IMPLEMENTING THE CORRECTIVE ACTION MANAGEMENT UNIT AT SANDIA NATIONAL LABORATORIES, NEW MEXICO

Darlene Moore, Scott Schrader, Gabe King, Sandia National Laboratories,
and John Cormier, U.S. Department of Energy, Kirtland Area Office

ABSTRACT

In September 1997, following significant public and regulator interaction, Sandia Corporation (Sandia) was granted a Resource Conservation and Recovery Act (RCRA) and Hazardous Solid Waste Amendment (HSWA) permit modification allowing construction and operation of a Correction Action Management Unit (CAMU). The CAMU follows recent regulatory guidance that allows for cost-effective, expedient cleanup of contaminated sites and management of hazardous remediation wastes. The CAMU was designed to store, treat, and provide long-term management for Environmental Restoration (ER) derived wastes. The 154 square meter CAMU site at Sandia National Laboratories, New Mexico (SNL/NM), includes facilities for storing bulk soils and containerized wastes, for treatment of bulk soils, and has a containment cell for long-term disposition of waste. Proposed treatment operations include soil washing and low temperature thermal desorption.

The first waste was accepted into the CAMU for temporary storage in January 1999. Construction at the CAMU was completed in March 1999, and baseline monitoring of the containment cell has commenced. At completion of operations the facility will be closed, the waste containment cell will be covered, and long-term post-closure monitoring will begin.

Sandia's CAMU is the only such facility within the U. S. Department of Energy (DOE) complex. Implementing this innovative approach to ER waste management has required successful coordination with community representatives, state and federal regulators, the DOE, Sandia corporate management, and contractors. It is expected that cost savings to taxpayers will be significant. The life-cycle CAMU project cost is currently projected to be approximately $12 million.

INTRODUCTION

SNL/NM is located within the boundaries of Kirtland Air Force Base, in Albuquerque, New Mexico. SNL/NM is managed and operated for the DOE by Sandia, a subsidiary of Lockheed Martin Corporation. Sandia has been involved in nuclear weapons research, component development and testing, and nuclear related research since 1949. As a result of these activities, certain sites have been contaminated with hazardous materials, radioactive materials, and combinations of both. The RCRA/HSWA permit was issued in 1993, and modified in 1997 for the CAMU activities. The restoration sites are now being cleaned up under ER voluntary corrective actions.

A CAMU is a waste management unit used for treating and containing RCRA contaminated remediation wastes generated on-site by environmental restoration activities. The advantage of

the CAMU process is that it results in the on-site treatment of more wastes than would occur under the other regulatory options. In addition, it is predicted to result in cost savings and reduced liability through on-site waste management (vs. off-site treatment and disposal), greater reliance on innovative technologies, and a lower incidence of capping waste in place without treatment.(1)

The SNL/NM CAMU is a facility designed to support the ER activities and will be used for consolidating, staging, treatment, and long-term containment of hazardous remediation waste. Hazardous wastes generated during voluntary corrective actions at some of the ER sites, primarily the remediation of the Chemical Waste Landfill (CWL), will be managed at the CAMU. The CAMU is located near the CWL within an existing ER site.

Hazardous wastes are regulated by requirements of RCRA and HSWA, which are specified primarily in 40 Code of Federal Regulation (CFR) § 260 - 264, 266, 268, 270 and 271. The CAMU was designed and permitted in accordance with the CAMU regulations specified in 40 CFR 264.552. Waste management operations at the CAMU must also comply with guidance from the U. S. Environmental Protection Agency (EPA) Region VI, New Mexico State regulations, applicable DOE Orders, and Sandia policies and procedures.

BACKGROUNDThe regulations governing CAMUs were established to accelerate cleanup schedules, reduce residual pollution at cleanup sites through better control of contaminant soils, and reduce the significant expense and potential liability associated with off-site disposal. Due to anticipated high volume remediation projects, the potential use of a CAMU was examined for corrective action remediation waste requirements. Wastes produced from on-going mission-related activities are not allowed to be managed under the CAMU regulations.

To help with the decision and to determine the most appropriate approach, various options were proposed. Community stakeholders were involved in the decision process through the CAMU Working Group and Citizens Advisory Board. Four options were considered:

1. No CAMU – Waste is transported by truck to off-site treatment, storage, and disposal (TSD) facilities.
2. CAMU for storage only – Waste is transported in bulk by rail (if possible) to off-site TSD facilities.
3. CAMU for storage and treatment – Treated soils are reused as fill on-site and concentrated treatment residue is disposed of off-site.
4. CAMU for storage, treatment, and disposal – Treated soils are managed in an on-site engineered disposal cell and concentrated treatment residue is disposed of off-site.

A number of assumptions were made because of uncertainties in waste types, volumes, remedial actions for some sites, cost of treatment, permitting costs, schedules, and health and safety issues. After the data was presented and reviewed, there was a strong preference for on-site treatment in a CAMU over the shipment of untreated waste off-site for treatment and disposal. An on-site engineered disposal cell was preferred over reuse of the soils, due to concerns about the soil contamination. Option 4, a storage, treatment and on-site disposal CAMU was determined to be the best approach.

After significant public involvement, Sandia applied for a modification to the existing RCRA/HSWA permit for managing hazardous waste, which allowed construction and operation of the CAMU. The EPA granted that modification in September 1997. Authorization to operate a soil washing treatment unit in the CAMU was granted by the EPA in November 1997, and authorization to operate a low temperature thermal desorber was granted by the New Mexico Environment Department (NMED) in April 1998.

Remediation wastes may include a wide variety of waste types such as; excavated soils, debris, sludge, general refuse, personal protective equipment, decontamination solutions, sampling equipment, drilling muds, etc. These wastes may be contaminated with solvents such as trichloroethene, metals (chromium, mercury, and lead), and/or other contaminants including polychlorinated biphenyls (PCBs).

Current permit conditions exclude Toxic Substance Control Act (TSCA) regulated wastes such as asbestos and PCBs. Radioactive or mixed wastes (consisting of both radioactive and RCRA waste) can not be treated or stored in the CAMU, at this time. Wastes with radioactive contamination are not allowed under existing permit conditions, however, the definition of "radioactive contamination" is not specified. Efforts are currently underway to quantify radioactivity levels and determine what may be allowable for management within the CAMU. Tritium contamination in soil is the only significant radioactive isotope expected to be found in ER remediation wastes. Tritium "background" levels at SNL/NM are 0.420 nanoCurie/liter (nCi/ltr) in soil moisture. Drinking Water Standards are set at 20 nCi/ltr as an acceptable level. Contamination levels in remediation wastes are expected to be low, and a request has been made to allow CAMU management of soils containing less than 20 nCi/ltr of tritium.(2) Other nuclides, if located, will be managed as radioactive or mixed waste, and will be excluded from entering the CAMU. Off-site treatment and disposal options for radioactive, TSCA, or mixed waste is very limited and very expensive. The management options depend on the level of contamination, the type of contamination, total waste volume, and waste type.

For the 29,000 cubic meters of soils and waste currently estimated to be excavated from the CWL, management and off-site disposal costs could be on the order of $32 million. The life-cycle project cost for the CAMU is currently projected to be on the order of $12 million, resulting in significant savings to the taxpayers while effecting better control of previously buried wastes.

CAMU SITE

The DOE and SNL/NM CAMU facility is located within Kirtland Air Force Base in Albuquerque, New Mexico. The SNL/NM site consists of five technical areas on 11,332 square meters. The CAMU is in the southeastern portion of technical area III. A map showing the CAMU site is in Figure 1.(3)

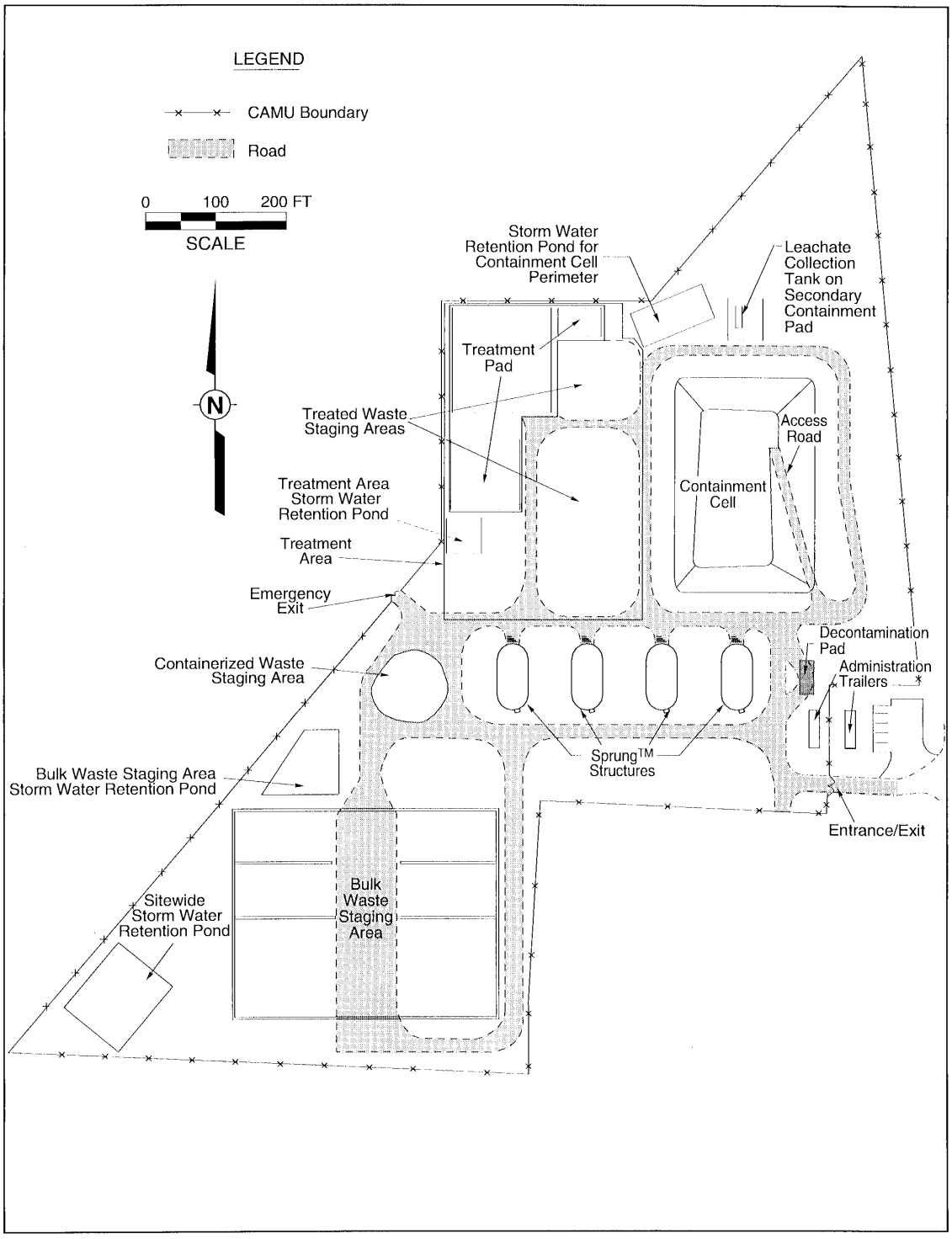

Figure 1.
Sandia National Laboratories, New Mexico, Corrective Action Management Unit (CAMU)

The 154 square meter CAMU site includes the following facilities:

- a Bulk Waste Staging Area (BWSA) designed to manage up to 17,000 cubic meters of contaminated soils,
- a containerized waste staging area for storage of large "roll-off" containers and other containers suitable for outdoor storage,
- four (4) temporary ("Sprung") structures of approximately 465 square meters each for storage of containerized wastes and/or materials and supplies,
- a large treatment area with associated utility connections for operation of mobile soil washing and stabilization (SW/ST) and Low Temperature Thermal Desorption (LTTD) treatment equipment,
- a containment cell with a capacity of 21,400 to 28,300 cubic meters for permanent on-site disposition of wastes that meet permit criteria; the cell design includes a monitoring system for leak detection, a leachate collection and removal system.
- decontamination facilities for personnel and equipment, and
- storm water management ponds for run-off control.

SITE OPERATIONS

The schedule for the CAMU is progressing in six phases:
Phase I – Preparation of Plans and Permits (February 1996 – December 1999)
Phase II – Construction and Site Preparation (December 1997 – March 1999)
Phase III – Waste Acceptance and Staging (January 1999 – November 2000)
Phase IV – Treatment and Final Disposition (October 2000 – December 2000)
Phase V – Decontamination and Demobilization (October 2000 – March 2001)
Phase VI – Closure and Monitoring (June 2001 – June 2031)

Currently the CAMU process is in Phase II - III. Schedules have slipped slightly due to modifications in waste management requirements, waste sampling and analysis for characterization, waste pile management, and health and safety issues.

Construction of the initial storage facilities (concrete pads for the Sprung structures, construction of two (2) Sprung structures, and construction of the bulk waste staging areas) was completed in April 1998. Construction of final storage facilities, the treatment area, and the containment cell was completed in March 1999.

The CAMU began to receive waste for storage in January of 1999. ER-derived wastes from any of Sandia's ER sites are candidates for management within the CAMU. However, most of the wastes to be managed in the CAMU (>90%) will originate from excavation of Sandia's CWL, ER Site 74. The CWL cleanup is a major remediation effort and is the primary driver for the CAMU process. It was originally scheduled for excavation from September 1998 through December 1999, but will be extended.

Baseline monitoring of the containment cell has begun. It is required by the CAMU permit and includes gathering soil moisture data from the primary subliner monitoring system, the vertical sensor arrays (VSAs), and the Chemical Waste Landfill/Sanitary Sewer (CSS) monitoring points.

Additionally, soil gas samples will be collected from the VSAs and CSS and analyzed. The monitoring will be conducted before the containment cell has waste in it, thus all data will be indicative of background or baseline conditions. Such data is necessary for comparison to future data (after waste is in the cell) in order to determine if a release has occurred. Baseline monitoring has been conducted during 1999 and will continue for over a year.

ER-derived waste must comply with the requirements specified in the CAMU operating permit. Each waste soil pile or waste package will be evaluated for acceptance into the CAMU prior to receipt into the facility. The CAMU is designed to accept both bulk wastes (primarily contaminated soils) and containerized, recovered wastes from the CWL. Soils, debris, recovered wastes, and other acceptable materials will be analyzed, taken into the CAMU, stored, treated as necessary, and disposed either within the CAMU containment cell or off-site. Complete records will be maintained to demonstrate compliance with permit and regulatory conditions.

Proposed treatment operations for waste taken into the CAMU include:(4)

- soil washing (a wet screening process) for metals-contaminated soils
- stabilization in a cement matrix
- low temperature thermal desorbtion for organic-contaminated soils that evaporates organics at approximately 260-315 ^{o}C, destroys them through catalytic oxidation, and wet scrubs the effluent gas prior to discharge

Waste treatment goals for the CAMU are based on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Superfund Land Disposal Restrictions Guidelines # 6A. Waste treatment in the CAMU is not planned to begin operation until excavation of the CWL is nearly complete, due to the permit time limit of the TU for waste treatment, and to make the process more cost effective by working with large volumes on a continuous basis. Treatment is not expected to begin before the fall of 2000. Treated soils that are less than the #6A standards will be placed in the containment cell. Treated soils more than #6A standards but less than risk-based standards will be containerized and placed in the cell. Treated soils greater than risk-based standards will be shipped off-site.

Storm water and decontamination water generated at the site will be carefully managed to ensure they contain no hazardous materials. If determined to be nonhazardous, the storm water may be used as makeup water for the treatment systems (e.g. stabilization) or managed as required for non-contaminated SNL/NM water discharge. In 1998 SNL/NM received approval to manage storm water at the CAMU under a Notice of Intent to Discharge, filed with the NMED Water Quality Bureau (WQB).

Decontamination water generated at the CAMU, suspected of being hazardous waste, will be characterized by sampling and analysis. Waters from the decontamination solution collection tank will be managed as hazardous waste if it is determined that the liquids exhibit any hazardous characteristics or are derived from any listed wastes. They may be treated at the CAMU or disposed off-site. In 1999 SNL received approval to manage decontamination water at the CAMU under a Notice of Intent to Discharge, filed with the NMED WQB.

After completion of treatment and disposal operations, the facility will be decontaminated, decommissioned, and the containment cell will be covered. The final cover system will incorporate a capillary barrier for primary hydraulic control and a liner for reinforced hydraulic control. Post-closure long-term environmental monitoring will be implemented in accordance with regulatory requirements (for 30 years) to detect releases if they occur.

REGULATIONS

The federal statute that directs waste management requirements for generators of hazardous waste is RCRA, Subtitle C. RCRA was amended by HSWA in 1984. HSWA added "land disposal restrictions" (LDR) and "minimum technology requirements" (MTR) for land-based hazardous waste disposal sites. It also described corrective action requirements for contaminated sites. EPA promulgated the Final Rule, "Corrective Action Management Units and Temporary Units, Corrective Action Provisions", 1993, which described requirements for CAMUs and temporary units (TU).(5) CAMU is defined in 40 CFR § 260.10 as "an area within a facility that is used only for managing remediation wastes for implementing corrective action or cleanup at the facility". Placement of remediation waste into a CAMU does not constitute land disposal of waste (40 CFR § 264.552 (a)). Recently the EPA promulgated the "Hazardous Remediation Waste Management Requirements (HWIR-Media)", 1998, that discussed facility cleanups.(6)

Sandia currently has a RCRA storage and treatment permit with a HSWA modification, and a mixed waste interim status permit application. After working with the public, Sandia applied for a Class III modification to the existing RCRA/HSWA permit that would allow construction and operation of a CAMU. The Class III modification to the permit was granted by the EPA, Region VI, in September 1997.(7) In addition, a Class II permit modification for a TU for authorization to operate a soil washing and stabilization treatment (SW/ST) unit in the CAMU, was granted by the EPA in 1998.(8) Authorization to operate a low temperature thermal desorber (LTTD) was granted by the NMED in 1998 through a Temporary Authorization (TA).(9)

The TUs are designed to operate in conjunction with the CAMU, as storage and waste treatment areas. TUs are described in 40 CFR § 264.553 and are for temporary tanks and container storage areas used to treat or store hazardous remediation wastes during remedial activities. The permit specifies the length of time a TU will be allowed to operate, which can be no longer than one year, however, the time may be extended for up to one year beyond that originally specified in the permit. TAs, such as for the LTTD, are used for short-term activities (180 days). Both the EPA and the NMED are involved in the permit process because the EPA currently has authority to administer the CAMU programs and the NMED has authority over the TAs and Subpart X units.

The CAMU was designed and permitted according to requirements specified in 40 CFR § 264.552, Subpart S-Corrective Action for Solid Waste Management Units.(10)
The CAMU was designed to address the seven decision criteria outlined in 40 CFR § 264.552 (c). The criteria and response are described below.(11)

1. *The CAMU shall facilitate the implementation of reliable, effective, protective, and cost-effective remedies (40 CFR § 264.552 (c) [1]).* The CAMU consists of on-site staging,

treatment, and containment capabilities for hazardous remediation wastes. Proven, off-the-shelf treatment technologies will be capable of meeting negotiated treatment performance standards. On-site, permanent waste containment will allow for cost-effective and controlled management of hazardous remediation wastes.

2. *Waste management activities associated with the CAMU shall not create unacceptable risks to humans or to the environment resulting from exposure to hazardous wastes or hazardous constituents (40 CFR § 264.552 (c) [2]).*
   The CAMU is located in a remote area of technical area III, in the vicinity of the CWL, from which most of the waste will originate. On-site management of hazardous remediation waste will reduce risks associated with off-site transport. The waste will be treated to decrease or eliminate the hazardous constituents before being placed in an on-site containment engineered cell.
3. *The CAMU shall include uncontaminated areas of the facility, only if such areas for the purpose of managing remediation waste is more protective than management of such wastes at contaminated areas of the facility (40 CFR § 264.552 (c) [3]).*
   The CAMU is located at ER site 107, a solid waste management unit included in Module IV of the SNL/NM RCRA Permit.
4. *Areas within the CAMU, where wastes remain in place after closure of the CAMU, shall be managed and contained so as to minimize future releases, to the extent practicable (40 CFR § 264.552 (c) [4]).*
   All hazardous remediation waste, except the debris, will be treated to meet specific treatment standards prior to being placed in the on-site containment cell. Debris and treated wastes not meeting treatment standards will be stabilized in containers before being transferred to the on-site containment cell. The containment cell was designed with a leachate collection and removal system and leak detection system to monitor and withdraw fluid from the cell either during operation or the post closure period. Finally, a vadose zone monitoring system will provide real-time information on the CAMU containment cell.
5. *The CAMU shall expedite the timing of remedial activity implementation, when appropriate and practicable (40 CFR § 264.552 (c) [5]).*
   The CAMU will allow multiple areas of contamination to be remediated and co-located within a centralized facility, thus expediting the corrective action process.
6. *The CAMU shall enable the use, when appropriate, of treatment technologies (including innovative technologies) to enhance the long-term effectiveness of remedial actions by reducing the toxicity, mobility, or volume of wastes that will remain in place after closure of the CAMU (40 CFR § 264.552 (c) [6]).*
   The CAMU was designed to incorporate proven and innovative treatment technologies (such as soil washing and thermal treatment) to significantly reduce the toxicity and mobility of remediation waste prior to placement into the on-site cell.
7. *The CAMU shall, to the extent practicable, minimize the land area of the facility upon which wastes will remain in place after closure (40 CFR § 264.552 (c) [7]).*
   Consolidating hazardous remediation waste from multiple ER Project sites into one centralized location minimizes the land area of the facility at which wastes will remain in place after closure.

The CAMU regulations also state four additional requirements to be addressed in the permit:

- The areal extent of the CAMU
- The design, operation, and closure requirements
- The groundwater monitoring requirements
- The closure and post-closure requirements

The information required in the CAMU permit modification is specific, but less structured than the traditional permit application.

LESSONS LEARNED

There were important lessons learned during the development of the CAMU. They include:

- Involve the citizens and openly explain the project
- Work closely with the regulators
- Examine your remediation options and costs associated with them
- Understand permit requirements to avoid modifications later
- Coordinate the CAMU design and permit requirements carefully
- Do a thorough records search of the remediation site early in the development of the project
- Characterize the waste you will be generating before you generate it
- Carefully manage the safety and health of the workers
- Try to develop accurate soil volume estimates
- Create a flexible site design that can be modified if required

CONCLUSIONS

The CAMU at Sandia is the only CAMU within the DOE complex. The purpose of building the CAMU at SNL/NM was to accelerate environmental restoration cleanup schedules, reduce residual pollution of hazardous wastes in unmanaged landfills, take advantage of current permitting and operational requirements with greater flexibility, and reduce the expense and potential liability of off-site disposal. It also allows management of wastes that may not have off-site treatment and disposal pathways, such as for low-level radioactive, TSCA, or mixed waste, if approved by the regulators.

The CWL schedule was accelerated due to waste management options at the CAMU. The first waste was received in 1999 for temporary storage in the CAMU. Waste treatment operations are planned for late 2000. After treatment, the waste that meets the permit requirements will be placed in an engineered containment cell, reducing the potential for pollution. An estimate of cost savings can be made by comparing on site management and off-site disposal costs against CAMU project costs. Current cost savings estimates are in the range of $20 million, depending on the final permit modifications, types of wastes to be managed, and extent of remediation.

The regulatory process for the CAMU is complex and continually evolving. The Citizens Advisory Board was active in the planning stages and the interaction helped in the permit modification process. As the operations raise new issues, modifications to the RCRA Permit continue to be addressed with the regulators. The EPA expects that use of CAMUs will increase

as more corrective action sites progress, and the Agency encourages States to adopt this mechanism for cleanup.

The CAMU project has required unique approaches in community involvement, regulatory knowledge, interfacing with regulators, and waste management facility design and operation. The project has demonstrated Sandia's ability to successfully coordinate with community representatives, state and federal regulators, the DOE, and experienced contractors to implement an innovative approach to a remediation site clean up.

ACKNOWLEDGEMENT

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under Contract DE-AC04-94AL85000.

REFERENCES

1. U. S. Environmental Protection Agency, 1993, "Corrective Action Management Units and Temporary Units; Corrective Action Provisions Under Subtitle C", Volume 58, No. 029, II, Part 58, Federal Register 8658, February 14, 1993, Washington, D. C.

2. U. S. Department of Energy, Albuquerque Operations Office, 1999, "Memorandum from M. Zamorski, Area Manager, Kirtland Area Office, DOE, reply to EPD:RJB, Authorized Limit Request for Radioactive Materials in Soil for Sandia National Laboratory, dated January 21, 1999", Albuquerque, N. M.

3. U. S. Department of Energy, Albuquerque Operations Office, 1997, "Class III Permit Modification for the Management of Hazardous Remediation Waste in the Corrective Action Management Unit, Technical Area III, Sandia National Laboratories, Environmental Restoration Project", September 1997, Albuquerque, N. M.

4. U. S. Department of Energy, Albuquerque Operations Office, 1998, "Site Operations Plan for the Corrective Action Management Unit, Technical Area III, Final, Sandia National Laboratories/New Mexico", Albuquerque, N. M.

5. U. S. Environmental Protection Agency, 1993, "Corrective Action Management Units and Temporary Units; Corrective Action Provisions; Final Rule," Federal Register Volume 58, No. 29, February 16, 1993, Washington, D. C.

6. U. S. Environmental Protection Agency, 1998, "Hazardous Remediation Waste Management Requirements (HWIR-Media); Final Rule", Federal Register Volume 63, No.229, November 30, 1998, Washington, D. C.

7. U. S. Department of Energy, Albuquerque Operations Office, 1997, "Class III Permit Modification Request for the Management of Hazardous Remediation Waste in the Corrective Action Management Unit, Technical Area III, Sandia National Laboratories/New Mexico, Environmental Restoration Project", Albuquerque, N. M.

8. U. S. Department of Energy, Albuquerque Operations Office, 1997, "Class II Permit Modification for Temporary Unit Treatment Operations at the Corrective Action Management Unit, Technical Area III, Sandia National Laboratories/New Mexico, Environmental Restoration Project", Albuquerque, N. M.

9. U. S. Department of Energy, Albuquerque Operations Office, 1998, "Temporary Authorization Request for Low-Temperature Thermal Desorption Treatment Operations at the Corrective Action Management Unit, Technical Area III, Sandia National Laboratories/New Mexico, Environmental Restoration Project", Albuquerque, N. M.

10. U. S. Environmental Protection Agency, 1993, "Corrective Action Management Units and Temporary Units; Corrective Action Provisions; Final Rule," Federal Register Volume 58, No. 29, February 16, 1993, Washington, D. C.

11. U. S. Department of Energy, Albuquerque Operations Office, 1997, "Class III Permit Modification Request for the Management of Hazardous Remediation Waste in the Corrective Action Management Unit, Technical Area III, Sandia National Laboratories/New Mexico, Environmental Restoration Project", Albuquerque, N. M.