not only destroy the hazardous component, but they must also contain the radioactive component in a form that allows final disposal while protecting workers, the public, and the environment. These considerations make the application of treatment methods to mixed waste more costly and time consuming.

Treatment is further complicated by political realities. Shipment of waste between DOE sites for treatment or disposal will be difficult. Treatment processes that handle the largest variety of waste, incineration being the most notable example, will be hard for the public to accept and for regulatory agencies to permit.

The DOE Albuquerque Office (DOE-AL) oversees nine DOE sites that have mixed waste (Fig. 1). The size and activities at these sites varies greatly (Fig. 2). Volumes of low-level mixed waste at these sites range from one gallon at the Pinellas Plant to the equivalent of 4500 drums at the Los Alamos National Laboratory (LANL) (Fig. 3). Of the nine sites, five have less than 50 drums of waste, and three of those have less than 10 drums. Throughout the nine sites, the volumes of individual waste streams are relatively small but diverse. Very few waste streams are larger than 200 drums, and most are less than 100 drums. Generally, the larger the waste volume at a site, the greater the diversity. For example, the 4500 drums at LANL are composed of approximately 50 waste streams. But even a small site like the Grand Junction Project Office (GJPO) shows diversity, having less than 10 drums of total waste made up of 18 different waste streams.

Simply stated, the problem is that a variety of treatment processes are needed at most of the nine sites. The treatment must be implemented quickly to meet the intent of the FFCAct. And because the activity is

funded by taxpayers and there are serious competing needs for tax dollars, the treatment must be implemented as inexpensively and efficiently as possible.

Purpose of the plan

The purpose of the plan is to use the resources of the nine sites to implement an effective program for treating mixed waste that minimizes time and cost. The team preparing this plan recognizes that each site is responsible for negotiating an STP with its state agencies. This plan offers resources outside those of individual sites that can be used in negotiating the STP.

Approach

The plan was prepared by a Treatment Selection Team (TST) made up of representatives from four of the sites and DOE-AL. The overall approach used to develop the plan is that used in the classical solution of any engineering problem:

- define the problem;
- determine what is given to work with;
- determine a basis for solution; and
- solve the problem.

In defining the problem, the team took a different approach from past efforts. The team visited each site and discussed the waste, treatment plans, and site capabilities. Instead of reducing the information into computer forms, the information was recorded as text wherever possible. This was important in characterizing the waste because it allowed the team to maintain the true identity and character of the waste throughout the process.

The team manually separated the wastes into treatability groups rather than using a computer data sort.

Team members were required to review and comment on all information collected. This requirement gave the team members the same information base from which to make decisions. The team made decisions by establishing ground rules, then applying common-sense judgment. All disagreements were discussed and resolved.

The team recognized that for the plan to be effective, it had to be reasonable and fair, using capabilities of the sites where the capabilities were real and complemented the work needed.

Scope of the plan

None of the nine sites has high-level mixed waste. Consistent with the DOE position that the Waste Isolation Pilot Plant is the designated repository for transuranic waste (TRU >100 nCi/g of transuranic elements), the plan does not include transuranic waste.

The plan concentrated on low-level mixed waste as the primary focus. However, during the site visits, the question arose whether any other waste could not be treated with existing treatment capacity to meet disposal requirements. These waste streams, which include PCBs, some nonradioactive hazardous waste, and low-level radioactive waste, are included in the plan.

Decontamination and decommissioning (D&D) wastes and environmental restoration (ER) wastes were included where the waste was adequately defined. Generally, these waste were outside the five-year period of the STP and this plan and were not sufficiently defined for inclusion. The work defined by the plan does not exclude the addition of these waste, and they may be included later.

The national effort

Although the Albuquerque Operations Office (AL) initiated the TST concept and the goal of mobile treatment sharing between sites, there is a tie to the national concept to develop the STPs. All guidance documentation about the draft STPs from the Headquarters level incorporates the idea of mobile treatment. Also the concept of a team of experts addressing mixed waste problems with the smaller DOE facilities is now being worked out of Headquarters.

The goal of having mobile treatment units that are available for multiple use allows for on-site treatment of waste. The concept precludes the need for extensive equity discussions among state regulators. The AL plan does not exclude other DOE sites from using mobile treatment units developed by AL sites, but encourages their use at any site if they apply to a specific waste. This issue will be addressed after AL waste is treated and the units are available.

This concept of mobile treatment-sharing will be reflected in each individual STP. The individual STPs will be part of the national DOE plan for treating mixed wastes. This report allows a consistent approach throughout the DOE-AL sites and is a mechanism for communicating similar problems and needs.

Mixed Waste Treatment Plan Objectives

Background

The Albuquerque Operations Office has waste management oversight responsibilities for nine diverse facilities. Because of this diversity, a coordinated approach to mixed waste treatment under the Federal Facilities Compliance Act (FFCAct) was desired. The TST was chartered with a mission to assist the Albuquerque sites in preparing workable draft site treatment plans.

Main goals

To fulfill this mission, the main goals of the team were to

- share treatment ideas among the sites and
- produce a plan that will identify a minimum number of technologies to treat all the mixed waste within the Albuquerque complex.

Secondary goals

Secondary goals were to

- consolidate resources and thus reduce expenses across the AL complex;
- augment the treatment expertise at each site;
- provide on-site treatment options to facilities that previous had only off-site options available; and
- provide expedient treatment to AL facilities.

Incorporating these goals, this document is the plan identifying mixed-waste treatment for the AL complex.

Mixed Waste Treatment Plan Methodology

The team used a classical engineering approach in developing the plan. The steps included defining the problem, determining what is given to work with, determining the basis for solution, and solving the problem. More detailed discussions of methodology are included in the following sections.

ne problem

The problem is the waste. Wastes were defined by visiting each site and collecting available characterization information as text on waste data sheets rather than on checklists so the individuality of the waste could be maintained through the development of the plan.

The givens include all the resources and rules that bound the possible solutions. Fact sheets were prepared for the sites, on-site treatment capabilities, off-site treatment capabilities, regulations impacting treatment options, and treatment technologies.

The basis was established by separating the waste into common treatability groups on the site waste matrix. This process bounds both the types and volumes of wastes that must be addressed by individual treatment technologies.

The solution is the plan, which was developed by evaluating and ranking alternative technologies, discussing the advantages and disadvantages of surviving technologies, and establishing activities for the required technologies. Common sense and engineering judgment were used in ranking technologies and establishing activities. Differences of opinions between team members were discussed, and a consensus reached.

owledge

Each team member provided quality reviews of all information so that everyone on the team had a common information base on which to make decisions.

The methodology used here is not perfect. The team did not attempt to select the perfect technology for each waste stream. The methodology was developed to identify easily implemented technologies that show the greatest potential for the most wastes, and to use those selections to generate direction for the sites.

Waste characterization

The plan is based on waste information collected at the sites. In some cases, information was sketchy, and additional characterization work was planned. Future characterization may cause a waste to be in the wrong treatment group. The methodology resulted in the selection of sound technologies with wide applications. Although it is possible a waste may be recharacterized outside the selected treatment technologies, the selected treatment technologies will still have wide application. If a waste is orphaned by recharacterization and cannot fit into one of the treatment technologies, a waste-specific technology will have to be added to the plan.

Presentation

The methodology created a lot of information. To keep the document simple, the text includes only a brief explanation of each section of the methodology. The fact sheets, waste data sheets, technology scoring sheets, and waste matrices are included as easy-to-reference appendices.

Methodology
Site fact sheets

Summary

A site fact sheet for each of the nine sites is in Appendix B. The site fact sheets summarize the following:

- general information, including relative size, site contractor, mission, and major activities;
- activities that generate mixed wastes;
- the radioactive isotopes and relative concentration of radioactive contamination in low-level mixed waste;
- the ability of the sites to support mixed waste treatment, including handling of residuals, space for treatment equipment, and engineering and analytical support; and
- information on the relationship of the site with the state regulators and the public relative to the impacts of on-site treatment.

Legend

A legend that describes the information on the fact sheets appears at the front of the appendix. Information is presented only if it is appropriate to that site, so not all of the sections are completed for all sites.

Preparation

The site fact sheets were prepared using information gathered during site visits. All team members reviewed the draft fact sheets. The information on these fact sheets provided the team with background information that influenced the plan for treating wastes presented in this document.

Methodology
Waste stream data sheet

Summary

Waste information was collected on each waste stream and recorded on the Waste Stream Data Sheets in Appendix C. A legend at the beginning of the appendix explains the information fields.

Data collection

The Waste Steam Data Sheets form the base knowledge set upon which the TST operated. These sheets initially contained information from the original Mixed Waste Inventory Reports (MWIRs) and the Conceptual Site Treatment Plans (CSTPs). After site visits and interviews, the TST member added their notes to the data sheets. The sheets were then sent to the sites for local review. All comments from the sites were included in the final version of the data sheets.

Site interviews

The TST interviewed waste management personnel at each site. Emphasis was on obtaining information that was not available from the MWIRs but that impacts handling and treatment of the waste, including anecdotal information. The TST also visited storage areas to see the waste. The objective was for each team member to get a mental picture of what the waste really is.

Methodology
Off-site fact sheets

Summary

Fact sheets for off-site mixed waste treatment and disposal sites in Appendix E give a quick reference of available commercial and DOE facilities. The sheets, one for each facility, contain the facility name and location. The sheets list applicable permits and capacity limitations. A summary is given of the materials permitted for treatment and of the treatment processes. For the disposal sheets, a brief description of acceptance criteria and requirements is presented. No one sheet is a complete description of activities or requirements at that facility; therefore, a contact name is also given.

Methodology
Site capabilities for mixed waste handling and treatment

Summary

Information on existing on-site treatment facilities or capabilities for mixed waste was collected during the site visits and is listed in Appendix D. Additional information is given in the site fact sheets in Appendix B. Not everything listed here is considered treatment under the RCRA regulations

The following table summarizes the capabilities at the various sites.

Site	Capabilities
ITRI	no current on-site capabilities
Pinellas	no current on-site capabilities
Grand Junction Project Office	no current on-site capabilities; extensive analytical capabilities
Kansas City	operates a depotting process; limited capabilities
Sandia/CA	can do less-than-90-day treatment of small-volume aqueous wastes without a permit
Pantex	limited capabilities
Sandia/NM	limited capabilities
Mound	limited capabilities
Los Alamos	three existing units, two of which are operational

Methodology
Regulatory fact sheets

Summary

Fact sheets for regulatory concerns affecting the plan are in Appendix F.

Areas of concern

Five areas of regulatory concern were identified during the planning process while identifying applicable treatment technologies for the wastes identified within the DOE/AL complex. These regulatory issues include

- hazardous waste debris;
- treatability study and sample exclusion;
- permitting requirements for mobile treatment units (MTU) versus research, development, and demonstration (RD&D) versus a RCRA operating permit;
- a summary of when each state received mixed waste authorization; and
- a comparison of proposed technologies to land disposal restrictions (LDRs).

Hazardous waste debris

The fact sheet for hazardous waste debris provides an overview of the August 18, 1992, Federal Register (57 FR. 37194) defines key terms identified in the final rule, identifies the BDAT technologies for hazardous debris, discusses unique circumstances that exist for characteristic debris and treatment residuals, and provides a disclaimer for using the fact sheet as a reference in making specific regulatory decisions.

Treatability studies and sample exemptions

The treatability studies and sample exemptions fact sheet provides a summary of the existing regulatory requirements in 40 CFR 261.4(e) and (f). The fact sheet provides an overview of these regulations, defines key terms, summarizes proposed changes to the quantities exempted per waste stream, and provides a disclaimer for using the fact sheet as a reference in making specific regulatory decisions.

Permitting

The permitting fact sheet summarizes and compares three permitting process under RCRA: MTUs, RD&D, and RCRA operating permits. Each type of permit available under RCRA was compared based on the reference or source for writing the fact sheet, the purpose and intent behind each unique permit, the permit process, the duration of each permit, and a note regarding information associated with each permit that may not appear obvious by reading the regulations.

State's mixed waste authorization

The fact sheet for the state's mixed waste authorization identifies each DOE facility included in this plan, the state in which the facility is located, the US EPA Region for each state, the date each state received mixed waste authorization from the EPA Region, and whether the EPA Region still retains authority for implementing the Land Disposal Restrictions.

Comparisons of proposed technologies

This fact sheet is a regulatory review of the waste streams identified by each site to determine the hazardous waste codes and the applicable LDR treatment standards that would apply to each waste stream. This review was done to ensure that if a technology-based standard were required for a specific waste code, the requirement would be addressed during the technology selection process.

Methodology
Site waste matrices

Summary

The purpose of the waste matrices is to facilitate grouping the wastes according to common treatment. The site waste matrices are in Appendix G.

Methodology

The wastes are first separated into waste categories; gases, aqueous liquids, organic liquids, solids, and special wastes. The special category includes elemental mercury and mercury salts, which require special consideration.

Waste categories are subdivided into waste streams based on characteristics that impact treatment. For example, organic liquids are divided into scintillation liquids, oils, halogenated solvents, and nonhalogenated organics. A matrix sheet is prepared for each waste stream. The matrix includes the quantity and site identification number for each waste.

The waste streams are further subdivided into substreams. If the wastes from different sites are the same, they are listed under the same substream name. Separate substream names are used if the waste has a characteristic different from that of the other waste that could impact treatment. For example, scintillation liquids with lead, actinides, and tritium are noted as three separate substreams. This approach allows the identity of the waste to be maintained throughout the sorting process.

Finally, the substreams are grouped based on a common base treatment. At this stage, the base treatments considered include only off-site commercial options or treatment technologies available or planned by the sites. The selection team assumed that waste could be shipped off-site to commercial treatment facilities, but significant quantities could not be shipped between DOE sites. Site-specific treatment, such as the CAI at LANL or the glass melter at Mound, are given as the base treatment only if the waste in that grouping occurs only at the respective site.

Preparation

The matrices were prepared by assigning each site to a team member. The wastes were assigned to the matrix sheets during a meeting of the team so that different opinions could be resolved. The assignments of sites to the team members were then changed; the new assignee was responsible for checking the matrix and waste stream data sheets to ensure that all wastes are included on the proper matrix. All conflicts between team members over categorization of the wastes and sorting based on base treatment were resolved through discussion and consultation of site notes and waste stream data sheets.

Volume disclaimer

Only relative volumes of individual wastes are needed by the team to formulate the plan. Volumes given during the site visits or in FFCAct documents were converted into units having visual impact, such as drums, gallons, or kilograms, then rounded off. In some cases, waste streams given in reports as a single stream were subdivided. For example, one waste stream called oil actually includes drums of water with oil contamination, drums of liquid oil, and drums of oil adsorbed on clay. The stream was subdivided into three streams and the individual volumes estimated based on notes from the site visit. In a few cases, educated guesses were made to reflect subdivisions. **Volumes cited in this report should not be directly compared with 180-day reports or CSTPs, nor should they be used for legal submissions.**

Methodology
Technology fact sheet

Summary

Technology fact sheets were prepared for applicable technologies and are in Appendix H. Technologies included are those proposed by the sites and the alternative technologies considered.

Sources and use of information

The information shown in the fact sheets was obtained from various sources, including DOE waste management and technology development personnel, published literature, and TST members.

The information is a technology profile and is intended to familiarize the reader with the main features of the technology, its complexity, application, limitations, and development status.

Methodology
Technology evaluation sheets

Ranking alternative technologies

After the base treatment technology was determined, alternative technologies were ranked against the base technology. The term "technology" is loosely used in that the base technologies and the alternatives included treatment opportunities, including treatment at off-site commercial facilities.

Alternative technologies were scored against the base as either much worse, worse, equal, better, or much better. The selection criteria are in the front of Appendix I, which includes the rating sheets. One rating sheet was prepared for each waste substream found on the site waste matrices.

Participants

Attending the rating were all team members and the technical program managers (TPMs) for the EM-50-supported research from LANL, Sandia, NM, and GJPO and the ETD representative from DOE-AL. Attendees could propose technologies and comment on ratings.

Ground rules

Five ground rules were established for rating technologies:

- team members have the final vote on scores;
- technologies considered must be directed toward the volumes and waste types found at the DOE-AL sites;
- technologies considered must have a realistic approach to shipment of waste; this means shipment of waste to commercial facilities for treatment or shipment of small volumes of waste between DOE sites for treatability studies is reasonable, but shipment of waste between DOE sites for treatment or disposal is not practical in the short term;
- treatment opportunities evaluated must be implementable within five years; and
- common sense must be used in selecting alternatives for scoring and, in rating those alternatives, solutions must fit the problem.

ces of alternatives

Two sources of alternatives were used. During the site visits, sites provided information on technologies that were proposed, being designed, or being studied.

Additional technologies were proposed by team members and the ETD representative familiar with applicable research and development activities at various sites.

This approach was augmented by referencing the DOE Office of Technology Development FY93 Program Summary that lists research and development activities.

The alternatives studied were by no means exhaustive. The team limited itself to technologies that reasonably fit the problem as defined by waste types, waste volumes, transportation limitations, permitting issues, and public acceptance. The team's attitude was to select alternatives that could be implemented in a short time to treat waste either through treatability studies or by design, construction, permitting and operation of treatment units of a size matching the problem. Many alternatives were discounted because of long lead-times for implementation, long permitting times, or the inability to be easily scaled to the waste volumes requiring treatment.

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g the alternatives

The alternatives were rated against the base by the criteria through group discussion using engineering and regulatory judgment. Through the methodology used, all the team members were familiar with all the waste, the waste volume, the proposed technologies, the site's ability to support treatment, final disposal options, off-site treatment capabilities, and the impact of regulations. All of these weighed in rating technologies.

The rating of technologies is specific to the waste substream and against the base technology. Ratings should not be compared between rating sheets.

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Regulatory considerations weighed heavily in the rating.

Example: if organic debris is treated by thermal desorption, the resulting debris is low-level waste even if the original waste was contaminated with an F-listed solvent. However, if the same waste with an F-listed solvent were treated by incineration, the residual must be handled as an F-listed waste.

In several cases no alternative was found, because either the team could not find an alternative or an alternative was not needed. An alternative was not needed if the waste occurred at a single site and that site had begun the design of a treatment technology.

Preferred options

After the alternatives were rated, the base and the alternatives were rated as either first, second, or third preferred options. The rating addressed the individual criteria scoring but once again applied judgment. In cases in which alternatives were considered equivalent, more than one first, second, or third rating was given.

Need for R&D

During the rating procedure, the need for research and development for particular waste was noted. In these cases, the team felt that while a technology existed that could handle the immediate problem, the problem was large enough or future anticipated generation warranted the development of a better alternative. These needs are cited later in the plan.

Methodology
Selected treatment versus waste streams

Summary

Sheets showing the technologies rated first, second, or third with the waste streams to which they apply are in Appendix J.

Methodology

The following table summarizes the methodology for selected treatment technologies.

Stage	Description
1	A list was made of the technologies or treatment options that were rated first, second, or third. A data sheet was prepared for each technology showing the waste applicable to that technology and how the technology rated for that waste. Waste volumes and site identification numbers are on the sheets. The sheets identify the customers for each technology.
2	The sheets were spread on a table. Certain technologies were considered unavoidable, and these sheets were removed from the table as needed technologies. **Example**: Regardless of what technologies are used to treat many of the wastes, some form of residual stabilization is needed. Although the chemistry of additives may differ for different residuals, the mixing process remains the same. Therefore, stabilization was considered an unavoidable technology.
3	Technologies with no alternatives were removed from the table as needed technologies. Generally, these were technologies for which design work was in progress.
4	Technologies whose application was limited to a few waste streams and that were not rated first were removed from the table as unneeded technologies. By the methodology used, all waste must have a technology rated as first. The waste rated second or third must appear as first for some other technology. In removing technologies with limited applications, the team was careful to confirm that an alternative and viable technology was still on the table or in the list of needed technologies.

Stage	Description
5	The advantages and disadvantages of the technologies left on the table were discussed and decisions made for their use in the plan. Those decisions appear later in the plan.

Methodology
Mixed waste from RMMAs

Suspect wastes from RMMAs

During the site visits, the team repeatedly heard that waste was suspect for radioactivity because it came from radioactive materials management areas (RMMAs). Surveying these wastes may allow release to commercial treatment and disposal facilities.

Waste matrices

Site waste matrices in Appendix K show the wastes that may not be radioactive and for which commercial treatment options exist if it is not radioactive.

The matrices are divided into solids and liquids. The matrices include roughly the equivalent of 500 drums of waste.

Potential for greater volume

The potential volume is greater because the matrices include only those wastes for which the statement was made and recorded that the waste was suspect because it came from an RMMA.

There are other wastes for which the statement may be true, but the wastes are not included in the matrices because the fact was not in the data collected.

Mixed Waste Treatment Plan
The Plan

Introduction

This section includes the plan to create treatment capacity that matches the needs of the site within DOE-AL. The plan consists of the direction given in this section and the following sections addressing project management, support groups, selected technologies, site assignments, and research and development needs.

Implementation and management

The plan does not include details for implementing the plan. The TST recognizes that an overall program manager (OPM) is needed to develop implementation details and to manage the plan. This plan identifies the responsibilities of the overall manager and recommends a structure for support to resolve the issues.

Overall program manager. The OPM will be appointed by DOE-AL and is responsible for the implementation of the plan and coordination of activities.

Site project managers. The plan makes assignments to the sites, which become the project managers (PMs) of their own assignments.

Working or support groups. The plan recommends forming support groups to handle issues. The plan identifies these groups and recommends a scope of work for each.

Structure of the plan

- Using the methodology previously described, the TST arrived at a group of technologies that address the waste at all sites, can be easily implemented, and provide contingency for major waste streams.

  (The term "technology" is loosely used and includes all available treatment opportunities, including using commercial capacity.)

- The TST then determined what must be done with the selected technologies. Options ranged from continued research and development to design and fabrication of a unit sized to treat the waste.

- Each technology was then assigned to a site, the site becoming the PM for that technology responsible for completing the assignment. The PM is responsible for recognizing the needs of its customers, who are defined by the waste streams that can be potentially treated with the technology assigned. The site PM must produce a schedule for each assignment that shows the steps needed to complete the assignment and when the technology will be available to clients.

- Initial assignments were made in a draft report and were discussed with the sites, DOE-AL, and DOE-HQ.

- Based on comments from the sites, assignments were reconsidered and finalized.

- The OPM is responsible for preparing more detailed assignment definitions, but the TST believes that the information given here is adequate for the PMs to begin planning.

Philosophy

The philosophy of the plan is simply to get the job done, to create treatment capacity. In preparing the management plans, the PMs must focus on the objective--the treatment of wastes--not the study of the treatment of waste. The team does not see these assignments as long-term programs that offset declining weapons work. If we are successful, that will follow. Good work leads to good work.

PMs must honestly draw upon real expertise and the experience of other sites in the DOE-AL complex. For example, several sites have done stabilization work. The experience of those sites must be used.

The TST has made a diligent effort to sort waste streams to matched technologies. If a single waste or relatively small problem threatens to significantly delay a project or explode costs, the PM may drop that waste from consideration for his or her assignment. However the OPM, must coordinate the waste back into the plan. The PM must use judgment in not letting small problems impede the solution of large problems.

Obvious choices

Several obvious courses of action were apparent in the study and have become part of the plan.

Portable treatment units. First, the size, diversity, and economy of waste streams justify the use of packaged, portable treatment units. In all cases, a treatment unit sized to work off the accumulated backlog of waste is oversized for the ongoing waste stream. The unit would have appreciable down time, allowing use at other sites. Even if movement of the treatment unit becomes impractical, the design of portable packaged treatment units allows rapid and economic replication of additional units for other sites.

Commercial facilities. Much of the waste can be sent to commercial treatment facilities. Efforts of individual sites to use these facilities should continue. The plan includes an effort to coordinate and expedite the use of commercial facilities.

Sort and survey. An appreciable volume of the waste may not be radioactive and can be handled by commercial facilities if it is not

radioactive. The plan includes an effort to expedite sorting, surveying, and any necessary decontamination of these wastes.

New technologies

The research and development needs and opportunities are identified in a following section. In formulating the plan, the team concentrated on technologies that are easy to implement.

Occasionally, the team considered technologies that are on the verge of readiness. These choices represent a starting point. We first create capacity and treat waste.

Nothing planned is of such an effort or cost that better technologies cannot be applied by the same process used here when they are ready and show a distinct advantage. However, if we continue to look to technologies on the horizon, we will fail to meet our objectives.

The OPM is responsible for establishing a process for evaluating new technologies. The process must include the participation of the sites.

Comparisons of proposed technologies to land-disposal restrictions

A regulatory review was performed on the waste streams identified by each site to determine the hazardous waste codes and the applicable LDR treatment standards that would apply to each waste stream. This review was done to ensure that if a technology-based standard were required for a specific waste code, this requirement was considered during the team's technology-selection process.

Most of the LDR standards for the waste streams identified by each site are concentration-based standards and can therefore have any technology applied to them as long as the standard can be attained. Four separate items of concern identified from this review indicate a possible conflict with the required LDR treatment standard. However, these items can be resolved by either proposing to EPA an equivalent alternative technology in accordance with 40 CFR 268.42(b) or by properly characterizing the problematic waste streams. See also the regulatory fact sheets in Appendix F.

The Plan
Selected technologies

Introduction

This section itemizes and justifies the selected technologies.

Unavoidable technologies

During the treatment selection process, six treatment options were identified as "unavoidable" treatment, in which the treatment steps had to be done regardless of what other treatment processes were needed. The following are unavoidable technologies.

Technology	Rationale
stabilization of residuals (heavy metals and mercury, and neutralization of solids)	Many of the processes selected produce treatment residuals that must be stabilized before disposal
tritium capture from vents	Many of the processes produce tritiated water that must be captured from process vents.
amalgamation of elemental mercury	The technology is BDAT for mercury and the only alternative if liquid elemental mercury cannot be decontaminated for release to the public domain.
macroencapsulation	The technology is required to allow long-term disposal of certain types of debris.
sorting and surveying of waste	Several waste streams must be sorted to allow treatment by any means, and a significant volume may be treated by commercial facilities if the waste is demonstrated not to be radioactive.
treated water evaporation	Several of the selected treatments generate water; if the waste treated is listed, the water may be listed. Evaporation reduces the amount of water that must be solidified and disposed.

No-alternative technologies

Five technologies were defined as no-alternative technologies. Either the team could not find an easily implementable alternative, or the base technology was being designed and an alternative was not needed. The following are no-alternative technologies.

Technology	Rationale
sulfate precipitation of barium	LANL has successfully used this simple treatment on nonradioactive barium sand and has designed a treatment skid.
gas cylinder skid	LANL has started work on this skid and the waste exists only at LANL.
uranium chips skid (pyrophoric metals)	LANL has designed and is fabricating a skid; LANL has most of the applicable waste.
reactive metals skid	LANL has completed bench work and is starting a skid design, LANL has most of the applicable waste.
retorting of mercury salts followed by recovery or amalgamation	No alternative was found for a small volume of certain mercury salts, retorting is BDAT.

Selected technology options

Eight treatment options were obvious selections for mixed waste within DOE-AL. The rationale for selecting these treatment options was based on several factors that became apparent during the evaluation of all the treatments initially identified in this report:

- the treatment ranked first for some wastes and
- the treatment solved a major portion of the mixed waste treatment problem within DOE-AL.

The eight selected technologies are the following.

Technology	Rationale
triple distillation of mercury	The technology allows elemental mercury to be recycled if a market can be found; LANL has a still that is not operating.
DSSI	Off-site treatment presents an immediate opportunity to treat a variety of liquid organics with low levels of radioactivity.
Quadrex	Off-site treatment presents an immediate opportunity to treat scintillation liquids with low levels of tritium.

Technology	Rationale
Envirocare	Off-site treatment presents an immediate opportunity to dispose of debris and treatment residuals.
stabilization	The technology satisfies land-disposal restrictions.
thermal desorption	The technology applies to a large amount of trash with organic contamination, is BDAT and a proven technology, and allows disposal of treated debris as low-level waste after treatment, even if it is contaminated with an F-listed solvent.
plating waste skid	The skid provides a variety of oxidation, neutralization, and reduction chemistries for aqueous waste; skid design is complete.
decontamination	The technology offers the opportunity to release waste for treatment at commercial facilities.

Evaluated technologies

The selection methodology left nine technologies to be evaluated. Basically these nine options are not obvious solutions, or they overlap or compete with technologies already selected or with each other. Some are still within the development arena and are not as well defined as others. The team discussed the advantages and disadvantages of these technologies and then developed and justified a course of action.

The nine technologies and the team's recommended course of action and justification are on the following table.

Reconsidered technologies

The findings of the team were presented in a draft report and comments solicited from the sites. Sites recommended several technologies be reconsidered because they solve other problems. The team agrees these technologies--$SCCO_2$, metal melting, and biodegradation--have potential to solve problems outside the scope of this plan. The TST recommends technologies be investigated with EM-50 funding and the support of EM-30.

The Plan
Table of evaluated technologies

Technology	Recommended course of action	Rationale
Controlled-air Incinerator	The team supports LANL efforts to bring the CAI back into operation for LANL waste.	The CAI is an existing demonstrated technology that can handle the wide variety and volumes of waste at LANL. The TST recognizes that political realities prevent this plan from assigning off-site waste to the CAI, although it technically can handle these wastes. Alternative technologies were selected for wastes from other sites that provide backup for the CAI. The CAI is designed for TRU waste, which is a larger volume waste stream than mixed wastes at LANL.
glass melter	The team supports Mounds efforts to bring the glass melter back into operation for Mound's waste.	The reasoning is similar to that for the CAI, although the application of the melter to Mound's waste is more limited because a portion of the candidate waste is contaminated with tritium.
$SCCO_2$ (supercritical CO_2)	The team recommends that EM-50 continue to fund research of $SCCO_2$, which is a good candidate for RD&D permitting and treatability studies.	This technology holds promise and is a valuable option for major waste streams at several sites, but it is not mature enough to apply to this plan.
chelating of lead followed by stabilization	The team elects to pursue the design, fabrication, and testing of a bench-top process for treatability studies.	This technology applies to lead waste but is unproven. Stabilization and macroencapsulation were chosen as primary technologies; however, the only site for disposal of macroencapsulated lead that is radioactive is Envirocare. An alternative is needed for the large volumes of activated lead in storage at LANL and additional lead expected from decommissioning of accelerators throughout the DOE complex. Chelating followed by stabilization should allow less expensive disposal as a low-level waste.
DETOX	The team elects to have LANL continue its skid design effort and to have a portable bench unit built for treatability studies on actual mixed waste.	DETOX has the potential for handling a wide variety of organic waste. It can be close-looped for tritium control. LANL has this technology in a Federal Facilities Compliance Agreement and in the Five-Year Plan

Technology	Recommended course of action	Rationale
hydrothermal oxidation	The team elects to have treatability studies conducted on uranium and thorium nitrates, other laboratory nitrates, aqueous liquids with organics, and PCBs.	The technology has potential for wide use at all sites, but the technology is immature. Equipment to perform treatability studies is available, and the treatability studies on mixed wastes can be conducted with very little funding.
evaporative oxidation	The team elects to acquire the bench scale unit from Clemson Technical Center for treatability testing , and based on the results of the studies determine future development	This flexible technology can handle aqueous waste with metals, aqueous waste with volatile organics, and volatile organic liquids. A bench-scale unit that can handle radioactive wastes is available in a size that can handle selected DOE-AL waste streams.
packed bed reactor/silent discharge plasma	The team elects to support Mound's current efforts to reach a technical decision point in the next few months, provide process technical support, and build a skid-sized unit if the technology decision is confirmed.	This technology is aimed at PCBs, but it is a backup to the DETOX unit for organic liquids that cannot be sent off-site; Mound has included this project in its Five-Year Plan. There are questions about scalability.
steam reforming	The team elects to support Sandia/NM's efforts to reach a technical decision for a drum-sized unit, provide process technical support, and build a portable drum-sized unit if the technology is proven.	This technology is an alternative to thermal desorption and is therefore aimed at a large volume of the DOE-AL waste. It has the advantage of volume reduction. It can be applied to Sandia's low-level waste to reduce disposal costs. Current work is included in the Five-Year Plan. There are questions about the chemical nature of the treatment residual. The equipment is available off the shelf.

The Plan
Site assignments

Summary

Project management duties were assigned to sites based on capabilities, waste distribution, and interest. ITRI and Sandia/CA did not receive assignments. Both sites expressed interest only as a user of treatment capabilities.

Assignments

Site assignments and the team's justification for the assignments appears in the following table. Prospective clients for the assignments appear in Appendix J, which contains the matrices of selected treatment versus waste streams.

In making assignments, technologies or treatment options were grouped where it made sense to do so.

Initial assignments were made in a draft report that was presented during a second site visit. The assignments were discussed with the sites, and the final assignments recognizes site comments.

Funding

All but three of the assignments are to be funded by EM-30 through the Five-Year Plan. EM-50 support, wherever appropriate, is requested. Support from EM-50 is specifically requested for three assignments noted on the table. These technologies were not judged to be mature enough for implementation by the TST with EM-30 funding. Sites have been assigned as project managers for these technologies to secure funding from EM-50 to direct development work on these technologies for DOE-AL waste leading, in turn, to demonstration and implementation.

Figures

The distribution of assignments and the site interdependencies are shown on figures that follow the assignment table.

The Plan
Table of project management assignments and rationale for them

Site	Technology	Assignment	Rationale for site selection
GJPO	sort, survey, and decon	Using resources available from LANL, PTX, and SNL/CA, develop the capabilities or find existing capabilities for a mobile field team to assist each site with sorting, surveying, and surface deconning suspect waste to allow release to commercial treatment facilities. This assignment includes preparing procedures and documentation that allow waste release, finding or building portable analytical and survey systems, providing portable sorting space and equipment, arranging for staffing to execute the actual work at the sites, and managing the site work. This effort is targeted to be completed by 10/95. Planned and ongoing efforts at the sites are to continue until this effort can provide support.	• GJPO has a reputation for strong project management expertise and timely completion of projects. • They have experience in assembling a team for this type of effort. • They have extensive analytical support facilities and a system for opening and sampling drums.
	thermal desorption	Using the pilot unit available from Clemson Technical Center, perform treatability tests on various applicable wastes from the sites. Based on the treatability tests, make the Clemson unit into a portable bench-scale treatment unit, or design and build a new bench-scale unit, whichever is the more cost-effective. Based on the treatability tests, design and build a skid-sized portable unit.	• A test unit is available through Rust. • They have an interest in performing treatability test for DOE and have started discussions with the state along these lines. • They have design and operating experience with this technology.
	evaporative oxidation	Using the pilot unit available from Clemson Technical Center, perform treatability tests on waste from applicable waste from the sites. Based on the treatability tests, design and build a skid sized portable unit.	• A test unit is available through Rust. • They have operating experience with this technology. • They have extensive analytical support for this activity.

Site	Technology	Assignment	Rationale for site selection
GJPO	treated water evaporation	Design and fabricate a bench-scale unit and a skid-sized unit to evaporate treated wastewater from various units for volume reduction.	• The technology is similar to that for the evaporative oxidation unit. • GJPO needs this technology independent of the mixed waste plan.
ITRI	none	none	• ITRI expressed an interest only in having alternatives to off-site treatment available. They would like to concentrate on what they are the best at, inhalation research.
KCP	off-site treatment (includes DSSI, Quadrex, and Envirocare)	Establish a program for expediting shipments from all sites; become the off-site experts and source of definitive information for all sites; working with DOE-AL. clarify off-site treatment residual fate; and coordinate shipments from small sites excluded from shipment because they are "too small." Planned and ongoing efforts at the sites are to continue until this effort can offer support.	• KCP has shown extensive innovation and follow through in working off-site options for other wastes. • KCP needs off-site treatment options.
	plating waste skid	Drawing upon the skid design from LANL, design and build a bench-scale unit to treat applicable waste. The unit should provide oxidation/reduction and neutralization chemistry on small volumes of aqueous waste. Manage treatability studies with the unit on radioactive waste to determine what happens to the radioactivity.	• KCP has experience in treating plating waste. • KCP requested this assignment during site presentations.
	$SCCO_2$ (EM-50)	Organize and manage an EM-50 funded effort to develop this technology for DOE-AL mixed waste.	• KCP has a commercial $SCCO_2$ test unit funded by EM-50 being tested on nonradioactive waste. • KCP has a pressing economic need for this technology for nonradioactive wastes.

Site	Technology	Assignment	Rationale for site selection
LANL	plating waste skid	Continue design and fabrication of the skid sized unit. Review the applicable waste from other sites and work with those sites to start permitting.	• The skid design is complete and permitting has started in NM. • The work is already projected in the Five-Year Plan.
	gas cylinder skid	Continue developing a skid unit to treat compressed gas cylinders.	• LANL has started developing the skid as part of a FFCA; it is funded in the Five-Year Plan. • All the wastes applicable to the skid are at LANL.
	reactive metals skid	Continue developing a skid to treat reactive metals. Perform bench tests on sodium metal to ensure that the skid will handle this metal. Expand the design to ensure that reactive metals from other sites can be handled.	• LANL has completed bench-testing on lithium hydride and will start skid design in 1994. Bench-testing apparatus is already available. • The skid is part of LANL's FFCA.
	uranium chips skid	Continue developing a skid to treat pyrophoric uranium. Perform bench testing to ensure the process will work on thorium metal.	• The skid is designed and will be fabricated in 1994.
	DETOX	Continue developing a skid sized DETOX unit. Develop a portable bench-scale unit for treatability studies on applicable mixed waste from the sites.	• This technology has been previously funded and managed by LANL. • LANL has the largest waste streams identified for this technology. • DETOX is included in LANL's FFCA.
	chelating followed by stabilization	Develop a bench-scale unit for treatability testing for chelating and stabilizing activated lead, including large shapes such as stringers and magnets.	• Most of the waste for this technology is at LANL. • The R&D work for this process was done at LANL.
	CAI	Continue plans to restart the controlled-air incinerator for LANL's waste.	• This is a site-specific activity for an existing facility.

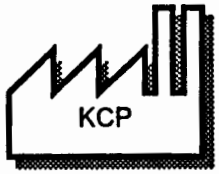
Site	Technology	Assignment	Rationale for site selection
LANL	lead decon trailer	Determine a schedule for availability to other sites. Prepare an operating plan addressing the problem of operation at other sites.	• The equipment is operating at LANL.
	hydrothermal processing	Conduct treatability studies for DOE-AL waste; emphasis should be on uranium and thorium nitrate, laboratory nitrates, and organics in water.	• LANL has waste for treatability studies. • LANL is conducting hydrothermal process research and has equipment available.
	triple distillation of mercury	Determine whether triple distillation can be used to treat contaminated mercury to allow recycle outside the DOE. Determine whether a market exists within the DOE for distilled mercury.	• LANL has a mercury still. • LANL has a large quantity of mercury to which this technology could apply.
MND	tritium capture	With assistance from tritium experts at LANL and SNL/CA, design and fabricate a family of portable tritium capture systems to support the treatment processes in the plan. The family should include units sized for bench-scale, drum-scale, and skid-sized portable units.	• MND has extensive tritium experience and can recover tritium from capture systems. • MND has an existing need to design a capture system for the BPR/SDP.
	PBR/SDP	Continue testing of the PBR/SDP process to reach a "go/no go" decision based on technical merit. If successful, proceed with the developing a skid-sized unit to treat applicable waste.	• MND is currently working with LANL researchers on this process. • MND is funded through the Five-Year Plan for this work.
	glass melter	Continue restart plans for the glass melter.	• This is a site-specific treatment option for an existing facility.
PIN	amalgamation	Optimize the process for amalgamating elemental mercury. Design and fabricate a bench-scale unit for amalgamation that can handle the problem within DOE-AL.	• PIN has experience in amalgamating nonradioactive mercury. • PIN requested this assignment
PTX	stabilization	Drawing upon the stabilization experience at LANL and GJPO, design and fabricate a family of stabilization processes to handle residuals from treatment and candidate wastes for direct stabilization. The family of units should include bench-scale, drum-size, and skid-sized processes.	• PTX has several large volume waste streams to which this technology applies.

Site	Technology	Assigment	Rationale for site selection
PTX	sulfate precipitation of barium	Drawing upon LANL's treatment experience and design for nonradioactive barium and the above stabilization assignment, design and fabricate one of the skid-sized stabilization units to treat barium. This assignment only requires that the skid sized stabilization unit accommodate the addition of calcium sulfate. This treatment capability is needed at sites other that PTX.	• PTX has large waste streams to which this technology applies.
	macro-encapsulation	With assistance from Sandia/NM, LANL, and MND, design and develop a portable process for macroencapsulation of waste for which this technology was rated first or second (activated lead will be held out, pending results from chelating followed by stabilization).	• This technology is similar to the stabilization assignment.
	metal metling (EM-50)	Organize and manage an effort funded by EM-50 to develop this technology for DOE-AL mixed waste.	• PTX has the largest ongoing waste stream for which this technology applies.
	biodegradation (EM-50)	Organize and manage an effort funded by EM-50 to develop this technology for DOE-AL mixed waste.	• PTX has ongoing nonmixed waste for which this technology has some advantages.
SNL/CA	none	none	• SNL/CA asked to be a user of technology, they did not feel they had enough techical support available at this time to support an assignment.
SNL/NM	steam reforming	Continue with current plans to install and test a steam reforming unit on organic solids. Call upon LANL's waste management process engineering staff for help in developing the test program. If testing is successful, proceed with the design and fabrication of a portable skid sized unit for use at other sites.	• SNL/NM has funding and is well along in the planning process for this technology. • SNL/NM needs to use this technology for volume-reduction of low-level waste.

Site	Technology	Assignment	Rationale for site selection
SNL/NM	retorting followed by amalgamation of mercury salts	Determine a method of retorting or equivalent treatment for mercury salts for which there is not an off-site treatment and disposal option. Perform treatability studies as needed. Based on treatability study, design and build a bench-scale unit to handle this waste.	• SNL/NM has the waste for which this treatment is needed.

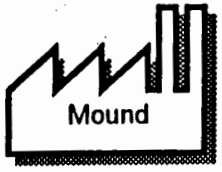
Treatment Development Assignments

- Sort, Survey & Decon
- Thermal Desorption Bench & Skid units
- Evaporative Oxidation
- Treated Water Evaporation

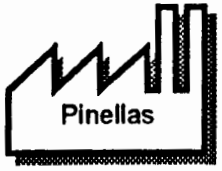


- Offsite Treatments; DSSI, Quadrex, Envirocare, et al.
- Plating Wastes (Bench Scale)
- SCCO2 (EM-50)

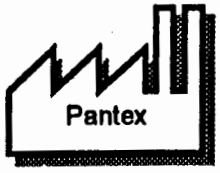
- Gas Cylinder Skid
- Plating Waste Skid
- Reactive Metals Skid
- Uranium Chips Skid
- Pb Decon Trailer
- DETOX
- CAI
- Chelating fb STABL
- Hydrothermal Processing
- Triple Distill. of Hg



- Tritium Capture
- PBR/SDP
- Glass Melter



- Amalgamation



- Stabilization
- Sulfate Precipitation of Barium
- Macroencapsulation
- Metal Melter (EM-50)
- Bio (EM-50)

- Steam Reforming
- Retorting fb AMLGM of Hg salts

Site MW Treatment Scheme

	Aqueous Liq. w/Organics WM 2-I	Aqueous Liq. wo/Organics WM 3	Scintillation Fluids WM 4-I	Halogen. Organic Liqs. WM 6-I	Nonhalog. Organic Liqs. WM 7-I	Soils w/Organics WM 19-I	Soils w/Org. & metals WM 19-II	Soils w/Hg WM 19-III
#1	Evap Oxid GJPO	*Plating Waste Skid LANL*	Quadrex/ DSSI	Bulked fb DSSI	Bulked fb DSSI	Thermal Desorp GJPO	Thermal Desorp GJPO	Thermal Desorp fb AMLGM GJPO/PIN *STABL PTX*
#2	*Hydrothermal Processing LANL*	Evap Oxid GJPO	Evap Oxid GJPO	*Hydrothermal Processing LANL PBR/SDP MND*	*Hydrothermal Processing LANL PBR/SDP MND*			
#3			*PBR/SDP MND*	Evap Oxid GJPO *DETOX LANL*	Evap Oxid GJPO *DETOX LANL*			

Italics indicates PM by another DOE site.
Black indicates local control or commercial treatment.

2/23/94

Site MW Treatment Scheme

ITRI

	Aqueous Liq. wo/Organics WM 3	Scintillation w/H3, C14 WM 4-II	Scintillation w/Actinides WM 4-III	Lead WM 11-I
#1	*Plating Waste Skid LANL*	Quadrex/ DSSI	DSSI	*Decon LANL*
#2	*Evap Oxid GJPO*	*Evap Oxid GJPO DETOX LANL PBR/SDP MND*	*DETOX LANL*	*Chelating fb STABL LANL MACRO SNL/NM*
#3			*PBR/SDP MND*	

Italics indicates PM by another DOE site.
Black indicates local control or commercial treatment.

2/23/94

Site MW Treatment Scheme

	Inorganic Debris WM 10-V	Organic Debris WM 15-1	Oxidizers WM 16
#1	Envirocare	*Thermal Desorp GJPO*	*STABL PTX*
#2	*Sort/MACRO PTX*	*Steam Reforming SNL/NM*	*Hydrothermal Processing LANL*

Italics indicates PM by another DOE site.
Black indicates local control or commercial treatment.

2/23/94

Site MW Treatment Scheme

LANL

	Aqueous Liq. w/Organics WM 2-1	Organic Debris WM 2-II	Oxidizers WM 15-I	Soils w/Hg WM 19-III	Soils w/Pb WM 19-IV	Soils w/BA WM 19-V	Special Hg non-rad WM 20-II
#1	*Evap Oxid fb STABL GJPO/PTX*	*Thermal Desorp GJPO*	*STABL PTX*	*Thermal Desorp fb AMLGM GJPO/PIN STABL PTX*	*STABL PTX*	*Sulfate Precip fb STABL PTX*	*Retort fb Recovery SNL/NM*
#2	Hydrothermal Processing LANL	*Steam Reforming SNL/NM*	Hydrothermal Processing LANL		Chelating fb STABL LANL		*Retort fb AMLGM SNL/NM PIN*

Italics indicates PM by another DOE site.
Black indicates local control or commercial treatment.

Waste groups for which LANL has primary treatment responsibility or uses commercial facilities:

- Compressed Gases, WM 1-I, 1-II
- Aqueous Liquids w/PCB, WM 2-II
- Aqueous Liquids without Organics, WM 3
- Scintillation Fluids, WM 4-III
- Organic Oils, WM 5-I, 5-II
- Halogenated Organic Liquids, WM 6-I, 6-II
- Nonhalogenated Solvents, Organic Liquids, WM 7-I
- Inorganic Debris, WM10-II, 10-V
- Lead, WM 11-I, 11-III
- Other Lab Packed Solids, WM12
- Reactive Metals, WM 17-I, 17-II
- Waste Water treatment Sludge, WM 18-I
- Special Hg w/H3, WM 20-I

2/23/94

Site MW Treatment Scheme

Mound

Italics indicates PM by another DOE site. Black indicates local control or commercial treatment.

	Aqueous Liq. wo/Organics WM 3	Scintillation w/Actinides WM 4-III	Scintillation High Activity WM 4-IV	Oil w/H3 WM 5-	Oil w/PCB & H3 WM 5-III	Liq.Org. Hal & nonHal WM 6-I & 7-I	Absorbed Aqueous WM 8	Absorbed Organic WM 9
#1	*Plating Waste Skid LANL*	DSSI	*Evap Oxid GJPO*	*DETOX LANL*	*DETOX LANL Hydrothermal Processing LANL*	Bulked fb DSSI	Neutralize fb STABL	*Thermal Desorp fb Oxid GJPO DETOX LANL*
#2	*Evap Oxid GJPO*	*DETOX LANL*	PBR/SDP fb TRS MND	*Hydrothermal Processing LANL*	PBR/SDP MND	PBR/SDP MND *Hydrothermal ProcessingLANL*		
#3		PBR/SDP MND	*Hydrothermal Processing LANL*			*DETOX LANL Evap Oxid GJPO*		

	Inorganic Debris WM 10-VI	Lead Shapes WM 11-I	Leaded Gloves WM 11-II	Org./ Inorg. Debris WM 13	NonDebris Heavy Metal WM 14	Organic Debris WM 15-I	Oxidizers WM 16	Special Hg WM 20-I
#1	*Sort, Survey, Decon GJPO*	*Decon LANL*	Envirocare	*Sort fb Thermal Desorption GJPO*	*STABL PTX*	*Thermal Desorption GJPO*	*STABL PTX*	*Triple Distill LANL*
#2		*Chelating fb STABL LANL MACRO PTX*		*Steam Reforming SNL/NM*		*Steam Reforming SNL/NM*	*Hydrothermal Processing LANL*	*AMLGM PIN*

This plan assumes that the Glass Melter will treat only Mound wastes. The potential waste streams are: Scintillation w/Actinides, Liquid Organics Hal & nonHal, Absorbed Organics, Organic Debris and Oxidizers.

20-I

2/23/94

Site MW Treatment Scheme

PANTEX

Italics indicates PM by another DOE site.
Black indicates local control or commercial treatment.

	Compressed Gases WM 1	Aqueous Liq. wo/Organics WM 3	Scintillation Fluids WM 4-III	Oil WM 5-I	Halog. Solvent Clear WM 6-I & 6-II	Paint Wastes WM 6-III	Debris w/Hg WM 10-I	Debris Batteries WM 10-IV	Solids Lab Packed WM 12
#1	Decon	*Plating Waste Skid LANL*	DSSI	*DETOX LANL*	Bulked fb DSSI	*Hydrothermal Processing LANL*	*MACRO PTX*	Decon	Sort, survey, Reclassify
#2		*Evap Oxid GJPO*	*DETOX LANL*	*Hydrothermal Processing LANL*	*Hydrothermal Processing LANL PBR/SDP MND*	*DETOX LANL*	*Thermal Desorp fb AMLGM GJPO/PIN*		
#3			*PBR/SDP MND*		*DETOX LANL Evap Oxid GJPO*				

	Org. / Inorg. Debris WM 13	nonDebris Heavy Metal WM 14	Org. Debris w/solvents WM 15-I	Org. Debris w/metals WM 15-II	Organic Debris w/Pb WM 15-IV	Oxidizers WM 16	Soils w/Org. & metals WM 19-II	Soils w/BA WM 19-V
#1	*Sort fb Thermal Desorption GJPO*	STABL PTX	*Thermal Desorption GJPO*	Survey, recharacterize send to NTS	Envirocare *MACRO SNL/NM*	STABL PTX	*Thermal Desorption GJPO*	Sulfate Precip fb STABL PTX
#2	*Steam Reforming SNL/NM*		*Steam Reforming SNL/NM*	*Steam Reforming fb STABL SNL/NM*	*Steam Reforming fb STABL SNL/NM/PTX*	*Hydrothermal Processing LANL*		
#3					*Chelating fb STABL LANL*			

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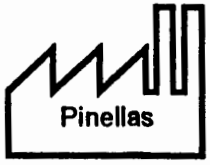
Site MW Treatment Scheme



	Aqueous Liq. wo/Organics WM 3	Oil WM 5-I	Non-debris Hvy. Metals WM 14	Sludge w/H3 WM 18-II
#1	*Plating Waste (Bench Scale) KCP*	*DETOX LANL*	*STABL PTX*	Survey
#2	*Evap Oxid GJPO*	*Hydrothermal Processing LANL*		

Italics indicates PM by another DOE site.
Black indicates local control or commercial treatment.

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Site MW Treatment Scheme

SNL/CA

	Scintillation w/H3, C14 WM 4-III	Oil WM 5-I	NonHal Clear Solvent WM 7-I	NonHal Mixed Solvent WM 7-II	Absorbed Aqueous WM 8	Absorded Organics WM 9	Inorganic Debris WM 10-IV	NonDebris Heavy Metal WM 14
#1	Quadrex/ DSSI	*DETOX LANL*	Bulked fb DSSI	*DETOX LANL*	Neutralize fb *STABL PTX*	*Thermal Desorp fb Oxid GJPO*	Envirocare	*STABL PTX*
#2	*Evap Oxid GJPO DETOX LANL PBR/SDP MND*	*Hydrothermal Processing LANL*	*Hydrothermal Processing LANL PBR/SDP MND*			*DETOX LANL*	*Sort/MACRO PTX*	
#3			*DETOX LANL Evap Oxid GJPO*					

	Organic Debris WM 15-III	Special Hg WM 20-I
#1	Separation	*Triple Distill LANL*
#2		*AMLGM PIN*

Italics indicates PM by another DOE site.
Black indicates local control or commercial treatment.

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Site MW Treatment Scheme

SNL/NM

	Aqueous Liq. w/Organics WM 2-1	Aqueous Liq. wo/Organic WM 3	Scintillation Fluid WM 4-II	Inorganic Debris w/H3 WM 10-III	Inorg. Debris w/metals WM 10-V	Inorg. Debris w/reactives WM 10-VI	Lead WM 11-I	Org. / Inorg. Debris WM 13	Organic Debris WM 15-I
#1	*Evap Oxid GJPO*	*Plating Waste Skid LANL*	Quadrex/ DSSI	Separation	Envirocare	*Sort, Survey, Decon GJPO*	*Decon LANL*	*Sort fb Thermal Desorption GJPO*	*Thermal Desorption GJPO*
#2	*Hydrothermal Processing LANL*	*Evap Oxid GJPO*	*Evap Oxid GJPO DETOX LANL PBR/SDP MND*		Sort/MACRO ~~SNL/NM~~ PTX		*MACRO PTX Chelating fb STABL LANL*	Steam Reforming SNL/NM	Steam Reforming SNL/NM

	Reactive Metals I WM 17-I	Reactive Metals II WM 17-II	Special Hg WM 20-1
#1	*Reactive Met Skid LANL*	*Uranium Chips Skid LANL*	*Triple Distill LANL*
#2			*AMLGM*

Italics indicates PM by another DOE site.
Black indicates local control or commercial treatment.

2/23/94

The Plan
Overall program manager

Introduction

The Treatment Selection Team has developed this scope of work as a guide and starting point for the overall program manager (OPM) of the plan. The TST suggests the scope of work knowing that the manager has the ultimate authority to proceed and complete business in the most effective manner.

Overall program manager

The term "overall program manager" is generic and does not necessarily denote a single person. The OPM can be as many people as it takes to complete the work.

Naming the OPM

DOE-AL will appoint the OPM by March 31, 1994.

Responsibilities

The following table summarizes responsibilities of the various players.

This program manager or agency . . .	is responsible to . . .	to do this . . .
OPM	project managers (PMs)	• prepare full definitions of assignments; • prepare the implementation plan; • maintain a current baseline of waste data; • integrate the plans of the site project managers; • develop an overall schedule, including treatment, and negotiate it with the site PMs; • monitor the site PMs and overall status of the program; • keep the site PMs focused on problem-solving; • support communication among sitePMs; • organize support to solve problems of site PMs and resolve issues; • implement the long-term use of portable treatment units; • coordinate common efforts; • support public involvement plans for the sites; • coordinate funding.

This program manager or agency . . .	is responsible to . . .	to do this . . .
OPM	support groups	• coordinate efforts to solve common problems among site program managers; • track and communicate progress; • keep support groups focused and on schedule; • use results and integrate them into the overall program; • be the focus for disposition of information; • organize support to expedite problem-solving.
OPM	DOE-AL	• communicate the schedule, progress, and problems; • request resources to solve unplanned problems; • identify new support groups as needed; • secure approval and assistance for support group solutions.
DOE-AL	OPM	• empower the OPM to do these tasks; • resolve liability; • establish support groups; • coordinate efforts for Site Treatment Plans; • communicate pertinent HQ information.

Initial schedule

The following table summarizes the initial schedule.

By this date . . .	this item will be completed . . .
04/01/94	identify a person to be lead manager.
05/01/94	write detailed assignments for the sites.
06/01/94	develop a draft project management plan for implementation of this plan.

The Plan
Project manager

Introduction

The sites are to be the project managers (PMs) for the assignments given in this plan. The PM is responsible for recognizing the needs of its customers, who are defined by the waste streams that can be potentially treated with the technology assigned.

Responsibility and authority of project managers

The PM is responsible for the following:

- bringing waste treatment capacity on-line for the assigned technologies to the satisfaction of all DOE-AL technology users within the framework of the FFCAct Site Treatment Plan and general DOE policies and procedures;
- formulating and executing a project management plan that defines schedule and cost for the design, procurement, and start-up of the treatment systems, including feed pretreatment and handling of secondary waste;
- preparing and clearly identifying funding requests in the Five-Year Plan; and
- interfacing with the appropriate parties for the various state- and DOE-related activities required for the FFCAct implementation and permitting, which must be included in the project management plan because they may affect the process design, project schedule, and cost.

The PM's full authority will be negotiated and defined as the development of the OPM implementation plan gains headway; however, the PM must retain the authority to direct efforts and act on the issues related to design, procurement, and start-up of the assigned process.

Proposed schedule

The following is a proposed schedule for initial activities:

By this date . . .	this item will be completed . . .
04/01/94	all sites have identified a person to be project manager for each assignment.
06/01/94	all project managers have met with their customers and prepared a draft project management plan to implement their assignments.
08/01/94	all project managers have negotiated a final plan with the OPM.

Assignments

Specific site assignments are given in a table in the plan section. PMs must use their initiative to began planing the assignments while the OPM writes a more detailed assignment. The PM and the OPM must negotiate the final assignment to ensure that both understand the scope of work to be done.

General guidance

Initiative: The plan relies on the PMs to take the initiative, to study and understand the problem, and to use their good engineering judgment in planning the work for their assignment. As PM, do not wait for the OPM to issue the detailed assignment. Look at the assignment and the waste to be addressed by the assignment, and start developing a project plan. This approach will help both the PM and OPM negotiate the final assignment.

Unit sizes: The assignments call for bench-, drum-, and skid-size units. The PM must use good engineering judgment in sizing the units to match the problem.

Unit	Description
bench-size	can be set on a laboratory bench top, possibly in a ventilation hood
drum-size	can handle a 55-gallon drum of waste as a single feed charge
skid-size	may be made up six modules Guidance on the physical size of the skid-size units will be issued by the working groups for portable treatment. Each module should be sized to fit on a flatbed truck and should not weigh more than 2 tons.

Treatability tests. PMs assigned treatability tests must have the tests run where the research is being done and the equipment is available unless otherwise stated in the assignment. The PM is responsible for

- organizing the treatability study,
- arranging for shipment of wastes,
- preparing a test plan, and
- issuing a test report.

Treatability test results must be reported to the DOE treatability study data base.

The Plan
Research and development needs

Summary

From the rating of technologies, several areas require additional research and development to provide better answers. The team selected options that provide immediate treatment capacity within the regulations. The team recognizes that, in some cases, better technology is needed. Occasionally, site assignments were made in which the technology appears to be reasonably well developed and could be applied to DOE-AL problems after conducting treatability studies. In other cases, the technology appears to be further out, needing the support of EM-50. For some waste, new ideas must be conceived and pursued.

The following are areas the team feels need the attention of EM-50 for DOE-AL waste.

Lead

A number of large lead items, many of which are activated, are in the DOE-AL waste. More of this waste is expected when accelerator and other physics experiments are decommissioned.

The obvious near-term solution is to macroencapsulate this waste. However, macroencapsulation of large lead items does not form a waste stream that passes TCLP. The only available disposal option for this waste is Envirocare, which is expensive. If the lead can be stabilized to pass TCLP, it can be disposed of as a low-level waste at less cost. The obvious approach to stabilization is to chop large lead items into very small pieces, a process that would be expensive and risky.

The team is interested in pursuing the chelating work at LANL and encourages EM-50 to pursue technologies that can stabilize lead or remove activation products to allow recycle of this lead.

Soils and debris with organics

Several waste streams include room trash, soils, and vermiculite that are contaminated with solvents and other liquid organics. This waste stream is relatively large, and generation will continue. Some of these wastes are mixtures of organic and inorganic debris, paper, protective clothing, and electronic parts and tools. Some of the solvent and organic contamination is not easily volatilized. The easy solution is thermal desorption, but high temperatures are needed to remove the heavier solvent and liquid organic contamination. Incineration is a good answer but not practical as a portable technology serving multiple sites. Depending on results from tests at Sandia-New Mexico, steam reforming with a screw feed may also be an option.

Supercritical carbon dioxide was considered an option not only for removal of the solvent contamination but also as a possible means of solubilizing the paper and clothing for oxidation, leaving behind the

metal debris. The technology did not appear to be ready for implementation to handle the volume of waste to which it should be applied. The team encourages EM-50 to pursue developing this technology or other technologies that can treat this waste stream.

Solid nitrates and aqueous waste with heavy organics

Limited solutions were located for these waste streams. Nitrates can be stabilized. Aqueous wastes contaminated with nonvolatile organic solvents or PCBs have limited solutions difficult to apply to the size of the waste streams involved. Hydrothermal processing appears to hold promise for both waste streams. The team requests support of treatability studies on DOE-AL waste and encourages EM-50 to pursue other technologies that show promise for these wastes.

Solids contaminated with heavy metals

Relatively large volumes of solid waste are contaminated with heavy metals, most notably mercury. Thermal desorption followed by amalgamation of the recovered mercury is BDAT for waste contaminated with mercury. Water-based treatment involving extractive chemistry would be safer, and chelating was discussed as an option that was not yet mature enough to be selected. The team encourages EM-50 to pursue alternatives for this waste problem.

Decontamination of large items

The DOE-AL wastes include several large equipment pieces that are hazardous because they have heavy metal components. Improved decontamination methods, possibly the use of radionuclide-specific chelating agents, would simplify decontamination and allow safer dismantlement and separation of these items. Research in this area is encouraged.

In addition to directly treating waste articles, new decontamination approaches would help the portable treatment concept. The treatment units must be decontamined before transport to a new site. A great benefit would be advanced cleaning agents that could flush the internals of the process equipment to remove radioactive contamination while minimizing the amount of secondary waste.

Metal debris and demilitarized components

This large ongoing waste stream includes electronic components and plated metal parts. Some is debris that can be disposed of as such. Other parts are chopped into small pieces to demilitarize the parts. The resulting pieces are too small to qualify as debris. The waste is hazardous mainly for lead, but other metals such as silver and cadmium are present. The electronic parts include plastic circuit boards. Most of these waste are suspect for tritium contamination. The TST has selected macroencapsulation and stabilization of these wastes as immediate treatment options. Other options, such as metal melting, are needed, and EM-50's help is needed in this area. Methods that can remove tritium to levels that allow release of the metal to recyclers are a real advantage.

Issues

The following table summarizes major issues.

This support group . . .	resolves these issues or completes these activities . . .
Portable Treatment Working Group	for portable treatment • chemical process engineering support to sites • detailed design support to the sites • fabrication support • commonality of design • storage, maintenance, and modification of units • scheduling and dispatching • portable treatment enclosures • operating support • decontamination of units • transportation • ownership • disposal of unit at the end of its life
NEPA Working Group	• determine the most effective and efficient approach for NEPA support of the plan • resolve issues between this plan and the PEIS
SAR Working Group	• determine the most efficient and effective way to meet safety documentation requirements and needs • develop activity levels that bound documentation needs for the planned activities • define activities in the plan that do not need SAR preparation other than site specific safety permits
Permitting Working Group	• identify alternative permitting approaches that support the plan and meet regulatory needs • make a permitting proposal to the National Governors Association • negotiate a permitting approach • layout a guidance strategy for demonstrating equivalent treatment under land disposal restrictions

This support group . . .	resolves these issues or completes these activities . . .
Disposal Working Group	• review the plan and identify any disposal problems that may have been overlooked by the TST, including the impact of radionuclide concentration • interface with the national disposal working group
Public Involvement Working Group	• develop and implement a short-term plan to present this plan to the National Governors Association, the Western Governors Association, and the affected state permit writers • develop a program to support the sites in presenting this plan to the public • develop a long-term plan to keep stakeholders involved in the progress of the plan

Proposed schedule

The following is a proposed schedule for initial activities:

By this date . . .	this item will be completed . . .
03/31/94	DOE-AL has recruited staffing for the groups
06/01/94	each group has developed problem definitions and project management plan for developing solutions

Through the affected sites, state regulatory agencies must be notified of all treatability tests. Treatability tests must be justified by a real technical need and are not to be used only to treat off waste. The TST believes that the assigned treatability tests are justified to demonstrate technologies for application to a larger waste volume or to determine the fate of radionuclides.

Administrative assignments: Several assignments, such as off-site treatment and sorting and surveying waste, are administrative assignments. The PM must contact all sites and determine current activities, and structure a work plan that helps solve problems and expedite the activities. Sites that have planned work or have work in progress should not stop these activities. Rather, the PM must catch up and provide help where it is needed.

Funding

The assignments in this report are expected to be issued by DOE-AL as mission assignments. As RCRA compliance actions, the assignments will be given priority in funding through the Five-Year Plan. Near-term funding needs should be addressed using change order controls.

In several instances, the TST made assignments that the team felt should be funded by EM-50. These are so noted in the assignments. PMs for these assignments must secure funding for these assignments from EM-50. DOE-AL will support these funding requests.

The Plan
Support groups

Introduction

Support groups are established to quickly resolve issues that affect implementation of the plan. Support groups are recommended to handle issues related to portable treatment, NEPA, safety documentation (SARs), permitting, disposal, and public involvement.

Formation of the groups

DOE-AL will recruit personnel and form the support groups by March 31, 1994. The portable treatment working group already exists. DOE-AL will review the make up of this group to ensure its membership meets the needs of this plan.

Make up of the groups

Except for the public involvement support group, all groups are to be made up of representatives from the sites and DOE-AL. DOE-AL representation must include a representative knowledgeable in the requirements related to the issues and empowered to make decisions that aid resolution of issues.

Permitting group. The permitting group should include representation from the National Governors Association and should be open to the affected states.

Public involvement group. The public involvement group should be DOE-AL personnel.

General assignment

For the issues given below, the support groups are to define the problem, develop a solution, and prepare a work plan for resolving the issues. All efforts must be communicated with the OPM. Each working group is responsible for preparing a presentation that sells its solution to the sites, DOE offices, and the public.

Other opportunities

EM-50 is encouraged to use the information gathered by the TST to aim developing technologies at real DOE-AL problems. DOE-AL will make every effort to make waste available for treatability studies for technologies that show promise and advantages over the technologies selected by the plan.

Implementation of technologies

The technologies selected by the TST are base technologies. By implementing the plan, DOE-AL hopes to demonstrate the ability to implement treatment technologies on real waste. Once that ability is established, it can be used to implement new technologies coming from EM-50. To guarantee our success, the TST solicits EM-50's support in implementing the following technologies:

- DETOX process,
- packed-bed reactor/silent discharge plasma (PBR/SDP),
- steam reforming,
- metal melting,
- $SCCO_2$, and
- biodegradation

Appendix G
Site Waste Matrices

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Site - Waste Matrix

Waste category: Gases

Waste Stream / Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Compressed gases	n/a	n/a	n/a		n/a	n/a		n/a	n/a	
I										
Aerosol cans				130 spray cans New 7			1 dm 11			Decon
II										
Ignitable				20 cyl L1, L2						GAS TREATMENT SKID
Corrosive				12 cyl L4						
Non-RCRA				68 cyl LNM1						
Non-Listed				26 cyl LNM2						
P-Listed				2 cyl L22.1, L22.2						
U-Listed				2 cyl L23						

The following abreviations may appear on the "Site - Waste Matrix"
CAI - Controlled Air Incinerator
dm - drum
DU - Depleted Uranium
fb - followed by
LP - Lab Pack
PBR/SDP- Packed Bed Reactor/Silent Discharge Plasma
TRS - Tritium Recovery System

In general, the volumes have been normalized to a drum size of 55 gallons.

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Site - Waste Matrix

Waste category: Aqueous Liquids

Waste Stream / Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Aqueous w/Organics		n/a	n/a		n/a	n/a	n/a	n/a		
I										
Solvent contaminated water bulk	483 Kg TG1, 3			~40 dm L16, L17					1 gal TG5	Evaporative Oxidation fb Stabilization
Process slurry				66 dm New 5						↓
Process slurry w/Hg				34 dm New 6						↓
II										
PCB contaminated solution				15 dm New 3						CAI
										Page 2

Site - Waste Matrix

Waste category: Aqueous Liquids

Waste Stream Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Aqueous w/o Organics			n/a					n/a		
Acids w/metals bottles or LP	11.7 Kg 2.1, 2.2			110 dm L5,8-12, 14, 21.2		2 Kg 1				Neutralization, precipitation, evaporation, stabilization
Chromic acid w/metals bulked							3 dm 2.2, 2.4			
Water w/Pb bulked							1 dm 2.3			
Aqueous reactives bulked				6 dm L7						
Aqueous reactives LP				9 dm L7, L20						
Caustics LP				6 dm L6						
Acids/ Bases LP		600 gal 5			6 Kg 9				1 gal TG5	
Wastewater w/metals bulked				2 dm L15			29 dm 2.1			
										Page 3

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Site - Waste Matrix

Waste category: Organic Liquids

Waste Stream / Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Scintillation Liquids			n/a			n/a				
I										
Vials w/H3 & Pb	3 dm TG 4									Evap. Oxidation fb stabilization
II										
Vials w/H3 & C14		1 dm 1						1 dm 1	2 gal TG 7	Quadrex
III										
Vials w/H3 & actinides				20 dm bulked L3			26 dm 1.5			DSSI
Vials w/actindes & other		5 dm & 9 dm 3 & 4			4500 Kg 1					DSSI
IV										
Vials w/H3 (hot)					1500 Kg 1					PBR/SDP fb TRS
										Page 4

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Site - Waste Matrix

Waste category: Organic Liquids

Waste Stream Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Oil	n/a	n/a	n/a							
I										
Oil w/H3 1000Ci/dm								12 dm 4		Detox
Oil w/H3, Actinides, Hg				49 items L13	110 dm 7		2 dm 1.3			Detox
Oil w/H3 low level <1 Ci/gal						1 dm 1, 2				Detox
Ethylene Glycol w/H3								2 dm 5		Detox
II										
Oil w/Actinides				73 dm nonRCRA New 8						CAI
Oil w/PCB's				12 dm New 3						CAI
Oils w/solvents				~40 dm L16, L17						CAI
III										
Oil w/PCB and hydraulic w/H3					300 gal 5					PBR/SDP
										Page 5

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Site - Waste Matrix

Waste category: Organic Liquids

Waste Stream / Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Solvents, Halogenated		n/a	n/a			n/a		n/a	n/a	
I										
Solvent/Clear: Bottles or LP	4.5 Kg 11.2			34 dm L21.1, L21.3	2 Kg 9		20 dm 1.1, 1.2, 1.4			Bulked fb DSSI
Misc. Org. Chem: LP							1 dm 1.4			Buked fb DSSI
II										
Solvent/Clear: Bulked				~40 dm L16, L17			2 dm 1.2			DSSI
III										
Paint Wastes: Bulked							5 dm 1.1			DETOX
										Page 6

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Site - Waste Matrix

Waste category: Organic Liquids

Waste Stream Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Solvents, Nonhalogenated		n/a	n/a			n/a	n/a		n/a	
I										
Solvent, clear	125 Kg 5,6,11.1,11.3			150 dm LP L3, L18, L19	2 Kg. 9			1 dm LP 2		DSSI
II										
Solvent, mixed, phased, bulked w/H3								1 dm bulked 2		DETOX
										Page 7

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Site - Waste Matrix

Waste category: Solids

Waste Stream / Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Absorbed Aqueous	n/a	n/a	n/a	n/a		n/a	n/a		n/a	
Battery Acid on kitty litter w/Pb					1 dm 3					Neutralize fb STABL
Acid & Bases neutralized w/heavy metals								3 dm 3		Neutralize fb STABL
										Page 8

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Site - Waste Matrix

Waste category: Solids

Waste Stream Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Absorbed Organic	n/a	n/a	n/a	n/a		n/a	n/a		n/a	
PCB/Oil w/TRU					181 Kg 6					High temp. desorption,
Waste Oil					10 dm 7					High temp. desorption,
Oil w/H3								12 dm 4		High temp. desorption,
										Page 9

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Site - Waste Matrix

Waste category: Solids

Waste Stream / Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Inorganic Debris	n/a	n/a				n/a		n/a		
I										
Metal w/Hg							~7 dm 6.6			Thermal Desorption fb AMLGM
Glass w/Hg							19 dm 6.4			Thermal Desorption fb AMLGM
II										
Capacitor w/PCB				9 dm New 3						decon
III										
Neutron Gen. w/HE									33 N gens TG1	separation
IV										
Thermal batteries w/ asbestos, Pb, Ni, Cd							1 dm 10			separate, survey,decon
V										
Metals w/ electrical parts w/heavy metals									35 dm TG9	ENVIROCARE
Large item w/Pb			1 dm 1.2							ENVIROCARE
Metal w/Cd				17 dm S5						ENVIROCARE
Tellurium metal, suspect H3, U								1 dm 7		ENVIROCARE
VI										
Stuff w/water reactives									8 dm TG2	sort, survey, DECON
Large item w/Cd(TRU?)									3 dm & tablesa TG11	sort, survey, DECON
Large item w/PCB(TRU)					Hydraulic press 6					sort, survey, DECON
										Page 10

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Site - Waste Matrix

Waste category: Solids

Waste Stream / Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Lead	n/a		n/a			n/a	n/a	n/a		
I										
Bricks & shapes, surface contaminated		14000 Kg 2		4000 Ft3 S7	4100 Kg 4				60 Kg TG4	DECON
Lead acid batteries				31 batteries S7	1000 Kg 3					DECON
II										
Leaded gloves					6 Kg 2					ENVIROCARE
III										
Lead shot, activated				450 Ft3 S7						MACRO
Bricks & shapes, activated				1000 Ft3 S7						MACRO
										Page 11

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Site - Waste Matrix

Waste category: Solids

Waste Stream / Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
LP not listed elsewhere	n/a	n/a	n/a		n/a	n/a		n/a	n/a	
Arsenic				1 dm S3						sort, survey & reclassify
Chromium				2 dm S6						
P Listed				>1 dm 33						
Mixed stuff w/organics, metals & Hg							26 dm 7			
										Page 12

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Site - Waste Matrix

Waste category: Solids

Waste Stream / Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Mixed Organic/ Inorganic Debris (het)	n/a	n/a	n/a	n/a		n/a		n/a		
Trash w/solvent, metals, H3							160 dm 6.5		150 dm TG10	Sort, thermal desorption
Trash w/solvent, debris, U metal					36 dm 11					Sort, thermal desorption
										Page 13

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Site - Waste Matrix

Waste category: Solids

Waste Stream Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Nondebris heavy metals		n/a	n/a	n/a					n/a	
Molten salt plating waste powder								1 bottle 6		STABL
Silver wool w/Hg, H3						160 grams 3				STABL
Powdered metals, LP					6 Kg 9					STABL
Demilitarized scrap metal							63 dm 6.2			STABL
										Page 14

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Site - Waste Matrix

Waste category: Solids

Waste Stream Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Organic Debris	n/a	n/a				n/a		n/a		
I										
Trash w/solvents,Hvy metals & H3						155 dm compacted	6.1		130 dm TG8	Thermal Desorption
Trash w/solvents			1 dm 1.1	>120 dm S10.1, S11						Thermal Desorption
Trash w/solvents, H3					7300 Kg 1					Thermal Desorption
Trash w/solvents, Hg				>10 dm S8						Thermal Desorption
Trash w/solvents, Hvy metals				130 dm S10.2						Thermal Desorption
II										
Trash w/solvents, metals, HE							16 dm 8.2			Burning Ground (Pad 13)
III										
Trash w/cyanides								1/4 dm 6		separation
IV										
Trash w/Pb							16 dm 6.3			ENVIROCARE
										Page 15

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Site - Waste Matrix

Waste category: Solids

Waste Stream Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Oxidizers	n/a	n/a				n/a	n/a	n/a	n/a	
Uranium & Thorium Nitrates			.5 Kg 6				see lab packs 7			STABL
Various Nitrates, LP				85 dm S1	5 dm 9 & 10					STABL
										Page 16

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Site - Waste Matrix

Waste category: Solids

Waste Stream Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Reactive Metals	n/a	n/a	n/a		n/a	n/a	n/a	n/a		
I										
Lithium Hydride w/DU				55 dm S2						REACTIVE METALS SKID
Pyrophoric metal powders									<1 dm TG3	REACTIVE METALS SKID
II										
Depleted Uranium				220 dm New 1					<1 dm TG4	URANIUM CHIPS SKID
Thorium Chips				<10 dm New 2						URANIUM CHIPS SKID
										Page 17

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Site - Waste Matrix

Waste category: Solids

Waste Stream / Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Sludge	n/a	n/a	n/a		n/a		n/a	n/a	n/a	
I										
Wastewater treatment sludge w/Pu				1260 dm S9						delist
II										
Neutralization facility sludge w/H3						5000 gal. 4				survey

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Site - Waste Matrix

Waste category: Solids

Waste Stream / Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Soils		n/a	n/a		n/a	n/a		n/a	n/a	
I										
Soils w/organics	103 Kg TG9.1-9.3, TG10									Thermal desorption
II										
Soils w/organics & metals	4 Kg TG8.1, TG8.2						1 dm 5			Thermal desorption fb STABL
III										
Soils w/Hg	36 Kg TG7			2 dm L13						Thermal desorption fb AMLGM
IV										
Soils w/Pb				40 dm S7						STABL
V										
Soils w/barium & debris				30 dm S4						Sulfate Precip fb STABL
Soils w/barium ash							102 dm 4.2			Sulfate Precip fb STABL
										Page 19

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Site - Waste Matrix

Waste category: Special

Waste Stream Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#	Base Treatment
Mercury Waste	n/a	n/a	n/a			n/a	n/a	n/a		
I										
Elemental w/H3				7500 Lbs L13	26 Kg 8			1 Lb 3	30 ml TG6	AMLGM
II										
Hg salts, non-Rad				4 bottles New 4						Retort fb AMLGM
										Page 20

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Site - Waste Matrix

Excluded from any other Matrix

Waste Stream Substream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
Segregation will yield a non MW			4.1, 4.2, 5						
									Page 21

Appendix I
Technology Evaluation Sheets

Technical Evaluation Sheet
Selection criteria

Selection criteria

The following selection criteria were selected during the first Treatment Selection Team meeting held October 5-7, 1993, in Grand Junction. These criteria were used during the selection of preferred treatment opportunities for the DOE-AL plan for treatment of mixed waste and other waste in the plan.

- treatment must perform the intended function (that is, meet LDR standards and all other regulations, be permittable, and be acceptable to the public);
- the treatment must be safe to workers, the public, and the environment;
- the selection of treatment should minimize risk; the treatment should show high potential for being implemented in a timely, cost-effective manner;
- the treatment should be simple, reliable, and easy to implement and operate;
- the treatment should be scalable to meet expected volumes;
- volume and toxicity of secondary waste should be minimized and not preclude treatment for final disposition.

Need for technology

If technology must be developed, the team prefers that the technologies have the potential for

- private sector involvement,
- transfer to the private sector, and
- recycling and material recovery.

FFCAct requirements

The FFCAct specifically requires the following criteria, which were included in the scoring; the selection of the waste treatment program should

- minimize risk, DOE liability, schedule duration, and cost;
- maximize public acceptance; and
- fully comply with RCRA.

Other desirable criteria

The team prefers several desirable criteria that were not scored but considered:

- treatment rapidly respond to changing conditions
- treatment is fully developed and not in the R&D stage.

Technology Rating
Gases, Compressed - I

Competing Treatment Technologies	**BASE** Decon					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)	NA					
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
This is not considered a treatment. No alternatives considered. Deconned cans go for commercial haz. waste disposal.						

Table 1-I

Technology Rating
Gases, Compressed - II

Competing Treatment Technologies	**BASE** Gas Treatment SKID					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Site specific. No alternatives needed.						

Table 1-II

Technology Rating
Aqueous Liquids, w/Organics - I

Competing Treatment Technologies	**BASE** Evap. Oxidation fb STABL	Hydro Thermal Oxidation	Steam Stripping w/carbon adsorption	E beam	Bio degradation	Microwave fluid bed
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)					◔	◔
Safety workers, public, env.		◔		◔	◕	
Minimize Risks DOE liab, sched, cost				◔	◔	
Simple/Reliable				◔		◔
Scalable up or down as req.		◔				◔
Secondary wastes minimized, treatable		◔	○	◔	◔	
For Technologies requiring development						
Potential for private sector development				◕	◕	◕
Tech. transfer to private sector				◕	◕	◕
Recycling & mat'l recovery						
Rating	1	2				
Comments						
Biodegradation must be tailored to each waste stream						

Table 2-I

Technology Rating
Aqueous Liquids, w/Organics - II

Competing Treatment Technologies	**BASE** CAI	Hydro Thermal Oxidation	Ozone UV	E beam	Microwave fluid bed	
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)		◔		◔	◔	
Safety workers, public, env.		◕	◕			
Minimize Risks DOE liab, sched, cost			◔	◔	◔	
Simple/Reliable		◕	●			
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development				◕	◕	
Tech. transfer to private sector				◕	◕	
Recycling & mat'l recovery						
Rating	3	2	1			
Comments						

Table 2-II

Technology Rating
Aqueous Liquids, w/o Organics

Competing Treatment Technologies	**BASE** Neutralization, Precipitation, evaporation, stabilization, chem. oxid.	Evap. Oxidation	Ion Exchange			
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)			◔			
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost			○			
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable			◔			
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1	2				
Comments						
The LANL Plating Waste Skid which implements the BASE treatment is similar to the evaporative oxidation process.						

Table 3

Technology Rating
Organic Liquids, Scintillation Liquids - I

Competing Treatment Technologies	**BASE** Evap. Oxidation	DSSI/ Quadrex *	DETOX	PBR/SDP		
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.			◔			
Minimize Risks DOE liab, sched, cost		◕				
Simple/Reliable		◕				
Scalable up or down as req.						
Secondary wastes minimized, treatable		●				
For Technologies requiring development						
Potential for private sector development			◕	◕		
Tech. transfer to private sector			◕	◕		
Recycling & mat'l recovery						
Rating	2	1		3		
Comments						
*The WAC for DSSI & Quadrex must be checked re. this waste.						

Table 4-I

Technology Rating
Organic Liquids, Scintillation Liquids - II

Competing Treatment Technologies	**BASE** Quadrex/ DSSI	Evaporativ Oxidation	DETOX	PBR/SDP		
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.		◔	○	◔		
Minimize Risks DOE liab, sched, cost		◔	◔	◔		
Simple/Reliable		◔	◔	◔		
Scalable up or down as req.						
Secondary wastes minimized, treatable		○	◔	◔		
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1	2	2	2		
Comments						

Table 4-II

Technology Rating
Organic Liquids, Scintillation Liquids - III

Competing Treatment Technologies	BASE DSSI	Evaporative Oxidation	DETOX	PBR/SDP	Hydro thermal Oxidation	Molten Salt
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						◔
Safety workers, public, env.		◔	◔	◔	◔	◔
Minimize Risks DOE liab, sched, cost		◔	◔	◔	◔	◔
Simple/Reliable						◔
Scalable up or down as req.				◔		
Secondary wastes minimized, treatable		○	◔	◔	○	○
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1		2	3		
Comments						

DSSI is the sole commercial disposal site acurrently available. For reliability reasons an alternate disposal path should be developed.

Table 4-III

Technology Rating
Organic Liquids, Scintillation Liquids - IV

Competing Treatment Technologies	**BASE** PBR/SDP fb TRS	DETOX	Molten Salt	Hydro thermal Oxidation	Biodeg-radation	Evap. Oxidation
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)			◔			
Safety workers, public, env.					◕	◕
Minimize Risks DOE liab, sched, cost			◔			
Simple/Reliable			◔		◕	
Scalable up or down as req.						
Secondary wastes minimized, treatable		◔			○	
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	2			3		1
Comments						
Mound is working on biodegradation. Its applicability should be revisited.						

Table 4-IV

Technology Rating
Organic Liquids, Oil - I

Competing Treatment Technologies	**BASE** DETOX	Hydro thermal Oxidation	PBR/SDP *	Biodeg-radation	Molten Salt *	Microwave Fluidized Bed *
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)				◔		
Safety workers, public, env.				◕		
Minimize Risks DOE liab, sched, cost						
Simple/Reliable				◔	◔	◔
Scalable up or down as req.			◔			
Secondary wastes minimized, treatable				◔		
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1	2				
Comments						
* Thermal treatments will require a greater permitting effort due to public perception.						

Table 5-I

Technology Rating
Organic Liquids, Oil - II

Competing Treatment Technologies	**BASE** CAI	DETOX	Hydro thermal Oxidation	Molten Salt		
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)		◕	◕			
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost		◔	◔	◔		
Simple/Reliable		◕	◕			
Scalable up or down as req.						
Secondary wastes minimized, treatable		◕	◕			
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	2	1	1			
Comments						
The PBR/SDP is not considered scalable for this waste stream.						

Table 5-II

Technology Rating
Organic Liquids, Oil - III

Competing Treatment Technologies	**BASE** PBR/SDP	Hydro thermal Oxidation	DETOX	Molten Salt	Base Catalyzed Decomp.	
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)					◔	
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost		◕	◕	◕	○	
Simple/Reliable				◔		
Scalable up or down as req.		◕	◕	◕	◕	
Secondary wastes minimized, treatable					○	
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	3	1	1	2		
Comments						

Table 5-III

Technology Rating
Organic Liquids, Halogenated Solvents - I

Competing Treatment Technologies	**BASE** Bulked fb DSSI *	DETOX	Hydro thermal Oxidation	Evap. Oxidation	PBR/SDP	
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost		◔	◔	◔	◔	
Simple/Reliable		◔	◔	◔	◔	
Scalable up or down as req.						
Secondary wastes minimized, treatable		◔	◔	◔	◔	
For Technologies requiring development						
Potential for private sector development		◕	◕		◕	
Tech. transfer to private sector			◕		◕	
Recycling & mat'l recovery						
Rating	1	3	2	3	2	
Comments						
* Must check DSSI WAC. Alternative to DSSI must be developed.						

Table 6-I

Technology Rating
Organic Liquids, Halogenated Solvents - II

Competing Treatment Technologies	**BASE** Bulked fb DSSI *	DETOX	Hydro thermal Oxidation	Evap. Oxidation	PBR/SDP	
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost		◔	◔	◔	◔	
Simple/Reliable		◔	◔	◔	◔	
Scalable up or down as req.						
Secondary wastes minimized, treatable		◔	◔	◔	◔	
For Technologies requiring development						
Potential for private sector development		◕	◕		◕	
Tech. transfer to private sector			◕		◕	
Recycling & mat'l recovery						
Rating	1	3	2	3	2	
Comments						
* Must check DSSI WAC. Alternative to DSSI must be developed.						

Table 6-II

Technology Rating
Organic Liquids, Halogenated Solvents - III

Competing Treatment Technologies	**BASE** DETOX	Molten Salt	Hydro thermal Oxidation			
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)		◔				
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable		◔				
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	2	3	1			
Comments						

Table 6-III

Technology Rating
Organic Liquids, Nonhalogenated Solvents - I

Competing Treatment Technologies	**BASE** Bulked fb DSSI *	DETOX	Hydro thermal Oxidation	Evap. Oxidation	PBR/SDP	
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost		◔	◔	◔	◔	
Simple/Reliable		◔	◔	◔	◔	
Scalable up or down as req.						
Secondary wastes minimized, treatable		◔	◔	◔	◔	
For Technologies requiring development						
Potential for private sector development		◕	◕		◕	
Tech. transfer to private sector			◕		◕	
Recycling & mat'l recovery						
Rating	1	3	2	3	2	
Comments						
* Must check DSSI WAC. Alternative to DSSI must be developed.						

Table 7-I

Technology Rating
Organic Liquids, Nonhalogenated Solvents - II

Competing Treatment Technologies	**BASE** DETOX					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Table 6-I technologies may be applicable. Waste requires further characterization. Waste will need pretreatment.						

Table 7-II

Technology Rating
Solids, Absorbed Aqueous

Competing Treatment Technologies	**BASE** Neutralize fb STABL					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Given the quantity involved, no alternatives were considered.						

Table 8

Technology Rating
Solids, Absorbed Organic

Competing Treatment Technologies	BASE High temp. Desorption fb Oxid.	DETOX	SCCO2 fb Oxidation	Solvent Extraction fb Oxidation	Molten Salt	Steam Reforming	SCH2O
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base	
Meet standards (RCRA, LDR, permits & public perception)		◔	◕	◔	◔	◔	
Safety workers, public, env.					◔		◔
Minimize Risks DOE liab, sched, cost			◕				
Simple/Reliable					◔	◔	
Scalable up or down as req.							
Secondary wastes minimized, treatable		◔			◔	◔	◔
For Technologies requiring development							
Potential for private sector development		◕	◕		◕		◕
Tech. transfer to private sector			◕		◕		
Recycling & mat'l recovery							
Rating	2	3	1				3
Comments							
Super critical carbon dioxide (SCCO2) Super critical water (SCH2O)							

Table 9

Technology Rating
Solids, Inorganic Debris - I

Competing Treatment Technologies	**BASE** Thermal Desoprtion fb AMLGM	MACRO				
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.		◕				
Minimize Risks DOE liab, sched, cost		◕				
Simple/Reliable		◕				
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	2	1				
Comments						
This type of waste needs additional treatment R&D. Chelators are being developed for Hg extraction at both LANL & ORNL.						

Table 10-I

Technology Rating
Solids, Inorganic Debris - II

Competing Treatment Technologies	**BASE** Decon					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Alternatives are not worth investigating unless interior is rad. contaminated.						

Table 10-II

Technology Rating
Solids, Inorganic Debris - III

Competing Treatment Technologies	**BASE** Separation					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
No alternatives are worth considering. A separation process is being developed.						

Table 10-III

Technology Rating
Solids, Inorganic Debris - IV

Competing Treatment Technologies	**BASE** Separate, survey, decon					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Note: Batteries are not debris. No alternatives were considered.						

Table 10-IV

Technology Rating
Solids, Inorganic Debris - V

Competing Treatment Technologies	**BASE** ENVIROCARE	Sort/ MACRO				
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable		◔				
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1	2				
Comments						
This waste stream will require MACRO after 5/8/94. A better technique must be developed to address the large volumes which are expected to be generated in the future.						

Table 10-V

Technology Rating
Solids, Inorganic Debris - VI

Competing Treatment Technologies	**BASE** Sort, survey, decon					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
No alternatives were considered. A large item DECON procedure needs to be developed.						

Table 10-VI

Technology Rating
Solids, Lead - I

Competing Treatment Technologies	BASE DECON	Chelating fb STABL	MACRO	Chelating fb DECON		
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)		◔ *	◔ *			
Safety workers, public, env.				◕		
Minimize Risks DOE liab, sched, cost		◔		◔		
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable		◔	◔			
For Technologies requiring development						
Potential for private sector development		◕		◕		
Tech. transfer to private sector		◕		◕		
Recycling & mat'l recovery		◔	◔			
Rating	1	3	3	2		
Comments						
* May not meet BDAT which requires recovery or reuse.						

Table 11-I

Technology Rating
Solids, Lead - II

Competing Treatment Technologies	**BASE** ENVIROCARE					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Site specific. No alternatives considered.						

Table 11-II

Technology Rating
Solids, Lead - III

Competing Treatment Technologies	**BASE** MACRO & STABL	Chelating fb STABL				
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost		○				
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable		◔				
For Technologies requiring development						
Potential for private sector development		◕				
Tech. transfer to private sector		◕				
Recycling & mat'l recovery						
Rating	2	2				
Comments						
This waste represents a very large future problem. R&D for the treatment of large volumes of activated lead is required. Lead melting & vitrification are possibilities.						

Table 11-III

Technology Rating
Solids, LP not listed Elsewhere

Competing Treatment Technologies	**BASE** Sort, survey, reclassify					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Waste needs to be sorted, recharacterized and then reclassified into some of the other categories for proper treatment.						

Table 12

Technology Rating
Solids, Mixed Organic/Inorganic Debris (het)

Competing Treatment Technologies	**BASE** Sort, thermal desorption	Steam Reforming	SCCO2			
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)		◔	◔			
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost			◔			
Simple/Reliable						
Scalable up or down as req.			◔			
Secondary wastes minimized, treatable			◔			
For Technologies requiring development						
Potential for private sector development		◕	◕			
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1	2	3			
Comments						
Super critical carbon dioxide (SCCO2)						

Table 13

Technology Rating
Solids, Non-debris Heavy Metals

Competing Treatment Technologies	**BASE** STABL					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Cannot identify an alternative within the selection ground rules. Organic removal, H3 decon, molten metals and mining technologies were considered. R&D is required for this type of waste.						

Table 14

Technology Rating
Solids, Organic Debris - I

Competing Treatment Technologies	**BASE** Thermal desorption	Steam Reforming	Molten Salt	SCCO2	DETOX	Biodeg-radation
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)		◔	◔		◔	◔
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable			◔		◔	
Scalable up or down as req.						◔
Secondary wastes minimized, treatable		◔	◔		◔	○
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1	3		2		
Comments						
Super critical carbon dioxide (SCCO2).						

Table 15-I

Technology Rating
Solids, Organic Debris - II

Competing Treatment Technologies	**BASE** Burning Ground (Pad 13)	Steam Reforming fb STABL	Survey recharact. send to NTS	Hydro thermal Oxidation fb STABL	Biodeg-radation fb STABL	
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)		◕	●	◕	◕	
Safety workers, public, env.		◕	●	◕	◕	
Minimize Risks DOE liab, sched, cost		◕	●		◕	
Simple/Reliable		◔		◔		
Scalable up or down as req.						
Secondary wastes minimized, treatable			●		◔	
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating		2	1		3	
Comments						

Table 15-II

Technology Rating
Solids, Organic Debris - III

Competing Treatment Technologies	**BASE** Separation					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Site specific. No alternatives considered.						

Table 15-III

Technology Rating
Solids, Organic Debris - IV

Competing Treatment Technologies	**BASE** ENVIROCARE *	Chelating fb STABL	MACRO	Steam Reforming fb STABL	DETOX fb STABL	
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.		◔	◔	◔	◔	
Minimize Risks DOE liab, sched, cost		◔				
Simple/Reliable		◔		◔	◔	
Scalable up or down as req.						
Secondary wastes minimized, treatable		◔			○	
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1	3	1	2		
Comments						
Base selection is only good until 5/8/94.						

Table 15-IV

Technology Rating
Solids, Oxidizers

Competing Treatment Technologies	**BASE** STABL	Hydro thermal Oxidation	DETOX	Calcining	NAC *	
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)				◕	◔	
Safety workers, public, env.		◔	◔			
Minimize Risks DOE liab, sched, cost					◔	
Simple/Reliable			◔		◔	
Scalable up or down as req.						
Secondary wastes minimized, treatable			◔		◕	
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1	2		2	3	
Comments						
* Nitrate to Ammonia and Ceramic (NAC).						

Table 16

Technology Rating
Solids, Reactive Metals - I

Competing Treatment Technologies	**BASE** REACTIVE METALS SKID					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
The BASE technology is viable for most of this stream. The Uranium chips SKID may be applicable to this stream. A benchscale technique should be developed for the thermite @ SNL/NM.						

Table 17-I

Technology Rating
Solids, Reactive Metals - II

Competing Treatment Technologies	**BASE** URANIUM CHIPS SKID					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Site specific. No alternatives were considered. The SNL/NM waste shouild be sorted (U/Pb).						

Table 17-II

Technology Rating
Solids, Sludge - I

Competing Treatment Technologies	**BASE** Delist					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Waste probably already meets LDR standards.						

Table 18-I

Technology Rating
Solids, Sludge - II

Competing Treatment Technologies	BASE Survey					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
Probably not radioactive. If survey does not work, a cyanide destruction process will be evaluated fb STABL.						

Table 18-II

Technology Rating
Solids, Soils - I

Competing Treatment Technologies	**BASE** Thermal Desorption	SCCO2	Hydro thermal Oxidation	DETOX	Steam Reforming	Biodeg-radation
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						◕
Minimize Risks DOE liab, sched, cost			◔	◔	◔	◔
Simple/Reliable			◔	◔	◔	
Scalable up or down as req.						
Secondary wastes minimized, treatable			◔	◔	◔	◔
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1	2				3
Comments						
Super critical carbon dioxide (SCCO2).						

Table 19-I

Technology Rating
Solids, Soils - II

Competing Treatment Technologies	**BASE** Thermal Desorption	SCCO2	Hydro thermal Oxidation	DETOX	Steam Reforming	Biodeg-radation
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						◕
Minimize Risks DOE liab, sched, cost			◔	◔	◔	◔
Simple/Reliable			◔	◔	◔	
Scalable up or down as req.						
Secondary wastes minimized, treatable			◔	◔	◔	◔
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1	2				3
Comments						
Super critical carbon dioxide (SCCO2).						

Table 19-II

Technology Rating
Solids, Soils - III

Competing Treatment Technologies	**BASE** Thermal Desorption fb AMLGM	STABL				
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.		◕				
Minimize Risks DOE liab, sched, cost		◕				
Simple/Reliable		◕				
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating	1	1				
Comments						
Retorting or thermal desorption is only required if waste contains >260 ppm of total Hg.						

Table 19-III

Technology Rating
Solids, Soils - IV

Competing Treatment Technologies	BASE STABL	Chelating fb STABL	Physical separation fb STABL			
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost		◔				
Simple/Reliable		◔				
Scalable up or down as req.						
Secondary wastes minimized, treatable		◕	◕			
For Technologies requiring development						
Potential for private sector development		◕				
Tech. transfer to private sector		◕				
Recycling & mat'l recovery						
Rating	2	3	1			
Comments						

Table 19-IV

Technology Rating
Solids, Soils - V

Competing Treatment Technologies	**BASE** Sulfate Precip fb STABL					
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable						
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery						
Rating						
Comments						
No other appropriate treatment identified.						

Table 19-V

Technology Rating
Special, Mercury - I

Competing Treatment Technologies	BASE AMLGM	Triple Distill Recovery *				
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.		◔				
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable		●				
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery		●				
Rating	2	1				
Comments						
* Must be able to find a customer for the Hg to ensure that the distillation process would not be considered a treatment.						

Table 20-I

Technology Rating
Special, Mercury - II

Competing Treatment Technologies	**BASE** Retort fb AMLGM	Retort fb Recovery				
Criteria	○ much worse	◔ worse	equal to base shown empty	◕ better than	● much better than	Ratings compared to Base
Meet standards (RCRA, LDR, permits & public perception)						
Safety workers, public, env.						
Minimize Risks DOE liab, sched, cost						
Simple/Reliable						
Scalable up or down as req.						
Secondary wastes minimized, treatable		◕				
For Technologies requiring development						
Potential for private sector development						
Tech. transfer to private sector						
Recycling & mat'l recovery		●				
Rating	2	1				
Comments						

Table 20-II

Appendix J
Matrices of Selected Treatment vs. Waste Streams

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Selected Treatment Versus Waste Stream

Selected Treatment: **Amalgamation**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice	fb 36 Kg/TG 7			fb 2 dm/L13					
2nd Choice				7500 lbs/L13	26 Kg/8		fb 7 dm/6.6 fb 19 dm/6.4	1 lb/3	30 ml/TG 6
3rd Choice									

Note: Some boxes have what appears to be duplicate entries. This is an artifact of the waste sorting process and is correct. Duplicate entries actually identify unique waste volumes within a site ID#.

Selected Treatment Versus Waste Stream

Selected Treatment: **Biodegradation**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice									
2nd Choice									
3rd Choice	4 kg/TGs 8.1, 8.2 103 Kg/TGs 9.1-9.3, 10						16 dm/8.2 1 dm/5		

Selected Treatment Versus Waste Stream

Selected Treatment: **CAI, Controlled Air Incinerator**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				15 dm/New 3 (default UV Oxidation)					
2nd Choice				73 dm/New 8 12 dm/New 3 ~40 dm/ L16, L17					
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: Calcining

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice									
2nd Choice			0.5 Kg/6	85 dm/S1	5 dm/9 & 10	Lab Packs/7			
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: **Chelating fb Decon**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice									
2nd Choice		14000 Kg/2		4000 ft3/S7 31 Batteries/S7	4100 Kg/4 1000 Kg/3				60 Kg/TG 4
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: **Chelating fb STABL**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				450 ft3/S7 1000 ft3/S7					
2nd Choice									
3rd Choice		14000 Kg/2		4000 ft3/S7 31 batteries/S7 40 dm/S7	4100 Kg/4 1000 Kg/3		16 dm/6.3		60 Kg/TG 4

Selected Treatment Versus Waste Stream

Selected Treatment: **Decontamination Only**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice		14000 Kg/2		130 cans/ New 7 4000 ft3/S7 31 batteries/S7 9 dm/New 3	4100 Kg/4 1000 Kg/3		1 dm/11		60 Kg/TG 4
2nd Choice									
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: DETOX

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				49 items/L13 73 dm/New 8 12 dm/New 3 40 dm/L16, L17	110 dm/7 300 gal/5	1 dm/1 & 2	2 dm/1.3	12 dm/4 2 dm/5 1 dm/2	
2nd Choice		1 dm/1 5 dm & 9 dm/ 3 & 4		20 dm bulked/ L3	4500 Kg/1		26 dm/1.5 5 dm/1.1	1 dm/1	2 gal/TG 7
3rd Choice	4.5 kg/TG 11.2 125 Kg/TGs 5.6, 11.1, 11.3			34 dm/ L21.1, L21.3 40 dm/ L16, L17 150 dm/ L3, L18, L19	2 Kg/9 2 Kg/9		20 dm/1.1, 1.2, 1.4 1 dm/1.4 2 dm/1.2	1 dm LP/2	

Selected Treatment Versus Waste Stream

Selected Treatment: **Envirocare**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice			1 dm/1.2	17 dm/S5	6 Kg/2		16 dm/6.3	1 dm/7	35 dm/TG 9
2nd Choice									
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: **Evaporative Oxidation fb STABL**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice	483 Kg/ TG 1, TG 3			~40 dm/L16, L17 66 dm/New 5 34 dm//New 6	1500 Kg/1				1 gal/TG 5
2nd Choice	11.7 Kg/TG 2.1, TG 2.2 3 dm/TG 4	600 gal/5 1 dm/1		110 dm/L5, 8-12, 14, 21.2 6 dm/L7 9 dm/L7, L20 6 dm/L6 2 dm/L15	6 Kg/9	2 Kg/1	3 dm/2.2, 2.4 1 dm/2.3 29 dm/2.1	1 dm/1	1 gal/TG 5 2 gal/TG 7
3rd Choice	4.5 Kg/TG 11.2 125 Kg/TGs 5, 6, 11.1, 11.3			34 dm/L21.1, L21.3 ~40 dm/ L16, L17 150 dm LP/L3, L18, L19	2 Kg/9 2 Kg/9		20 dm/1.1, 1.2, 1.4 1 dm/1.4 2 dm/1.2	1 dm LP/2	

Selected Treatment Versus Waste Stream

Selected Treatment: **Gas Treatment Skid**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				20 cyl/L1, L2 12 cyl/L4 68 cyl/LNM 1 26 cyl/LNM 2 2 cyl/L22.1, L22.2 2 cyl/L23					
2nd Choice									
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: **Hydrothermal Oxidation**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				73 dm/New 8 12 dm/New 3 ~40 dm/L16, L17	300 gal/5		5 dm/1.1		
2nd Choice	483 Kg/TGs 1 & 3 4.5 Kg/TG 11.2 125 Kg/TGs 5, 6, 11.1, 11.3		.5 Kg/6	~40 dm/L16&17 ~40 dm/L16&17 15 dm/New 3 49 items/L13 66 dm/New 5 34 dm/New 6 34 dm/L21.1, L21.3 150 dmLP/L3, L18, L19	5 dm/9 & 10 110 dm/7 2 Kg/9 2 Kg/9	1 dm/1 & 2	2 dm/1.3 20 dm/1.1, 1.2, 1.4 1 dm/1.4 2 dm/1.2 see Lab Packs/7	12 dm/4 2 dm/5 1 dm LP/2	1 gal/TG 5
3rd Choice					1500 Kg/1				

Selected Treatment Versus Waste Stream

Selected Treatment: MACRO

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice							7 dm/6.6 19 dm/6.4 16 dm/6.3		
2nd Choice			1 dm/1.2	17 dm/S5 450 ft3/S7 1000 ft3/S7				1 dm/7	35 dm/TG 9
3rd Choice		14000 Kg/2		4000 ft3/S7 31 batteries/S7	4100 Kg/4 1000 Kg/3				60 Kg/TG 4

Selected Treatment Versus Waste Stream

Selected Treatment: **Molten Salt**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice									
2nd Choice					300 gal/5				
3rd Choice							5 dm/1.1		

Selected Treatment Versus Waste Stream

Selected Treatment: **Neutralization fb STABL**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice					1 dm/3			3 dm/3	
2nd Choice									
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: **Nitrite to Ammonia & Ceramic**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice									
2nd Choice									
3rd Choice			.5 Kg/6	85 dm/S1	5 dm/9 & 10	lab packs/7			

Selected Treatment Versus Waste Stream

Selected Treatment: Ozone, UV

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				15 dm/New 3					
2nd Choice									
3rd Choice									

*Alternative is CAI which exists on-site.

Selected Treatment Versus Waste Stream

Selected Treatment: **Packed Bed Reactor/ Silent Discharge Plasma**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice									
2nd Choice	125 Kg/TGs 5.6, 11.1, 11.3	5 dm & 9 dm/ 3 & 4 4.5 Kg/11.2		34 dm/L21.1, L21.3 40 dm/L16, L17 150 dm LP/ L3, L18, L19	1500 Kg/1 2 Kg/9 2 Kg/9		20 dm/1.1, 1.2, 1.4 1 dm/1.4 2 dm/1.2 1 dm LP/2		
3rd Choice	3 dm/TG 4	1 dm/1		20 dm bulked/ L3	4500 Kg/1 300 gal/5		26 dm/1.5		

Selected Treatment Versus Waste Stream

Selected Treatment: **Plating Skid**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice	11.7 Kg/TG 2	600 gal/5		110 dm/L5, L8-12, L14, L21.2 6 dm/L7 9 dm/L7, L20 6 dm/L6 2 dm/L15	6 Kg/9	2kg/1	3 dm/2.2, 2.4		1 gal/TG 5
2nd Choice									
3rd Choice									

2/25/94

Selected Treatment Versus Waste Stream

Selected Treatment: Quadrex/DSSI

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice	3 dm/TG 4 4.5 Kg/TG 11.2 125 Kg/TGs 5, 6, 11.1, 11.3	1 dm/1 5 dm/3 9 dm/4		20 dm bulked/ L3 34 dm/L21.1, L21.3 40 dm/L16, L17 150 dm/L3, L18, L19	4500 Kg/1 2 Kg/9		26 dm/1.5 20 dm/1.1, 1.2, 1.4 1 dm/1.4 2 dm/1.2	1 dm/1 1 dm/2	2 gal/TG 7
2nd Choice									
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: **Reactive Metals Skid**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				55 dm/S2					<1 dm/TG 3
2nd Choice									
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: **Retort fb AMLGM**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice									
2nd Choice				4 bottles/ New 4					
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: **Retort fb Recovery**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				4 bottles/ New 4					
2nd Choice									
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: **Separate, Survey, Decon**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				1 dm/S3 2 dm/S6 1 dm/33 **40 dm/S7	HydroPress/6 ** 36 dm/11	^^5000 gal/4	26 dm/7 1 dm/10 **160 dm/6.5 ^^16 dm/8.2	**.25 dm/6	8 dm/TG 2 3 dm/TG 11 Tablesaw/TG 11 **150 dm/TG 10 **33 Ngen/TG1
2nd Choice									
3rd Choice									

**separation only is required. ^^survey only is required.

Selected Treatment Versus Waste Stream

Selected Treatment: STABL

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice			0.5 Kg/6	85 dm/S1	1 dm/3 6 Kg/9 5 dm/9 & 10	160 grams/3	63 dm/6.2 see Lab Packs /7	3 dm/3 1 bottle/6.2	
2nd Choice				450 ft3/S7 1000/S7 40 dm/S7					
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: **Steam Reforming**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice									
2nd Choice					36 dm/11		160 dm/6.5 16 dm/8.2 16 dm/6.3		150 dm/TG 10
3rd Choice			1 dm/1.1	120 dm/S10.1, S11 10 dm/S8 130 dm/S10.2	7300 Kg/1		155 dm/6.1		130 dm/TG 8

Selected Treatment Versus Waste Stream

Selected Treatment: **Sulfate Precipitation**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				30 dm/S4			102 dm/4.2		
2nd Choice									
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: Super Critical CO2

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice					181 Kg/6 10 dm/7			12 dm/4	
2nd Choice	103 Kg/TG 9.1 -9.3, TG 10 4 Kg/TG 8.1 & 8.2		1 dm/1.1	>120 dm/ S10.1, S11 >10 dm/S8 130 dm/S10.2	7300 Kg/1		155 dm com-pacted/6.1 1 dm/5		130 dm/TG 8
3rd Choice					36 dm/11		160 dm/6.5		150 dm/TG 10

Selected Treatment Versus Waste Stream

Selected Treatment: Super Critical Water

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice									
2nd Choice									
3rd Choice					181 Kg/6 10 dm/7			12 dm/4	

Selected Treatment Versus Waste Stream

Selected Treatment: **Thermal Desorption**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice	103 Kg/TG 9.1 -9.3, TG 10 4 Kg/TG 8.1 & 8.2 36 Kg/TG 7		1 dm/1.1	>120 dm/ S10.1, S11 >10 dm/S8 130 dm/S10.2 2 dm/L13	36 dm/11 7300 Kg/1		160 dm/6.5 155 dm com-pacted/6.1 1 dm/5		150 dm/TG 10 130 dm/TG 8
2nd Choice					181 Kg/6 10 dm/7		~7dm/6.6 19 dm/6.4	12dm/4	
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: Triple Distillation - Recovery

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				7500 lbs/L13	26Kg/8			1lb/3	30 ml/TG 6
2nd Choice									
3rd Choice									

Selected Treatment Versus Waste Stream

Selected Treatment: **Uranium Chips Skid**

Candidate Waste Stream	GJPO Vol/ID#	ITRI Vol/ID#	KCP Vol/ID#	LANL Vol/ID#	MND Vol/ID#	PIN Vol/ID#	PTX Vol/ID#	SNL/CA Vol/ID#	SNL/NM Vol/ID#
1st Choice				220 dm/New 1 <10 dm/New 2					<1 dm/TG 4
2nd Choice									
3rd Choice									

ATTACHMENT 2

DRAFT SITE TREATMENT PLAN
ALBUQUERQUE OPERATIONS OFFICE
COST ESTIMATE

DRAFT SITE TREATMENT PLAN
ALBUQUERQUE OPERATIONS OFFICE
COST ESTIMATE

Introduction

The order-of-magnitude cost estimate prepared for the Albuquerque Operations Office (AL) Draft Site Treatment Plan is contained herein. The estimate is for the treatment, by the nine sites that report to AL, of mixed low-level waste on-site and off-site. The on-site treatment capacity is provided by mobile treatment units. The off-site treatment capacity is provided by commercial treatment facilities. Engineering design has just begun on the mobile treatment units and future waste stream quantities are uncertain. Because of these unknowns, this order-of-magnitude cost estimate should not be used for budgeting purposes as the accuracy of the estimate is between +50 percent and -30 percent.

This estimate was prepared according to the reporting format in the Draft Site Treatment Plan Cost Information Guide, April 21, 1994, and, with the exception of operating labor and maintenance, the estimating values are presented consistently with the report format.

The operating labor and maintenance estimate was time-phased following the fabrication of the mobile treatment unit. Fabrication of the units occurs annually from FY97 through FY99. The staggering of unit fabrication causes fluctuations in the annual labor and maintenance values. To accommodate the reporting format, total operating labor and maintenance were provided for the respective work breakdown structure (WBS) elements. The sum of those values was divided by the number of years covered by the estimate to calculate an "Average O&M" rather than an "Annual O&M."

Excluded from this cost estimate are the costs to treat all waste generated by the Environmental Restoration (ER), Decontamination and Decommissioning (D&D) programs, D&D of mobile treatment units and on-site treatment/storage facilities, and annual utilities and materials.

The wastes from D&D and ER were included in waste quantities when the waste was adequately defined. The treatment capacity estimated does not exclude the addition of these wastes, and they may be included later.

The D&D of mobile treatment units and on-site treatment/storage facilities was excluded on the basis of immateriality. The mobile treatment unit D&D will take one or two days maximum. The on-site treatment/storage facilities will not be

decontaminated and will continue to be used for treatment/storage purposes in the future.

The annual utility and material costs were not included in the estimate on the basis of immateriality and unavailable historical data. The mobile treatment units are powered by 50 horsepower motors, which consume small amounts of electricity. Utility and material costs are not broken out in the baseline documentation used to prepare this estimate. These costs are generally captured in site overhead rates and costed through direct labor estimates.

Albuquerque Operations Office - On site Mobile Treatment Unit Option Cost Estimate

Option Name: On-site Mobile Treatment

Module Name	Mobile Treatment Units		Transportation of MTUs		Frnt end/Bck end Spt.		Interim Storage		*TOTAL OPTION*	
Module Location Albuquerque Operations Office Sites										
Waste Type MLLW,non-alpha,contact handled										
Module Status New,Small Generator,On-site,Portable										
WBS ELEMENT	($ x 1000) SUB $	($ x 1000) ELEMENT $	($ x 1000) SUB $	($ x 1000) ELEMENT $	($ x 1000) SUB $	($ x 1000) ELEMENT	($ x 1000) SUB $	($ x 1000) ELEMEN	($ x 1000) SUB $	($ x 1000) ELEMENT
1.0 Pre-Operations										
1.1 Studies and Bench Scale Tests	$4,545		$0		$0		$0		$4,545	
1.2 Demonstration Costs			$0		$0		$0		$0	
1.3 Operations Budget Funded Activities									$0	
1.3.1 Conceptual Design	$405		$0		$0		$0		$405	
1.3.2 Safety Assurance Documentation	$7,942		$0		$0		$0		$7,942	
1.3.3 Permitting	$12,216		$0		$0		$0		$12,216	
1.3.4 Preparation for Operations	$5,377		$0		$0		$0		$5,377	
1.3.5 Project Management	$7,192		$0		$0		$0		$7,192	
TOTAL PRE-OPERATIONS		$37,677		$0		$0		$0		$37,677
2.0 Facility Construction Costs										
2.1 Design (Title I and II)	$4,455		$0		$0		$0		$4,455	
2.2 Inspection	$0		$0		$0		$0		$0	
2.3 Project Management	$0		$0		$0		$0		$0	
2.4 Building Construction (inc. Indirect)	$180		$0		$0		$0		$180	
2.5 Equipment	$9,664		$0		$0		$0		$9,664	
2.6 Construction Management	$0		$0		$0		$0		$0	
2.7 Contingency	$0		$0		$0		$0		$0	
TOTAL FACILITY CONSTRUCTION COSTS		$14,299		$0		$0		$0		$14,299
3.0 Operating and Maintenance										
3.1 Operating Labor	$82,580		$0		$11,204		$1,867		$95,652	
3.2 Annual Utilities	$0		$0		$0		$0		$0	
3.3 Annual Materials	$50		$0		$0		$0		$50	
3.4 Maintenance	$23,367		$0		$0		$0		$23,367	
3.5 Annual Contingency	$0		$0		$0		$0		$0	
AVERAGE O&M	$8,833		$0		$934		$156		$9,922	
X NUMBER OF YEARS OF OPER.	12				12		12		12	
TOTAL O&M COSTS		$105,998		$0		$11,204		$1,867		$119,069
4.0 Decontamination and Decommissioning	See Assumtions									
4.1 Facility D&D									See Assumptions	
4.2 Closure, Post-Closure, Monitoring										
TOTAL DECON. AND DECOM.		$0								
5.0 Contracted Services										
5.1 Commercial Treatment/Disposal										
5.1 Mobile Treatment			$5,665		$0		$0		$5,665	
TOTAL CONTRACT SERVICES		$0		$5,665		$0		$0		$5,665
6.0 Off-site Treatment (DOE)		$0		$0		$0		$0		$0
7.0 Transportation		$0		$0		$0		$0		$0
Total Cost for On-site MTU Module	(1994 Dollars)	$157,974	(1994 Dollar	$5,665	(1994 Dollar	$11,204	(1994 Dollar	$1,867	(1994 Dollars)	$176,710

DSTP OPTION YEARLY COST ESTIMATE

Option Name: On-site Mobile Treatment Units

Option Location: Albuquerque Operations Office

Total Cost of Option (thousands):

FY 1994 Dollars	$176,708
Escalated Dollars	$209,926

FISCAL YEAR	ANNUAL FUNDING (FY 1994 DOLLARS Capital	Operating	ANNUAL FUNDING (Escalated Dollars) Capital	Operating	ACTIVITIES
1994	$234	$6,481	$234	$6,481	Benchscale studies, Operation labor at existing facilities
1995	$1,930	$17,583	$1,986	$18,093	Upgrade CIA, assemble benchscale units, Pre operation activities
1996	$0	$12,225	$0	$12,959	Pre operation activities
1997	$1,500	$13,366	$1,638	$14,596	Fabricate three MTUs, Pre operation activities
1998	$2,000	$13,731	$2,252	$15,461	Fabricate four MTUs, Pre operation activities
1999	$4,000	$14,901	$4,636	$17,270	Fabricate eight MTUs, Pre operation activities
2000	$0	$14,252	$0	$17,017	Operate MTUs
2001	$0	$14,901	$0	$18,328	Operate MTUs
2002	$0	$14,901	$0	$18,880	Operate MTUs
2003	$0	$14,901	$0	$19,446	Operate MTUs
2004	$0	$14,901	$0	$20,027	Operate MTUs
2005	$0	$14,901	$0	$20,623	Operate MTUs
TOTAL	$9,664	$167,044	$10,746	$199,180	

treatment capacity inventory project manager	mtu description		design and permitting cost	fabrication cost
GJPO				
	Thermal Desorption			
	1 Skid		$900 0	$500 0
	1 Bench Scale Unit		$450 0	$50 0
	Evap. Ox.			
	1 Skid		$900 0	$500 0
	Treated Water Evap.			
	1 Skid		$900 0	$500 0
	1 Bench Scale Unit		$450 0	$50 0
KCP				
	Offsite Treatments		$0 0	$0 0
	Plating Wastes			
	1 Bench Scale Unit		$450 0	$50 0
	SCCO2 (EM-50)		$0 0	$0 0
LANL				
	Gas Cylynder			
	1 Skid		$900 0	$500 0
	Plating Waste			
	1 Skid		$900 0	$500 0
	Reactive Metal			
	1 Skid		$900 0	$500 0
	Uranium Chips			
	1 Skid		$900 0	$500 0
	Pb Decon Trailer		$0 0	$0 0
	Triple Distill. of Hg		$0 0	$0 0
	DETOX			
	1 Skid		$900 0	$500 0
	1 Bench Scale Unit		$450 0	$50 0
	CAI		$755 0	$0 0
	Chelating fb STABL			
	1 Drum Size Unit		$900 0	$500 0
	Hydrothermal Processing			
	1 Skid		$900 0	$500 0
MND				
	Tritium Capture			
	1 Skid		$900 0	$500 0
	1 Bench Scale Unit		$450 0	$50 0
	1 Drum Size Unit		$900 0	$500 0
	PBR/SDP			
	1 Skid		$900 0	$500 0
	Glass Melter		$0 0	$0 0
PP				
	Amal.			
	1 Bench Scale Unit		$450 0	$50 0
PX				
	STBL			
	1 Skid		$900 0	$500 0
	1 Bench Scale Unit		$450 0	$50 0
	1 Drum Size Unit		$900 0	$500 0
	Sulfate Prec. of Barium			
	1 Skid		$900 0	$500 0
	Macroencap.			
	1 Drum Size Unit		$900 0	$500 0
	Metal Melter (EM-50)		$0 0	$0 0
	Bio (EM-50)		$0 0	$0 0
SNL/NM				
	Steam Reforming			
	1 Skid		$900 0	$500 0
	Retorting fb AMLGN			
	of Hg salts			
	1 Bench Scale Unit		$450 0	$50 0
Total				
	Skid Units	11	$9 900 0	$5 500 0
	Drum Units	4	$3 600 0	$2 000 0
	Bench Scale Units	5	$2 250 0	$250 0

description	Inlaste Operation	est specific wbs (000 omitted)	fy94	fy95	fy96	fy97	fy98	fy99	fy2000	fy01	fy02	fy03	fy04	fy05	total
Bench Scale Units	5 units in FY 96	1.1 Studies/Benchscale Test	$562.5	$1,687.5											$2,250.0
		2.5 Equipment		$250.0											$250.0
		3.1 Annual Operating Labor			$642.2	$642.2	$642.2	$642.2		$642.2	$642.2	$642.2	$642.2	$642.2	$5,779.8
		3.4 Annual Maintenace			$7.5	$7.5	$7.5	$7.5		$7.5	$7.5	$7.5	$7.5	$7.5	$67.5
Drum Units	4 units cold start in FY 99	1.1 Studies/Benchscale Test			$412.0										$412.0
		1.3.1 Conceptual Design			$108.0										$108.0
		1.3.2 Safety Docs.			$396.0	$396.0									$792.0
		1.3.3 Permitting				$792.0									$792.0
		1.3.4 Prep for Ops					$108.0								$108.0
		2.1 Design (Title I and II)					$1,188.0								$1,188.0
		2.5 Equipment						$2,000.0							$2,000.0
		3.1 Annual Operating labor						$1,027.5	$1,027.5	$1,027.5	$1,027.5	$1,027.5	$1,027.5	$1,027.5	$7,192.6
		3.4 Annual Maintenace						$60.0	$60.0	$60.0	$60.0	$60.0	$60.0	$60.0	$420.0
Solid Units	4 units cold start in FY 99	1.1 Studies/Benchscale Test			$412.0										$412.0
		1.3.1 Conceptual Design			$108.0										$108.0
		1.3.2 Safety Docs			$396.0	$396.0									$792.0
		1.3.3 Permitting				$792.0									$792.0
		1.3.4 Prep for Ops.					$108.0								$108.0
		2.1 Design (Title I and II)					$1,188.0								$1,188.0
		2.5 Equipment						$2,000.0							$2,000.0
		3.1 Annual Operating labor						$1,027.5	$1,027.5	$1,027.5	$1,027.5	$1,027.5	$1,027.5	$1,027.5	$7,192.6
		3.4 Annual Maintenace						$60.0	$60.0	$60.0	$60.0	$60.0	$60.0	$60.0	$420.0
	4 units cold start in FY 98	1.1 Studies/Benchscale Test		$412.0											$412.0
		1.3.1 Conceptual Design		$108.0											$108.0
		1.3.2 Safety Docs.		$396.0	$396.0										$792.0
		1.3.3 Permitting			$792.0										$792.0
		1.3.4 Prep for Ops				$108.0									$108.0
		2.1 Design (Title I and II)				$1,188.0									$1,188.0
		2.5 Equipment					$2,000.0								$2,000.0
		3.1 Annual Operating labor					$1,027.5	$1,027.5	$1,027.5	$1,027.5	$1,027.5	$1,027.5	$1,027.5	$1,027.5	$8,220.2
		3.4 Annual Maintenace					$60.0	$60.0	$60.0	$60.0	$60.0	$60.0	$60.0	$60.0	$480.0
	3 units cold start in FY 97	1.1 Studies/Benchscale Test	$229.5	$229.5											$459.0
		1.3.1 Conceptual Design		$81.0											$81.0
		1.3.2 Safety Docs.		$594.0											$594.0
		1.3.3 Permitting			$594.0										$594.0
		1.3.4 Prep for Ops			$81.0										$81.0
		2.1 Design (Title I and II)			$222.8	$668.3									$891.0
		3.4 Building Construction				$180.0									$180.0
		2.5 Equipment				$1,500.0									$1,500.0
		3.1 Annual Operating labor				$578.0	$770.6	$770.6	$770.6	$770.6	$770.6	$770.6	$770.6	$770.6	$6,743.1
		3.4 Annual Maintenace				$33.8	$45.0	$45.0	$45.0	$45.0	$45.0	$45.0	$45.0	$45.0	$393.8

Project Management	GJPO	1.3.5 Project Management	$692.0	$1,800.0											$2,492.0
	9 Sites		$350.0	$350.0	$400.0	$400.0	$400.0	$400.0	$400.0	$400.0	$400.0	$400.0	$400.0	$400.0	$4,700.0
CIA	end of FY 1995	1.3.2 Safety Docs	$504.0	$373.5	$378.0	$380.5	$403.5	$417.5	$417.5	$417.5	$417.5	$417.5	$417.5	$417.5	$4,972.0
		1.3.3 Permitting	$229.0	$2,996.0	$556.0	$574.0	$583.0	$614.0	$614.0	$614.0	$614.0	$614.0	$614.0	$614.0	$9,246.0
		1.3.4 Prep for Ops	$504.0	$373.5	$378.0	$380.5	$403.5	$417.5	$417.5	$417.5	$417.5	$417.5	$417.5	$417.5	$4,972.0
		2.5 Equipment	$234.0	$1,680.0											$1,914.0
		3.1 Annual Operating labor		$437.0	$1,602.0	$1,654.0	$1,711.0	$1,769.0	$1,769.0	$1,769.0	$1,769.0	$1,769.0	$1,769.0	$1,769.0	$17,797.0
		3.4 Annual Maintenance	$3,044.0	$4,109.0	$1,569.0	$1,139.0	$1,177.0	$1,217.0	$1,217.0	$1,217.0	$1,217.0	$1,217.0	$1,217.0	$1,217.0	$21,569.0
Load Dozen Trailer	Third Quarter FY 1995	3.1 Annual Operating labor	$0.0	$98.6	$197.6	$197.6	$197.6	$197.6	$197.6	$197.6	$197.6	$197.6	$197.6	$197.6	$2,074.6
Sort, Survey and Dozen	FY 94	3.1 Annual Operating labor	$150.0	$137.5											$287.5
		3.3 Annual Materials	$25.0	$25.0											$50.0
Glass Melter	Start up in FY 94, Treat in FY 96														
		3.1 Annual Operating labor	$191.0	$488.0	$730.0	$1,437.0	$2,189.0	$2,987.0	$2,987.0	$2,987.0	$2,987.0	$2,987.0	$2,987.0	$2,987.0	$25,954.0
Triple Distill of Hg	3rd Qtr FY 95	3.1 Annual Operating labor		$64.2	$128.4	$128.4	$128.4	$128.4	$128.4	$128.4	$128.4	$128.4	$128.4	$128.4	$1,348.6
		subtotal	$6,715.0	$18,890.5	$10,936.5	$13,591.7	$14,357.9	$16,675.9	$12,226.2	$12,875.9	$12,875.9	$12,875.9	$12,875.9	$12,875.9	$157,973.5

transportation module summary back-up																
Bench Scale Units	5 units in FY 96	5.2 Mobile Treatment			$19.0	$19.0	$19.0	$19.0	$19.0	$19.0	$19.0	$19.0	$19.0	$19.0	$190.0
Drum Units	4 units cold start in FY 96	5.2 Mobile Treatment						$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$761.6
								$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$761.6
Skid Units	4 units cold start in FY 96	5.2 Mobile Treatment						$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$761.6
								$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$761.6
	4 units cold start in FY 98	5.2 Mobile Treatment						$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$761.6
								$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$761.6
	3 units cold start in FY 97	5.2 Mobile Treatment					$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$108.8	$870.4
Lead Decon Trailer	Third Quarter FY 1995	5.2 Mobile Treatment			$12.0	$0.4	$0.4								$12.8
Triple Distill of Hg	3rd Qtr. FY 95	5.2 Mobile Treatment			$12.6	$9.7									$22.3
		Total	$0.0	$0.0	$43.6	$29.1	$128.2	$780.6	$780.6	$780.6	$780.6	$780.6	$780.6	$780.6	$5,995.1
front end/back end support and interim storage module summary back-up																
frnt end/bck end opt	MTU crews	3.1 Annual Operating labor		$533.5	$1,067.0	$1,067.0	$1,067.0	$1,067.0	$1,067.0	$1,067.0	$1,067.0	$1,067.0	$1,067.0	$1,067.0	$11,203.9
Interim Storage	MTU crews	3.1 Annual Operating labor		$88.9	$177.8	$177.8	$177.8	$177.8	$177.8	$177.8	$177.8	$177.8	$177.8	$177.8	$1,867.3
		total	$6,715.0	$19,513.0	$12,224.9	$14,865.7	$15,731.0	$18,901.4	$14,251.7	$14,901.4	$14,901.4	$14,901.4	$14,901.4	$14,901.4	$176,709.8

ON-SITE TREATMENT ASSUMPTIONS

I. GENERAL ASSUMPTIONS

A. The operating labor and maintenance estimate is time-phased based on the fabrication of MTUs. These units are fabricated during FY97-99. Therefore, annual labor and maintenance fluctuate with the MTU fabrication schedule. On the module estimate worksheet, total operations labor and maintenance are provided instead of annual values. An average "O&M" value is calculated based on the estimate schedule of 12 years (FY94 to FY 2005).

B. Standard size for skids

3 sizes of units
Skid - 6 modules: the dimensions for each module 5 ft(w) x 10 ft(l) x 12 ft(h) lay side by side.
Drum size - single or dual module: 5 ft(w) x 10 ft(l) x 12 ft(h) each module
Bench scale - Fit on lab table

C. The operating cycle for the units is based on the following assumptions:

50% Run Time
15% Decon/Restart
35% Travel/Storage

MTUs will be stored at site the that designed it. Annual treatment capacity is defined by operating MTUs plus commercial off-site treatment. MTUs will rotate from site to site.

D. Bench scale

Fabricate all units in FY95.
$50K Engineering estimate for fabrication costs: VWR Lab Equipment Catalog if part pricing is required for estimate back-up.

E. Drum size units

Fabricate four units per year starting in FY99.
Each unit costs $500K to fabricate (equal to skid fabrication cost estimate).

F. Skids

Fabrication cost of $500K for each skid per cost estimate in LANL LLMW treatment skid PMP. Fabricate three in FY97 and four in FY98 and FY99.

G. We will always choose commercial off-site treatment option when more than one option is identified for waste stream treatment.

H. Decon trailer to sites 3rd quarter FY95.

I. How much waste can MTU treat per hour?

Lead decon - 3½ Ton of Lead / week (40 hours/wk)
Drum size unit - assume one drum / day (8 hour shift)
Skid size - 3 drums / day (8 hours)
MTU crew for skid operation - 2 FTEs / 8 hour day
Health Physicist (HP) tech / 8 hour day
Drum scale operating crew - same FTEs as skid
Bench scale - 1 FTE, Operator, ½ FTE, HP

II. MOBILE TREATMENT UNIT MODULE

A. Pre-operations And Design (Title I and II)

1. Design and permitting assumptions per telecon with Mona (5/10/94). The WBS elements in the LANL treatment skid PMP that have already been completed by the sites or AL/FFCA Treatment Team are:

   1.1 Waste Sampling
   1.2 Waste Characterization
   1.3 Identifying Treatment Technology
   1.4 Process Selection

   Removing these items from the treatment skid PMP schedule and the cost estimate provided by Stan Zygmunt ($1.2M) has the following impact:

   a. Shorten design and permitting schedule by one year.
   b. Reduces design and permitting costs by the following:

      - Total design and permitting was 50 months at $1.2M.
      - New design and permitting will be ¾ of this estimate or 38 months and $900K.
      - Use 36 months and $900K for pre-operations and design estimate of skids and drum sized units.

   Design and permitting costs for bench scale units is estimated at 50% of the skid/drum sized units design and permitting costs. This assumption is based on the fact that 48% of the LANL treatment skid PMP schedule for design and permitting is allocated to studies and bench scale development test.

   Allocation of Design/Permitting into cost estimate WBS:

		Mos.	%
1.0	Pre-operations		
	1.1 Studies/Bench Scale Tests	6	17
	1.2 Demo	0	0
	1.3.1 CDR	1	3
	1.3.2 Safety Documents	9.5 (8.0)	22
	1.3.3 Permitting	8	22
	1.3.4 Prep for Operations	1.5 (1.0)	3

2.0	Facility Construction Costs		
	2.1 Design	12	33
	TOTAL	38 (36) (Use 36)	100%

B. Pre-operations, Design, and Fabrication Schedule

1. For skids fabricated in FY97, assume design and permitting is 3 months effort in FY94, 12 months effort each in FY95 and FY96, and 9 months effort in FY97.

   For units fabricated in FY98, allocate estimate to WBS as described below:

FY95	100%	of	1.1 and 1.3.1	(7 mos)
	50%	of	1.3.2	(4 mos)
FY96	50%	of	1.3.2	(4 mos)
	100%	of	1.3.3	(8 mos)
FY97	100%	of	1.3.4	(1 mos)
	100%	of	2.1	(12 mos)

   For skids and drum size units fabricated in FY99, adjust above assumption to start one year later.

FY96	100%	of	1.1 and 1.3.1	(7 mos)
	50%	of	1.3.2	(4 mos)
FY97	50%	of	1.3.2	(4 mos)
etc.				

2. Bench scale units schedule

   a) ¼ of design completed in FY94
   b) Design completed end of 3rd quarter FY95
   c) All units assembled in 4th quarter FY95
   d) Following WBS 1.1 (Studies/Bench scale) activities use WBS 2.5 Equipment. Following Pre-operations (WBS 1.1), bench scale parts will be ordered and assembled by project manager site. Replace units after 20 years.

3. Drum sized units - all four units will be fabricated in FY99. Design life of 20 years.

4. Skid sized units - three skids will be fabricated in FY97 and four skids will be fabricated in FY98 and four in FY99.

C. Project Management, Inspection, and Building Construction

1. Project Management

Estimate all in Pre-operations 1.3.5.
GJPO - For FY94 used $692K from GJPO baseline and for FY95 used $150K per month (See pages 11 and 12 from GJPO FY94/95 baseline).

Site Project Management:

• One FTE for LANL	1.0
• .5 FTE for each site: SNL/NM, KC, PX, MD	2.0
• .25 FTE for each site: PP, SNL/CA	.5
• 0 FTE for ITRI	—
TOTAL	3.5

Total Site FTE = 3.5 @ $100K per FTE including travel and support = $350K per year.

GJPO Site Project Management:

- .5 FTE or $50K/year starting in FY96.

2. 2.2 Inspection. No construction inspection activities has been estimated in support of equipment fabrication. WBS 2.5, Equipment, has estimate for inspection of unit.

3. 2.4 Building Construction. Each site will require $20K to refurbish/construct facility to accommodate MTU. Construction will begin in FY97 to coincide with the fabrication of the first three skids.

D. Operating Labor and Maintenance

1. Bench Scale: Annual operating labor - each unit will use one waste operator ($45/hr) for 2,080 hours and one HP ($100/hr) for 1,040 hours per year. (See FY94 site baseline data that was used to calculate $45/hr. $100/hr is LANL average rate per Stan Zygmunt). Unit will be operating 50% of the time plus 15% of the time for decon and restart activities. Annual maintenance was estimated at 3% of equipment cost per AACE Skills and Knowledge of Cost Engineering.

2. Drum sized units: Design, permitting, and fab cost and schedule estimate same as skid units.

3. Skid Unit: Operating crew is two waste operators @ $45/hr for 2,080 hour per year and one HP @ $100/hr for 2,080 hours per year. Assume operating crew runs cold start for one year per LANL treatment skid PMP schedule. Waste treatment begins one year after fabrication.

4. Controlled Air Incinerator: Cost estimate from LANL FY94 baseline, WBS 3.1.3.9.1.05.

5. Lead Decon Trailer: Start operation at LANL the beginning of the 3rd quarter FY95. Crew size equal to skid crew size.

6. Sort, Survey, Decon: $50K in miscellaneous monitoring equipment. Estimate as materials at $25K per year for FY94 and FY95. Effort completed August 1995 per GJPO schedule baseline.

7. Glass Melter: Estimate from FY94 MD baseline: Used FY99 value for FY 2000 - FY 2005.

8. Triple Distill of Hg - O&M estimated as bench scale, one waste operator @ $45/hr for 2,080 hours; 1 HP @ $100/hr for 1,040 hours. Unit already exists, no pre-operations activities. Begin operations 3rd quarter FY95 (after final STP submitted in February 1995).

III. TRANSPORTATION MODULE ASSUMPTION

A. Skid and Drum Units

35% 18 weeks travel time and set-up
65% 34 weeks operation / decon restart

Use $4 per mile - price of shipping contact handled waste from EG&G report (EG&G-WM-10877, Jan 1994). Distance of sites from LANL is 6,759 miles (use 6,800). Assume each skid and drum size unit travels to every site once per year. 6,800 miles x $4 per mile = $27,200/skid or drum unit per year. Skid and drum units will not move to other sites until one year after cold start test (per LANL treatment skid PMP schedule).

B. Bench Scale Units

Assume a bench scale unit will travel average distance of site from LANL (950 miles) once per year @ $4 per mile = $3,800 / bench scale unit per year.

C. Lead Decon Trailer

From LANL to ITRI: 100 miles
MD: 1,519 miles
SNL/NM: 0 (come from ITRI)

Send trailer to MD in FY96 and treat all their waste. Return unit to LANL in FY96 (3,000 miles x $4/mile). Send trailer to ITRI and SNL/NM in FY97 and return to LANL at end of FY98. Split mileage and cost equally between FY97 and FY98 for ITRI and SNL/NM trip.

D. Triple Distill of Hg

MD 1,519 miles (26Kg)
SNL/CA 1,213 miles (1 lb)
SNL/NM 100 miles (30 ml)

Skid to MD (3,040 miles x $4/mile) and SNL/NM; return to LANL (100 miles x $4/mile) in FY96. Skid to SNL/CA in FY97 (2,430 miles x $4/mile) and returned to LANL. Unit treats waste in LANL when not at other sites.

IV. FRONT END/BACK END SUPPORT AND INTERIM STORAGE MODULES

A. Skid size MTU crews will spend 65% of their time running, cleaning, and restarting MTUs. The remaining 35% of their time will be spent working in the front end/back end support facility (30%) and interim storage facility (5%).

1. Each site (9 sites) will have these crew operating front end/back end support and storage facilities starting in the 3rd quarter FY95 (after final STP is issued in February 1995).

Albuquerque Operations Office - Commercial Off-site Treatment Option Cost Estimate

Option Name:Off-site Commercial Treatme

Module Name:
Module Location:Albuquerque Operations Office Sites
Waste Type:MLLW,non-alpha,contact handled
Module Status New,Small Generator,On-site,Portable

WBS ELEMENT	Packaging ($ x 1000) SUB $	Packaging ($ x 1000) ELEMENT $	Interim Storage ($ x 1000) SUB $	Interim Storage ($ x 1000) ELEMENT $	Cert. for Shipment ($ x 1000) SUB $	Cert. for Shipment ($ x 1000) ELEMENT	Transportation ($ x 1000) SUB $	Transportation ($ x 1000) ELEMEN	Commercial Treatment ($ x 1000) SUB $	Commercial Treatment ($ x 1000) ELEMENT	TOTAL OPTION ($ x 1000) SUB $	TOTAL OPTION ($ x 1000) ELEMENT
1.0 Pre-Operations												
1.1 Studies and Bench Scale Tests	$0		$0		$0		$0		$0		$0	
1.2 Demonstration Costs									$0		$0	
1.3 Operations Budget Funded Activities									$0		$0	
1.3.1 Conceptual Design	$0		$0		$0		$0		$0		$0	
1.3.2 Safety Assurance Documentation	$0		$0		$0		$0		$0		$0	
1.3.3 Permitting	$0		$0		$0		$0		$0		$0	
1.3.4 Preparation for Operations	$0		$0		$0		$0		$0		$0	
1.3.5 Project Management	$0		$0		$0		$0		$0		$0	
TOTAL PRE-OPERATIONS		$0		$0		$0		$0		$0		$0
2.0 Facility Construction Costs												
2.1 Design (Title I and II)	$0		$0		$0		$0		$0		$0	
2.2 Inspection	$0		$0		$0		$0		$0		$0	
2.3 Project Management	$0		$0		$0		$0		$0		$0	
2.4 Building Construction (Inc. Indirect)	$0		$0		$0		$0		$0		$0	
2.5 Equipment	$0		$0		$0		$0		$0		$0	
2.6 Construction Management	$0		$0		$0		$0		$0		$0	
2.7 Contingency	$0		$0		$0		$0		$0		$0	
TOTAL FACILITY CONSTRUCTION COSTS		$0		$0		$0		$0		$0		$0
3.0 Operating and Maintenance												
3.1 Operating Labor	$2,069		$503		$264		$0		$0		$2,875	
3.2 Annual Utilities	$0		$0		$0		$0		$0		$0	
3.3 Annual Materials	$0		$0		$0		$0		$0		$0	
3.4 Maintenance	$0		$0		$0		$0		$0		$0	
3.5 Annual Contingency	$0		$0		$0		$0		$0		$0	
AVERAGE O&M	$190		$46		$26		$0		$0		$261	
X NUMBER OF YEARS OF OPER.	11		11		11		11				11	
TOTAL O&M COSTS		$2,069		$503		$264		$0		$0		$2,875
4.0 Decontamination and Decommissioning	See Estimate Intro./Assmpts.		See Estimate Intro./Assmpts		See Estimate Intro./Asem		See Estimate Intro./Ass					
4.1 Facility D&D									See Assumptions		See Assumptions	
4.2 Closure, Post-Closure, Monitoring												
TOTAL DECON. AND DECOM.		$0		$0		$0		$0				
5.0 Contracted Services												
5.1 Commercial Treatment/Disposal									$1,995		$1,995	
5.1 Mobile Treatment									$0		$0	
TOTAL CONTRACT SERVICES		$0		$0		$0		$0		$1,995		$1,995
6.0 Off-site Treatment (DOE)		$0		$0		$0		$0		$0		$0
7.0 Transportation		$0		$0		$0		$994		$0		$994
Total Cost for Commercial Off-site Treatment	(1994 Dollars)	$2,069	(1994 Dollar	$503	(1994 Dollar	$264	(1994 Dollar	$994	(1994 Dollars)	$1,995	(1994 Dollars)	$5,865

DSTP OPTION YEARLY COST ESTIMATE

Option Name: Commercial Off-site Treatment

Option Location: Albuquerque Operations Office

Total Cost of Option (thousands):

FY 1994 Dollars	$5,865
Escalated Dollars	$6,776

FISCAL YEAR	ANNUAL FUNDING (FY 1994 DOLLARS Capital	Operating	ANNUAL FUNDING (Escalated Dollars) Capital	Operating	ACTIVITIES
1994	$0	$0	$0	$0	
1995	$0	$577	$0	$594	Eight shipments: DSSI(3), Envirocare(3),Quadrex(2)
1996	$0	$804	$0	$852	Nine shipments: DSSI(5), Envirocare(3),and Quadrex(1)
1997	$0	$804	$0	$878	Nine shipments: DSSI(5), Envirocare(3),and Quadrex(1)
1998	$0	$804	$0	$905	Nine shipments: DSSI(5), Envirocare(3),and Quadrex(1)
1999	$0	$815	$0	$945	Ten shipments: DSSI(5), Envirocare(3), and Quadrex(2)
2000	$0	$804	$0	$960	Nine shipments: DSSI(5), Envirocare(3),and Quadrex(1)
2001	$0	$250	$0	$308	Six shipments: DSSI(2), Envirocare(3), and Quadrex(1)
2002	$0	$249	$0	$315	Six shipments: DSSI(2), Envirocare(3), and Quadrex(1)
2003	$0	$249	$0	$325	Six shipments: DSSI(2), Envirocare(3), and Quadrex(1)
2004	$0	$249	$0	$334	Six shipments: DSSI(2), Envirocare(3), and Quadrex(1)
2005	$0	$260	$0	$360	Seven shipments: DSSI(2), Envirocare(3) and Quadrex(2)
TOTAL	$0	$5,865	$0	$6,776	

		fy94	fy95	fy96	fy97	fy98	fy99	fy2000	fy01	fy02	fy03	fy04	fy05	total
	shipments													
	DSSI													
	LANL(1086dms)		2	4	4	4	4	4	1	1	1	1	1	27
	GJPO(4dms),MND(75dms), PX(74dms),SNL/CA(1dm), ITRI(14dms).		1	1	1	1	1	1	1	1	1	1	1	11
	ENVIROCARE													
	LANL(843dms)		2	2	2	2	2	2	2	2	2	2	2	22
	KCP(1dm)MND(1dm), PX(16dms),SNL/CA(1dm), SNL/NM(35dms).		1	1	1	1	1	1	1	1	1	1	1	11
	QUADREX													
	ITRI(36dm)						1						1	2
	SNL/CA(1dm),SNL/NM(1dm).		2	1	1	1	1	1	1	1	1	1	1	12
	total shipments		8	9	9	9	10	9	6	6	6	6	7	85
	estimate specific wbs (000 omitted)													
packaging module														
	3.1 Annual Operating Labor		$244	$319	$319	$319	$319	$319	$50	$50	$50	$50	$50	$1,069
interim storage module														
	3.1 Annual Operating Labor		$56	$69	$69	$69	$74	$69	$19	$19	$19	$19	$19	$503
certification for shipping module														
	3.1 Annual Operating Labor		$32	$42	$42	$42	$41	$42	$8	$8	$8	$8	$8	$284
commercial treatment module														
	5.1 Commercial Treatment		$153	$275	$275	$275	$275	$275	$95	$93	$93	$93	$96	$1,995
transportation module														
	7.0 Transportation													
	DSSI		$46	$59	$59	$59	$59	$59	$39	$39	$39	$39	$39	$535
	Envirocare		$28	$28	$28	$28	$28	$28	$28	$28	$28	$28	$28	$305
	Quadrex		$19	$12	$12	$12	$20	$12	$12	$12	$12	$12	$20	$154
	subtotal Transportatoin		$93	$99	$99	$99	$107	$99	$78	$78	$78	$78	$87	$994
		total	$577	$804	$804	$804	$815	$804	$250	$249	$249	$249	$260	$5,865

off-site inventory site	waste stream		matrix	current quantity (dm)	facility	future	future quantity (dm)	total quantity (dm)
GJPO	Solvents, Halogenated	Solvents/Clear	6-1	1.0	DSSI	n	0.0	
	Solvents, nonhalogenated	Solvents/Clear	7-1	0.5	DSSI	y	2.4	
	Solvents, nonhalogenated	Solvents/Clear	7-1	in 7-1 above	DSSI	n	0.0	
ITRI	Scintillation Liquids	Vials w/H3 & C14	4-11	1.0	Q/D	y	37.2	
	Scintillation Liquids	Vials w/actindes & other	4-111	14.0	DSSI	n	0.0	
KCP	Inorganic Debris	Large Item w/Pb	10-V	1.0	Env	n	0.0	
LANL	Scintillation Liquids	Vials w/H3 & actindes	4-111	20.0	DSSI	y	89.1	
	Solvents, Halogenated	Solvents/Clear	6-1	33.0	DSSI	y	151.5	
	Solvents, Halogenated	Solvents/Clear	6-1	1.0	DSSI	n	0.0	
	Solvents, Halogenated	Solvents/Clear. Bulked	6-11	40.0	DSSI	y	178.2	
	Solvents, nonhalogenated	Solvents/Clear	7-1	150.0	DSSI	y	668.3	
	Inorganic Debris	Metal w/Cd	10-V	17.0	ENV.	y	843.5	
MND	Scintillation Liquids	Vials w/actindes & other	4-111	64.0	DSSI	n	0.0	
	Solvents, Halogenated	Solvents/Clear	6-1	1.0	DSSI	?	0.0	
	Solvents, nonhalogenated	Solvents/Clear	7-1	10.0	DSSI	?	0.0	
	Lead	Leaded gloves	11-11	1.0	ENV.	?	0.0	
PX	Scintillation Liquids	Vials w/H3 & actindes	4-111	26.0	DSSI	n	0.0	
	Solvents, Halogenated	Solvents/Clear	6-1	21.0	DSSI	y	23.3	
	Solvents, Halogenated	Solvents/Clear. Bulked	6-11	2.0	DSSI	y	2.3	
	Organic Debris	Trash w/solvents, metals	15-11	16.0	NTS	y	1.0	
	Organic Debris	Trash w/Pb	15-1V	16.0	ENV.	?	0.0	
SNL/CA	Scintillation Liquids	Vials w/H3 & C14	4-11	1.0	Q/D	n	0.0	
	Solvents, nonhalogenated	Solvents/Clear	7-1	1.0	DSSI	n	0.0	
	Inorganic Debris	Tellurium metal, sus. H3, U	10-V	1.0	ENV.	?	0.0	
SNL/NM	Scintillation Liquids	Vials w/H3 & C14	4-11	1.0	Q/D	?	0.0	
	Inorganic Debris	Metals w/elec. parts	10-V	35.0	ENV.	n	0.0	
Total				474.5			1996.8	2471.3

Quantity (dms)	
Envirocare	914.0
Q/D	39.0
NTS	16.0
DSSI	1502.3

Shipments (dms/40)	
Envirocare	22.9
Q/D	1.0
NTS	1.0
DSSI	37.6

COMMERCIAL OFF-SITE TREATMENT ASSUMPTIONS

1. Commercial off-site locations

   DSSI - Kingston, TN (Near O.R.)
   Envirocare - Salt Lake City, UT
   IT Corp - Knoxville, TN
   NFS - Erwin, TN
   NTS - NTS, NV
   Quadrex - Gainesville, FL
   RAMP Industries - Denver, CO

2. Quantities are expressed in drum units (dm). If drum is not used on W_S data sheet, 1 dm will be assumed.

3. LLMW quantity was calculated by multiplying 2.4 by the five year quantity projection from the Mixed Waste Inventory Report to arrive at a 12 year (FY94-00) quantity projection. Cubic meters was converted to drum equivalent by dividing the total cubic meters by .2m^3/drum.

   For LANL, added all quantities for Organic liquids from Site-Waste Matrix. Calculated waste stream percentage from total waste stream quantities and multiplied percentage by five year projection.

4. From the Waste Management Facilities Cost Information for Transportation of Radioactive Materials EG&G-WM-10877 Report, January 1994, an unshielded truck can haul 40 drums (55gal/drum) of contact handled MLLW.

5. Shipments to DSSI

Site	Quantity (dm)	Trips
GJPO	4	11
KCP	0	0
LANL	1,086	27
MD	75	11
PX	74	11
SNL/NM	0	0
SNL/CA	1	11
ITRI	14	11
TOTAL	1,254	36 (Annual shipments for sites with 11 trips. 36 trips = 27 LANL trips + 11 annual trips)

Following issuance of Final STPs and beginning in the 3rd quarter of FY95, the following travel schedule to DSSI is assumed. All sites' shipments, excluding LANL, will be made at the middle and end of the 12 year schedule (FY94-05).

LANL will ship quarterly starting in the third quarter of FY95 through FY 2000. Annual shipments will occur from FY 2001 through FY 2005.

GJPO, SNL/CA, and ITRI combined will ship a total of two drums annually from FY95 through FY01 and 1 drum from FY02 through FY05 to DSSI. MD and PX will ship all their projected waste volumes to DSSI annually from FY95 through FY05.

6. Envirocare and Quadrex Shipments.

Each site ships individually to Quadrex.

SNL/CA will ship two drums annually to Quadrex and PX will ship 2drums annually to Envirocare.

Shipments to Envirocare from KCP, MND, SNL/CA, and SNL/NM will be made annually.

The labor supporting shipments to Envirocare for LANL is included in the labor estimate associated with DSSI shipments.

The labor supporting FY99 and FY 2005 shipments to Envirocare for the other sites is included in the labor estimate associated with DSSI shipments.

Estimated one month of labor in FY95 for the other sites to support the shipments to Envirocare (5 shipments) and Quadrex (2 shipments).

The labor supporting the ITRI shipments to Quadrex in FY99 and FY 2005 are included in the labor estimate associated with DSSI shipments.

6. Crews that support commercial off-site shipment are assumed to be:

LANL - 4 waste operators at $45/hr. for 2,080 hrs. each operator. 1 fork lift driver at $24/hr. for 160 hrs. per year (40 hrs/quarter) from the 3rd quarter FY95 through FY 2000. From FY 2001 through FY 2005, 2 waste operators will work 364 hours/year and the forklift driver will work 80 hours/year.

All other sites will use 2 waste operators @ $45/hr. and 1 fork lift driver @ $24/hr. per the following assumptions.

GJPO, SNL/CA, and ITRI will use 173 hours (1 month) per year for each crew member for FY99 and FY 2005 only. Forklift drivers will work 40 hrs./year in FY99 and FY 2005.

MD and PX will use 346 hours (2 months) per waste operator, per year for FY99 and FY 2005 only. Forklift drivers will work 80 hrs./year in FY99 and FY 2005.

7. Packing Module

Waste operators are estimated to spend 75% of their time packing wastes.

8. Interim Storage Module

Waste operators spend 15% of their time arranging waste in storage area. Fork lift operator spends all his time moving waste in and out of storage facility.

9. Certification for Shipping Module

Waste operators spend 10% of their time certifying shipments.

10. Transportation Module

Per EG&G-WM-10877 Report, transportation charge is $4.00 per mile plus $880 per shipment to cover fixed transportation costs such as demurrage and shipment hardware used when loading and unloading.

Distance of sites from DSSI (per EG&G-WM-10877 Report).

Site	Miles
GJPO	1,612 (250 miles to Denver + RF)
KCP	730
LANL	1,485

MD	341
PX	1,103
SNL/NM	1,389
SNL/CA	2,512
ITRI	1,389

See assumptions in item 5, Shipments.

11. Commercial Treatment - 5.1

The generic unit treatment costs from the DSTP Cost Guidance-Revision 1 were used. The unit cost used for all shipments was the midpoint of the organic liquids category; $4.00/lbs.

Assumed 55 gal. drum weighs 375 lbs. (85% of the weight of water @ 8 lbs./gal) when filled with organic liquids. Use of 85% provided by Rick Dotson, hydrologist.

QUANTITIES ASSUMPTIONS

One gallon of H_2O weighs 8 lbs. ÷ 2.21 Kg/lb. = 3.6 Kg

One gallon of aqueous liquid/solvents weighs 85% of H^2O or = 3.1 Kg

Quantities through FY 2005 derived from information on WS data sheets, MW inventory report and factoring. Waste generated form FY93-FY97 was allocated to WS based on future generation indications from WS data sheet. An annual waste generation rate was calculated by dividing the FY93-FY97 value by 5.

Quantities through FY 2005 is the sum of quantities now (as of 12/31/94) plus ¾ of annual waste generation rate for FY 1994 plus 11 (FY95-FY 2005) multiplied by annual waste generation rate.

NTS weight limit of 544 Kg per 55 Gal drum. Assume drums average 50% that weight. Same w/ 5dm of oxidizers.

ft^3 to m^3	f^3 / 35.31
	$5m^3$ / 25 drums
	$.2m^3$ / drum
	$.2m^3$ = 1 drum
	$.2m^3$ = 7.06 ft^3
	1 drum = 7.06 ft^3
Lead density	11.35 gm / c^3
Hg	13.55 gm / c^3

For debris:

Asphalt	1.1 - 1.5 gm / c^3
Cement	2.7 - 3.0 gm / c^3
Concrete	2.3 - 2.4 gm / c^3