Dear Colleague:

In the year since the Waste Isolation Pilot Plant opened, we have initiated shipments from three of our ten major transuranic waste sites, obtained a hazardous waste facility permit from the New Mexico Environment Department, and began mining of Panel 2.

The Carlsbad Area Office has documented these and other key milestones that led to the opening and operation of the WIPP. I am pleased to provide you with our latest publication, Pioneering Nuclear Waste Disposal, which portrays the 40-plus years of studies, accomplishments, and pioneering clean-up efforts in the launching of the nation’s first deep geologic repository for transuranic waste.

I am proud to be one of many who have been involved in this project. I hope you enjoy reading our shared history and will save it as a reminder of problems created, science-based solutions, and challenges for the future.

Sincerely,

Dr. Inés R. Triay
Manager

www.wipp.carlsbad.nm.us 1-800-336-WIPP
Pioneering
Nuclear Waste Disposal
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Standard waste boxes and seven packs stacked in Panel 1, Room 7 of the WIPP repository.
Closing the Circle on Transuranic Waste

Some 225 million years ago, the area around Carlsbad, New Mexico was a barren salt bed more than 2,000 feet thick. Dinosaurs had not yet roamed the Earth, and the first humans were in the distant future. The area had been covered by the Permian Sea, which by this time had repeatedly evaporated, leaving behind the salt bed that would eventually be buried more than 1,000 feet beneath the sands and cacti of the Chihuahuan Desert.

Today that salt formation houses the Waste Isolation Pilot Plant (WIPP)—an underground repository certified by the Environmental Protection Agency and permitted by the New Mexico Environment Department—that is our nation’s solution to the risks posed by temporary storage of transuranic radioactive waste. Modern technology and engineering have turned a minute part of this enormous salt formation into a tomb for radioactive wastes, such as those generated during the Cold War.

After more than 25 years of study and evaluation, the first shipment of transuranic waste arrived at the gates of the WIPP at 4:00 a.m. on March 26, 1999. Despite the early hour and low temperature, several hundred employees, local officials, and private citizens turned out to greet the shipment. When the unique TRUPACT-II shipping containers on the back of the truck emerged from the pre-dawn darkness, the crowd erupted into applause, whistles, and cheers. Many there had worked on the WIPP project for years, and some had spent their careers waiting for this moment.

By isolating this waste from people and the environment, the U.S. Department of Energy (DOE) is closing the circle on the generation, management, and disposal of transuranic waste. But the WIPP story is not just about radioactive waste. It is also a story about people, commitment, federal legislation, government agencies, environmental regulations, and engineering challenges.
The journey to the WIPP began nearly 60 years before the first barrels of transuranic waste arrived at the repository. The United States produced the world’s first significant quantities of transuranic material during the Manhattan Project of World War II in the early 1940s.

The government idled its plutonium-producing reactors and warhead manufacturing plants at the end of the Cold War and scheduled most of them for dismantlement. However, the DOE will generate more transuranic waste as it cleans up these former nuclear weapons facilities. The WIPP is a cornerstone of the effort to clean up these facilities by providing a safe repository to isolate transuranic waste in disposal rooms mined out of ancient salt beds, located 2,150 feet below ground.

The need for the WIPP

The DOE and its predecessor agencies, beginning with the Atomic Energy Commission in the 1940s, designed and tested dozens of nuclear warhead models and manufactured a total of about 70,000 individual weapons. (Fewer than half of these weapons were present in the arsenal at any one time.)

In recent years, the DOE’s emphasis has shifted to the legacy of nuclear arms production: numerous contaminated sites and a large accumulation of radioactive and hazardous wastes in temporary storage. The government must protect present and future generations from exposure to these materials. The primary concerns related to transuranic waste management are

- Plutonium’s long half-life, requiring isolation for tens of thousands of years
- Serious health hazards posed by tiny quantities of plutonium, particularly if inhaled or ingested
- Potential radiation exposure to workers who handle, repackage, and transport the waste

Scientists have explored many alternatives for managing transuranic waste. Since no practical method for destroying radioactive isotopes exists at pres-
The only option is to wait for them to decay.

Temporary aboveground storage of transuranic waste has not posed serious imminent hazards to the public, but it is unacceptable for the long term. Many barrels and boxes containing waste have exceeded their design lifetimes, and some of them have corroded and leaked. Continued temporary storage would require periodic repackaging, at considerable expense and some risk to workers, for the indefinite future. The land occupied by surface storage cannot be used for other purposes, and the sites must be guarded and monitored at an annual cost of roughly 70 million dollars. These facilities are vulnerable to natural catastrophes, such as fires, storms, and earthquakes.

Permanent disposal must satisfy a demanding set of criteria:

- By law, the disposal site must isolate its wastes, causing no significant risk to the public for at least 10,000 years.
- Due to uncertainty about future cultures and languages, durable and comprehensible warnings must be created to discourage human intrusion.
- The disposal facility should be in an area unlikely to be in high demand for agriculture, mineral extraction, or residential or industry use.
- Surface and underground construction of the facility must comply with all safety and environmental standards.

What is transuranic waste?

Transuranic waste consists of material contaminated with elements that have atomic numbers greater than that of uranium, the heaviest natural element. In 1970 the Atomic Energy Commission created a separate category for transuranic waste, which until then had not been distinguished from other "low-level" radioactive waste. Most of this waste is everyday industrial trash, including used protective clothing, rags, old tools and equipment, and pieces of dismantled buildings. Some of the waste contains residues from chemical processes or soils from cleanup activities. A small portion consists of plutonium chips, cuttings, and other scraps that were not economically recoverable.

1972 Lyons, Kansas ruled out as a possible site for a radioactive waste repository.

1974 After a nationwide search for a suitable disposal site, field investigations begin at a site 30 miles east of Carlsbad, New Mexico.

1975 New Mexico Governor Apodaca establishes a “Governor’s Advisory Committee on WIPP.”
• Waste shipment to the site and emplacement in the repository must pose minimal risk to workers and to citizens along transport routes.

• During the entire process of establishing and operating the facility, the DOE must fully inform—and listen to—other government agencies, scientific advisory panels, and concerned citizens.

• As a taxpayer-funded project, the disposal site must meet its goals in the most cost-effective manner.

Establishment of the WIPP has not been easy, quick, or cheap, but the process produced a facility that is safe, that satisfies scientific and regulatory requirements, that has earned awards for safe operation, and that has served as a model for citizen involvement.

The National Academy of Sciences

The National Academy of Sciences first suggested salt beds for disposing of radioactive waste in a 1957 report. A committee evaluated several radioactive waste disposal media and said, “Disposal in cavities mined in salt beds and salt domes is suggested as the possibility promising the most practical immediate solution of the problem.” However, the report noted that

Carlsbad and the nation — then and now

The National Academy of Sciences first identified salt as a promising medium for the disposal of radioactive waste in 1957. Carlsbad and the nation have changed a lot since then. Here are a few examples.*

<table>
<thead>
<tr>
<th>1957</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. President</td>
<td>Dwight Eisenhower (R)</td>
</tr>
<tr>
<td>Carlsbad population</td>
<td>18,000</td>
</tr>
<tr>
<td>World population</td>
<td>2.5 billion</td>
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<tr>
<td>Televisions in use in the U.S.</td>
<td>42 million</td>
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<td>First-class postage stamp</td>
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<tr>
<td>Pinto beans (10 lbs)</td>
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</tr>
<tr>
<td>Movie ticket</td>
<td>$1.50</td>
</tr>
</tbody>
</table>

*Prices are not adjusted for inflation.

December 3, 1976
Energy Research & Development Administration applies to the U.S. Bureau of Land Management for the withdrawal of 17,200 acres of land in Eddy County for the WIPP.

December 1978
The New Mexico Environmental Evaluation Group is established to provide full-time, independent technical assessment of the WIPP.

1979
New Mexico Interim Legislative Radioactive and Hazardous Materials Committee and the Radioactive Waste Consultation Task Force are established.
its findings were presented in advance of research and development, and it did not have some essential data.

The WIPP as a neighbor

While nearly everyone recognizes the need for waste disposal, many communities have a “not in my backyard” attitude about accepting hazardous or radioactive waste facilities. The city of Carlsbad, New Mexico is an exception.

Since the early 1970s, city leaders and residents have supported the idea of siting the WIPP near Carlsbad, and they have built a relationship of cooperation with the DOE. The community has benefitted from the people and organizations that now consider Carlsbad their home. The DOE has been welcomed into a community where people are willing to do their part to solve a national problem.

Carlsbad and the state have also enjoyed economic benefits from WIPP-related employment and funding. Below are some examples of cooperative efforts between the DOE and the community.

- The Carlsbad Environmental Monitoring & Research Center monitors for any potential radiological effects of the WIPP on people and the environment.
- The Southeast New Mexico Environmental Technology Training Center was launched to offer technical training programs for employees of the National Transuranic Waste Program and now provides computer software, industrial, and professional development training across the U.S.
- The Advanced Manufacturing & Innovation Training Center’s mission is to enhance the competitiveness of area manufacturers and diversify the area economy through the support of new business development.

Members of an Academy committee further narrowed disposal options to salt beds in a 1970 report. The panel that issued the report favored a site near Lyons, Kansas.

The site near Lyons had 250-million-year-old salt beds, a low probability of an earthquake, and a simple, flat bedding structure. Erosion was not expected to reach the disposal site in fewer than 15 million years. These favorable characteristics of the Lyons site are even more applicable to salt formations near Carlsbad, New Mexico.

In 1972, the Atomic Energy Commission abandoned the Lyons site because of concerns about the many holes that had been drilled through the site, the risk of salt dissolution, and political opposition.

Community leaders suggest Carlsbad as the site for the WIPP

Carlsbad’s involvement with the WIPP began in the fall of 1971 when State Senator Joe Gant, Jr. learned that the Atomic Energy Commission had rejected the Lyons, Kansas salt mine for a proposed nuclear waste disposal site. Gant called his friend, Congressman Harold Runnels, and asked, “Why not Carlsbad?”
Gant enlisted the support of Carlsbad Mayor Walter Gerrells and other community leaders. In October 1971, N. William Mueller, president of Continental American Royalty Company, the parent company of U.S. Potash, wrote to Frank Pittman of the Atomic Energy Commission and proposed that a soon-to-be abandoned U.S. Potash mine would make a good site to store high-level radioactive waste.

Nuclear waste disposal deep in salt formations seemed a likely prospect for Carlsbad. Potash mining had been the economic backbone of the town for decades. It seemed only logical to use the vast network of mines to dispose of nuclear waste. As it turned out, the Atomic Energy Commission selected federally owned land to create a mine specifically for disposing of radioactive waste.

Community leaders had been working tirelessly to pull the town out of a disastrous economic downturn. In 1967, the largest local employer, U.S. Borax and Chemical, had closed, eliminating 1,000 jobs. The schools lost more than 2,000 students during the next several years. Hundreds of homes went on the market; some were abandoned as families left town to find work.

Over the years, city leaders had built strong ties with state officials. When the opportunity for a large, new federal project came to the community’s attention, Carlsbad worked vigorously for the WIPP. Local leaders frequently traveled to Washington to work on other issues. They added the WIPP to their agenda.

Construction of the WIPP
After nearly a decade of study, the DOE decided in January 1981 to proceed with construction of the WIPP. An exploratory shaft reached a depth of 2,305 feet. Ten months later, while deepening a previously drilled test borehole near the WIPP (a mile from the current storage area), the DOE struck a large pressurized brine reservoir. The DOE relocated the proposed repository’s transuranic waste area approximately 6,000 feet south of its original location.

In May 1981, New Mexico Attorney General Jeff Bingaman filed suit against the DOE and the Department

July 1, 1981
DOE, DOI, and New Mexico enter into Stipulated Agreement and Consultation and Cooperation Agreement to address Bingaman’s concerns. These agreements are modified in 1983, 1984, and 1989.

October 1982
Underground excavation at the WIPP begins.
of the Interior (DOI), alleging that continued development of the WIPP violated federal and state law. The federal agencies and the Attorney General entered into a “stipulated agreement” that required the DOE to perform additional geotechnical studies at the WIPP site, provide the results to the state of New Mexico, and address “off-site concerns” such as emergency response and highway improvements. Laws and regulations that were to govern the WIPP began to take shape.

**The WIPP Land Withdrawal Act**

In 1992, Congress passed and President George Bush signed the WIPP Land Withdrawal Act. The title of this crucial legislation underscores that Congress “withdrew” from public use the area devoted to the site. Congress transferred jurisdiction of the site from the DOI to the DOE.

The Act also established an array of regulatory conditions and standards covering everything from limits on the kinds and quantities of waste the DOE could place in the repository to transportation safety. The Act set requirements for oversight and regulation of the WIPP by federal and state agencies, for publication of information and documents, and for provision of economic assistance to the state of New Mexico. The 1992 Act established the U.S. Environmental Protection Agency (EPA) as the WIPP’s primary regulator.

The Act limited the waste sent to WIPP to the DOE’s defense-related waste. It also prohibited the disposal of high-level radioactive waste and spent nuclear fuel.

In 1996, Congress amended the Act, deleting requirements that the WIPP obtain a “no-migration” variance from the EPA. This meant that the DOE would not need to submit a lengthy application showing why it should be exempt from land disposal restrictions under the Resource Conservation and Recovery Act. The rationale for this amendment is that the WIPP is not a shallow landfill of the kind typically used for waste containing toxic chemicals or metals, and that the requirements imposed on radioactive waste transport and disposal are more than sufficient for containing any hazardous constituents of waste disposed of at the WIPP.

In addition, the 1996 amendments confirmed a 1993 decision by the Secretary of Energy to cancel tests using radioactive waste at the WIPP. Instead, national laboratories conduct-
ed this research in existing labs, rather than underground at the WIPP.

The Act is a landmark in the legal history of the site. It serves as a concise record of the essential steps required to establish the WIPP, the major institutions involved, and the basic requirements for disposal and decommissioning activities.

Certification by the EPA
Since 1992, the EPA has been the WIPP’s primary regulator, responsible for evaluating and verifying that the WIPP will safely isolate transuranic waste and protect human health and the environment. To carry out this responsibility, the EPA issued regulatory standards for waste containment during handling and after disposal (40 CFR 191).

Then, to determine whether the WIPP would meet these containment standards, the EPA formulated a set of WIPP-specific criteria (40 CFR 194) that required the DOE to provide certain kinds of information to show that the WIPP would meet the containment standards.

These standards had to address several crucial aspects of the WIPP and the waste that would be placed in it.

• The longevity and potential dangers of transuranic waste require any permanent disposal facility to be highly reliable. The nation’s responsibility toward future citizens, who have no say in decisions made before their time, means that containment standards must be particularly rigorous.

• The WIPP is the world’s first deep geologic disposal site designed specifically for transuranic wastes, and it is one of a very small number of permanent repositories in salt beds for any type of waste. People have had no opportunities to observe such a site for more than a few decades. Therefore, EPA regulation could not be based upon actual measured performance over the short term. Instead, the DOE performed research, simulation, and independent reviews to demonstrate that the WIPP can satisfy containment standards.

Stakeholders participated in public hearings and meetings. Many views for and against the WIPP have been expressed over the years.
• The EPA and the DOE must be very confident that the facility will perform as expected, because removing wastes from the salt bed becomes more difficult and costly as time passes.

In late 1996, the DOE submitted its WIPP Compliance Certification Application (CCA) to the EPA. This document, consisting of more than 80,000 pages, contained the results of decades of research, review, and public comment. The EPA evaluated whether the application demonstrated that the WIPP could comply with the stringent containment requirements for transuranic waste. On May 18, 1998, the EPA certified that the repository system would meet the standards.

The EPA’s certification of the repository, followed by the Secretary of Energy’s decision to proceed with waste disposal, completed one of the major steps in opening the WIPP.

Every five years during the disposal phase, the EPA will review whether to continue or modify its certification of the WIPP.

The National Environmental Policy Act
The National Environmental Policy Act requires government agencies to analyze the environmental impacts of any proposed project. The DOE has made decisions about the WIPP based on the results of three extensive environmental analyses of the WIPP facility and its environment.

The first study, in 1980, was called the Final Environmental Impact Statement for the Waste Isolation Pilot Plant. The DOE decided, in a document called a Record of Decision, to begin surface and underground construction of the facility.

After constructing most of the WIPP facility, the DOE prepared another environmental study to assess impacts of proposed underground research using radioactive materials. In its 1990 decision based on this study, called the Final Supplement Environmental Impact Statement for the Waste Isolation Pilot Plant, the DOE chose to proceed with a test phase using radioactive materials at the facility. This research, however, was never conducted at the WIPP. Instead, national laboratories performed the tests.

In its 1990 Record of Decision, the DOE committed to prepare another study before deciding whether to dispose of waste at the WIPP. The new

Continued on page 12
From the beginning:
National Academy of Sciences provides independent oversight

In 1978, the National Academy of Sciences (NAS) formed a panel of WIPP experts that has continued to provide independent advice and analysis to the DOE, carrying on the work that began with the search for radioactive waste disposal methods. The two NAS studies described below offer an independent perspective on transportation and on the WIPP’s ability to isolate waste for 10,000 years.

1989: Review Comments on ... DOE Draft Plan for the [WIPP] Test Phase: Performance Assessment and Operations Demonstration
This brief evaluation of the DOE’s proposed research plans focused on the philosophy behind “performance assessment” —computer modeling of how the repository would perform under a wide range of possible future events. The panel also examined the DOE’s transportation and emergency preparedness programs, concluding that:

The system proposed for transportation of TRU waste to WIPP is safer than that employed for any other hazardous material in the United States today and will reduce risk to very low levels. ... In the Panel’s view, the Department is being exemplary and responsible in giving a high level of attention to TRU waste transport.

Such attention is appropriate for shipment of all hazardous materials, almost all of which pose greater risk than the TRU shipments.

After assessing a range of environmental, regulatory, and technical issues related to the site, the WIPP panel provisionally endorsed several aspects of the repository.

The report recommended that DOE consider measures that might be practical without major changes in site design, including “engineered barriers” and “pre-emptive mining” of nearby resources. However, the panel noted that some regulatory requirements and DOE assumptions were overly cautious and could lead to excessive costs. The committee concluded:

Provided the WIPP repository is sealed effectively and undisturbed by human activity, the committee knows of no credible or probable scenario for release of radionuclides.
Continued from page 10

study was to analyze long-term performance of the underground repository based on information obtained after 1990. The DOE would also study the expected effects of disposal operations at sites that prepare and ship wastes to the WIPP and would complete an environmental study of the proposed transportation system.

In a 1998 Record of Decision, the DOE decided to dispose of its defense-generated transuranic waste at the WIPP after the material is prepared to meet waste acceptance criteria. The Department also decided to transport the waste by truck, although rail transportation might be used in the future. These decisions were based upon the Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement, completed in September 1997. That study evaluated waste treatment, disposal, and transportation alternatives.

Compliance with the National Environmental Policy Act has been an important part of decision-making at the WIPP. The DOE considered these environmental studies, along with other important regulatory and policy requirements, at critical junctures of the repository’s development.

The Resource Conservation and Recovery Act

Congress passed the Resource Conservation and Recovery Act (RCRA) in 1976 to establish requirements for the management of hazardous waste. Much of the waste to be disposed of at the WIPP is mixed waste, meaning that it contains both hazardous and radioactive components. Therefore, the WIPP must comply with RCRA to dispose of mixed waste. The EPA delegated its RCRA authority to the New Mexico Environment Department, which enforces RCRA in the state of New Mexico through the Hazardous Waste Act.

The RCRA permit application consists of Part A and Part B. Part A is a standard form that identifies the types and quantities of waste intended to be disposed of at the site.

Timely submission of a Part A application and notification of hazardous waste activities usually qualify owners and operators of existing hazardous waste management facilities for “interim status.” A facility with interim status is treated as having been issued a permit until the EPA or an authorized

October 30, 1992
President Bush signs into law the WIPP Land Withdrawal Act, designating the EPA as the WIPP’s primary regulator.

October 21, 1993
DOE moves radioactive waste tests planned for WIPP to national laboratories.

December 9, 1993
DOE creates the Carlsbad Area Office to manage the National Transuranic Waste Program and the WIPP.
state makes a final determination on the facility’s permit application. In 1991, the New Mexico Attorney General and others filed a challenge in court as to whether the WIPP qualified for interim status. The issue was resolved in March 1999 when the U.S. District Court of the District of Columbia ruled that the WIPP qualified for interim status.

Part B of the permit application presents an extensive set of requirements describing how the facility will operate to meet the Act’s requirements. Part B includes waste characterization information on the hazardous wastes to be handled at the WIPP, a description of procedures for handling hazardous wastes, security procedures and equipment, and closure and post-closure plans, including groundwater monitoring.

As it evaluated the DOE’s application for a hazardous waste permit, the New Mexico Environment Department issued two draft permits, one in May 1998 and the other in November 1998. After considering public comments, it issued a final hazardous waste permit in October 1999.

A standard hazardous waste permit is issued for a fixed term not to exceed 10 years. Several permit renewals will be necessary during the projected 35-year operation of the repository.

**Disposal of non-mixed transuranic waste**

When it became clear that the WIPP would not have a hazardous waste permit as early as had been expected, the DOE decided to proceed with non-mixed transuranic waste disposal. Despite its belief that the WIPP had interim status and therefore was legally able to accept mixed waste, the DOE decided to ship only non-mixed waste to the WIPP.

In June 1998, the DOE delayed plans for the first shipments from Los Alamos National Laboratory (LANL) to the WIPP because of New Mexico Environment Department concerns about the DOE’s characterization of the waste and claims by then-New Mexico Attorney General Tom Udall that the 1992 injunction on the WIPP was still in effect.

The first issue was resolved by confirmatory sampling and analysis in accordance with a plan that the New Mexico Environment Department approved. The sampling confirmed...
that the wastes were not mixed and therefore are not regulated under RCRA. The DOE sent the results to the Environment Department, which agreed in December 1998 that the LANL waste was non-mixed. The second issue was resolved in court.

**Court rulings deny request for further delays**

After the EPA certified that the WIPP met the standards for disposal of transuranic waste in May 1998, then-New Mexico Attorney General Tom Udall asserted that the lack of a hazardous waste permit from the state of New Mexico and lack of interim status prevented the WIPP from receiving any waste.

On March 22, 1999, Judge John Garrett Penn of the U.S. District Court of the District of Columbia denied a request for injunctive relief that would have prevented the first shipment of waste to the WIPP.

The Court’s March 22, 1999 ruling made several key points:

- The injunction entered in 1992 no longer applied and therefore did not prevent the shipment of waste from LANL to the WIPP
- The WIPP has interim status under RCRA.
- The LANL waste is not hazardous waste under RCRA, so even without interim status the DOE could ship it to the WIPP.
- The plaintiffs failed to demonstrate that they had a likelihood of success on the basis of the evidence and the facts introduced.
- The interest of the public would not be served by an injunction.

On March 24, 1999, eight federal judges in three separate courts agreed that the WIPP’s opening should not be delayed. The long-awaited first shipment of transuranic waste to the WIPP was now just hours away.

**The fog**

The first shipment of waste was scheduled to leave LANL for the WIPP at 12:01 a.m. on Thursday, March 25. Required notifications were made, three TRUPACT-IIIs were loaded, and everything was ready for the first shipment to roll out of the laboratory’s gate. Only the weather refused to cooperate. Thick fog reduced visibility along part of the

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Each transuranic waste site that ships to the WIPP must first characterize (identify and describe) the waste’s physical, chemical, and radiological properties. Real-time radiography is a characterization method that uses x-rays.
route, causing the DOE to postpone the shipment once again.

The DOE, drivers, and law enforcement personnel remained ready throughout the night in anticipation that the fog would lift and the shipment could proceed. Once the fog did lift, the DOE decided to delay departure by 19 hours so that drivers and law enforcement personnel would be well-rested.

The first shipment
The first shipment of transuranic waste to the WIPP left LANL on March 25 at 7:49 p.m. Los Alamos residents cheered as the truck departed. The truck traveled through the city of Santa Fe after rush hour traffic had ended. Demonstrations against the WIPP in northern New Mexico were peaceful.

The historic first shipment rolled through Carlsbad, New Mexico amidst cheers, flashing lights, and honking horns of support early on March 26. By the time the truck reached the WIPP, it was 4:00 a.m. Despite low temperatures and the early hour, several hundred employees, local officials, and private citizens had gathered to witness the arrival.

When the distinctive TRUPACT-IIIs on the back of the truck appeared, the crowd erupted into applause, cheers, and whistles. Many had worked toward this moment for years. After WIPP workers completed security and radiological inspections on the containers and the truck carrying them, the truck was allowed through the main gates and to the Waste Handling Building.

First to ship: Los Alamos National Laboratory
LANL has been a leader in noteworthy nuclear events. The lab developed the world’s first atomic bomb in the 1940s. Half a century later, LANL was the first to ship waste to the WIPP.

Location: Northern New Mexico, 25 miles northwest of Santa Fe
Size: 43 square miles
Transuranic waste volumes (cubic meters):
- Contact-handled
  - Stored - 8,255, Projected - 8,544
- Remote-handled
  - Stored - 101, Projected - 128

Inside the Waste Handling Building, WIPP workers unloaded the first TRUPACT-II and placed its waste in the repository by early afternoon on March 26. Workers unloaded the two remaining TRUPACT-IIs and placed their contents underground on March 30.

**Grand opening**

On April 17, 1999, Energy Secretary Bill Richardson welcomed dignitaries to the grand opening ceremonies at the WIPP. U.S. Senators Pete Domenici and Jeff Bingaman, Congressman Joe Skeen, Carlsbad Mayor Gary Perkowski, and the DOE’s Acting Carlsbad Area Office Manager Keith Klein joined the Secretary.

About 1,500 people attended the event. After speeches and a ribbon-cutting ceremony, Congressman Skeen, whose congressional district includes the WIPP, symbolically rode a truck with empty TRUPACT-II containers through the front gate to the Waste Handling Building.

**New Mexico Environment Department issues hazardous waste permit**

On October 27, 1999, the WIPP reached another regulatory milestone when the New Mexico Environment Department issued a long-awaited hazardous waste permit under the Resource Conservation and Recovery Act.

The permit authorizes the DOE to dispose of transuranic waste that is mixed with hazardous constituents, such as solvents and lead. More than half of the waste to be placed in the WIPP is mixed waste.

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**A ribbon cutting ceremony marked the official opening of the WIPP. Pictured left to right: Carlsbad Mayor Gary Perkowski, U.S. Senator Pete Domenici, Energy Secretary Bill Richardson, U.S. Senator Jeff Bingaman, and Acting Carlsbad Area Office Manager Keith Klein.**

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**After the ribbon cutting, Congressman Joe Skeen rode a truck with empty TRUPACT-II containers from the front gate to the Waste Handling Building.**

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**March 25, 1999**

First shipment of waste departs Los Alamos National Laboratory.

**March 26, 1999**

First shipment arrives at the WIPP; first waste placed underground later that day.

**April 17, 1999**

Energy Secretary Bill Richardson welcomes dignitaries to the WIPP’s grand opening.
April 27, 1999
First shipment from the Idaho National Engineering and Environmental Laboratory departs for the WIPP. This shipment marks the first out-of-state shipment to the WIPP.

June 15, 1999
First shipment from the Rocky Flats Environmental Technology Site departs for the WIPP.

October 27, 1999
The New Mexico Environment Department issues a final hazardous waste permit for the WIPP under RCRA authority.

Hundreds gathered at the WIPP’s grand opening ceremony, April 17, 1999.
Looking to the Future

The WIPP’s first waste receipt, 11 years later than originally planned, was a monumental step forward in the safe management of nuclear waste. Far from ending, however, the WIPP story has really just begun. For the next 35 years, the DOE will face many challenges as it manages a complex shipment schedule from transuranic waste sites across the United States and continues to ensure that the repository complies with all regulatory requirements. The DOE will work to maintain the highest level of safety in waste handling and transportation.

Coordination with sites
Disposal operations require coordination with sites that will ship transuranic waste to the WIPP and include periodic certification of waste characterization and handling practices at those facilities. During the WIPP's operational phase, shipments will originate from 10 major sites and a number of small-quantity sites. The 10 major sites are:

- Los Alamos National Laboratory (LANL) in New Mexico
- Idaho National Engineering and Environmental Laboratory (INEEL) in Idaho
- Rocky Flats Environmental Technology Site (RFETS) in Colorado
- Hanford Site (Hanford) in Washington
- Savannah River Site (SRS) in Georgia
- Oak Ridge National Laboratory (ORNL) in Tennessee
- Nevada Test Site (NTS) in Nevada
- Mound Plant (Mound) in Ohio
- Lawrence Livermore National Laboratory (LLNL) in California
- Argonne National Laboratory - East (ANL-E) in Illinois

Transuranic waste sites that ship to the WIPP are required to obtain CAO certification and approvals by EPA and the New Mexico Environment Department (NMED) prior to

Anticipated: 2000
First mixed-waste receipt.

Anticipated: January 2002
Remote-handled transuranic waste shipping system operational.

Anticipated: October 1, 2002
Seventeen shipments per week will arrive at the WIPP through the life of the program.
Shipping. Certification ensures that a site's procedures and processes meet regulatory requirements and accurately control waste characterization, packaging, and transportation activities.

The Los Alamos, Idaho, and Rocky Flats facilities were the first to obtain EPA certification and ship non-mixed waste to the WIPP. Now that WIPP has a hazardous waste facility permit, the NMED must also approve the final CAO audit report for each site.

Before a site is certified, CAO audit teams review documentation and observe operations. Typically, EPA and NMED representatives accompany the teams. Sites must be able to accurately identify what is inside the waste containers, ensure that it meets the WIPP waste acceptance criteria, and confirm that it is packaged correctly.

To coordinate shipments effectively, the CAO ensures that the correct number and type of shipping containers are sent to the sites at the right time. In addition, DOE must consider legal agreements that may affect the shipping schedule. For example, Idaho and the DOE negotiated an agreement that required the first transuranic waste shipment to leave the state by April 30, 1999. This requirement was met with INEEL’s first shipment on April 27, 1999.

Transportation

The unique design of the TRUPACT-II shipping containers makes the transportation of waste one of the most noticeable activities of the disposal phase. For the transportation of contact-handled (CH) transuranic waste, each shipment consists of a truck and trailer with up to three TRUPACT-II containers. Upon certification by the Nuclear Regulatory Commission, a shorter, lighter version of the shipping container, called the HalfPACT, may substitute for one or more TRUPACT-IIs.

In 1999, the DOE awarded contracts to manufacture 12 additional TRUPACT-IIs, which will be put into use beginning in 2000. Eventually, the WIPP will be capable of handling 17 shipments per week. Additional

Safety plays a key role in all aspects of the WIPP

Safety is no accident. It is the result of careful planning and practice. WIPP employees at every level have the authority and responsibility to stop others from working in an unsafe manner. This approach includes sites around the country that package and store transuranic waste, as well as the transportation system that carries waste to southeastern New Mexico.

The WIPP has earned “Star Status” in the Voluntary Protection Program, was awarded the Operator of the Year mine safety award eight consecutive times (1988 through 1995), and performs exceptionally well during Mine Safety and Health Administration inspections.

In addition, on January 16, 1998, Westinghouse employees celebrated the completion of one million work hours without an on-the-job injury that would prevent an employee from working as usual.

Anticipated: 2004

EPA re-certification of the WIPP.

Anticipated: October 2004

Six shipments per week of remote-handled transuranic waste will arrive at the WIPP.
Remote-handled transuranic waste
Remote-handled (RH) transuranic waste has a higher level of radioactivity than CH waste. RH waste is handled and shipped in shielded containers to protect people and the environment from exposure.

Unlike CH waste, RH waste will not be shipped in a TRUPACT-II. Instead, it will be shipped in a cask called the RH-72B. Both shipping containers require Nuclear Regulatory Commission certification. The Commission has already certified the TRUPACT-II; certification of the RH-72B cask is pending.

RH disposal operations are anticipated to begin in 2002 with two shipments per week, eventually increasing to four shipments per week.

Waste volumes and characteristics
The capacity of the WIPP is limited by the WIPP Land Withdrawal Act to 175,590 cubic meters of waste. A breakdown of the anticipated volume of waste from each major site is shown in the table on this page.

The waste itself can be described in a variety of ways:

- It is classified as defense-generated waste.
- More than half the waste is considered mixed transuranic waste (meaning it contains hazardous components, usually metals or organic solvents) and is subject to regulation by RCRA.
- About 97 percent of the waste is CH transuranic waste, while the remaining three percent is RH transuranic waste.
- The waste currently in storage at sites around the country was generated after 1970. Most of the remainder will be generated from activities such as environmental restoration, decontamination, and decommissioning.

How much waste are we talking about?

The following table gives the anticipated volumes of waste in cubic meters to be received from the major transuranic waste sites.*

<table>
<thead>
<tr>
<th>Site</th>
<th>CH waste</th>
<th>RH waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANL-E</td>
<td>203</td>
<td>0</td>
</tr>
<tr>
<td>Hanford</td>
<td>23,432</td>
<td>1,782</td>
</tr>
<tr>
<td>INEEL</td>
<td>79,584</td>
<td>139</td>
</tr>
<tr>
<td>LANL</td>
<td>16,799</td>
<td>229</td>
</tr>
<tr>
<td>LLNL</td>
<td>1,132</td>
<td>0</td>
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<tr>
<td>Mound</td>
<td>247</td>
<td>0</td>
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<tr>
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<td>637</td>
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<td>1,097</td>
<td>1,368</td>
</tr>
<tr>
<td>RFETS</td>
<td>8,493</td>
<td>0</td>
</tr>
<tr>
<td>SRS</td>
<td>29,536</td>
<td>22</td>
</tr>
</tbody>
</table>

*Includes stored and projected waste
Mining
The WIPP repository will eventually consist of eight panels, each of which contains seven waste disposal rooms. Panel 1, which was completed in 1988, is the only one that has been mined so far. Since 1988, the walls and floors have been maintained by shaving off the salt that creeps, or closes in on, open areas due to the plastic nature of the salt formation. In addition, workers have installed roof bolts in Panel 1 to reinforce the ceiling.

The DOE will mine the remaining panels as they are needed. Completion of the mining of Panel 2 is anticipated in 2000. Panels will be closed as they are filled, and waste disposal will continue in the next panel. When a panel is half filled with waste, mining will begin on the next panel. Each panel is expected to take approximately five years to mine, fill, and close.

Institutional controls
One of the WIPP’s greatest challenges will begin at the end of the disposal phase: minimizing the risk of human intrusion for thousands of years. The DOE plans to use active institutional controls—fences and guards—to prevent intrusion into the repository for 100 years after the disposal phase ends. Concurrently, the DOE will develop and construct passive institutional controls. These controls will inform people in the future of the nature of the repository and discourage them from digging into it.

Public involvement
The WIPP is now in the operational phase, but the DOE will continue informing stakeholders and encouraging them to express their concerns and opinions. To aid informed involvement, the Carlsbad Area Office distributes information on all aspects of the project and solicits public comment and participation. Public education and involvement are legal and practical obligations and are integral to establishing and operating the site.

As the world’s first deep geologic repository for transuranic radioactive waste, the WIPP has attracted international interest. The challenge facing the Carlsbad Area Office is to respond appropriately to researchers, political representatives, and citizens with a wide range of interests and technical training. Brief fact sheets provide all of the information some stakeholders want. Others want to evaluate and comment on lengthy technical documents.

Here is how to get more information about the WIPP and become involved:

- Call the WIPP Information Center (1-800-336-WIPP).
- Visit the WIPP Home Page at www.wipp.carlsbad.nm.us.
- Request a presentation from the WIPP Speakers Bureau.
- Take a tour of the WIPP.
- Schedule an exhibit for a major event or conference.
- Sign up on the WIPP mailing list to receive the CAO Monthly Calendar, the TRU Progress newsletter, and other materials.

Active institutional controls (fences and guards) in place.
Passive institutional controls in place to deter human intrusion. Active institutional controls no longer used at the WIPP.
The messages will be delivered by:

- Permanent markers located directly above the “repository footprint” (the boundary at the surface of the underground waste disposal rooms) and at the outer boundary of the land reserved for the WIPP (16 square miles)
- Records in archives, such as the Library of Congress and the United Nations, and in libraries around the world
- Government ownership documents and land use restrictions to warn those seeking natural resources
- Other means of distributing knowledge, such as encyclopedias, text books, and maps

One challenge is to anticipate the possibility that, within the next 10,000 years, people may not understand any language now in use. Messages on the permanent markers will be engraved in seven languages. Pictograms will complement the written information or convey it independently.

**Future research and development**

The characteristics of the WIPP repository and its infrastructure make it uniquely suited for other research. The DOE is proceeding with its vision of becoming an international research center to conduct underground particle astrophysics and low dose radiation biology research, improve natural resource extraction, provide repository science services to other nations, and demonstrate nuclear safeguards and transparency technologies.

In addition, the CAO is pursuing technology transfer opportunities along the U.S.-Mexico border and elsewhere.

All of these activities, which can and will be conducted without compromising the primary disposal mission and the priority on safety, will benefit tremendously from the DOE’s significant financial and intellectual investment in the WIPP.
Related Reading


The WIPP Team

Staff as of March 26, 1999

The DOE would like to thank the hundreds of people who contributed to the WIPP's success. The names below are those who were on the team on the day of first waste receipt.

The U.S. Department of Energy
Carlsbad Area Office

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Bennington, Beth
Briceño, Frank
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Carroll, Kimberly
Conway, Della
Colt, Stanley
Countiss, Sue
Crockett, Patti
Daugherty, Mike
Eavenson, Donna
Farrell, Richard
Fox, Bernice
Galbraith, Don
Gilbert, Jack
Huckeba, Freida
Hunter, Kent
Hurtt, Dennis
Italiano, Marc
Johnson, Harold
Kilgore, Patricia
King, Lila
Klaus, Jim
Klein, Keith
Lilly, Bruce
McDade, Mike
McIntyre, Mark
Meathe, Maggie

The Carlsbad Area Office Technical Assistance Contractor

Antiporda, Mike
Aguilera, Amy
Ash, Martha
Barden, Tom
Barker, Mike
Borden, Tommy
Brown, Earl
Burgos, Lourdes
Calvert, Steve
Cherryhomes, Mary
Davis, Matt
DeMoss, Tim
Doherty, Mark
Eusay, Heather
Frank, Mark
Fremont, Jody
Hale, Betty
Harvill, Joe
Holdeman, Jerry
Jennings, Stephanie
Johnson, Bobby
Jones, Sandy
Kearney, Mike
Leith, Dan
Ledford, Jane
Leitz, Sheri
Marshall, Ann
May, Jeff
Meyers, Cindy

Day & Zimmerman

Acosta, Maria
Aguero, Lisa
Alvarez, Di
Asbury, Dondee
Bates, Antonio
Bates, Leigh
Barrett, Tommy
Berry, Lacy
Bichner, Sheila
Brocco, Deb
Campos, Alex
Chad, Pete
Compton, Beb

Acosta, Fernando
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Alvarez, Di
Asbury, Dondee
Bates, Antonio
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Barrett, Tommy
Berry, Lacy
Bichner, Sheila
Brocco, Deb
Campos, Alex
Chad, Pete
Compton, Beb

Day & Zimmerman
Sandia National Laboratories

The Westinghouse Electric Company
Waste Isolation Division
| Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          | Name          |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Banman, David| Cobb, Billly | Estes, Dawn  | Gut, John    | Kada, Ashok  |
| Banman, Danny| Cobb, James  | Estes, Leo   | Haeck, David | Karchne, Rodney|
| Banman, Randy| Cobb, John   | Pekan, Sherzill| Harness, Ellen| Keeley, William|
| Banman, Sacie| Cob, Lawrence| Pekan, William| Harren, Joyce| Kelman, Robert|
| Banoli, Susan| Coleman, Jack| Pickralt, William| Harvey, Gregory| Kelley, Charles|
| Brawn, Dary  | Condon, Robert| Pulk, Bruce  | Hever, Nohl  | Kelley, Clameleon|
| Brawn, Gary  | Connors, Ralph| Fellins, Letha| Hauber, Cagig| Kelle, Kathleen|
| Brawn, Henry | Cotton, Jeffrey| Ferguson, Tommy| Heves, Dana  | Kelle, Kathlen |
| Brawn, Jerry | Courtey, Cheri| Fernandez, Anohny | Hices, Ronald | Kessler, Gary |
| Brawn, Kate  | Cout, Curtis | Fierro, Manuel| Higel, Janet  | Kessler, Kathy|
| Brawn, Timmy | Cout, Curtis | Fling, Howard | Head, Ronald | Keyser, Edige |
| Beard, Michael| Cox, Curtis  | Flynn, Edward | Heidin, James| Kippenberger, Jimmy|
| Beckham, Ray  | Cox, Effie   | Foster, William| Heine, Carig  | Kibbi, Robert|
| Beaucous, Gerald| Cum, George | Franco, Joe   | Henry, Lorraine| Kiedy, Alfred|
| Be Rohingya, Bob| Cum, Shawn  | Pisco, Orlando| Hermes, Sarah  | Kiedy, Billy |
| Beucus, Maxm  | Delton, Linda| PInez, Deboah | Herpe, Charlie | Kiedy, Cara  |
| Beuton, Tony  | Dem, Peter  | Friend, Mark  | Hernandez, Connie| Kin, Jeff |
| Beuton, Sandra| Daniel, George| Fry, Richard  | Hernandez, David| Koch, Jon  |
| Bev, Ray   | Danielson, Raymond| Fry, David   | Hernandez, Edmundo| Komba, Steven |
| Bevens, Genaro| Darx, Kyle  | Fry, Tress  | Hernandez, Edna | Konvalin, John|
| Bevens, Michael| Darx, Ronald | Fudge, James  | Hernandez, Jessica| Kause, Sandra|
| Bevens, Owen | Davis, Waltex | Fusion, Jon  | Hernandez, Judy| Kueotec, William|
| Bevora, Hemand| Davis, Jacoben| Gabron, Donlad | Hernandez, Kathyn| Kuhn, Blaline |
| Bexar, Deena | Davis, Mick  | Galhhey, Stephen| Hernandez, Richard| Kump, Dave |
| Bevel, Ameda| Davis, Susan | Gappe, Lane  | Heil, Andrew  | Langstine, Bruce |
| Bevelinga, Julia| Day, Sherey | Gallows, Glenn| Hilm, Mary   | Lanctt, Judy |
| Bevelingp, Wayne| De Vito, Paul| Garcia, Adele | Hinopos, Michael| Lin, Ann  |
| Belloder, George| Deering, Roy | Garcia, John  | Hodges, Paul  | Lee, John  |
| Bevien, Weston| Debree, Peter | Garcia, Oscar | Hofe, Dennis  | Lees, Catherine|
| Bezen, Mano  | Dunx, Lou   | Garcia, Robert| Hoff, Jon    | Lees, Jay|
| Bezen, Reynudo| Dvass, Erich | Garcia, Robert| Hoffman, Paul | Legresta, Jose |
| Bezen, Ruben | Dupps, Pucilla| Garcia, Teddy | Hogue, Jessica | Levis, David |
| Bezdicher, Mike| Dunck, Roger | George, Lercy | Holle, Jack  | Levis, Robert |
| Bedick, Noeman| Dominex, Randaa| George, Lass  | Holle, James | Lichy, Thomas |
| Bedick, Michael| Dominex, Carolina| Giblin, John | Hoods, Belan  | Link, Chuck |
| Bedick, Mitchel | Dominex, Sam  | Gibson, Kacy  | Hoos, James  | Lipinsbic, Richard |
| Bedick, Steve | Donex, Anthony| Gilber, Dennis | Hoyland, Robert| Lipscomb, Michael |
| Bedick, Wellk  | Donex, Don  | Gilber, Donald | Houser, Joel  | Littacell, Carolyn |
| Bedingham, Brecha| Donex, Kevin| Gilber, Elizabeth| Hufman, Dougs | Long, Mack |
| Bedingham, Scot | Donex, Danday| Gilber, Paul  | Hughes, David | Long, Tom |
| Bedtalo, Albeet| Donex, Dennis | Godfray, Ray  | Hughes, William| Longe, Steve |
| Bedtalo, Rudy | Donex, Cela  | Golden, Jerome | Humphrey, Shirley| Lopez, Dona Lee |
| Bevis, Pacciano | Dupps, Pucilla| Gomez, Caetlin  | Hurst, Kenneth | Lopez, Joe, Jr.|
| Bevis, Mike | Dunck, Roger  | Gonzales, Caetlin | Kimberly | Lopez, Robert |
| Bevis, Timothy | Duex, Steven | Gonzales, Manret | Mace, Judick  | Loughmillos, Petti |
| Beza, Acon | Esteb, Decon  | Gonzales, Bevry | Machtin, Masion| Lovell, Mickey |
| Beza, Micky, Jr| Esteb, Emmanuy | Guilla, Mite | Inagain, John | Lucen, John |
| Beza, Richal  | Esteb, Marthia| Guilla, Jerry  | Ingam, Mats  | Lucas, Hershel |
| Chen, Jing Heong| Esten, Othlyn | Guan, John    | Inag, Maceus | Lunsford, Kathleen |
| Chester, Curics| Estens, Randa | Guen, Kim    | Jackson, John | Lynch, James |
| Chestr, Virgil| Esten, Rondick | Guen, Mouly  | Jackson, Kimberly| Lynn, Dougis |
| Chidaste, Stepheh| Esteconda, Richay| Gregy, Philip | James, Michael| Macellos, Ronald |
| Chi, Tony  | Elcon, Jessica | Gezre, Ronald | Johns, James  | Mail, Lancy |
| Chlak, Cary  | Ellet, Jimmey | Gistzwil, Lenin| Johns, Suzanne| Majly, Dorothy |
| Chlak, Tavis | Elsetty, Stephen | Gistz, Ruben | Johns, Wendell | Magee, Donnas |
| CIm, Penny  | Ends, Ernest | Gistvaa, Donna | Jones, Srazve | Mattin, Lacy |
| Clementz, Leczy | Espirin, Joseph| Guilleemo, Katen| Joo, Iane | Maples, Gav |
| Clementz, Larry| Estad, Leo | Estes, Dawn  | Gut, John  | Mar, John |
| Clementz, Larry| Estes, Leo | Estes, Dawn  | Gut, John  | Kada, Ashok |
Sunset at the WIPP