**ENVIRONMENTAL HEALTH CENTER**
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HAZARDOUS & RADIOACTIVE MATERIALS PROGRAM / WASTE

August 6, 1997

**Memorandum**

To: Steve Zappe & Bobby Lopez

From: Kim McCauley

Re: WIPP Reporters Guide

Attached is the **first draft** of the *Reporters Guide to the WIPP*. Please review the text for accuracy and omissions. If you have suggestions, changes, etc. please make them directly on the review copy. Our deadline in August 20.

There are several things listed below that you should keep in mind when reviewing this document

1. The preface page is blank. Bud Ward (Executive Director of the Environmental Health Center is writing this and it will be dropped in later. It will include information that will tailor it more closely to journalist's needs.

2. Graphics are not complete. There are several areas where there are place holders for suggested graphics. **If NMED staff have additional suggestions or originals for graphics that are currently in the guide book, please forward to me as soon as possible. We would like to use the state map of New Mexico and the Transcom Tracking System graphics (taken from your website). Are the routes still accurate? Also, did we correctly source NMED in Tables on pages 20 and 21?**

3. The additional resources list is a draft list. We've invited all of the listed individuals to serve as contacts in the guide. We are calling and confirming participation over the next few weeks. Again, **suggestions are welcome**. Please let us know ASAP if you agree to be listed as a resource.

4. The suggested reading/website list is not complete. **Please forward suggestions** on additional resource materials. (including, but not limited to any NMED materials that you would like listed).

5. Font sizes, styles, headlines and spacing will be carefully reviewed and possibly changed.

6. All notes in brackets are comments that require review.

7. We're in the process of carefully going over the glossary and reference list.

Please contact **Kristin Marstiller ext. 469 from August 11-18** with questions, concerns, etc. Otherwise, I will return August 19.

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*National Safety Council*

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# A Reporter's Guide to the Waste Isolation Pilot Plant

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A Publication of the
Environmental Health Center
National Safety Council
1025 Connecticut Avenue, NW, Suite 1200
Washington, DC 20036
September 1997

This guidebook was produced with funds from the U.S. Environmental Protection Agency under grant no. 828862-01 The contents of this document do not necessarily reflect that agency's views or policies. This guidebook was produced with support also from the Environmental Health Center's parent organization, the National Safety Council, a not-for-profit, nongovernmental public service organization.

 This guide benefited substantially from prepublication review by a range of experts but their review does not necessarily connote their or their organizations' endorsement of or support for all aspects of this guide.

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# Preface

# The WIPP Facility

"WIPP" is the abbreviation for the Waste Isolation Pilot Plant, a U.S. Department of Energy (DOE) facility in southeastern New Mexico, 26 miles southeast of Carlsbad. The facility was built to serve as the nation's first geological repository for permanent disposal of transuranic radioactive wastes.

Transuranic wastes generally consist of protective clothing, tools, glassware, equipment, and sludge contaminated with radioactive materials at nuclear weapons production facilities in the United States. Only defense-generated radioactive wastes are to go to the WIPP. Under federal law, the WIPP is not authorized to accept high-level or low-level* radioactive wastes.
[*EPA, PLEASE VERIFY]

## Management of the WIPP Facility

In 1993, DOE created the Carlsbad Area Office (CAO) to lead its transuranic waste disposal efforts. CAO coordinates DOE's transuranic program at waste-generating sites and national laboratories. The CAO manager reports to DOE's assistant secretary for environmental management at DOE headquarters in Washington, D.C., and receives administrative support from DOE's Albuquerque Operations Office.[CAOFACTSHEET ] Westinghouse Electric Corporation is the WIPP's managing and operating contractor.

## A Brief Chronology of WIPP-Related Events

More than 40 years ago, in 1955, the U.S. Atomic Energy Commission (AEC) asked the National Academy of Sciences (NAS) to study permanent disposal methods for radioactive wastes from nuclear weapons production in the United States. (AEC was disbanded in 1974. Its functions were assumed by the newly created the Energy Research and Development Administration and the Nuclear Regulatory Commission. The Energy Research and Development Administration later became DOE.) A 1957 NAS report to the AEC recommended that transuranic and high-level wastes be buried in geologic formations and that the feasibility of using salt beds or salt domes as a disposal medium be investigated.[LOWV42]

In 1970, the AEC tentatively selected a nuclear waste repository site in salt deposits near Lyons, Kansas. In 1972, the federal government withdrew that site from consideration for the repository because of concerns that drilling in the vicinity had compromised the salt deposits' geologic integrity. [LOWV49]

In the mid-1970s [CTC46], the U.S. Geological Survey identified a salt formation east of Carlsbad, New Mexico, as a possible site. A first borehole, drilled to 3,000 feet, found salt bed deformations and pressurized brine; these conditions suggested that waste might escape from the site. To avoid these problems, the site was moved seven miles further southwest, to its current location.[BKG7]

After environmental studies of the new site were completed in 1979, Congress authorized construction of the WIPP.[CTC46] In the legislation that authorized the WIPP, Congress expressed its intention that the facility be developed to demonstrate safe methods for disposal of transuranic waste. The bill also specified that only certain amounts and types of defense-generated transuranic waste could be disposed of at the WIPP.

DOE drilled the first exploratory shaft at the current site in 1981 and two years later decided to proceed with full construction of the WIPP. Construction and maintenance activities have contin-

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ued at the site every since.

Before the WIPP would be able to open, the 10,240 acres of land surrounding the site had to be withdrawn from public use. The site is owned by the federal government and had been under the control of the U.S. Department of the Interior's Bureau of Land Management. In January 1991, the Department of the Interior attempted to administratively transfer control of the site to DOE. In October of the same year, the state of New Mexico filed suit against DOE, arguing that Congress, and not the executive branch alone, should make the transfer. In October 1992, Congress passed the WIPP Land Withdrawal Act, which assigned authority for the land to DOE.[LOWV119]

In September 1996, Congress amended and the president signed into law the WIPP Land Withdrawal Act. The amendments exempted the WIPP from Resource Conservation and Recovery Act (RCRA) land disposal restriction requirements. Congress and EPA agreed that this exemption was appropriate because the WIPP was already subject to comprehensive regulation under the Atomic Energy Act, the WIPP Land Withdrawal Act, and other portions of RCRA. The amendments also struck requirements in the original act that DOE conduct underground tests onsite with actual transuranic waste to determine whether it could be disposed of safely. In doing so, Congress ratified a conclusion reached several years earlier by DOE and other agencies – that the site's safety performance could be accurately assessed with a combination of nonwaste tests at the site and laboratory mathematical models.

[INSERT BOX WITH SHORT CHRONOLOGICAL LIST OF KEY EVENTS?]

Before the WIPP can open, DOE must obtain EPA certification that the facility is in compliance with EPA disposal standards for transuranic wastes. EPA is required to make a certification decision within one year of receiving a complete application. DOE applied for certification on October 29, 1996. After receiving the DOE application, EPA asked for additional information; on May 16, 1997, EPA declared DOE's application complete. If EPA certifies that the WIPP meets the disposal standards (and assuming no legal obstacles remain to be resolved), the facility can begin accepting waste 30 days after receipt of certification, or as early as June 1998.

## Site Characteristics

Based on recommendations by NAS, DOE decided that deep underground disposal in a suitable rock formation would be the safest, most practical, and most cost-effective means of permanently disposing of transuranic wastes. For a rock formation to be suitable, it should be highly stable, contain no circulating groundwater, be in an area where severe earthquakes or volcanic eruptions are highly unlikely, and be deep enough to allow for buffers of the same rock above and below the storage area.

NAS also recommended salt deposits as a disposal medium for radioactive waste. Salt, according to NAS, offers several advantages: most salt deposits are in stable geological areas; the presence of salt demonstrates the absence of flowing fresh water (which would have dissolved the salt beds); salt is relatively easy to mine; and salt formations, because of their plastic quality, will eventually fill in mined areas and seal the radioactive waste from the environment. [WHYSALT, Carlsbad Factsheet]

[INSERT "GEOLOGIC PROFILE OF THE WIPP," CAO "Why Salt?" Factsheet??]

The site chosen for the WIPP is a 16-square-mile tract of

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federal land in the arid rangelands of southeastern New Mexico. The site consists of a thick layer of rock salt deposited about 225 million years ago. The low rainfall in the desert environment also limits the amount of water that will move through the ground in the vicinity of the WIPP. Fewer than 30 people live within 10 miles of the WIPP site.

Although the WIPP site is under the control of DOE and is in a sparsely populated area, there is oil drilling, gas drilling, and potash mining in the vicinity. Because transuranic waste remains radioactive and must be kept isolated for thousands of years, some have expressed concern that future drilling or mining could disturb the site centuries from now, when government controls over the repository may have deteriorated.

In an October 1996 report, the Committee on the Waste Isolation Pilot Plant of the National Research Council (which is administered by NAS) found that "provided it is sealed effectively and remains undisturbed by human activity, . . . the WIPP repository has the ability to isolate [transuranic] waste for more than 10,000 years." It also found that "the only known possibilities of serious release of radionuclides appears to be from poor seals or some form of future human activity that results in intrusion into the repository." [NRCp3] The committee recommended that "speculative scenarios of human intrusion should not be used as the sole or primary basis on which to judge the acceptability of the WIPP." [NRCp3]

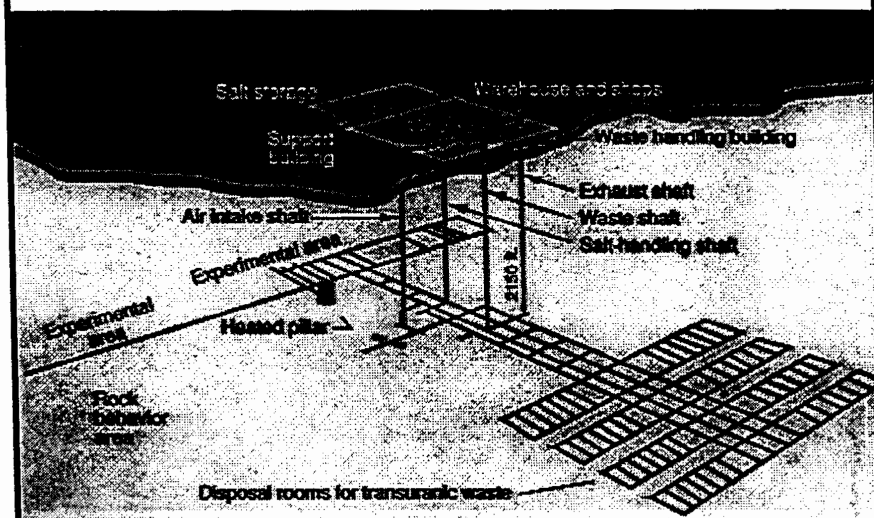
## WIPP Construction

WIPP excavation began in 1982 and continued throughout the 1980s. Four vertical shafts provide access and ventilation to the underground portion of the WIPP, where transuranic wastes will be deposited if the facility opens. This underground portion, which is 2,150 feet below ground level, is to consist of 56 large rooms –

each about 300 feet long, 33 feet wide, and 13 feet high. By mid-1997, seven of these rooms had been constructed. Construction of additional rooms will be postponed until the need arises. Upon completion, the WIPP could hold more than 6 million cubic feet of transuranic wastes.

The above-ground portion of the WIPP facility includes the Waste-Handling Building, where containers of transuranic wastes are to be unloaded and their contents characterized, inventoried, inspected, and prepared for disposal underground; a health physics laboratory; an exhaust filter building; emergency electric generators; and staff offices. The WIPP site also has its own fire department, ambulance service, and mine rescue capability.

**Figure 1. Layout of the Waste Isolation Pilot Project**




*Source:* Closing the Circle on the Splitting of the Atom, *U.S. Department of Energy, January 1995.*

# Radiation

Radiation is energy in the form of high-speed atomic particles (ionizing) or electromagnetic waves (nonionizing). Atoms release radiation as they change from unstable, energized forms to more stable forms. All matter is composed of elements, and each element can take many different forms (called isotopes). Some of these isotopes are unstable and emit radiation; these unstable isotopes are known as radioisotopes or radionuclides. Stable isotopes do not undergo radioactive decay and therefore do not emit radiation.

## Types of Radiation

Radiation is either ionizing or nonionizing. Only ionizing radiation has enough energy to alter atoms. It has three main forms:

**Alpha particles** can travel only a few inches in the air and lose their energy almost as soon as they collide with anything. They are easily shielded by a sheet of paper or the outer layer of a person's skin.

**Beta particles**, which are identical to electrons, are more energetic than alpha particles. They can travel in the air for a distance of a few feet. Beta particles can pass through a sheet of paper but can be stopped by a sheet of aluminum foil or glass.

**Gamma rays** are waves of pure energy and are similar to x-rays. They travel at the speed of light through air or open spaces. Gamma radiation can be very penetrating. Concrete, lead, or steel is necessary to block it.

## Measurement of Radiation

Radiation is measured in different ways. Measurements used in the United States include the following:

**Roentgen** is a measure of exposure; it describes the amount of radiation energy, in the form of gamma or x-rays, in the air.

**Rad** (radiation absorbed dose) measures the amount of energy actually absorbed by a material, such as human tissue.

**Rem** (roentgen equivalent man) measures the biological damage of radiation. It takes into account both the amount, or dose, of radiation and the biological effect of the type of radiation in question. A millirem is one one-thousandth of a rem.

**Curie** is a unit of radioactivity. One curie refers to the amount of any radionuclide that undergoes 37 billion transformations of atoms in one second. A nanocurie is one one-billionth of a curie.

## Everyday Exposure to Radiation

Individual exposures vary, but humans are exposed routinely to radiation from both natural sources, such as cosmic rays from the sun and indoor radon, and from manufactured sources, such as televisions and medical x-rays. Even the human body contains natural radioactive elements.

Because individual human exposures to radiation are usually small, the millirem (one one-thousandth of a rem) is generally used to express human dosages of radiation. The U.S. government has set maximum acceptable levels of radiation exposure at two rems (2,000 millirems) a year for occupational exposure and 0.1 rem (100 millirems) a year for general public exposure. The following table shows some average radiation doses from several common sources of human exposure.

**Table 1. Sources and Doses of Radiation***

| *Radiation Source* | *Dose (Millirems)* |
|---|---|
| Chest x-ray | 10 |
| Mammogram | 30 |
| Cosmic rays | 31 (annually) |
| Human body** | 39 (annually) |
| Household radon | 200 (annually) |
| Cross-country airplane flight | 5 |
| Full set of dental x-rays | 40 |

*This table illustrates average radiation doses from several common sources of exposure. Reporters should note, however, that the public may not perceive similar levels of exposure as comparable. Different perceptions arise in part because some potential exposure sources, such as mammograms and chest x-rays, are voluntary and may provide more readily apparent benefits than exposures from other sources.
**From naturally occurring radioactive elements in the human body.

[ALSO INCLUDE PIE CHART SHOWING SOURCES OF HUMAN EXPOSURE?]

## Effects on Humans

Ionizing radiation is powerful enough to alter cellular chemicals and disrupt normal cell functioning. All three types of ionizing radiation are potentially harmful to humans. Alpha and beta particles can cause damage to tissue primarily through inhalation or ingestion. Inhaling or ingesting particles that emit gamma rays is also potentially harmful; in addition, gamma rays from outside sources can penetrate and cause damage throughout the human body.

Two types of cellular damage can result from exposure to ionizing radiation:

**Genetic damage**, which alters – or mutates – reproductive cells, results in damage to future generations.

**Somatic damage**, which alters ordinary, nonreproductive cells, harms the exposed individual during his or her lifetime. Cancers, including some leukemias and bone, thyroid, breast, skin, and lung cancer, are the most common type of somatic damage resulting from exposure to ionizing radiation. Other types of somatic damage include burns and cataracts [LOWV18, LINE543].

The nature and extent of damage caused by ionizing radiation depend on a number of factors, including the amount of exposure, the frequency of exposure, and the penetrating power of the radiation to which an individual is exposed. Rapid exposure to large doses of ionizing radiation is rare but can cause death within a few days or months. The sensitivity of the exposed cells also influences the extent of damage. For example, rapidly growing tissues, such as developing embryos, are particularly vulnerable to harm from ionizing radiation [LINE543].

## Duration of WIPP Waste's Radioactivity

A half-life measures the amount of time it takes for half the radioactive atoms in a radioisotope to decay to a more stable form. After one half-life, for example, half the radioactive atoms in a sample remain radioactive; after two half-lives, one-quarter remain radioactive; after three half lives, one-eighth remain radioactive; and so on. Each element has a unique half-life. Half-lives range from a fraction of a second to billions of years.

[INSERT CHART SHOWING BROAD RANGE OF SAMPLE HALF LIVES]

The half-lives of the radioisotopes in transuranic wastes vary, but some transuranic elements have very long half-lives. For example, the half-life of plutonium-239 is approximately 24,000 years, and it takes plutonium-239 nearly 240,000 years to decay by 99.9 percent. Some radioactivity will remain in the waste indefinitely, but the amount of radiation will continually decrease.

Because of the long half-lives of some transuranic radioisotopes, transuranic wastes must be isolated and controlled for many, many years. Before the WIPP is opened to accept waste, DOE must obtain certification from EPA that the waste can be isolated from the human environment for at least 10,000 years.

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# Transuranic Waste

There are five general categories of radioactive waste: (1) spent nuclear fuel from nuclear reactors and high-level waste from reprocessing spent nuclear fuel; (2) transuranic waste, resulting mainly from defense programs; (3) uranium mill tailings, from the mining and milling of uranium ore; (4) low-level waste, from contaminated industrial or research waste; and (5) naturally occurring radioactive materials. Mixed waste is waste that contains both radioactive components and other hazardous components.

Transuranic, or TRU, waste generally consists of protective clothing, tools, glassware, equipment, and sludge contaminated with manmade radioisotopes heavier than uranium. (The term transuranic is derived from "trans," meaning beyond, and "uranic," which refers to uranium; thus, transuranic elements are beyond uranium on the periodic table of the elements.) These elements include plutonium, neptunium, americium, curium, and californium. Transuranic waste is produced during nuclear fuel assembly; during nuclear weapons research, production, and cleanup; and as a result of reprocessing spent nuclear fuel.

The WIPP Land Withdrawal Act 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 from the definition [WIPPLWA, section 2(18)].

## Types of Transuranic Waste

Transuranic waste is itself divided into two categories, based on its level of radioactivity.

Contact-handled transuranic waste (CH-TRU) accounts for about 97 percent of the volume of transuranic waste. It is packaged in 55-gallon metal drums or in metal boxes and can be handled under controlled conditions without any shielding beyond the container itself. The maximum radiation dose at the surface of a contact-handled transuranic waste container is 200 millirems per hour. Contact-handled waste primarily emits alpha particles that are easily shielded by a sheet of paper or the outer layer of a person's skin.

Remote-handled transuranic waste (RH-TRU) has a higher level of radioactivity than contact-handled transuranic waste and must therefore be handled and transported in shielded casks. Surface radiation levels of unshielded containers of remote-handled transuranic waste exceed 200 millirems per hour. Remote-handled waste primarily emits gamma radiation, which is very penetrating and requires concrete, lead, or steel to block it.

## Transuranic Wastes Allowed at the WIPP

In addition to withdrawing the WIPP site from public use and transferring the land to DOE control, the 1992 WIPP Land Withdrawal Act restricted the amount and types of transuranic wastes than can be disposed of at the facility.

- ***Only defense-generated transuranic wastes*** that have been stored for shipment since 1970 are to be disposed of at the WIPP. Before 1970, transuranic wastes were not distinguished or separated from low-level wastes. Since then, however, transuranic wastes have been separated from other wastes and placed in retrievable storage for eventual permanent disposal at the WIPP.

- ***DOE can store a maximum of 6.2 million cubic feet*** of transuranic waste at the WIPP. The existing inventory of defense-generated waste totals about 2.32 million cubic feet. In addition, an estimated 3.7 million cubic feet of transuranic waste will be generated over the next 35 years as DOE defense sites are closed.

The WIPP is to be a disposal site for both the existing inventory and this yet-to-be-generated portion of transuranic waste.

- ***The WIPP cannot accept*** remote-handled transuranic waste with a surface dose rate in excess of 1,000 rems 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 rems per hour.

- ***The WIPP can accept no more*** than 5.1 million curies of remote-handled transuranic waste.

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# Transporting Waste to the WIPP

The U.S. Department of Energy estimates that over a 35-year period the WIPP is to receive 37,723 shipments of transuranic wastes from the 10 major waste-generator sites across the United States. Early shipments, which could begin as early as mid-1998, are to consist of contact-handled wastes only. Shipments of remote-handed wastes are expected to begin in late 2001.

**Table 2. Number of Shipments to the WIPP**

| Generator Site | Number of Contact-Handled Shipments | Number of Remote-Handled Shipments | Total Shipments |
|---|---|---|---|
| Los Alamos, New Mexico | 5,009 | 367 | 5,376 |
| Idaho National Engineering Lab | 5,782 | 3,136 | 8,918 |
| Rocky Flats, Colorado | 2,485 | 0 | 2,485 |
| Savannah River Site, South Carolina | 2,238 | 0 | 2,238 |
| Hanford, Washington | 13,666 | 3,178 | 16,844 |
| Mound Laboratory, Ohio | 59 | 0 | 59 |
| Argonne National Lab-East, Illinois | 28 | 0 | 28 |
| Lawrence Livermore, California | 162 | 0 | 162 |
| Nevada Test Site | 86 | 0 | 86 |
| Oak Ridge, Tennessee | 251 | 1,276 | 1,527 |
| **Totals** | **29,766** | **7,957** | **37,723** |

*Source:* WIPP Disposal Phase Draft SEIS-II, *DOE, DOE/EIS-002-S-2, November 1996, Chapter 5, Proposed Action. Numbers are subject to change. Table is adapted from the Website of the New Mexico WIPP Transportation Safety Program, http://www.emnrd.state.nm.us/wipp*

[VERIFY WITH N.M. THAT THIS CREDIT IS OK.]

The WIPP is also to receive waste shipments from small-quantity generator sites. The total volume of WIPP-bound waste from these sites, however, is estimated to amount to only 6,038 cubic feet, or less than 1 percent of the total waste to be transported to the WIPP.

**Table 3. Small-Quantity Sites**

| Site Name | State |
|---|---|
| Ames Laboratory | Iowa |
| ARCO Medical Products Company | Pennsylvania |
| Babcock & Wilcox | Virginia |
| Battelle Columbus Laboratories | Ohio |
| Bettis Atomic Power Laboratory | Pennsylvania |
| Energy Technology Engineering Center | California |
| General Electric Vallecitos Nuclear Center | California |
| Knolls Atomic Power Laboratory | New York |
| Lawrence Berkeley Laboratory | California |
| Paducah Gaseous Diffusion Plant | Kentucky |
| Pantex Plant | Texas |
| Sandia National Laboratories | New Mexico |
| Teledyne Brown Engineering | New Jersey |
| University of Missouri Research Reactor | Missouri |
| U.S. Army Material Command | Missouri |

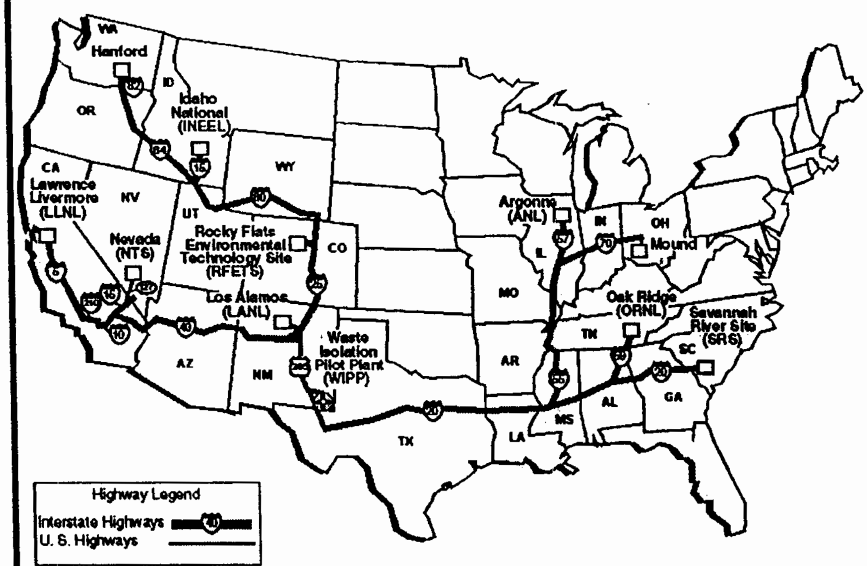
*Source: Adapted from the Website of the New Mexico WIPP Transportation Safety Program, http://www.emnrd.state.nm.us/wipp*

## Transportation Routes

An individual shipment bound for the WIPP may pass through as many as eight states, including New Mexico and the shipment's state of origin. A total of 22 states are to have designated routes for shipments of transuranic wastes.

The U.S. Department of Transportation (DOT) has issued regulations that set guidelines for routing waste to the WIPP.

**Figure 2. Proposed WIPP Shipment Routes**




*Source: U.S. Department of Energy, Carlsbad Area Office, January 1997.*

Those regulations give states and Indian tribes authority to designate routes within their borders. Different departments make the decision in different states, ranging from the Department of Health in Texas to the Public Service Commission in Indiana. DOT regulations require that designated shipping routes from storage and generator sites follow the most direct interstate highway route, bypassing highly populated areas as much as possible.

In 1991, the State Highway Commission designated WIPP shipment routes within the state of New Mexico.

[INSERT MAP OF WIPP SHIPMENT ROUTES IN N.M. FROM N.M. WEBSITE]

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## Transport Vehicles

A dedicated fleet of trucks, operated under contract with DOE, is to transport waste to the WIPP. These trucks are modified flatbed trailers attached to conventional diesel tractors, each with the capacity to haul up to three containers specifically designed to transport transuranic waste. Special safety measures applicable to WIPP transport vehicles include designation of safe parking areas for use en route in the event of bad weather, procedures for quickly (within eight hours) replacing or repairing vehicles that malfunction en route, and routine replacement of tractors at three-year or 300,000-mile intervals.

## Transport Containers

Contact-handled transuranic waste is to travel in special containers, called Transportation Packaging Transporter Model 2, or TRUPACT-II, which are designed to prevent radioactive releases, even in the event of an accident or other emergency. Each stainless steel TRUPACT-II container is 8 feet in diameter and 10 feet high, airtight, and constructed with inner and outer containment vessels.

To demonstrate durability under extreme conditions, the TRUPACT-II container has been subjected to and has passed a series of tests: dropping the container 30 feet onto a steel-reinforced concrete pad; submitting it to jet fuel flames at temperatures greater than 1,475 degrees Fahrenheit for at least 30 minutes; and dropping it onto a steel spike to test puncture resistance.

Any container used to transport radioactive waste must be tested and approved by the Nuclear Regulatory Commission (NRC). The TRUPACT-II has received NRC approval for transport of contact-handled transuranic waste. Prototypes of a new transuranic waste transport container, called the HALFPACK, have been developed and submitted to NRC for certification. The HALFPACK, a shorter version of the TRUPACT-II, is designed to carry heavy drums of waste more efficiently and would therefore reduce the number of shipments necessary and, in turn, transportation costs.

DOE is developing a transport container specifically designed for remote-handled transuranic waste. This container also is to be tested by and submitted for approval to the NRC.

**Figure 3. Casks for Shipping Transuranic Waste**

*Source:* Closing the Circle on the Splitting of the Atom, *U.S. Department of Energy, January 1995.*

## Driver Training

Drivers who transport transuranic waste must comply with all DOT requirements for transporting radioactive materials. They must have more than 100,000 miles of trucking experience, cleanly pass all substance abuse tests, and be trained and retrained each year to tackle a variety of transport conditions and situations, including rough terrain, severe weather conditions, and sabotage. Drivers must also satisfactorily complete a First Responders Course, which is taught to all emergency response forces along designated transuranic waste routes, to prepare them to take proper steps in case of an accident or incident. In addition, drivers are trained to use radiation detection instruments so they can reliably determine the presence or absence of radiation.

## Vehicle Inspection

Once a shipment bound for the WIPP has been loaded onto the truck it must be inspected and certified as safe for travel. Certified state inspectors check the vehicle, the cargo, and the driver. These inspectors can prevent a shipment from reaching the highway if they determine that it poses any danger to the public or the environment. Vehicles that pass this inspection are identified with a special decal.

[INCLUDE AN ILLUSTRATION OF THE INSPECTION DECAL]

## Tracking Waste Shipments

To track and communicate with vehicles transporting radioactive and certain other types of hazardous wastes, DOE has developed the Transportation Tracking and Communication System, known as TRANSCOM. All shipments to the WIPP are to be tracked through this system. TRANSCOM, which has a 24-hour control center in Oak Ridge, Tennessee, uses satellite communications and computer networks to track shipments from start to end. The control center is to house and maintain a database containing scheduling, routing, materials, and emergency response information about each shipment to the WIPP. Federal, state, and tribal officials are to have access to this database.

Vehicles transporting waste to the WIPP are to be tracked by two satellites. The vehicle's position is transmitted to a satellite receiving station and relayed to the TRANSCOM control center, where the information is displayed on computer-generated maps. Officials with access to TRANSCOM can monitor this information on their computers.

Drivers and others with access to the system can communicate with one another through TRANSCOM's central operator. State police, for example, could transmit a message to drivers through the TRANSCOM central operator about driving conditions along a route, and drivers, in turn, could respond through the operator [NMWEB].

[INSERT TRANSCOM DIAGRAM LIKE ONE ON N.M. WEBSITE?]

## Emergency Response

The DOE Albuquerque Field Office Emergency Operations Center is to be in charge of any incident involving a shipment of transuranic waste, regardless of where the incident occurs. DOE's response is to be automatic and not contingent on a state request for assistance. DOE maintains regional offices that can receive calls for assistance 24 hours a day and are prepared to send trained personnel and equipment to incident sites.

The initial response to an incident is most likely to come from local "first responders," such as state or local police departments, fire departments, and other emergency response personnel. Local governments have emergency response plans that outline specific procedures and designate special response teams.

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Local first responders are trained in material identification, regulations, response procedures, and personal protection. In the event of an incident, local responders would usually contact state public health agencies, and, if necessary, the first response team would be followed by the appropriate DOE Radiological Assistance Team and eventually augmented by the Incident/ Accident Response team, which is on standby while transuranic waste shipments are in progress.

DOE's States Tribal Education Program (STEP), which began in 1988, offers courses on responding to potential incidents involving shipments of waste to the WIPP. In 1993, the Occupational Safety and Health Administration reviewed and certified the STEP courses. Through STEP, DOE has trained more than 11,000 emergency response personnel.

The six STEP courses consist of an eight-hour First Responder Course; a four-hour First Responder Refresher Course; a two-day Command and Control Course for individuals who may be in charge at the scene of a WIPP transportation incident; a twelve-hour Train-the-Trainer Course that teaches state-certified instructors how to incorporate WIPP-specific information from the First Responder Course into their hazardous materials training programs; a Mitigation Course, aimed at state health, safety, environmental, and radiological personnel who have radiological monitoring and assessment responsibilities in the event of a WIPP transportation incident; and an eight-hour Medical Management Course for hospital emergency room doctors and nurses who may have to treat patients contaminated with radioactive material.[ERT-Carlsbad Fact Sheet]

# Certification and Public Participation

The secretary of DOE is responsible for deciding whether to open the WIPP for acceptance of waste. The secretary is not authorized to make this decision, however, until EPA has certified that the WIPP complies with EPA disposal standards and any outstanding legal issues are resolved.

## EPA Certification of the WIPP

The WIPP Land Withdrawal Act gave EPA responsibility for determining whether to issue a certification of compliance to the WIPP. Without this certification, which indicates that the WIPP has complied with all EPA disposal standards for transuranic wastes, the WIPP cannot open. By law, EPA must make a certification decision within one year of receiving a complete application from DOE.

On October 29, 1996, DOE applied for a certification of compliance from EPA. After receiving the DOE application, EPA asked for additional information, which DOE submitted. On May 16, 1997, EPA declared DOE's application complete. If the agency certifies that the WIPP meets EPA disposal standards (and assuming no other legal issues are pending), the facility can begin accepting waste 30 days after receipt of certification, or as early as June 1998.

## Other Legal Requirements

Obtaining EPA's certification of compliance is the most crucial event that must occur before the WIPP can open, but several other things must also happen: the New Mexico Environment

Department (NMED) must issue a hazardous waste disposal permit; DOE must finalize an environmental impact statement; any outstanding lawsuits must be resolved; and Congress must fund the disposal activities it has authorized.

## Public Participation in WIPP Decision Making

Government decisions about the WIPP are constrained by a wide range of laws and regulations covering nuclear waste, hazardous waste, transportation, environmental pollution, and even the procedures by which the government makes decisions. Many decisions about the WIPP have already been made, and citizens have been involved in the decision making through federal and state government agencies, such as EPA, DOE, and NMED, and also through their elected representatives in the White House, Congress, and state government. The agencies involved have sought public participation through public meetings, hearings, comment periods, and other mechanisms.

EPA's decision on whether to certify that the WIPP complies with radioactive waste disposal standards will be made through a formal public rulemaking process, and the agency's proposed decision on whether the WIPP should open will be available for public comment. EPA will hold public hearings on the proposed decision in New Mexico and will consider public comments received during both comment periods before reaching a final decision.

[USE ILLUSTRATION OR TEXT FROM UPCOMING EPA BROCHURE HERE?]

At the state level, before issuing DOE a hazardous waste disposal permit for the WIPP, NMED is to issue a draft permit for public comment. NMED also publishes public notices in

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newspapers of general and local circulation throughout New Mexico.

# Future Management and Oversight of the WIPP

When the WIPP reaches its legal storage capacity (6.2 million cubic feet or 5.1 million curies) in an estimated 35 years, it is precluded by current federal law from accepting more waste. The repository is to be sealed with backfill, cement, and other materials to isolate the waste from the accessible environment. Then begins the long-term process of keeping the waste isolated for the 10,000 years or more it takes for the waste to become less radioactive.

During the first hundred years or so after the repository is sealed, it is to be monitored, fenced, and guarded by DOE. But because it is difficult to predict which government institutions may evolve or disappear over the next 10,000 years, DOE is also to use "passive" measures to warn people against disturbing the site. Monuments, berms, warning markers, and widespread records are to be designed to inform people of the contents of the site and to keep people from drilling into the WIPP site. Drilling poses the greatest potential danger of releasing material from the repository.

## Recertification by EPA

Throughout its operation of the WIPP, DOE is to submit a recertification application to EPA every five years. EPA is to review the recertification applications to determine whether the facility remains in compliance with applicable standards, and the public is to have an opportunity to inspect and comment on the applications. By law, EPA must consider all public comments before issuing a final recertification decision on the WIPP's continued operation.

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## Recertification by NMED

The hazardous waste disposal permit issued to DOE by NMED is effective for no more than ten years and, to ensure compliance, is subject to a mandatory review five years after issuance. Before the existing permit expires, DOE is to submit an application to renew the permit. Permit renewal follows the same procedures as an initial permit application, with opportunities for public comment before NMED issues a renewal. NMED is to also conduct regular inspections of the WIPP to ensure compliance with the permit, and the state agency can revoke the permit with cause.

# Glossary of Terms and Acronyms

**AEC**. Abbreviation for the U.S. Atomic Energy Commission. AEC was disbanded in 1974 into the Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission (NRC). ERDA later became the Department of Energy (DOE).

**alpha particles**. A particle that is positively charged. It is emitted by radioactive material consisting of two neutrons and two protons. They can travel only a few inches in the air and lose their energy almost as soon as they collide with anything. They are easily shielded by a sheet of paper of the outer layer of a person's skin. Contact-handled transuranic (TRU) waste emits primarily alpha particles.

**atom.** The smallest part of an element that still has all properties of that element. Its nucleus consists of protons and neutrons and is surrounded by orbiting electrons.

**beta particles.** A particle that is negatively charged. It is emitted in the radioactive decay of specific nuclides. A beta particle has the same properties (mass and charge) equal to an electron. A beta particle can travel in the air for a distance of a few feet and can pass through a sheet of paper. They can be shielded by aluminum foil or glass.

**CAO**. Carlsbad Area Office. In 1993, DOE created the Carlsbad Area Office to lead its transuranic waste disposal efforts. CAO coordinates DOE's transuranic program at waste-generating sites and national laboratories.

**certification of compliance.** EPA must grant a certification of compliance indicating that the WIPP has complied with the agency's disposal standards for transuranic wastes before WIPP can open.

**contact-handled transuranic waste (CH-TRU).** Radioactive transuranic waste that consists of unprocessed laboratory trash and paper, glassware, gloves, boots, and scrap metals and of solidified sludges from the dewatering of fluids. "Contact handled" transuranic waste means the maximum radiation dose rate at the surface of the waste container cannot exceed 200 millirems per hour, and the waste therefore can be safely handled without any shielding other than that provided by the waste container itself. About 97 percent by volume of the waste scheduled to go to the WIPP is considered contact-handled.

**cosmic ray**. A stream of ionizing radiation (chiefly of protons, alpha particles, and other atomic nuclei).

**curie.** A measure of radioactivity. One curie of radioactive material will have 37 billion transformations of atoms (disintegrations) in one second. One curie of radium is approximately one gram.

**defense-generated transuranic waste.** Radioactive waste resulting from weapons research and development, the operation of naval reactors, the production of weapons material, the reprocessing of defense spent fuel, and the decommissioning of nuclear powered ships and submarines.

**disposal.** Permanent removal from the human environment with no provision for continuous human control and maintenance.

**dose.** A quantity of radiation or energy absorbed; measured in rads.

**element.** An atom with a unique number of protons in its nucleus.

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**environmental impact statement.** The National Environmental Policy Act (NEPA) mandates that all federal agencies and departments consider potential environmental impacts before beginning projects or implementing rules and regulations. An environmental impact statement or EIS is often prepared to comply with NEPA. DOE is required to finalize an environmental impact statement before WIPP can open.

**gamma radiation.** Short-wave length electromagnetic radiation emitted in the radioactive decay of certain nuclides. Gamma radiation can be very penetrating and requires concrete, lead, or steel to stop it. Remote-handled TRU waste emits gamma radiation.

**gamma rays.** Waves of pure energy, similar to x-rays. Gamma rays travel at the speed of light through air or open spaces. Concrete, lead, or steel will block gamma rays.

**genetic damage.** cellular damage that can result from ionizing radiation. It can alter or mutate reproductive cells, resulting in potential damage to future generations.

**half-life.** Measure of the amount of time it takes for half the radioactive atoms in an element to decay to a more stable form. The half-life of a radioisotope plutonium-239, for example, is about 24,000 years. After one half-life, half the radioactive atoms in a sample remain radioactive; after two half-lives, one quarter remain radioactive; after three half lives, one-quarter remain radioactive; after three half lives, one-eighth remain radioactive; and so on. Half-lives range from a fraction of a second to billions of years.

**HALFPACK.** A prototype of a new transuranic waste transport container that has been developed and submitted to NRC for certification.

**high-level waste (HLW)**. Highly radioactive material which contains traces of uranium and plutonium, fission products and other transuranic products. Occurs from reprocessing of spent nuclear fuel from nuclear reactors.

**ionizing radiation**. Ionizing radiation is powerful enough to alter (ionize) cellular chemicals, disrupting normal cell function. There are three main forms --alpha particles, beta particles and gamma rays.

**isotopes**. Different forms of elements. All matter is composed of elements, and each element can take many different forms (called isotopes). Some of these isotopes are unstable and emit radiation.

**low-level waste (LLW)**. Radioactive waste that consists of contaminated industrial or research waste. Most LLW is short-lived with low radioactivity.

**mixed waste**. Waste that contains both radioactive and other hazardous components.

**NAS**. Abbreviation for the National Academy of Sciences.

**NMED**. Abbreviation for the New Mexico Environment Department.

**non-ionizing radiation.** Non-ionizing radiation includes visible, ultraviolet, and infrared light as well as radio waves.

**NRC.** Abbreviation for the Nuclear Regulatory Commission.

**Rad**. Radiation absorbed dose -- a measure of the absorbed dose -- the amount of energy actually absorbed by some material, such as human tissue.

**radiation.** Energy in the form of high speed particles (ionizing) or electromagnetic waves (non-ionizing).

**radioactivity.** The spontaneous emission of radiation from the nucleus of an atom. Radioisotopes of elements lose particles and energy through this process of radioactive decay.

**radioisotopes.** An unstable isotope of an element that will eventually undergo radioactive decay (disintegration).

**radionuclides.** Any species of an atom that is radioactive.

**radon.** A cancer-causing gas produced by the breakdown of uranium in soil, rock, and water.

**rays.** Waves of pure energy that travel at the speed of light through air or open spaces.

**RCRA.** Abbreviation for the Resource Conservation and Recovery Act (RCRA).

**remote-handled transuranic waste (RH-TRU).** Radioactive transuranic waste that consists of unprocessed laboratory trash and paper, glassware, gloves, boots, and scrap metals and of solidified sludges from the dewatering of fluids. "Remote handled" transuranic waste means that the waste has a higher level of radioactivity than contact-handled transuranic waste and must therefore be handled and transported in shielded casks.

**Rem.** (Roentgen equivalent man) -- a measure of the actual biological effects of radiation absorbed. The rem is often expressed as millirem, which represents one-thousandth of a rem.

**repository.** A permanent disposal facility for high-level or transuranic waste and spent fuel.

**Roentgen.** Measure of exposure -- the amount of radiation energy (in the form of gamma or x-rays) in the air.

**somatic damage.** A type of cellular damage that can result from exposure to ionizing radiation. It will alter ordinary, nonreproductive cells. Cancers, including some leukemias and bone, thyroid, breast, skin, and lung cancer, are the most common type of somatic damage resulting from exposure to ionizing radiation.

**spent nuclear fuel.** Irradiated fuel from a nuclear plant's reactor. Spent fuel no longer contributes to the nuclear chain reaction and is thermally hot and highly radioactive.

**STEP.** Abbreviation for DOE's States Tribal Education Program. The program offers courses on responding to potential incidents involving shipments of waste to the WIPP.

**TRANSCOM.** Abbreviation for the Transportation Tracking and Communication System developed by DOE. TRANSCOM tracks and communicates with vehicles transporting radioactive and certain other types of hazardous waste. All shipments to WIPP are to be tracked through TRANSCOM, which has a 24-hour control center in Oak Ridge, Tennessee, and uses satellite communications and computer networks to track shipments from beginning to end.

**transuranic waste (TRU)** Waste that generally consists of protective clothing, tools, glassware equipment and sludge that have been contaminated with manmade radioactive elements heavier than uranium on the periodic table of elements. These elements include plutonium, neptunium, americium, curium, and californium. Transuranic waste is produced during nuclear fuel assembly; during nuclear weapons research, production, and cleanup; and as a result of reprocessing spent nuclear fuel.

**TRUPACT II.** Abbreviation for Transportation Packaging Transporter Model 2. A special container constructed to hold contact-handled transuranic waste. The container is designed to prevent radioactive releases, even in the event of an accident or other emergency.

**uranium mill tailings**. Waste from the mining and milling of uranium ore.

**U.S. DOE**. Abbreviation for the United States Department of Energy. WIPP is a U.S. DOE facility.

**U.S. DOT**. Abbreviation for the United States Department of Transportation. DOT regulates the transport of radioactive materials.

**U.S. EPA**. Abbreviation for the United States Environmental Protection Agency. The U.S. Environmental Protection Agency has substantial responsibility for regulating many of the U.S. DOE's activities at the Waste Isolation Pilot Plant.

**U.S.G.S.** Abbreviation for the U.S. Geological Survey

**WIPP.** Abbreviation for the Waste Isolation Pilot Plant, a U.S. Department of Energy (DOE) facility located in southeastern New Mexico.

**WIPP Land Withdrawal Act.** In October, 1992, Congress passed the WIPP Land Withdrawal Act which assigned authority for the land to the U.S. Department of Energy. It also gave EPA responsibility for determining whether to issue a certification of compliance to the WIPP.

# Appendix A
# Other Invited Contacts

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# Appendix B
# Other Resources

## Books & Periodicals

*Closing the Circle on the Splitting of the Atom: The Environmental Legacy of Nuclear Production in the United States and What the Department of Energy is Doing About It*, U.S. Department of Energy, January 1995.

*Frequently Asked Questions on the Waste Isolation Pilot Plant*, Environmental Health Center, A Division of the National Safety Council, Washington, DC, 1997.

*Implementation of the Waste Isolation Pilot Plant Land Withdrawal Act: FY 1996 Report to Congress*, U.S. Environmental Protection Agency.

*Living in the Environment,* G. Tyler Miller, Jr., Wadsworth Publishing Company, Belmont, CA, 1992.

*The Nuclear Waste Primer: A Handbook for Citizens*, The League of Women Voters, Lyons & Burford, New York, NY, 1993.

*The Waste Isolation Pilot Plant: A Potential Solution for the Disposal of Transuranic Waste*, National Research Council, Washington, DC, 1996.

## On-Line Resources

National Safety Council/Environmental Health Center
http://www.nsc.org/ehc.htm

State of New Mexico's WIPP Transportation Safety Program
http://www.emnrd.state.nm.us/wipp

U.S. Department of Energy
http://www.wipp.carlsbad.nm.us

U.S. Environmental Protection Agency
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