

# FUSRAP THE PAST, THE PRESENT, AND THE FUTURE

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## ABSTRACT

The Formerly Utilized Sites Remedial Action Program (FUSRAP) is a U.S. Department of Energy (DOE) program to evaluate and remedy radiological and chemical contamination conditions at sites across the nation where contamination exceeding current guidelines remains from the early years of the nation's atomic energy program or from commercial operations that resulted in conditions Congress has mandated DOE to remedy. FUSRAP was initiated in 1974 and now includes 29 sites in 12 states. Since the start of field work in 1979, through the end of fiscal year 1987, 218,000 m<sup>3</sup> of contaminated material have been removed during remedial action and one permanent disposal facility has been constructed. Current estimates are that the program will be completed in 2002 at a cost of approximately \$960 million. Significant issues in the immediate future are the development of permanent disposal sites to permit the program to be completed and the impact of the Superfund Amendments and Reauthorization Act (SARA) on the program.

The program's origin, organization and responsibilities, and activities from 1981 to 1987 are described. The current status of FUSRAP is presented and the paper concludes with a discussion of the future of FUSRAP.

## INTRODUCTION

The Formerly Utilized Sites Remedial Action Program (FUSRAP) is one of four Department of Energy (DOE) programs to decontaminate or control assigned privately, institutionally, and DOE-owned sites to ensure the protection of public health and safety and the environment. Most FUSRAP sites contain low-level radioactive and chemical contamination at levels exceeding current guidelines that remain from activities performed as part of the first U.S. atomic energy programs. Additionally, remedial action has been authorized by Congress at certain sites where contamination was not a result of U.S. Government atomic energy projects. This paper presents a brief description of the origin of the program and how it currently functions; a summary of activities through the end of 1987; a description of the current status, activities, and key issues; and a discussion of the future of the program.

## BACKGROUND: THE ORIGIN OF FUSRAP

In the early years of the nuclear energy program, most uranium was extracted from foreign ores. Pitchblende was imported, stored for short periods, transported to sampling plants, and finally transferred to mills and refineries for uranium extraction. Some ores were also processed for thorium. Much of the government-sponsored research and

development was conducted at national laboratories, colleges, and universities, with commercial firms producing the needed feedstock and finished material. Ores were processed to obtain a mill concentrate that was refined and converted to other uranium or thorium compounds or transformed into metal and distributed to other participants in the program. Most of the metals manufactured from these various operations were ultimately transported to the Hanford site at Richland, Washington; to Clinton Semi-Works at Oak Ridge, Tennessee; and to the Savannah River Plant near Aiken, South Carolina, for use in plutonium production and reactor development programs. Commercial firms also conducted operations to recover uranium from scrap and to salvage ferrous and non-ferrous metals from radioactively contaminated scrap. Figure 1 summarizes the steps for producing uranium material during the Manhattan Project.

As a result of these activities, materials, equipment, buildings, and land became contaminated, primarily with naturally occurring radionuclides. As operations were completed or phased out and facilities closed or returned to non-nuclear uses, decontamination operations were typically performed in accordance with the standards and survey methods in use at that time. Since then, radiological criteria, guidelines, and proposed guidelines for release of

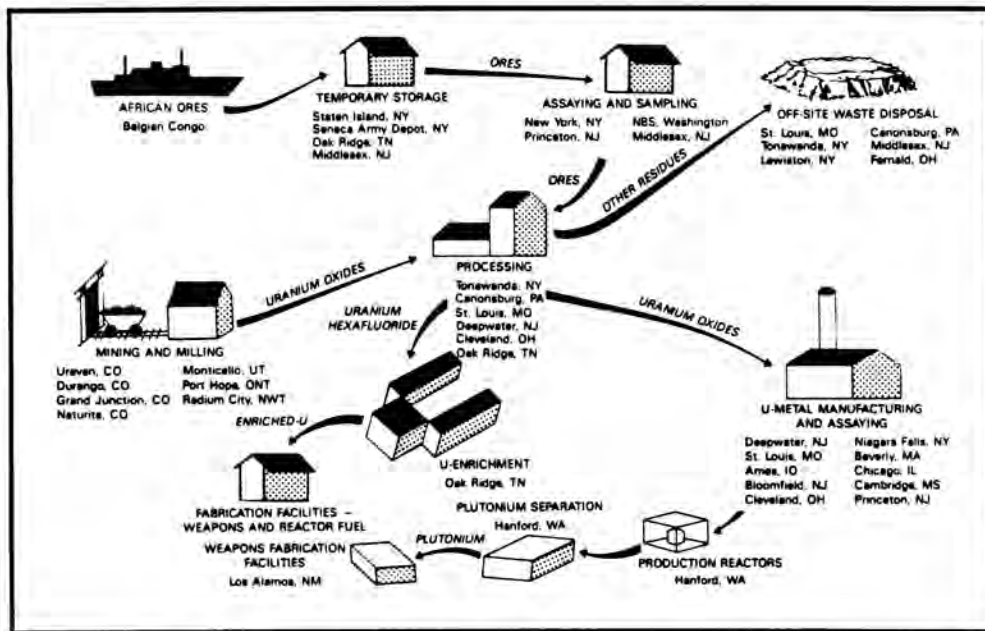


Fig. 1. Paths for Uranium Production During the Manhattan Project.

such sites for unrestricted use have become more stringent as research on the effects of low-level radiation provides new information. Records documenting some of these early decontamination efforts cannot be found. Because the final radiological conditions of the sites could not be adequately determined from the records, FUSRAP was initiated in 1974 to identify these formerly used sites and to reevaluate their current radiological status.

Since 1974, the DOE and its predecessor agencies have identified more than 400 government- and contractor-owned and -operated sites that were used in support of the Manhattan Engineer District (MED) and Atomic Energy Commission (AEC) operations from the early 1940s through the early 1960s. Most are known to have been involved in some way with the processing or handling of radioactive material owned by the government. By reviewing operational records from the period and analyzing information from other sources, these sites were identified as potential candidates for consideration under FUSRAP. Many of these sites were under the jurisdiction of other Federal remedial action programs or other agencies and, therefore, required only minimal review under FUSRAP. Other sites required more detailed investigations and, in some cases, radiological surveys. To date, 24 sites and their vicinity properties have been included in the program for remedial action under authority provided in the Atomic Energy Act of 1954, as amended. Five additional sites were

included in FUSRAP under specific legislation enacted by the Congress. Over 300 sites have been eliminated from further consideration under this program, primarily because (1) records assembled for each site do not indicate a significant potential for residual radioactive contamination, (2) the DOE does not have authority to conduct the necessary remedial action, and/or (3) it has been determined that another government agency or program has authority and is responsible for cleanup of the sites. When sites were eliminated from consideration under FUSRAP because DOE does not have the authority to conduct required remedial action, the Environmental Protection Agency (EPA) and state in which the sites are located were advised of DOE's decision and were provided information pertaining to the condition and status of the site for their consideration and appropriate action.

### FUSRAP TODAY: ORGANIZATIONS AND RESPONSIBILITIES

FUSRAP falls under the purview of the Assistant Secretary for Nuclear Energy. The Director of the Office of Remedial Action and Waste Technology is responsible for policy and budget issues affecting the program; the Division of Facility and Site Decommissioning Projects manages FUSRAP and three similar programs. Technical, administrative, and financial management of FUSRAP field activities is the responsibility of the Technical Services Division (TSD) of the DOE Oak Ridge Operations Office

\* Inactive uranium mill tailings sites in the western States are being investigated under a separate program authorized by Public Law 95-604 (Uranium Mill Tailings Radiation Control Act of 1978).

(OR). Supporting OR/TSD, Argonne National Laboratory (ANL) provides services related to compliance with the National Environmental Policy Act (NEPA) and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA). ANL also furnishes general technical support to OR/TSD, along with the Oak Ridge National Laboratory (ORNL).

Bechtel National, Inc. (BNI), the FUSRAP Project Management Contractor since 1981, assists OR/TSD in planning and implementing FUSRAP activities. BNI is assisted in its work by two major subcontractors, Thermo-Analytical/ Eberline for radiological support and Roy F. Weston, Inc. for chemical analysis. BNI conducts radiologi-

cal permanent waste disposal sites that are planned for FUSRAP.

**1981 1987 ACTIVITIES**

The focus during these years has been on those sites with the highest potential threat to the health and safety of the public and, particularly, in removing material from residential and commercial properties. A highlight of these years has been completion of interim remedial action at the Niagara Falls Storage Site (NFSS) in Lewiston, New York, and the construction of an engineered disposal cell intended as a permanent repository for the contaminated material. The NFSS disposal cell was funded jointly by FUSRAP and another DOE remedial action program, the Surplus

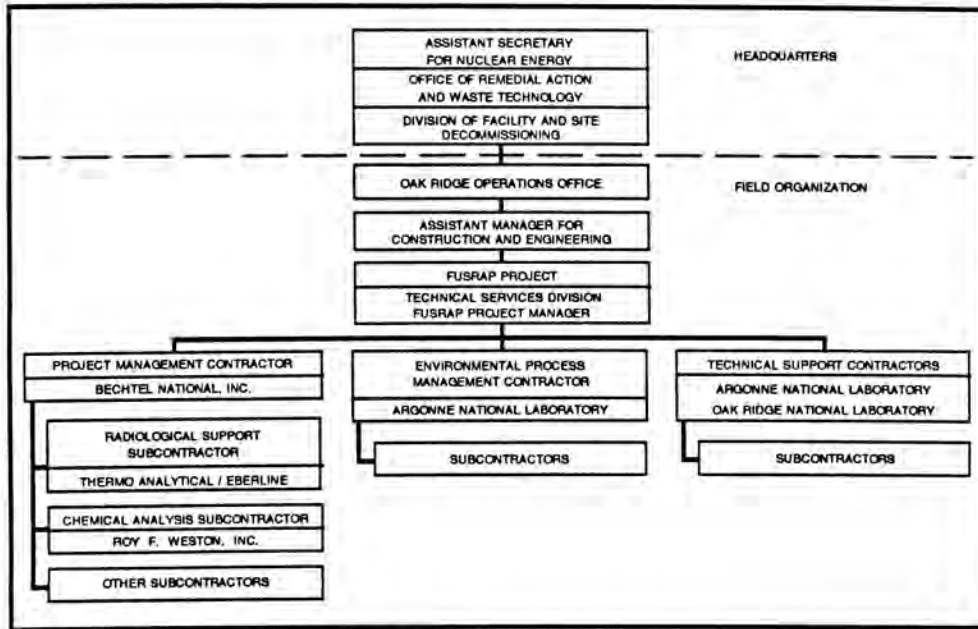


Fig. 2. FUSRAP Organization Structure.

cal and chemical characterization of sites to evaluate and define conditions. This information is evaluated and recommendations for remedial action are made to OR/TSD. Upon approval, BNI performs the necessary engineering, procures remedial action subcontractors, and manages the field remedial action work. BNI conducts an extensive environmental monitoring program during and after remedial action. BNI is responsible for ongoing surveillance and maintenance at five DOE-owned and one DOE-leased site that are a part of the program.

BNI is also responsible to OR/TSD for the development, construction, operation, and closure of four addition-

Facilities Management Program (SFMP). Future surveillance and maintenance will be under the sponsorship of SFMP.

During these years, DOE has used DOE-owned or -leased facilities near contaminated vicinity properties as interim storage sites for material until permanent disposal sites could be established in the state concerned. The initial such use was of the Middlesex Sampling Plant in Middlesex, New Jersey, to store material from nearby vicinity properties and, later, the Middlesex Municipal Landfill. Other sites were acquired by DOE as described below at Wayne, New Jersey; Maywood, New Jersey; and Colonie, New

York. A leased facility was made available for a limited amount of material at Latty Avenue in Hazelwood, Missouri. Major cleanup of vicinity properties took place at all of these locations.

1984 was significant with the addition by Congress, as a part of the 1984 Energy and Water Development Appropriation Act, of four additional sites which had not previously met requirements for inclusion under FUSRAP: Wayne, New Jersey; Maywood, New Jersey; Colonie, New York; and Latty Avenue in Hazelwood, Missouri. Both Wayne and Maywood are now on the EPA's National Priority List (NPL).

In 1985, the 1985 Energy and Water Development Act directed DOE to reacquire the St. Louis Airport Site (SLAPS) and to use it as a disposal site for certain St. Louis area radioactive wastes.

Activities at the sites added in 1984 and 1985 and NFSS have represented a major part of FUSRAP efforts during 1984 through 1987.

In 1986 another major development occurred with the passage on October 17, 1986, of the Superfund Amendments and Reauthorization Act (SARA). The provisions of SARA made remedial action at FUSRAP sites and disposal site development subject to overview and review by EPA and state agencies. Both SARA and NEPA requirements must now be met. Implementing FUSRAP objectives now requires revised, more extensive, documentation and more extensive public involvement. FUSRAP is wrestling with the implication of this major program change; our approach will be described later.

Significant activities conducted from 1981 through the end of fiscal year 1987 are summarized below:

- Interim remedial action was completed at NFSS. Approximately 190,000 m<sup>3</sup> of contaminated materials from the site and more than 25 vicinity properties were placed in a 4-hectare engineered disposal cell with an interim cap, including 2,500 m<sup>3</sup> of "high" specific activity (220,000 pCi/gm) K-65 residues from a storage tower. Installation of a final cap on the disposal cell has been deferred pending discussions with the EPA.
- Remedial action was completed at the Middlesex, New Jersey, Municipal Landfill and at approximately 30 Middlesex Sampling Plant vicinity properties. Approximately 54,000 m<sup>3</sup> of material were moved to interim storage at the Middlesex Sampling Plant.
- Remedial action was completed on vicinity properties and Sheffield Brook at Wayne, New Jersey. Approximately 29,000 m<sup>3</sup> of material was moved to interim storage at the Wayne Interim Storage Site.

- Remedial action was completed at 35 vicinity properties in Colonie and Albany, New York. The contaminated material is in interim storage at the Colonie facility. At the facility itself, the cleanup has included the incineration of over 450 kg of uranium chips, encapsulation of roughly 270 kg of depleted uranium, processing of uranium-contaminated oil and water, neutralization of cyanide solutions and nitric acid, and disposition of laboratory chemicals.
- Remedial action was completed at 25 vicinity properties in Maywood, New Jersey. Approximately 27,000 m<sup>3</sup> are stored at the Maywood Interim Storage Site.
- Extensive remedial action was completed in the Latty Avenue area of Hazelwood, Missouri. Approximately 10,300 m<sup>3</sup> were moved to the Hazelwood Interim Storage Site.
- In total, about 214,000 m<sup>3</sup> of material were moved to interim storage pending final disposal.
- Over 3,800 m<sup>3</sup> of material were transported to existing facilities for disposal.
- Nearly 39 million liters of waste water resulting from remedial action activities were processed and released.
- Approximately 312 hectares were characterized, i.e., sampled and analyzed to determine radiological and chemical conditions.

#### LESSONS LEARNED

Obviously, many lessons have been learned in conducting FUSRAP over the years. A few of these lessons are described below.

- Maximize use of historical records in planning characterization and remedial action activities.

As described earlier, historical records were used extensively in determining whether a site was "formerly utilized" for MED/AEC activities. In addition, historical records, particularly old site photographs and aerial maps, have been and continue to be extremely valuable for planning characterization and remedial action activities. In Maywood, for example, old aerial photographs were used to identify the course of a stream long since channeled in underground pipes, filled in, and built upon, that had carried contamination from the Maywood Chemical Works into Lodi, an adjacent community. Information gained from this review assisted in developing a focused designation and characterization program that identified contaminated residential properties along the old stream bed, as well as firmly establishing the source of the contamination.

An important part of historical records is the collective memory of former employees or others familiar with past activities at a site. The memories of such "old timers" have filled in important missing gaps in site knowledge.

- Develop a balance of expenditure of resources on characterization versus remedial action to ensure reasonably accurate characterization while remaining cost effective.

An ever-present tradeoff in many remedial action programs is what portion of the available resources should be devoted to characterization. It is obviously possible, and even preferable in many cases, to conduct remedial action with a minimum of characterization only doing enough to define the nature of the contamination for health and safety purposes and its outer boundaries. Monitoring is conducted as remedial action progresses and when no more contaminated material is found, work is finished. A nontechnical problem inherent in this approach is that fixed-price contracts for remedial action are difficult to implement in such a situation, and cost and schedule estimates are subject to considerable uncertainty.

On the other hand, complete characterization and resultant extensive documentation including work scopes for fixed-price contract procurement, can be very expensive and, in some cases, not cost effective. Such up-front expenditures prior to any actual remedial action are prime targets for questioning.

The lesson and message is, if you elect not to expend the resources necessary for complete characterization, be prepared for uncertainties and surprises.

- Ensure that field remedial action contracts contain provisions for changed scope and schedule.

Unless an inordinate amount of time and money is spent in characterizing areas or structures where remedial action is to be accomplished, the exact scope of the work has an element of uncertainty. This presents problems to those charged with getting work done in the field, especially when using subcontractors. On FUSRAP, fixed-price contracting, with its requirement for a well-defined scope of work, is desirable. On the other hand, seldom are the conditions known with enough accuracy that changes are not expected. On the contrary, changes should be expected. Provisions must be written into contractual documents to allow changes without disrupting field work or creating the necessity for lengthy negotiations with the subcontractor.

#### Expect political redirection to impact plans, costs, and schedules.

At their best, remedial action activities are somewhat controversial to those affected; at their worst, they are

extremely controversial. Those affected most, of course, are residents and property owners in the vicinity of remedial action sites, interim storage sites, and, particularly, permanent disposal sites. A natural recourse for these individuals is to appeal to their elected representatives; local, state, or national. The result of this action is often "political redirection" of activities.

Two examples of this are the inclusion of four non-MED/AEC sites in FUSRAP by Congress via the FY 1984 Energy and Water Appropriations Act, and the delays that have been experienced at one of these sites, Maywood, New Jersey. The Act (Public Law 98-50) included four properties in FUSRAP that had not been previously eligible for designation under the basic legislative authority of the Atomic Energy Act of 1954, as amended. The Act included these sites as "research and development" activities and directed that priority be given to their decontamination. This has had a substantial impact on overall FUSRAP costs. Since 1984, a substantial portion of FUSRAP resources have been directed to activities at these sites.

In Maywood, New Jersey, the source of contamination is the former Maywood Chemical Works, which processed monazite sands from 1916 to 1956 to extract thorium for use in gas lamp mantles and other commercial uses, including supply of thorium to the AEC. Substantial vicinity property remedial action has been accomplished and an interim storage site established on land acquired from the Stepan Chemical Co. (present owners of the former Maywood Chemical Works). Incident to site and area investigations and characterizations, it was discovered that residential, commercial, and public properties in an adjacent community were contaminated. As described previously, searches of historical records established that the Lodi contamination originated from the Maywood Chemical Works. Basic DOE FUSRAP policy is that residential properties have the highest priority for remedial action. Proposals to remove contaminated material from Lodi residential properties to the Maywood Interim Storage Site have met with resistance from Maywood local officials to the point that no remedial action has been conducted in the Maywood/Lodi area since 1986. Two local council elections have had the "thorium issue" as its main theme.

#### CURRENT STATUS AND ACTIVITIES

The current status of the 29 FUSRAP sites is as follows:

- Final remedial action completed (nine sites)
- Interim remedial action completed (two sites)
- Interim or final remedial action planned and underway or planned in the near term (three sites)

- Site material to be disposed of at existing disposal facilities (five sites)
- Remedial action deferred until in-state disposal sites developed (eight sites)
- Special cases (two sites)
- Dupont and Co., Deepwater, New Jersey:  
On-site disposal cell planned
- Maywood, New Jersey: Additional interim remedial action planned if political problems are overcome. Otherwise, remedial action will await a New Jersey disposal site.

One site under the program receives monitoring only, Palos Park Forest Preserves, Palos Park, Illinois. In addition, BNI has surveillance and maintenance responsibility for NFSS, which is under the SFMP.

Significant interim remedial action opportunities are rapidly diminishing and the need for permanent disposal sites becomes even more urgent. While initial activities leading to permanent disposal site selection and development have been underway since the beginning of the program, they intensified in 1987 with substantial progress in the areas of site identification, engineering, characterization, and interaction with the EPA and state/local agencies. This activity continues at an increased pace in 1988.

As mentioned previously, the passage of SARA in 1986 had a significant impact on FUSRAP. The key words in CERCLA, as revised by SARA, are in Section (120)(a)(1):

"Each department. . . of the United States shall be subject to, and comply with, this act in the same manner and to the same extent, both procedurally and substantively as any non-governmental entity..."

This means that FUSRAP activities are now subject to the requirements of both CERCLA and NEPA.

Sorting out the details of compliance with new requirements and dealing with a new agency, EPA, as well as the increased involvement mandated by SARA with public, state, and local agencies has been a major effort over the past 15 months. As those who work with the regulations know, there is much room for interpretation and negotiation. There are also substantial differences in approaches between different EPA regional offices.

From a practical standpoint, all on FUSRAP have had to learn and adapt to a new vocabulary, a host of new acronyms, and a changed sequence of getting the job done. Over the years a sequence of sequential and concurrent activities has been developed and used on FUSRAP to ac-

complish and document remedial action. This is now changed with impacts throughout the project.

The full impact of SARA on FUSRAP has yet to be assessed. Initial indications are that it will certainly increase costs and likely stretch out the schedule for the project. Initially, the impact is being felt on the preparation of documentation.

The basic approach that has developed to date has been to integrate NEPA and CERCLA requirements into the documents required to support a Record of Decision (the document that establishes the remedial action to be accomplished). The "process" has been termed the Environmental Review and Analysis Process (ERAP). For the more complex sites and for those on the National Priority List (NPL)\*, three volumes of documentation are anticipated:

- Volume I-Plans for conducting the ERAP
- Volume II - Site characterization/remedial investigation report
- Volume III Environmental impact/feasibility study reports

These three volumes of documentation will be prepared for the following FUSRAP sites:

- New York sites (Ashland 1 and 2, Linde, and Colonie)
- St. Louis Area Sites [St. Louis Airport Site, St. Louis Airport Site Vicinity Properties, Latty Avenue Properties (Hazelwood), and the St. Louis Downtown Site (Mallinckrodt Chemical Works)]
- Maywood, New Jersey
- Wayne, New Jersey

The nature and extent of EPA involvement, review, and concurrence will most likely vary based on several factors such as whether a site is on the NPL, the provisions of the applicable Federal Facilities agreement between EPA and DOE, and the philosophy/approach of the EPA region involved.

A less draconian approach is envisioned for a number of sites where a straightforward removal action (removing the material to an existing or a newly developed disposal facility) is the obvious alternative of choice.

Major FY 1988 activities for FUSRAP are summarized as follows:

#### Remedial Action

- Complete interim remedial action of Albany, Oregon (Bureau of Mines Research Center)

\* FUSRAP has three sites on the NPL: 1) Wayne, New Jersey; 2) Maywood, New Jersey; and 3) Shpack Landfill, Norton, Massachusetts

- Complete vicinity property remedial action at Colonie, New York Transfer material to the Colonie Interim Storage Site
- Complete "hot spot" cleanup of NFSS. (An SFMP site maintained by FUSRAP.)

#### Characterization/ERAP Volume I Review/Public and Agency Involvement- Colonie, New York

- Ashland 1 and 2, Tonawanda, New York
- Linde Air Products, Tonawanda, New York
- St. Louis Airport Site and Vicinity Properties
- St. Louis Downtown Site
- Latty Avenue Properties (Hazelwood), Missouri
- Maywood, New Jersey
- Wayne, New Jersey

#### Completion of Post Remedial Action and Certification Documentation

- National Guard Armory, Chicago, Illinois
- Middlesex Municipal Landfill, New Jersey
- Interim remedial actions from various sites

Volume I documentation has been produced for sites as follows:

#### Surveillance, Maintenance, and Environmental Monitoring

- At five DOE-owned sites (NFSS, Wayne, Maywood, Middlesex, Colonie), at one DOE-leased site (Latty Avenue, Hazelwood) and at SLAPS

#### Other Activities

- Roof repair at Ventron
- Ventron characterization
- Hazard assessment, Seaway Industrial Park, Tonawanda, New York (to establish technical basis for leaving material in place)- Resolve Maywood, New Jersey impasse
- Execute cooperation agreement with State of New Jersey on waste disposal site selection and development

### FUSRAP: THE FUTURE

FUSRAP is entering what is perhaps its most difficult phase. The emphasis now is focused on the processes necessary to move on with site selection and development of permanent waste disposal facilities. Total FUSRAP costs for the life of the project (now projected to be complete in 2002) have increased from the Project Plan, Rev. 1 (August 1985) estimate of \$675 million to the current Rev. 2 (June 1987) level of \$960 million. The reasons are understandable and justifiable (increased quantities of material, additional sites,

new requirements) but, of course, troublesome to explain. In order to meet the project cost and schedule estimates, permanent waste disposal sites must start receiving wastes in the fiscal year indicated. Total quantities to be received over the lifetime of the disposal facility are also indicated.

The question obviously arises regarding whether alternatives to in-state disposal of 1,101,600 m<sup>3</sup> have been considered. Options such as ocean disposal, leave-in-place (at interim storage sites), use of regional facilities, use of existing facilities, establishment of a permanent disposal site(s) in less populated states, and volume reduction have all been examined in detail and do not appear to be viable or feasible for a variety of reasons.

In addition to the waste disposal site matter, other issues loom in the future. These include mixed waste and the full impact of complying with CERCLA/SARA.

Considerations involving identification and disposal of hazardous and, concomitantly, mixed waste have become a major focus on FUSRAP in recent years. Particularly troublesome is that there are no regulations covering permanent disposal of mixed waste. Thus, the impact on design, construction, and long-term surveillance of such sites is quantifiable only via educated assumptions.

Compliance with CERCLA/SARA is very much an evolving issue. Everything to date spells increased costs and lengthening schedules. In particular, the ultimate impact of involvement with the EPA is an open question.

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