NEW MEXICO ENERGY, MINERALS
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MEMORANDUM

To: Benito Garcia
Robert "Stu" Dinwiddie
John Tymkowych
Steve Zappe

From: Chris Wentz, Coordinator
N.M. Radioactive Waste Task Force

Re: REVIEW of DRAFT WIPP FACT SHEET

Attached is a draft WIPP fact sheet, entitled "Which Wastes Will the WIPP Accept." It has been developed by the Environmental Health Center (EHC) of the National Safety Council out of Washington, D.C. They have contracts with both DOE-CAO and EPA to develop WIPP-related fact sheets, but this one appears to be for DOE. Anyway, I strongly encourage you to coordinate a review of this draft and get any comments to Chrysa Cullather at the EHC. At a minimum, please look at the last paragraph on page 3, as it (incorrectly) references your agency. Chrysa can be reached at:

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In her e-mail to me today requesting my review, she failed to specify a comment deadline. I plan on getting her comments tomorrow, but you may wish to contact her to see how quick feedback is needed. Thanks.

Which Wastes Will the WIPP Accept?

Environmental Health Center Draft 2
Tuesday, August 04, 1998

The first shipments of transuranic waste are scheduled for delivery to the Waste Isolation Pilot Plant (WIPP) in 1998. The WIPP, a U.S. Department of Energy (DOE) facility near Carlsbad, New Mexico, is the first deep geologic repository for permanent disposal of defense-related transuranic waste in the United States. Only transuranic waste generated in support of U.S. nuclear weapons production is to be disposed of at the WIPP. DOE estimates that nearly 38,000 shipments of transuranic waste will travel from 23 (10 major) transuranic waste sites to the WIPP.

Transuranic Waste Characterization

Only certain types of transuranic waste will be accepted for disposal at the WIPP (see "Waste Prohibited at the WIPP," below). To ensure that only the appropriate wastes are sent to the WIPP, the 23 transuranic waste sites must characterize their waste and certify that it meets WIPP Waste Acceptance Criteria (WAC) before it can be shipped to the WIPP. These criteria define the physical, chemical, and radiological properties of transuranic waste that the WIPP will accept. Characterization refers to the process of identifying these properties. Wastes that do not meet the criteria are prohibited from being disposed of at the WIPP.

The WIPP Waste Acceptance Criteria

The WIPP Waste Acceptance Criteria (WAC) are performance requirements designed to protect public health and safety and ensure the safe handling of transuranic waste at the WIPP. Transuranic waste sites must certify that their waste complies with the criteria prior to transporting it to and disposing of it at the WIPP. Because the waste generated and the methods required to characterize it vary from site to site, each of the 23 transuranic waste sites develops and implements its own site-specific plan for characterizing, certifying, and packaging transuranic waste sent to the WIPP. Each of the sites documents or references the methods of complying with the WAC in a site-specific plan, which the WIPP must approve. The approval process may include an audit and inspection by WIPP personnel.

Sidebar

Transuranic Waste Defined

Transuranic waste generally consists of protective clothing, tools, glassware, equipment, soils, and sludge contaminated with manmade radioactive elements heavier than uranium, such as plutonium, neptunium, americium, curium, and californium. It is produced during nuclear fuel assembly; during nuclear weapons research, production, and cleanup; and as a result of reprocessing spent nuclear fuel.

Transuranic waste began accumulating in the United States in the 1940s with the beginning of the nation's nuclear weapons program. A synthetic byproduct of the nuclear weapons program, transuranic waste remains radioactive for thousands of years. Sound environmental practice requires that the material be permanently isolated to protect human health and the environment for future generations.

The Waste Isolation Pilot Plant Land Withdrawal Act of 1992 (Public Law 102-579, as amended), which stipulated the requirements for WIPP operations and activities, defines transuranic waste as "waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years." The law specifically excludes high-level waste and spent nuclear fuel from the definition, and neither of these types of wastes is allowed to be disposed of at the WIPP.

Types of Transuranic Waste

Based on its level of radioactivity, transuranic waste is divided into two categories: contact-handled transuranic waste and remote-handled transuranic waste. Transuranic waste may also be found mixed in with other types of waste. These "mixed transuranic wastes" have special restrictions, as described below.

Contact-Handled Transuranic Waste

Contact-handled transuranic waste accounts for about 97 percent of the volume of transuranic waste currently destined for the WIPP. While it can be handled under controlled conditions without any shielding beyond the disposal container itself, contact-handled transuranic waste can pose a health hazard if inhaled, ingested, or absorbed into the body through an open wound. Radiation emitted by contact-handled waste primarily consists of alpha particles, which are easily blocked by a sheet of paper or the outer layer of a person's skin (see figure 1). Contact-handled waste is packaged in 55-gallon metal drums or in metal boxes and transported in special shipping containers certified by the Nuclear Regulatory Commission (NRC). The maximum allowable radiation dose, from all types of radiation, at the surface of a contact-handled waste disposal container is 200 millirem per hour.

Figure 1: Three types of radiation and examples of how they can be contained

Remote-Handled Transuranic Waste

Remote-handled transuranic waste has a higher level of radioactivity than contact-handled transuranic waste and must therefore be handled by remote control and transported in shielded shipping containers. Remote-handled waste primarily emits gamma radiation, which requires a dense material such as concrete, lead, or steel for shielding (see figure 1). Surface radiation levels of remote-handled disposal containers are greater than 200 millirem per hour.

Transuranic Mixed Waste

Transuranic mixed waste contains both radioactive and hazardous waste components. The Resource Conservation and Recovery Act (RCRA) defines a hazardous waste as any substance that possesses at least one of four characteristics: ignitability, corrosivity, reactivity, or toxicity. Toxicity is the only hazardous waste characteristic permitted in transuranic mixed waste disposed of at the WIPP; ignitability, corrosivity, and reactivity are not permissible (See "Wastes Prohibited at the WIPP," below). All transuranic mixed waste accepted by the WIPP must be contact-handled transuranic waste.

Transuranic mixed waste can result from mixing solvents or other compounds with transuranic waste when cleaning components or equipment used to produce or disassemble nuclear weapons. Discarded contaminated lead shielding is also an example of transuranic mixed waste. Some mixed transuranic will be treated to remove its hazardous characteristics before it is shipped for disposal at the WIPP.

Types and Quantities of Transuranic Wastes Allowed at the WIPP

The WIPP Land Withdrawal Act restricts both the amount and types of transuranic wastes than can be disposed of at the repository. DOE can dispose of a maximum of 6.2 million cubic feet of transuranic waste at the WIPP. The existing inventory of defense-related transuranic waste is about 2.3 million cubic feet. In addition, approximately 3.7 million cubic feet of transuranic waste will be generated over the next 35 years as DOE defense sites are closed.

The WIPP Land Withdrawal Act places other restrictions on the volume and nature of transuranic waste that the WIPP can accept:

- The WIPP cannot accept remote-handled transuranic waste with a surface dose rate in excess of 1,000 rem per hour.
- The WIPP can accept no more than 5 percent by volume of remote-handled transuranic waste with a surface dose rate in excess of 100 rem per hour.
- The WIPP can accept no more than 5.1 million curies of remote-handled transuranic waste.

In addition, the state of New Mexico and DOE agreed that no more than 250,000 cubic feet of remote-handled transuranic waste will be disposed of at the WIPP.

Waste Prohibited at the WIPP

Under RCRA, EPA grants the state of New Mexico's Environmental Division the responsibility and authority for developing and issuing permits governing the types of transuranic mixed waste that can and cannot be disposed of at the WIPP. In mid-1998, the state issued DOE a draft permit prohibiting many types of wastes, including liquids; remote-handled transuranic mixed waste; ignitable, corrosive, or reactive wastes; and spontaneously ignitable materials. For a full list, see the box below.

Waste Prohibited at the WIPP

- Liquid waste
- Spontaneously ignitable materials
- Hazardous wastes not occurring as co-contaminants with transuranic wastes
- Wastes that are not compatible with the other materials used inside the WIPP or the methods planned to be used in closing the WIPP (e.g., backfilling)
- Wastes containing explosives or compressed gases
- Wastes with polychlorinated biphenyl concentrations equal to or greater than 50 parts per million
- Ignitable, corrosive, or reactive wastes
- Remote-handled transuranic mixed waste
- Any waste container that has not undergone headspace-gas sampling and analysis to determine the concentration of volatile organic compounds
- Certain types of mixed wastes that have not been treated to New Mexico's treatment standards

How Transuranic Waste Is Characterized

Transuranic waste is characterized based on its waste stream. A waste stream is defined as a waste substance that is similar in material, physical form, isotopic makeup, and hazardous constituents and is generated from a single process or activity. Different waste characterization methods are required for different types of waste streams.

First, the transuranic waste sites use "acceptable knowledge" to describe and categorize waste streams. Acceptable knowledge refers to existing information about the materials or processes used to generate waste. Acceptable knowledge may incorporate or be based on records accompanying the waste; administrative, procurement, and quality controls associated with the processes generating the waste; past sampling and analytical data; material put into the waste generating process; or the time period during which the waste was generated. For each transuranic waste stream, transuranic waste sites compile all process information and data that support the characterization of the waste stream. The type and quantity of supporting documentation will vary by waste stream, but will include information such as the area and building where the waste stream was or is being generated, the waste stream volume and time period of generation, the waste-generating process, process flow diagrams, and the chemical and radionuclide content.

Next, the transuranic waste sites use a variety of assessment methods to confirm the acceptable knowledge data and further define the content and radiological limits of the waste. These assessment methods include radiography, visual examination, headspace-gas sampling, and sampling and analysis.

Radiography

Radiography is a method that uses x-rays to confirm the physical characteristics of the contents of a waste container. Radiography can also be used to verify the physical form of debris wastes (fragments or discarded remains). Once the technicians know the physical form, they can attribute the hazardous constituents to the waste.

Visual Examination

Visual examination is typically used as a quality control check on radiography. During visual examination, waste containers are unpacked and their contents are physically examined to confirm the physical characteristics of the contents of a waste container. Other characteristics, such as the nature and weights of component materials,

can also be measured during visual examination. Usually, a relatively small sample of the overall population of waste disposal containers undergoes visual examination.

Headspace Gas Sampling

The headspace is the volume left at the top of the waste containers before sealing. This headspace gas is sampled and analyzed for hydrogen, methane, and volatile organic compounds.

Radioassay

Radioassay is a sampling and analysis method that determines the activities of all the individual isotopes of significance, the total alpha activity, the amount of plutonium-239, and the thermal power of the substance being assayed.

Quality Assurance

The WIPP Quality Assurance Program Plan provides definitions and requirements for the frequency of testing, sampling, and analyzing transuranic waste. Because waste streams, rather than actual waste, are being characterized, many characteristics are not individually determined for each waste container. Only a fraction of the waste undergoes actual assessment for specific characteristics. Therefore, random sampling of waste streams is required for quality assurance and control.

Before a transuranic waste site can ship waste for disposal at the WIPP, the site must establish a quality assurance program and procedures for waste characterization. The program and procedures must be documented in a quality assurance program plan and submitted to EPA for approval. The plan provides (1) information on how acceptable knowledge is used for waste characterization, (2) proof of a system of controls that confirms compliance with the WIPP Land Withdrawal Act waste component limits, and (3) demonstration that the site has procedures in place for adding data to the WIPP Waste Information System (WWIS), the electronic tracking system for transuranic waste components. Before approving a site's quality assurance plan, EPA audits the site or inspects a DOE audit of the site, publishes a notice in the *Federal Register*, and solicits public comment. As of June 1998, the only site with EPA's approval of its quality assurance program was Los Almos National Laboratory.

Packaging the Characterized Waste

After the transuranic waste sites characterize the waste, the waste disposal containers (55-gallon drums, 85-gallon drums, standard waste boxes,10-drum overpacks) are loaded into NRC-certified shipping containers. A dedicated fleet of trucks with custom trailers transports these shipping containers to the WIPP. All waste shipped to WIPP must be accompanied by a form that contains the following information:

- The generator's site name
- A description of the waste stream
- The date the waste was characterized by the transuranic waste site
- The waste characterization procedures used
- The information used to support the characterization
- The EPA hazardous waste codes (if applicable)

- A Waste Stream Profile Form Certification statement signed by the manager of the transuranic waste site

After the transuranic waste site has characterized the individual payload container, the characterization information from the form is entered into the WWIS.

For more information on the packaging and transport of waste to the WIPP, see WIPP Backgrounders 9 (*How Are WIPP Transportation Routes Chosen?*), *10 (Selecting a Shipment Method: Trucks Versus Trains*), and 11 (*Transuranic Waste Shipping Containers*).

Arrival at the WIPP

Before the waste can be accepted at the WIPP, it must go through a series of steps:

1. Once the waste arrives at the repository, WIPP personnel inspect the truck and shipping containers to determine if they have radioactive material on their outer surfaces. In addition, the New Mexico Department of Public Safety's Motor Transportation Division will review the truck's log book and perform a mechanical inspection of the truck and a radiological inspection of the truck and containers.
2. WIPP staff open the sealed shipping containers and inspect the outer surface of the waste disposal containers for surface damage and contamination.
3. The WAC limit the amount of radioactivity on the transuranic waste disposal containers. If surface radioactivity detected is within the allowable limit, the shipment is approved and the drums, waste boxes, or overpacks are removed from the shipping container for disposal in the WIPP.
4. If surface contamination on the disposal containers exceeds the allowable limit, WIPP personnel decontaminate their surfaces. The shipment is accepted if decontamination is successful. The shipping container must be resealed and returned to the transuranic waste site of origin if the shipment cannot be decontaminated.