

# IMPLEMENTATION OF A MIXED WASTE DISPOSAL FACILITY\*

Colleen B. Owens  
Idaho National Engineering Laboratory  
EG&G Idaho, Inc.  
P. O. Box 1625  
Idaho Falls, Idaho 83415

## ABSTRACT

Mixed waste generated by commercial nuclear power plants, fuel fabrication facilities, research reactors, factories using radioactive material, manufacturers of radioactive instruments and radiopharmaceuticals, hospitals and other medical facilities, and private sector and university laboratories comprise approximately five percent of the total of low-level radioactive waste volume generated in the United States. Mixed waste is regulated jointly by the U. S. Environmental Protection Agency and the U. S. Nuclear Regulatory Commission, by individual agency and by joint agency regulations.

Host States are concerned about the time, expense, regulations and the complex steps involved in developing mixed waste disposal facilities. This poster session will provide an understanding of the requirements controlling the management of low-level mixed waste. Such an understanding of the regulatory framework will assist States and compact regions in carrying out their responsibilities under the Low-Level Radioactive Waste Policy Amendments Act. Issues associated with implementing all of the requirements will also be addressed.

## INTRODUCTION

Mixed waste is low-level radioactive waste that contains materials that either (a) are listed as hazardous waste in Subpart D of 40 CFR 261, or (b) cause the waste to exhibit any of the hazardous waste characteristics identified in Subpart C of 40 CFR 261. The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigns to States the responsibility for disposal of this type of mixed waste.

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## REGULATION

Mixed waste is regulated separately and concurrently under the Atomic Energy Act (AEA) and the Resource Conservation and Recovery Act (RCRA). For commercially generated mixed waste, the provisions of the AEA are implemented by the NRC or an Agreement State. The provisions of RCRA are implemented by EPA or an Authorized State program.

The NRC and EPA have issued three joint guidance documents on mixed waste:

- Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste

- Guidelines for Siting Facilities for the Disposal of Commercial Mixed Low-Level Radioactive and Hazardous Waste
- Conceptual Design Approach for Commercial Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities

## MANAGEMENT OF MIXED WASTE

Currently, facilities for treatment, storage, and disposal are not yet available for all types of commercially generated mixed waste. Prior to land disposal, mixed waste must meet certain treatment standards in conformance with the requirements of both 40 CFR 268 and 10 CFR 61. In most cases this treatment must be permitted by the hazardous waste regulator and licensed by the radioactive material regulator. Since treatment facilities are not yet available for most waste types, the generator is forced to store the waste. Generally, storage of hazardous waste beyond 90 days requires a hazardous waste permit as well as radioactive materials license.

Storage of hazardous waste is prohibited by Section 3004(u) of the Resource Conservation and Recovery Act, as amended, "unless such storage is solely for the purpose of the accumulation of such quantities of hazardous waste as are necessary to facilitate proper recovery, treatment, or disposal" (40 CFR 268.50). In addition, long term storage of some wastes, such as liquids, can pose risks. Pre-treatment of the waste for storage pending development of a mixed waste treatment facility can reduce its hazard, but it can also convert the waste into a form that is less suitable

\* Work supported by the U.S. Department of Energy Assistant Secretary for the Office of Waste Management, under DOE Contract No. DE-AC07-76IDO1570.

for subsequent treatment. With each waste handling operation (pre-treatment, storage, final treatment), people are potentially exposed to the radioactive component of the mixed waste.

Once a characteristic hazardous waste is treated to remove the characteristic properties and to meet the requirements of 40 CFR 268, it may then be disposed of as nonhazardous low-level radioactive waste in a land disposal facility. If, however, the waste contains a component listed in 40 CFR 261, Subpart D, or retains a hazardous characteristic after treatment, the treated waste must be disposed of at a facility that is licensed under the Atomic Energy Act and permitted under the Resource Conservation and Recovery Act. No such disposal facility is currently available. Lacking the necessary waste management facilities, the generator is again forced into storage of the mixed waste. The Environmental Protection Agency does not restrict the duration of such storage of treated waste at permitted facilities; however, because of safety concerns, NRC discourages long term storage of any radioactive waste. The mixed waste management process is diagrammed in Fig. 1.

In spite of the general lack of mixed waste treatment and storage, liquid scintillation counting fluids are a particular category of mixed waste that are being managed, treated, and disposed of. This type of waste is generated as a byproduct of a radiation counting technique employing a chemical fluor that emits light in the presence of radiation. The fluors usually require an organic liquid solvent, and the solvents typically used are toluene and xylene. This type of waste can usually be managed under the supplemental fuels provisions of RCRA (40 CFR 266, Subpart D) and exempt quantity provisions under the AEA (10 CFR 20.306) even though toluene and xylene are classified as a listed (FOO3 and FOO5) ignitable and toxic waste.

One storage and treatment facility in Houston, Texas, has received its Part B permit for storage and limited treatment of mixed waste. Other low-level radioactive waste treatment facilities are attempting to permit their facilities for the treatment of mixed waste.

#### Issues Associated with the Management of Mixed Waste

Because of the difficulty in treating mixed waste, EPA granted a two-year national capacity variance, providing needed temporary regulatory relief from EPA's storage restrictions and treatment requirements for most types of mixed wastes. The variance did not extend, however, to wastes containing solvents and dioxins, and those classified as California-list waste (heavy metals, including lead). EPA also established new treatability groups for certain types of mixed waste, thereby recognizing that treatment of some mixed waste differs from that for nonradioactive hazardous waste.

Design of a disposal facility is strongly determined by the volumes of waste requiring disposal. While States and compact regions have performed many surveys of mixed waste generated, it is difficult to project estimated volumes of waste that will require disposal when the necessary treatment facilities are not yet fully permitted or licensed. In each State and compact, this volume is expected to be less than 1,000 cubic feet per year, and some States, such as Texas, are predicting less than 100 cubic feet per year will require disposal as mixed waste.

It is also difficult to predict whether or not nuclear power plant decommissioning and Superfund cleanup sites will add significantly to the volume of mixed waste that will require commercial disposal.

Because of the low volumes, it is estimated that disposal costs will be much greater for mixed waste than low-level radioactive waste. Other issues that arise because of the high cost of disposal are:

- Generation of mixed waste may be minimized or eliminated.
- Do fourteen mixed waste disposal facilities need to be developed?

#### **MAJOR PHASES OF FACILITY DEVELOPMENT**

Implementation of a mixed waste disposal facility includes seven major phases of facility development:

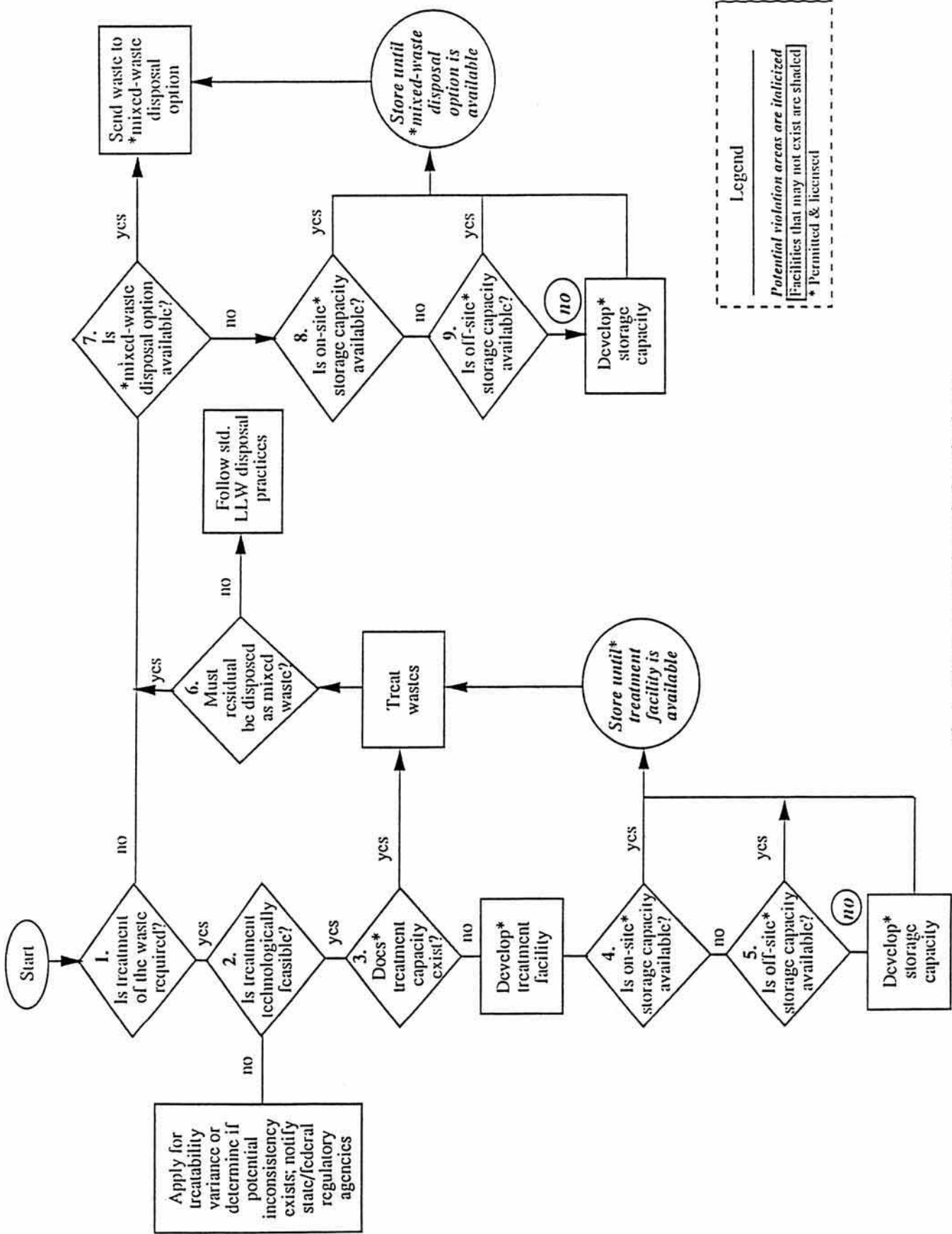
- Organizational and planning activities
- Waste characterization
- Siting and characterization
- Engineering and Design
- Licensing and permitting
- Agency review
- Construction.

#### Organizational Phase

Once a State commits itself to developing a mixed waste disposal facility, it should address three key types of institutional and organizational requirements in the organizational phase of mixed waste disposal facility development:

- Program planning
- Quality assurance
- Public involvement.

All three of the above elements need to be established early to provide consistency and guidance to the overall effort. A program management plan guides the entire process of facility development so that radioactive and hazardous waste management policies and goals are integrated with State- and compact-specific resources,



Legend

Potential violation areas are italicized

Facilities that may not exist are shaded

\* Permitted & licensed

Fig. 1. Management schematic for mixed waste.

responsibilities, objectives, and schedules in a manner that provides for accountability and assessment of progress.

Quality assurance plans and public involvement plans that are integrated into every component of the program are essential for at least two reasons. First, they provide minimal assurance that regulatory requirements pertaining to such activities as public meetings, testing and sampling, and documentation are met. Second, and more importantly, they establish public and technical confidence in the processes, data, and eventual decisions that need to be made.

Issues associated with the organizational and planning phase are:

- Will the mixed waste disposal facility be developed independently of, or as part of, the State of compact low-level radioactive waste disposal facility?
- Will both disposal facilities be licensed and permitted on the same time frame or on separate time frames?
- How will the facility be developed and operated? What will be the role of the private vs. public sectors?
- How will facility development and operation be financed?
- Which agencies will be involved with development, regulation, and policy?
- How will waste be managed prior to disposal?
- How large a facility will be needed?
- How will State-specific legislation and special needs be incorporated into a Successful project?

#### Waste Characterization

Key steps to successful mixed waste characterization are:

- Identification of all current and potential generators of mixed waste in the State or compact region
- Communication with the generators of the importance of accurate characterization of their mixed waste streams
- Documentation of annual generation rates of mixed waste by chemical and radiological category
- Documentation of total inventory of stored mixed wastes by chemical and radiological category
- Aggregation of mixed wastes into chemical, radiological, and waste form categories to determine total annual volumes
- Identification of existing and planned treatment facilities and processes

Application of volume reduction factors to waste stream volumes which are expected to be treated to determine final volume for disposal.

There is no Federal statute that mandates States to characterize their hazardous wastes, although characterization is a practical outcome of the need to provide disposal capacity. It is, however, a generator's responsibility to know the types and quantities of waste generated under 40 CFR 261 and 10 CFR 61.

#### Siting and Characterization

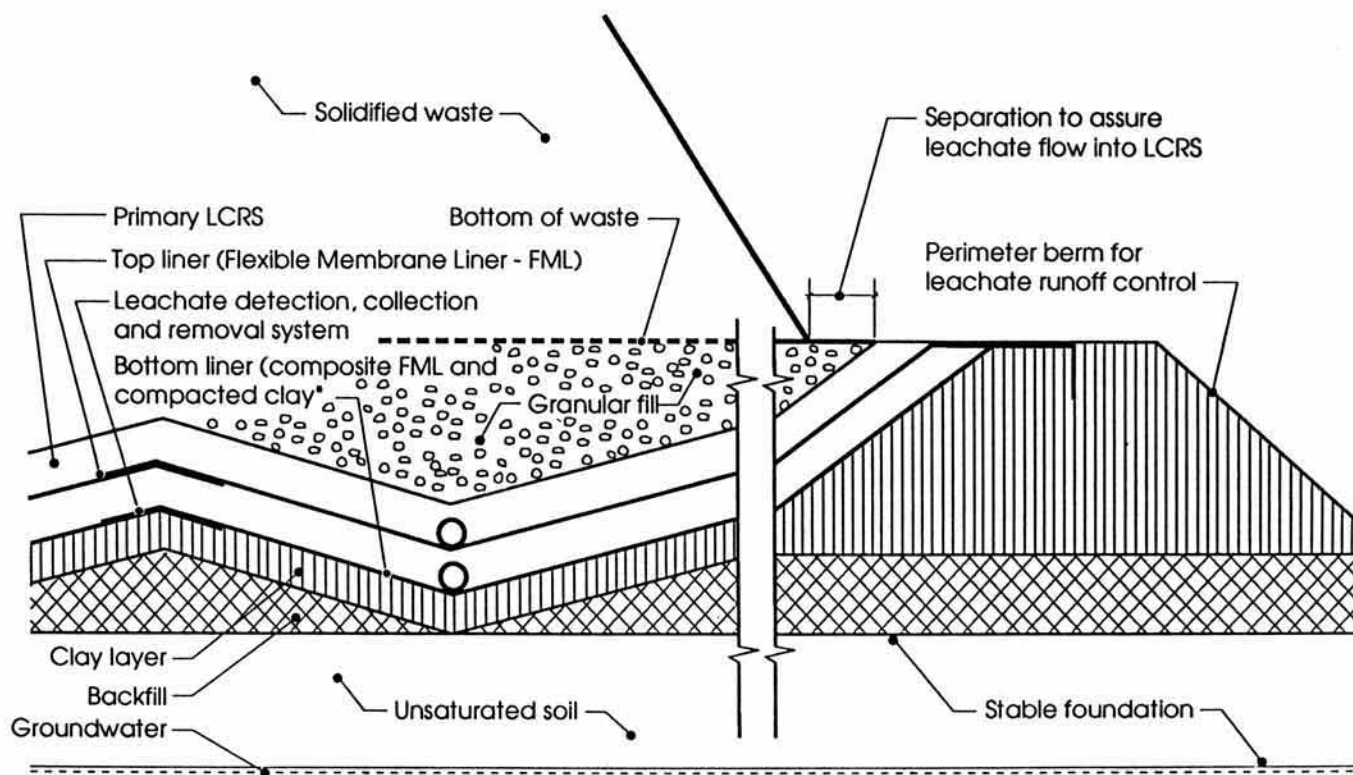
A key technical and political element of the process to develop a mixed waste disposal facility is siting and detailed characterization of the preferred site or sites. NRC and EPA recognized the pivotal importance of siting to the timely development of mixed waste disposal facilities and thus issued Combined NRC-EPA Siting Guidelines for Disposal of Commercial Mixed Low-Level Radioactive and Hazardous Wastes. This document was intended to allow progress on the development of mixed waste disposal facilities while EPA was developing specific location standards for hazardous waste disposal facilities, Subpart Z to 40 CFR 264.

Site characterization is the process of investigation and testing, in the field, laboratory, and library to perform the following functions: identify the site attributes affecting the ability of the site to isolate the waste from the environment; provide long-term, stability of the disposed waste; and quantify the interactions among the waste, the site, the disposal facility, and its surroundings. The information required to support licensing and permitting decisions emphasizes geology, hydrology, geochemistry, and engineering properties of soils. No apparent conflicts exist between the data needed to permit a mixed waste disposal facility and that required to license the facility.

#### Engineering and Design

Facility development requires careful attention and consultation with regulators of radioactive and hazardous waste components because the performance-based design requirements developed by NRC tend to contrast with the minimum technical requirements mandated by RCRA.

NRC and EPA recognized this potential area of conflict and issued Conceptual Design Approach for Commercial Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities. This document was intended to show the feasibility of reconciling NRC's goal of avoiding contact of waste with water while complying with the legal requirements under the Resource Conservation and Recovery Act to include double liners and leachate collection systems in the land disposal facility design. Figure 2 depicts the double liner and leachate collection system.



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Fig. 2. Double liner and leachate collection system.

If the facility will not resemble a landfill, the permitting authority could impose appropriate design and operating conditions to meet the performance-based objectives of 40 CFR 264, Subpart X, for so-called "Miscellaneous Units." However, Subpart X may not be available in all Authorized States, and there is little available guidance on applying Subpart X to mixed waste facilities.

The design element develops in parallel with the information gathered as part of the siting, characterization, and permit/license application, and review process.

#### **License and Permit Applications**

For Federally permitted and licensed activities, three major documents are required to be submitted by an applicant:

- Safety Analysis Report in support of the license application
- Environmental Report in support of the license application
- Part A and Part B permit application.

If an Agreement State is taking the licensing action, an Environmental Report may not be needed; the require-

ments of the National Environmental Policy Act apply only to Federal agencies. However, the Agreement State must address substantive environmental issues in the licensing process. The permitting process under the Resource Conservation and Recovery Act has been determined to be the functional equivalent of the process required by the National Environmental Policy Act, so environmental documentation apart from the permit application is not required.

How this required information is to be submitted is largely a matter of preference and scheduling compatibility with the facility's strategic plan. The NRC has issued guidance on how a low-level radioactive waste disposal facility license application is to be submitted (NUREG-1199, Standard Format and Content of a License Application for a Low-Level Radioactive Waste Disposal Facility). The EPA has also issued guidance on the desired content of the permit application but has not specified a format for permit applications. States are not required to use the written guidance however, the license or permitting process may take longer to review if the standard format and content are not utilized.

Most of the information required in support of permitting by EPA and licensing by NRC is either duplicative or

complementary. A potentially contradictory requirement is the need to perform confirmatory sampling of waste at the disposal facility, contrasted with the need to maintain radiation exposures as low as reasonably achievable.

While not contradictory, other requirements tend to be duplicative and cumbersome. One such example is the transportation reporting requirements whereby different individuals must be notified of the progress of a shipment at different time intervals. Most of the differences in this area are because of a different assignment of responsibility between the generator, intermediate processor of the waste, and the disposal facility operator.

Another area where the hazardous waste and radioactive waste regulators have developed separate but functionally similar requirements is in risk assessment. The methodology used by the two Federal agencies differs, with no requirement to consider the combined radiological and chemical risk from a facility.

Both agencies also developed separate but similar regulatory practices for financial assurance. In this area, NRC requirements appear to have greater flexibility, and financial assurance documents acceptable to EPA may be found adequate by the NRC. However, clarification or confirmation by the respective regulators is needed to determine:

- The adequacy of using the same financial assurance instrument(s) to meet the requirements of NRC and EPA
- The extent, if any, of insurance coverage by the nuclear insurance pool over the hazardous component of mixed waste
- The relationship between post-closure care responsibilities of the owner or operator and the custodial care period
- The different time frames (30 years under RCRA; 100 years under AEA) required for custodial care
- Commercial availability of liability coverage for mixed waste.

It does not appear that any of these issues are inherently contradictory, but they are not issues that are easily resolved. They involve not only regulators but also the private insurance industry.

#### Agency Review

Early involvement of the regulators in the project will provide greater assurance that the required tests, studies,

and evaluations are performed to the regulators' expectations.

The NRC procedures call for evaluation of an applicant's Safety Analysis Report and the issuance of a draft and final Safety Evaluation Report. The NRC must also evaluate an applicant's Environmental Report and issue a draft and final Environmental Report.

EPA typically concentrates its technical review on the adequacy of the Part B permit application. EPA is not required to review a separate Environmental Report since EPA's review of Parts A and B of the permit application have been determined to be functionally equivalent to NEPA requirements. Scheduling of public involvement activities differs between the two agencies, making joint hearings and review processes difficult to coordinate. Coordination should be easier if licensing is by an Agreement State, since States are not required to follow NRC's procedural requirements.

### CONSTRUCTION

Construction of a mixed waste disposal facility cannot begin until authorizations to construct are received from EPA and NRC, and any other involved agency. Estimated construction time for an engineered low-level radioactive waste disposal facility ranges from 6 to 27 months depending on size and complexity of the facility. Mixed waste disposal facilities should also fall within this range. Figure 3 illustrates the components of a completed storage vault.

Operation of the mixed waste disposal facility cannot begin until the facility passes inspection and is certified to operate by NRC and EPA, and potentially other permitting agencies.

### SUMMARY

While it is possible to site, design, construct, and operate a mixed waste disposal facility under a system of dual regulation, the path may be challenging and time consuming. Several significant issues will require resolution among the involved regulators. A successful project will involve seeking those areas of common interest among the applicable regulations, developing innovative solutions that meet the intent of all applicable requirements, accommodating unanticipated delays, and being receptive to alternative methods of achieving the same goal.

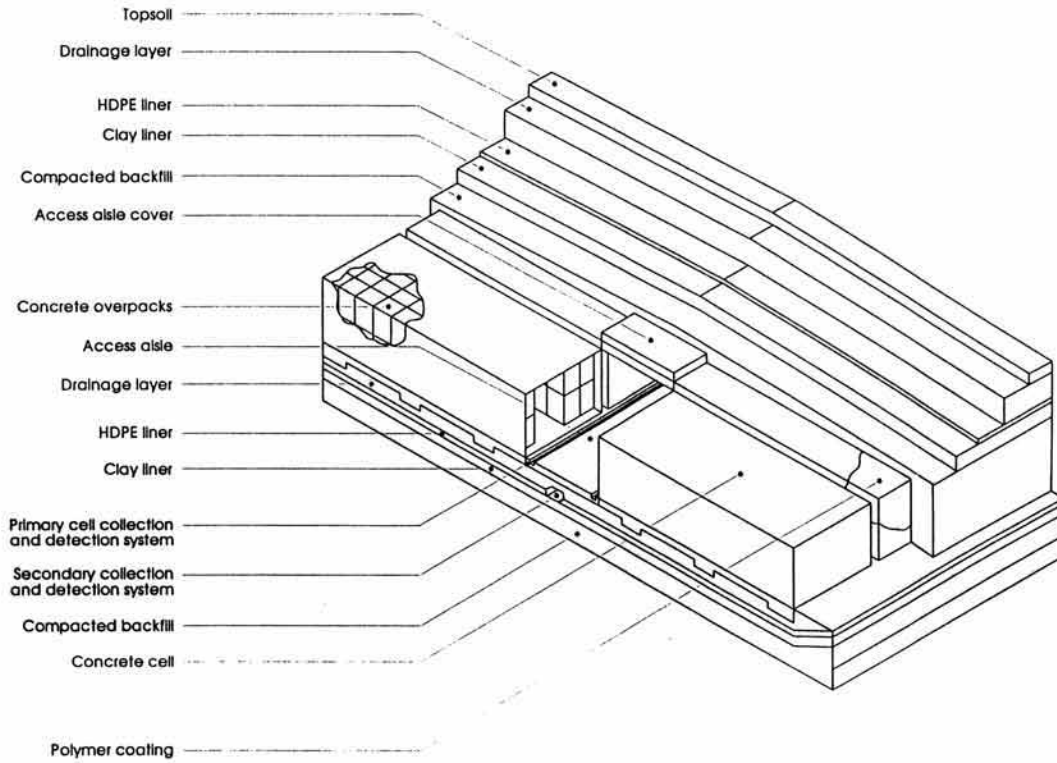


Fig. 3. Cut-away of a completed disposal vault.