18. What Disposal Methods Are Being Considered for New Jersey's Low-Level Radioactive Waste?

Nuclear power plants, industries, medical facilities, research institutions, and universities generate low-level radioactive waste. This waste must be shipped to a specially designed facility for permanent disposal. To ensure that disposal is performed properly, the federal government has written regulations for disposing low-level waste in the United States (see Code of Federal Regulations, Title 10, Part 61). Several types of disposal facility designs have been proposed to meet these regulations.

This Fact Sheet outlines the federal regulations governing low-level radioactive waste disposal and describes some types of disposal methods being considered for New Jersey.

➤ Federal Regulations Governing Disposal

Federal regulations restrict the concentration of radioactive material in wastes that may be placed in a low-level radioactive waste disposal facility. These regulations specify three different classes of waste that may be placed in such a facility. Packaging requirements are given for each of the three classes. Disposal facilities are designed to accommodate all three classes of low-level waste.

Title 10 of the Code of Federal Regulations, Part 61, (10 CFR 61) defines the three classes of low-level radioactive waste (Class A, Class B, and Class C) that may be placed in a low-level waste disposal facility. The definitions of these classes are based on the specific radioactive isotopes present, their concentrations, and their half-lives. Any low-level waste with a concentration of radioactive material greater than that specified for these three classes is a federal responsibility and must be disposed of in a deep geologic repository like the facility being designed for high-level waste at Yucca Mountain, Nevada.

Class A waste, the bulk of all low-level radioactive waste by volume, has the lowest concentration of radioactive material and poses the least potential hazard. It must meet minimum regulatory requirements specified in 10 CFR 61.

Class B waste, which contains a higher concentration of radioactive material than Class A, must meet additional standards and be structurally stable or packaged in a stable container. The vast majority of Class A and Class B waste will decay within 100 years to levels that pose no hazard to inadvertent intruders.

Class C has the highest concentration of radioactive material allowed in a low-level radioactive waste disposal facility. Class C waste must meet the same standards as Class B; in addition, it must be packaged so that inadvertent intruders are protected from exposure to the waste 500 years after the disposal facility has closed.

➤ Methods of Disposal

The general approach to low-level radioactive waste disposal is to isolate the waste by minimizing its contact with water and reducing the release of radioactive atoms into the environment. Multiple engineered barriers work in cooperation with natural barriers at the site, such as space-filling materials, concrete vaults and clay capping, which are incorporated into all disposal facility designs to help isolate the waste and to discourage inadvertent intrusion after the facility has been closed.

In the past, three methods of low-level radioactive waste disposal have been used: near surface land disposal, intermediate

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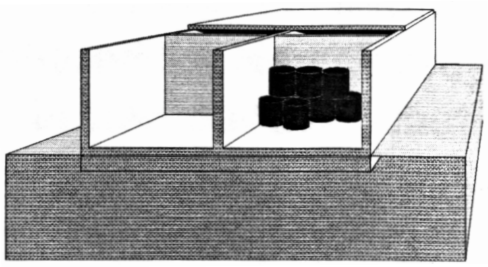

Figure 1. **Above-Grade Vault (simplified; earthen cap not shown)**

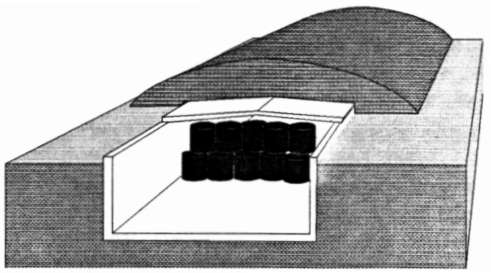

Figure 2. **Below Grade Vault (simplified)**

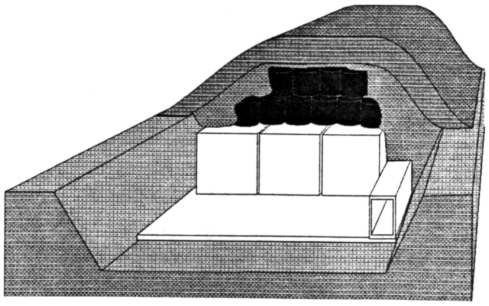

Figure 3. **Earth Mounded Concrete Bunker (simplified)**

depth disposal, and ocean disposal. Near surface land disposal entails confining low-level waste either at or below the earth's surface, within 30 meters depth. Intermediate depth disposal is used in Sweden, where waste is sequestered in crystalline rock 60 meters below the Baltic Sea floor. Ocean disposal, employed by the United States and other countries prior to 1970, involved depositing waste containers on the ocean floor. This method is no longer used by the United States. Other disposal options such as mine disposal, deep well injection, and beneath-seabed disposal are used or being considered around the world but are not currently used or under consideration in the United States.

➤ Near Surface Land Disposal Facilities

Near-surface land disposal is the most commonly considered design in the United States for future low-level radioactive waste disposal. This includes both above grade and below grade facilities. Several options are described here.

Above-Grade Vaults are rectangular structures, similar in size to warehouses. They are built above grade using reinforced concrete, metal, or masonry blocks (Figure 1). After the waste container is placed in the vault, the space between the waste containers will be filled with sand or grout. The vault will then be covered with concrete and with a multi-layered earthen cap to prevent water from coming in contact with the waste. Because it is erected above the ground, the top of the closed vault will be 30-50 feet above ground level.

Below Grade Vaults (Figure 2) are underground facilities similar in size and design to Above-Grade Vaults. They are constructed of metal or reinforced concrete, with the floors sloped to facilitate water drainage. Each vault has a monitoring systems and a water collection point.

Modules are constructed of reinforced concrete and will hold a number of waste containers. Filled modules are sealed, stacked on a concrete floor and grouted in place. An earthen cover is used to prevent water from coming in contact with the modules.

Earth-Mounded Concrete Bunkers combine features of above and below grade disposal (Figure 3.) In this design, a trench is completely lined with concrete. Concrete wall panels are used to divide each trench into large compartments where containers of Class B and C waste are stacked. Spaces between containers are filled with concrete. Modules filled with Class A waste containers are

stacked on top of the compartments. The Class A modules are situated above ground level and are covered with a cap of earth and clay. Grass may be planted on the cap to minimize wind damage and erosion.

Combination Concrete Canister/Concrete Vault disposal facility is also possible. In this facility, concrete modules containing the waste containers could be placed in an above or below grade vault.

➤ Site Selection

The final selection of a design for New Jersey's disposal facility will be made only after careful consideration of the site's physical characteristics and input from the host community.

➤ Methods not being considered for New Jersey

Several other disposal methods are not under consideration for the New Jersey facility for a variety of reasons. They include:

Above grade vaults without an earthen cover. Such a cover is deemed necessary to protect the vault from weather-related deterioration.

Below ground concrete silos. These would require approximately 60 feet of depth, which would likely place them within the seasonal high water table anywhere in the state.

Mined cavities. These, too, would involve placing waste containers within the ground water in much of the state.

Shallow land burial. This is prohibited by the New Jersey Siting Act N.J.S.A. 13:1E-185.

➤ For More Information

If you would like to read more about disposal of low-level radioactive waste, some of the references listed below may be helpful.

- Code of Federal Regulations, Title 10, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste", 1992.
- *Conceptual Design Report: Alternative Concepts for Low-Level Radioactive Waste Disposal*, National Low-Level Radioactive Waste Management Program, EG&G Idaho, Inc., Idaho Falls, 1987.
- Edward L. Gershey et. al., *Low-Level Radioactive Waste From Cradle to Grave*, Van Nostrand Reinhold, New York, 1990.
- Robert E. Berlin and Catherine C. Stanton, *Radioactive Waste Management*, John Wiley & Sons, New York, 1989.

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