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# THE SANTA FE NEW MEXICAN



## Fouling the Nest

A New Mexican Special report on  
Los Alamos National Laboratory

## Soviet proposal sent to Saddam

New Mexican wire services

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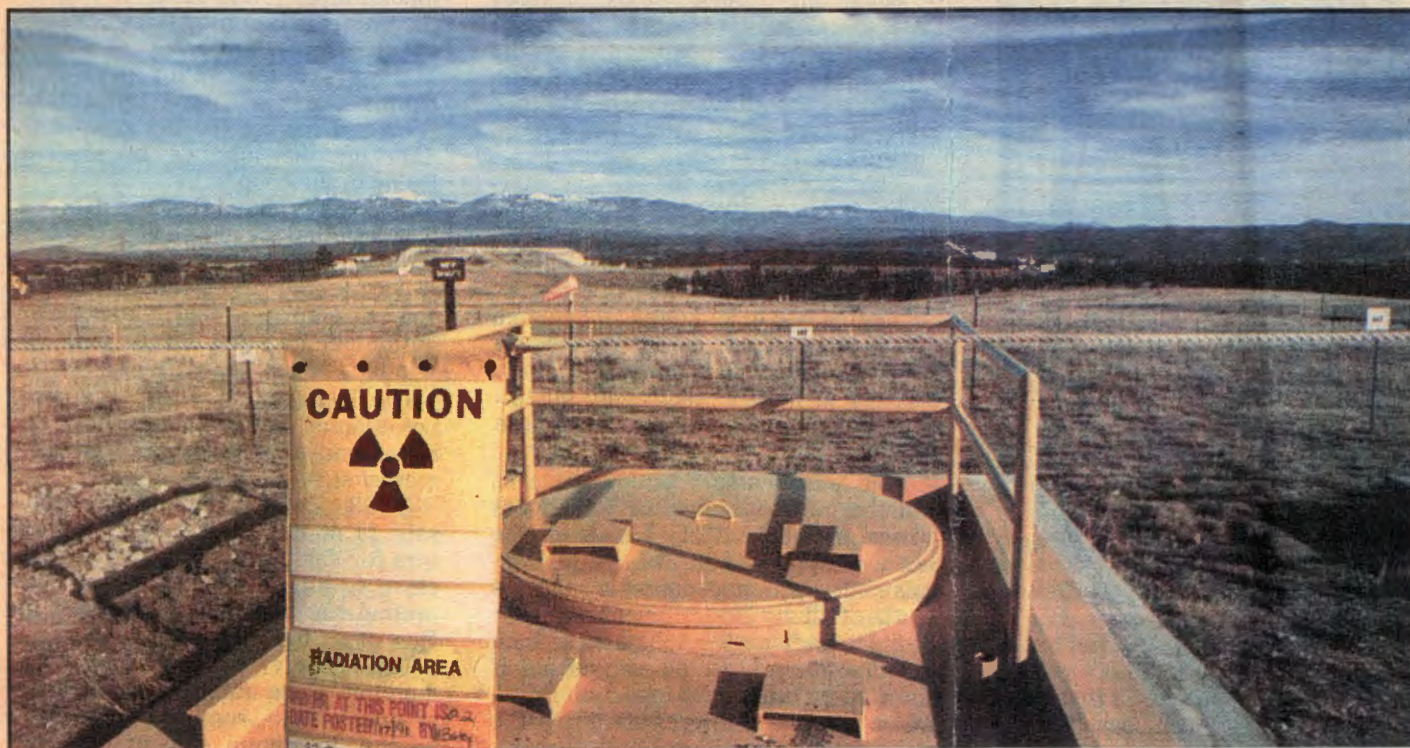
### DEVELOPMENTS

■ Iraq's foreign minister, Tariq Aziz, was scheduled to arrive back in Baghdad today with a proposal from Soviet President Mikhail S. Gorbachev that a Kremlin spokesman described as a "concrete plan" for settlement of the gulf crisis, based on an end to Iraq's occupation of Kuwait.

■ White House statements indicated the diplomatic efforts in Moscow would not affect the U.S. timetable for the war. But President Bush said that "a lot of interesting things" were happening.

■ American gunners pounded Iraqi positions with artillery fire, and Iraqi mines — one of them possibly a type not previously seen in the Persian Gulf — damaged two U.S. Navy warships in the gulf. Page A-5.

■ The U.S. 2nd Marine Division repositioned its forces Monday to

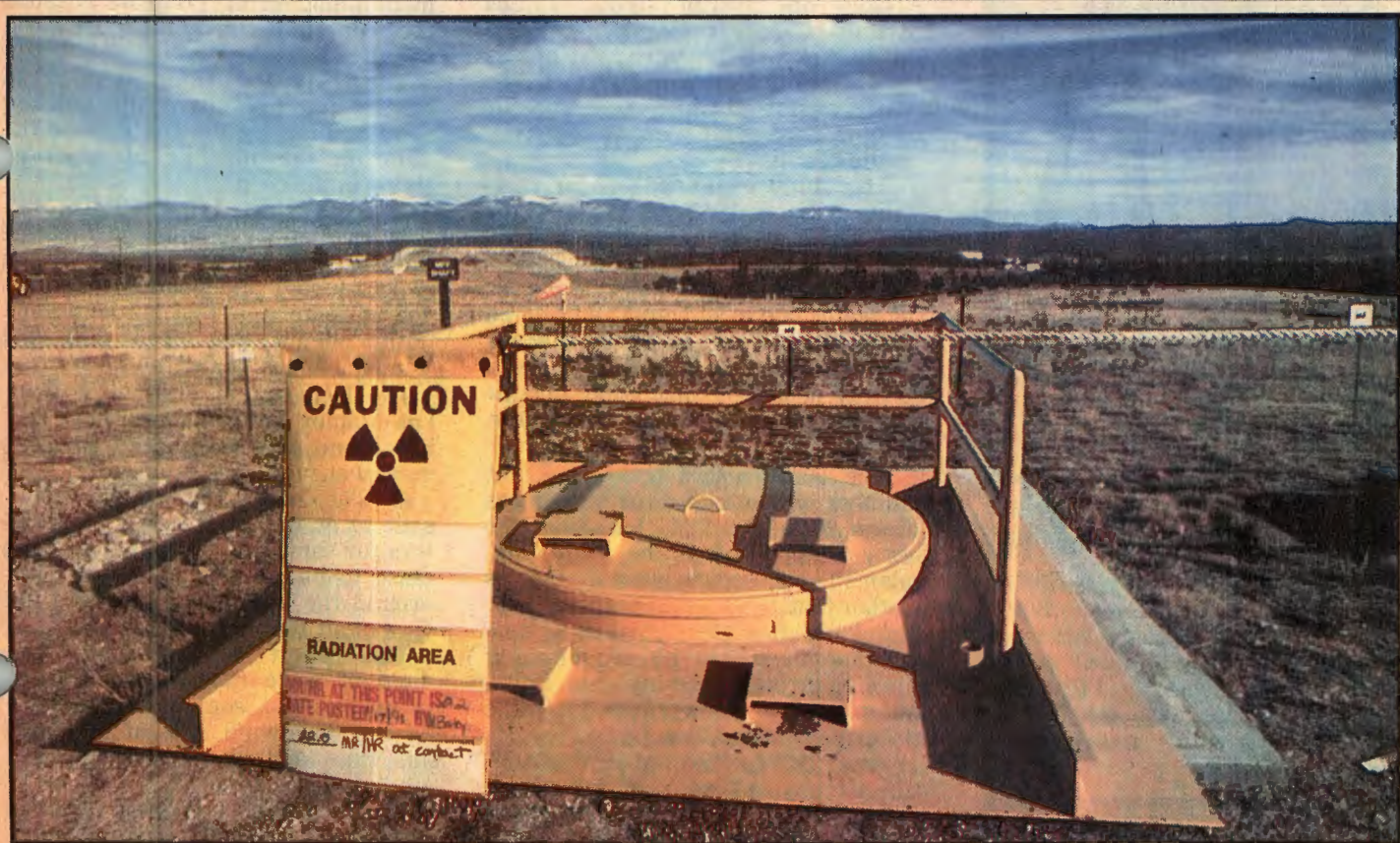






## Fouling the Nest

A New Mexican Special report on  
Los Alamos National Laboratory



One of the shafts at Area G at the Los Alamos lab containing radioactive waste. According to the sign, a person would be exposed to 22 millirems of radioactivity an hour upon contact with the structure.

## Public at risk?

### Air emissions small, says lab, but monitoring is challenged

Charlie Mills probably is exposed to more radioactive air emissions than just about anyone in Los Alamos.

Mills works as a security guard at EG&G Inc. just east of the airport, the site identified by Los Alamos National Laboratory as receiving the most radioactive air emissions from the lab.

Mills, 70, also lives just a few blocks from EG&G, in a house just west of the airport.

He said he was unaware that the air emissions were centered in the area but added he also was unconcerned.

"I feel perfectly safe," Mills said. "I'm sure there aren't any emissions that are going to hurt you."

Tyler Mercier, 33, an artist, lives across town from EG&G. He believes the radioactive air emissions from Los Alamos National Laboratory pose a threat to public health.

"The issue is the facts," he said. "I think there is clear level for concern in the facts."

Mercier last year set up his own

monitoring stations for radioactive air emissions. He and his wife and their 8-year-old son also wear devices to measure the radioactivity they receive.

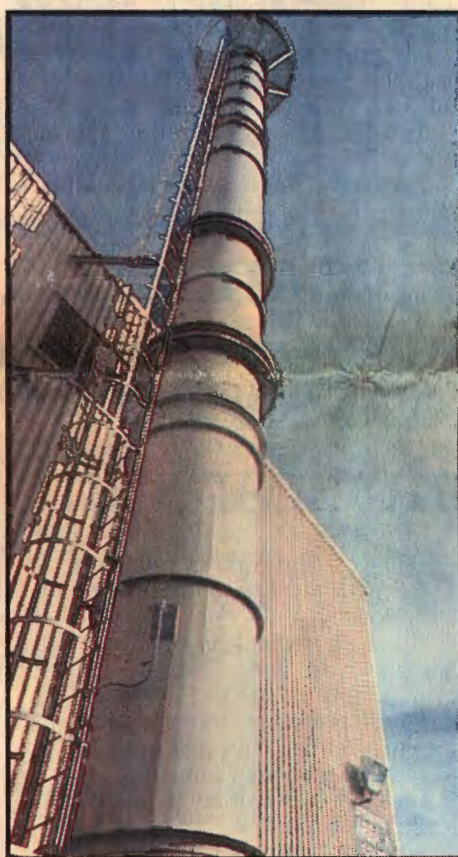
Each day Los Alamos National Laboratory releases radioactivity into the environment. Officials say the amounts are small, the risk of public health damage is slight and the risk is infinitesimal when compared to a person's overall chance of one in four of contracting cancer.

There is a risk, though, primarily from the laboratory's radioactive air emissions.

In 1988, the last year in which complete data are available, the maximum dose of radiation from air emissions for a resident of Los Alamos was calculated by LANL at 6.2 millirems based on air-monitoring results. A rem is a unit to measure radioactivity, and a millirem is 1/1,000th of a rem.

When a U.S. Environmental Protection Agency model was used to

Please see **AIR**, Page A-2



An air-emission stack at the Los Alamos particle accelerator where contaminants are released. Across the canyon, sensors record the county's highest radioactivity rate.

## Earth, air & water: Lab's pollutants touch all

Every year, Los Alamos National Laboratory emits hundreds of different air pollutants, dumps millions of gallons of contaminated water and buries enough solid waste to fill 20,000 refrigerators.

All three forms of the lab's waste — solid, liquid and gaseous — contain radioactive and hazardous materials.

Handling large amounts and varieties of waste under increasingly strict environmental regulations is an expensive proposition for lab officials, who expect to spend hundreds of millions of dollars in the next five years improving their

waste-management handling.

A few of the planned projects: \$120 million for new radioactive waste storage facilities, \$2 million to upgrade one waste incinerator and as much as \$12 million for a new one, and \$16.7 million for a new sewage treatment plant.

A look at the lab's wastes:

### Solid waste

Solid radioactive and hazardous waste — everything from a single piece of paper to a contaminated truck — is buried or stored in two

Please see **WASTE**, Page A-3

# Soviet plan sent to S

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President Bush, who returned Monday afternoon from a long weekend in Kennebunkport, Maine, convened a two-hour meeting of his national security advisers to discuss the Soviet plan but offered no immediate comment.

Presidential spokesman Marlin Fitzwater explained that the Soviets had asked U.S. officials to keep the substance of their proposal "confidential," and "thus we will not comment further on it."

But, he added, "our military campaign remains on schedule," referring to the air and ground assaults by the U.S. and its allies aimed at driving Iraq out of occupied Kuwait by force. "The war goes on."

In fact, the spokesman noted, the United States may not offer any public comment on the proposal, choosing instead to pass on its views to the Soviets privately.

"This doesn't require a response from us," Fitzwater said. "This is between the Soviets and the Iraqis."

The White House was not consulted in advance about the proposal, Fitzwater said earlier in the day. Details came in a cable from the Soviets, which was received later Monday at the State Department. However, it had not been translated from Russian into English in time for Bush and his advisers to examine it. The discussion at their meeting was based instead on an English summary of the proposal given to Secretary of State James A. Baker III by the Soviet embassy.

In Moscow, Gorbachev spokesman Vitaly Ignatenko declined to provide any specifics of the peace proposal but said it is "fully in line with the Soviet position that there should be an unconditional withdrawal from Kuwait."

Soviet Middle East envoy Yevgeny Primakov, who attended Monday's 3½-hour meeting, said later that he was "optimistic" peace could be achieved.

## Grapefruit juice body's drug

N.Y. Times News Service

Researchers spend long hours at the laboratory bench, trying to make balky instruments work and intricate experiments go according to plan.

But the scientific enterprise is not always so arduous.

Take the happy inquiry into highballs by Dr. David G. Bailey. His research, he reports in a recent issue of *The Lancet*, has led to the surprising conclusion that grapefruit juice helps the body absorb certain drugs into the blood. Orange juice, strangely enough, does not.

Bailey, a pharmacologist at the Victoria Hospital and University of Western Ontario in London, Ontario, has long been interested in the effect of alcohol on the drugs used to treat high blood pressure. Since the drugs are often taken over a lifetime, they are likely to mingle at some point with alcohol.

Reviewing earlier studies, he found

### THE SERIES

**Sunday:** Overview and security

**Monday:** Cleanup

**Today: Public safety**

✓ Each day Los Alamos National Laboratory releases radioactivity into the environment. Officials say the amounts are small and the public health risk is slight, but there is a risk, primarily from the laboratory's radioactive air emissions.

✓ Although public attention is focused on future radioactive shipments to the Waste Isolation Pilot Plant near Carlsbad, the laboratory already is moving some radioactive and hazardous materials in and out of Los Alamos.

**Wednesday:** Worker safety

**Thursday:** Hot spots

**Friday:** Oversight

### INSIDE





## Fouling the Nest

A New Mexican Special Report on Los Alamos National Laboratory

# AIR: Lab says it's keeping close tabs on what is released

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calculate the maximum dose, the result was higher, 9.1 millirems.

Environmental data from 1990 have not been released officially yet, but laboratory officials say the maximum dose, based on air-monitoring results, was 8.8 millirems.

To receive the maximum dose, an individual would have to live in the area of EG&G, which is in the path of the prevailing winds that blow over LANL's biggest radioactive air emissions source, the Los Alamos Meson Physics Facility (LAMPF).

According to estimates made by the National Research Council's Committee on the Biological Effects of Ionizing Radiations, 52 excess cancer deaths could be found in a population of 100,000 men exposed to 10 millirems each year over their lifetimes. For a population of 20,000, about the size of Los Alamos, about 10 excess cancer deaths could be expected.

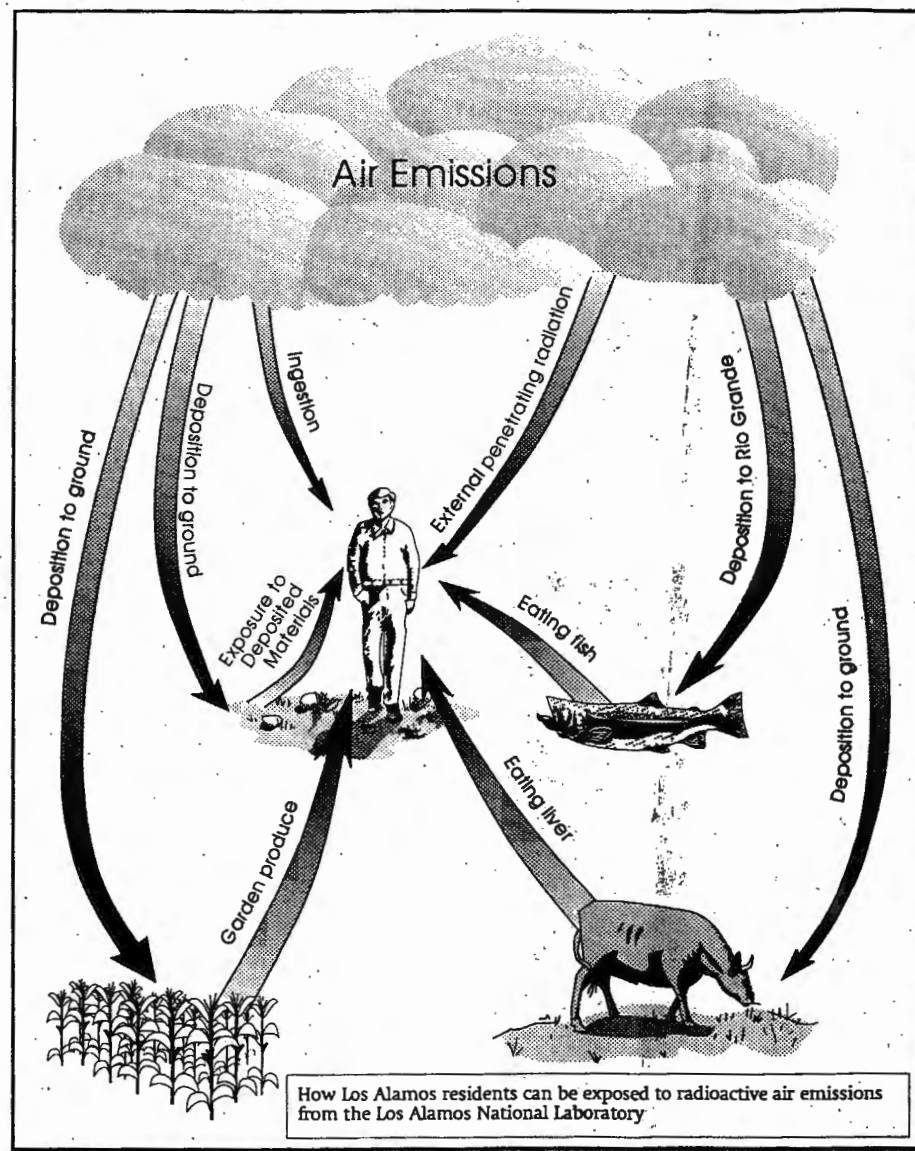
The estimates for a population of all women are slightly higher. The BEIR Committee cautions the estimates could be off by 50 percent or more.

Not everyone in Los Alamos is exposed to the maximum dose of radiation because all do not live downwind from the Meson Physics Facility, which is south and east of town. The prevailing winds in the area blow to the north and northeast, carrying most emissions away from town over sparsely populated areas toward Espanola. Many of the emissions also are dangerous only for a few minutes.

In 1988, according to LANL, the average dose of radiation from emissions for a resident of Los Alamos was slightly more than one-tenth of a millirem.

According to the estimates made by the BEIR Committee, fewer than one excess cancer death could be expected in a population of 20,000, or even 100,000, from that dose.

The doses of radiation received by Los Alamos residents from the air emissions aren't the only way in



which residents are exposed to radioactivity from the laboratory.

Particles in the radioactive air emissions also settle on the ground, contaminating produce in some gardens and feeding areas for some cattle. That contamination can be spread to humans who eat the produce or the livers of the cattle.

Radioactive air emissions that fall on the ground also are carried by rain water or snow runoff into the Rio Grande, a source of public

drinking water and fish for human consumption.

Some radioactive waste dumped by LANL in Púeblo and Los Alamos canyons also has made its way to the river. Walking in those canyons, some parts of which are open to the public, is another way for residents of Los Alamos to come in contact with radioactivity from the laboratory.

LANL officials say the laboratory's environmental-monitoring data show

none of the additional pathways for radioactivity to reach humans poses a health risk.

"Based on careful measurements we have made for many years, I believe public health is in no way threatened by releases resulting from laboratory operations," said James Jackson, deputy director of LANL. "These measurements show that any exposure to the public is well within established limits."

Only one health study of Los Alamos County residents has been made since the construction of the laboratory during World War II. The study was of all white men, whether they worked at the plant or just lived in the county.

The study examined cancer mortality between 1950 and 1969 and the incidence of cancer between 1969 and 1974.

The study found a possible excess of deaths due to leukemia and related disorders. The possible excess deaths could have been due to a variety of hazards, including chemical and radiological exposure, the study said.

The study also found an excess number of rectum and colon cancers from 1969 to 1974, but said the excess appeared to be better explained by socioeconomic factors rather than by laboratory operations.

Some radioactive substances, such as plutonium, can be dangerous if inhaled or otherwise ingested. Plutonium particles are emitted by the laboratory in small amounts.

From 1959 to 1963 and 1967 to 1977, the tissues and bones of some dead Los Alamos residents who didn't work at the laboratory were tested for plutonium as part of a nationwide program of tissue and bone analysis for plutonium. All people are exposed to plutonium from the fallout of nuclear weapons testing.

The data show the Los Alamos residents generally had higher concentrations of plutonium in their lungs than did the residents of other study populations around the country.

The study also showed Los Alamos

residents had unusually high amounts of plutonium in their livers and bone structures — the other two main deposition areas for plutonium.

Although Los Alamos residents generally ranked high in plutonium deposition, the amounts of the radioactive element in their bodies were well below established health standards.

Some environmentalists have been critical of the laboratory's environmental-monitoring program because the program is run by the laboratory, not an independent group.

They say the setup is akin to having the fox guard the chicken coop and having the fox release the data on the number of chickens living in the coop.

Jackson rejected the criticism.

"First, let me emphasize that the environmental-surveillance program is conducted independently within the laboratory — that is, the organization being monitored does not conduct surveillance," he said.

The Department of Energy owns Los Alamos National Laboratory and has found faults with the environmental-surveillance program.

A 1988 Energy Department report said 14 of the laboratory's 20 monitors for sampling air quality were so close to buildings that the air flow around the buildings influenced the flow of air to the monitors.

The report said many of the monitors were under roof overhangs or eaves. Also, some monitors were on the downwind side of buildings and, thus, sheltered from the natural air flow in the areas.

The laboratory's written response to the report said 11 monitors were moved. It said the others were not moved for security reasons or because they were near buildings short enough so that sampling results would not be significantly affected.

"It is the opinion of the meteorologist and health physicist (assigned to the project) that all stations are now located so that monitoring results will not be significantly affected by nearby structures," LANL wrote the Department of Energy.

## Long before WIPP, radioactive material has rolled through town

The scenario goes something like this: Trucks travel daily from Los

1975 and December 1987, according to a group called the Radioactive Waste Cleanup National materi-

fuel, nuclear weapons parts or special nuclear materials are made in specially designed containers de-



The scenario goes something like this: Trucks travel daily from Los Alamos through or around Santa Fe delivering radioactive and hazardous waste to the Waste Isolation Pilot Plant near Carlsbad.

But, to borrow from Scrooge's experience, that is the ghost of danger yet to come.

In the past and present, other shipments of radioactive and hazardous materials have moved in and out of LANL, posing a possible threat to the health and safety of the public along the routes.

Laboratory officials downplay the danger, but there have been a few accidents. And government investigators have found some safety problems with the shipping program.

The shipments in and out of Los Alamos include highly radioactive spent nuclear fuel, nuclear weapons components and special nuclear materials, including plutonium-contaminated scrap and plutonium metal for weapons fabrication.

The number of shipments of weapons parts and special nuclear materials moving in and out of the laboratory is classified, but there are clues that the number has declined in the past year.

Los Alamos officials say that since the shutdown of the Rocky Flats nuclear weapons plant near Denver in December 1989, the laboratory has stopped shipping plutonium metal there for weapons fabrication.

And with no metal moving off-site, there also might have been a cut in shipments of plutonium-contaminated scrap sent to LANL for recycling.

Shipments of nuclear weapons parts and special nuclear materials are made in "safe secure trailers" operated by the U.S. Department of Energy, which owns Los Alamos. The trailers are pulled by truck tractors and are escorted by other Energy Department vehicles.

The routes used by the trucks are classified for security reasons, but two routes have been identified by the group Nukewatch, which twice a year tracks the trucks.

The group says the trucks have been spotted traveling from Texas to Clines Corners to Santa Fe to Los Alamos and from Los Alamos to Espanola to Chama to Colorado.

Suspected other routes are Los Alamos to Santa Fe to Albuquerque to Arizona; Los Alamos to Taos to Colorado; and Los Alamos to Santa Fe to Las Vegas, N.M., to Colorado.

In 1989 and 1990, Los Alamos made at least seven shipments of spent reactor nuclear fuel to the Department of Energy's Hanford plant near Richland, Wash. Each shipment included several pounds of plutonium and uranium, according to notices filed by the lab with the state.

The notices say the shipments traveled along State Road 502 to U.S. 84-285 through Santa Fe to Interstate

## How to spot those convoys likely carrying nuclear stuff

Nuclear weapons components and special nuclear materials, such as plutonium, are transported by the U.S. Department of Energy in "safe secure trailers" pulled by truck tractors.

The tractor-trailers are not marked in any way and look like many other trucks on the road, but there are those who believe they can be identified.

The trailers have unpainted steel sides and U.S. government license plates starting with the letter E, according to a private, anti-nuclear group called Nukewatch.

The long-nose tractors that pull the trailers often are decorated with stripes, the group says. The patterns of stripes vary from parallel straight lines to lines that zig-zag across each other.

The tractors have an elaborate antenna system on their roofs. The antennas look much like white luggage racks. The letters AM are sometimes on the front of the tractors.

But possibly the easiest way to identify the tractor-trailers is to identify their escort vehicles.

Like the tractor-trailers, the escort vehicles also are unmarked and have U.S. government plates.

The escort vehicles are Chevrolet Suburbans or Ford Econoline vans, Nukewatch says, although the use of Suburbans apparently is being phased out.

Each of the escort vehicles is fitted with a large whip antenna on its left rear.

The Department of Energy also has used an Olds Cutlass, Beechcraft travel home and a 40-passenger bus as escort vehicles, according to another anti-nuclear group, Radioactive Waste Campaign.

Each tractor-trailer will have at least one escort, says the Radioactive Waste Campaign. Convoys, however, can include more trucks and escorts.

For security and safety reasons, the convoys are in constant communication via satellite with a command center at the Department of Energy's Albuquerque office, the group says. The office is responsible for the shipping program.

Drivers and guards receive weapons training, and the tractors are armor-plated with each door weighing 210 pounds, the Radioactive Waste Campaign says.

The tractors are operated by three drivers, the group says. At any given time, one is behind the wheel, another is sleeping and the third is serving as guard, more commonly known as riding shotgun.

In its fleet, the Department of Energy has 45 safe secure trailers, 51 tractors and 100 escort vehicles, an Energy Department spokesman says.

at the lab.

In one of the most serious accidents involving a Los Alamos shipment, a safe secure trailer carrying plutonium to the lab overturned in December 1980 on Interstate 25 in Colorado. None of the plutonium was released into the environment, it was said.

Ben McCarty is a spokesman for the Department of Energy's Albuquerque office, which oversees all shipments in the nation of nuclear weapons parts and special nuclear materials.

"We have never had any of the cargo come loose in the trailer ... or any release of radioactivity from the trailer," McCarty says.

He says there have been no major accidents and 17 minor accidents involving the shipments since 1982. Information on the originations and destinations of the trucks involved in the accidents was not provided.

Department of Energy records show 173 accidents involving safe secure trailers between the fall of

1975 and December 1987, according to a group called the Radioactive Waste Campaign. No nuclear materials were released into the environment, the group says.

The three states with motor pools for the safe secure trailer program — New Mexico, Texas and Tennessee — had the most accidents, the group says. Most of the accidents were mishaps in parking lots.

The accident/incident rate for the trailers was four accidents per million miles traveled, slightly below the rate for all heavy trucks in the United States of 4.5 accidents per million miles.

The cleanup costs associated with a severe accident involving a safe secure trailer have been estimated by government officials to be as high as \$1.2 billion. However, the probability of such an accident has been estimated to be no greater than once in 300 million years.

In a search of New Mexico State Police records for the last several years, no serious accidents involving trucks traveling to or from LANL could be identified, but there was a minor accident of note apparently involving the lab.

In October 1986, a large container marked "radioactive" fell from the back of a truck traveling on U.S. 285 between Ojo Caliente and Espanola, according to state police records.

A commercial delivery van driver saw the container fall and stopped the truck. The truck driver, however, refused to go back for the cargo. The container, which was found not to be dangerous, was claimed the following day by a representative of LANL.

King, the packaging and transportation chief at the lab, says he was unaware of the incident and could not find records.

Records from the Federal Aviation Administration show no major accidents at Los Alamos Airport or accidents involving Ross Aviation in recent years.

Dick Blondefield, manager of flight standards for the FAA's district office in Albuquerque, says Ross Aviation comes under greater safety scrutiny than other airlines because it is a carrier for the Department of Energy.

"Ross Aviation on inspection comes up cleaner than a whistle," Blondefield says.

King says there is no reason for great public concern about the radioactive and hazardous shipments moving in and out of Los Alamos National Laboratory.

"What they have to really concern themselves with is the typical hazards," such as a truck hauling gasoline, he says.

Shipments of hazardous materials are packaged at Los Alamos according to the danger they pose. For example, shipments of spent nuclear

fuel, nuclear weapons parts or special nuclear materials are made in specially designed containers designed to withstand a major accident.

In 1988, Department of Energy investigators audited LANL's packaging and transportation program.

The appraisal found no maintenance program for some heavily used containers; old markings and labels on some containers; lack of testing of one container to certify safety; and the use of trash bins to transport low-level radioactive waste on-site.

The audit said off-site shipments of radioactive material were satisfactory but that off-site shipments of weapons components needed further attention. It did not specify what improvement was needed.

The appraisal found container maintenance, particularly maintenance for containers for weapons components, needed further review. Again, the report was not specific.

The appraisal did cite some improvements in the packaging and transportation program, including implementation of a plan to assure the quality of shipping containers for radioactive material and internal audits of the program.

The U.S. Department of Transportation and the Nuclear Regulatory Commission are the regulating agencies for Type B packages, those containers used to transport nuclear weapons components.

The Department of Transportation, however, has given the Department of Energy the authority to certify the safety of its own Type B packages, but the packages must meet standards set by the Nuclear Regulatory Commission.

Congress' General Accounting Office in 1988 released a report critical of the Department of Energy's certification program for containers for nuclear weapons parts. The certification program is run by the department's Albuquerque office.

The report said:

"We found, for example, that some nuclear weapons packages were uncertified [for safety], while others had incomplete documentation or had been used for extended periods on the basis of a temporary certificate.

"Officials at Albuquerque said they regard most of the problems we identified as matters of documentation rather than matters of safety. We believe that the problems could be more significant than that, and we do not think Albuquerque is aggressively ensuring that the problems are not safety related."

McCarty, the spokesman for the Department of Energy's Albuquerque office, says improvements have been made in the packaging program, including certifications of package safety.





## Fouling the Nest

A New Mexican Special Report on Los Alamos National Laboratory

# WASTE: In air & water

Continued from Page A-1

main areas, both along Pajarito Road. Area G contains radioactive wastes and Area L holds the toxic chemical wastes. Both handle mixed wastes, a combination of radioactive and toxic substances.

In the early days of laboratory operations, handling solid waste was easy: You dug a pit, tossed in the trash and covered it up. Today, though, waste is segregated into different categories, each of which is treated differently.

■ The majority of low-level radioactive waste, the most common type of waste at LANL, goes into pits. The laboratory is working on Pit No. 37, which is 61 feet deep, 83 feet wide and 731 feet (2½ football fields) long. It will hold the equivalent of 50,000 or more 55-gallon drums full of waste and take two years to fill.

■ Low-level waste that is highly radioactive goes into 65-foot-deep shafts with diameters of 1 to 6 feet. The shafts provide more immediate shielding than pits. About 148 such shafts have been used.

■ Toxic chemical waste and mixed waste is stored until it can be shipped to an out-of-state treatment facility. Eventually, the laboratory plans to burn such waste on site.

■ Transuranic waste, which consists of plutonium and other long-lived radioactive waste, is being stored while the lab waits for the Waste Isolation Pilot Plant, a planned underground dump, to open near Carlsbad.

The lab is storing about 1,200 55-gallon drums and 50 boxes of transuranic waste that has been certified as appropriate for WIPP. Another 22,000 drums of uncertified transuranic waste will have to be re-opened and examined in special facilities before it can be sent to WIPP. Some transuranic waste also could be incinerated in the future.

In 1989, the last year for which figures are available, the laboratory produced 139 cubic meters of transuranic waste, 292 cubic meters of mixed waste, 2,797 cubic meters of toxic chemical waste, 356 cubic meters of other non-radioactive waste such as asbestos, 794 cubic meters of cancer-causing polychlorinated biphenyls (or PCBs) and 6,369 cubic meters of low-level radioactive

Ken Hargis, group leader of lab environmental protection, said there have been repeat violations because of the sheer numbers of people involved in generating the waste.

"We've trained nearly 4,000 people in the past year and it may be 5,000 before we're done," he said.

### Air emissions

While handling solid waste may create the greatest amount of work for the laboratory, air pollution is the main source of radioactive exposure for Los Alamos-area residents.

The Los Alamos Meson Physics Facility (LAMPF) accounts for 95 percent of the public's exposure to radioactivity. In 1990 the maximum dose to the public because of operations at LANL was 8.8 millirems, comfortably under the Environmental Protection Agency's limit of 10 millirems for air exposure and 100 millirems for all means of exposure.

A rem is a widely used unit to measure radioactive exposure. A millirem is 1/1,000th of a rem. The lab tolerates an exposure of five rems per person per year.

The laboratory plans a \$3 million to \$4 million upgrade of the Meson Physics Facility's air filter in order to decrease radioactive emissions. The upgrade is needed because the facility is being forced to shorten its hours to comply with the 10 millirem limit, said Tom Gunderson, deputy division director.

Background radiation from natural sources, such as the sun and radon gas, in northern New Mexico is about 336 millirems, but that background level can fluctuate from 10 to 30 millirems per year, he said.

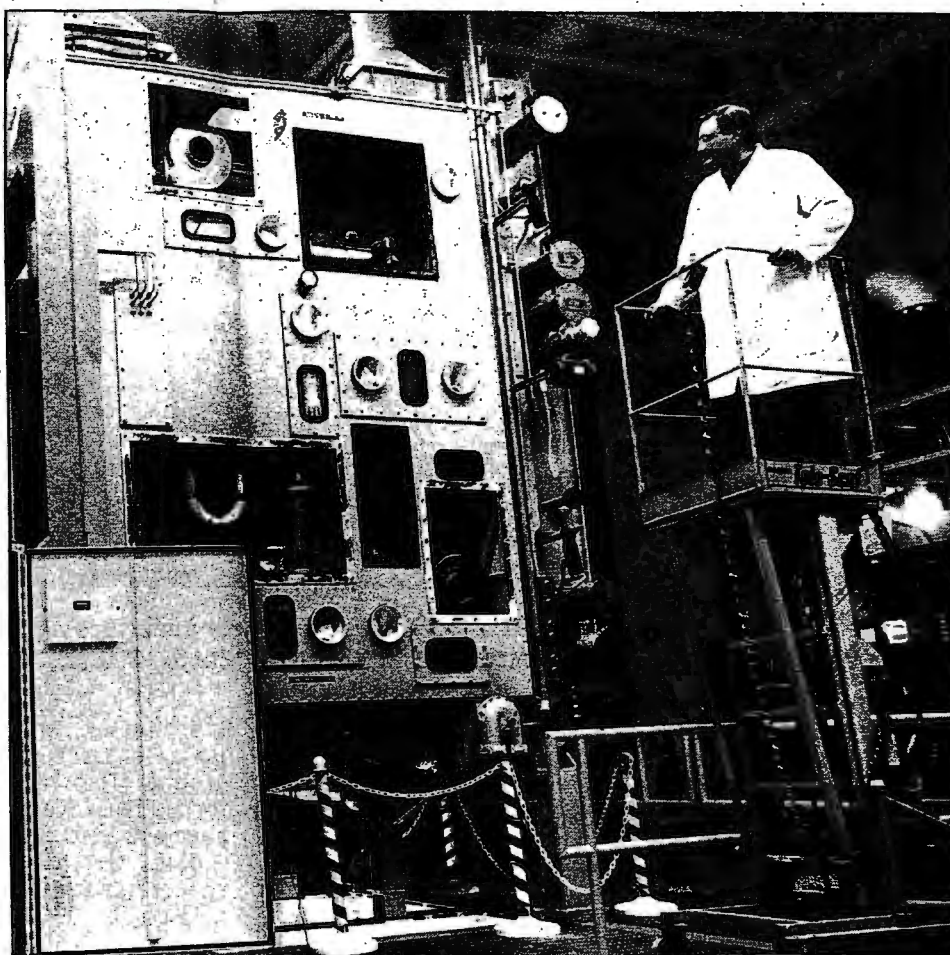
**'We've trained nearly 4,000 people in the past year and it may be 5,000 before we're done'**

**Ken Hargis**  
Lab scientist



The Meson Physics Facility is not the only source of air pollution at LANL.

Radioactive releases are monitored



Officials are seeking permits for the Air-Controlled Incinerator that will burn contaminated waste.

facilities. Existing polluters such as LANL were "grandfathered in" and don't have to comply, Williams said.

New federal clean-air amendments that will regulate 189 chemicals also were passed last year, but the regulations covering those chemicals have not yet been written and it is unclear whether they will cover Los Alamos, EPA officials said.

Waste incinerators are another potential source of air pollution that has been controversial.

Incineration makes some danger-

canyons every day. Radioactive and other industrial waste is treated to remove most of the contamination.

The waste enters the canyons at 138 different spots. There are 126 outfalls for chemically contaminated and radioactive wastes and 12 for sanitary effluent.

That means the laboratory has more outfalls than any other facility in the area and possibly more than anyone else in the country, said Mike Saladen of the state Environmental Improvement Division.

The EPA regulates all of these discharges, with the state's help, through a National Pollutant Discharge Elimination System permit which sets limits on the amount of waste that can be discharged.

The laboratory, however, was cited for numerous violations of its permit virtually every year throughout the 1980s.

LANL currently is operating under a compliance agreement with EPA because of the lab's inability to meet the limits of its permit and the Clean Water Act.

# Scientists find fault with lab's quake stand

Scientists at Los Alamos National Laboratory say the facility might be seriously underestimating the dangers it faces from earthquakes.

Earthquake activity in the area has been low in recent years, but Los Alamos is part of an active fault system that has experienced moderate earthquakes in the past hundred years and large ones in the past few thousand years — a relatively short time in geologic terms.

Laboratory engineers rely on 1972 and 1984 studies to help them design laboratory buildings to withstand the largest earthquake — and the attendant danger of radiation releases — that Los Alamos could reasonably be expected to receive.

More studies by Los Alamos scientists in 1987 and 1988 say the earlier studies being used at LANL could be flawed and the earthquake danger could be as much as 100 times greater than previously believed.

While LANL's engineers are skeptical, they take the possibility seriously enough that a major study is planned later this year to re-evaluate the lab's earthquake risk.

Adding to the usual earthquake concerns are the "significant and unique hazards" a quake poses to facilities that routinely handle hazardous materials, according to a report by Lawrence Livermore National Laboratory.

After a 1980 earthquake at Lawrence Livermore, for example, "hazardous materials locally escaped the integrity of their containment systems," a 1988 LANL report said. Lawrence Livermore is a national scientific lab similar to LANL.

Los Alamos handles significant amounts of hazardous materials, including plutonium, at several sites.

An area's earthquake hazard usually is determined by estimating the largest earthquake it is likely to receive in a 100-year period.

Based on the results from seismic instruments in place in Los Alamos since 1974, the 100-year earthquake would be expected to have a relative-



waste, for a total of 10,730 cubic meters. A cubic meter is roughly equal to two cubic-foot refrigerators.

A laboratory report shows the radioactive waste contained 9,234 pounds of uranium and 56.5 pounds of plutonium. The total radioactivity was 74,419 curies. By comparison, a cancer patient's radiation would be measured in microcuries, or 1/1,000th of a curie.

Toxic chemical wastes are managed and disposed of under a permit from the state, which conducts an annual inspection.

In six of the past seven years, the state has issued a notice to the laboratory that the permit was violated. Most of the violations were corrected quickly, but the laboratory paid \$30,000 last year for failure to address promptly the 1984 and 1987 violations.

Despite the continued violations, the laboratory has made important strides in recent years to improve waste-handling operations, said Boyd Hamilton of the state Environmental Improvement Division.

"Because of their mode of operation, I would not consider it unusual to be cited on an annual basis," he said.

The lab's most frequent repeat violation has been mislabeled or unlabeled containers of waste, Hamilton said. Improperly labeled waste could lead to incorrect disposal practices or mixture of incompatible materials, causing a chemical reaction, he said.

at 87 different release points at Los Alamos, according to the laboratory's 1988 environmental report.

And another lab document lists 161 air stacks where non-radioactive chemicals are released.

More and more these days, chemical emissions are considered more important than radioactive ones, Hargis said. The laboratory has been estimating its air emissions each year, but it now plans to do a study to measure the amount of air pollution Los Alamos-area residents are breathing, he said.

The list of laboratory air emissions in 1989 contained 97 different chemicals, ranging from such common items as kerosene and gasoline to such exotic-sounding things as 2-butoxyethanol and dichlorofluoromethane.

The total output of those chemicals was about 66,000 pounds, or 33 tons. That might seem like a lot, but emissions by large polluters such as power plants usually are measured in the hundreds of tons, said Cecilia Williams, chief of the state Environmental Improvement Division's Air Quality Bureau.

Only two of those emissions, besides radioactivity, are regulated by the state and EPA: beryllium and asbestos. State inspections relating to beryllium and asbestos have not resulted in any citations in recent years.

New clean-air regulations that took effect last year give the state authority over 600 additional chemicals, including most of the ones produced by Los Alamos, but only for new

ous chemicals safe by breaking their compounds. It does not affect levels of radioactivity, but it does reduce the waste volume by 99 percent and concentrate the radioactivity in a more stable, insoluble form that is less likely to reach groundwater after it's buried.

The lab's Controlled-Air Incinerator, which was built in 1973 and began test burns in 1979, has been closed for the past three years during a \$2 million upgrade that will improve it from a test incinerator to a fully operational one.

The incinerator, which could begin operation by late summer, will be used for radioactive, toxic chemical and mixed wastes.

LANL has obtained a state permit to burn hazardous wastes, although the laboratory has taken the state to court over the permit's requirements, and the lab is in the process of obtaining a mixed-waste permit.

Although a new state law will require future incinerators to obtain a permit to burn radioactive waste, the Controlled-Air Incinerator is exempt because it pre-dates that law.

Laboratory officials say the incinerator will not expose any member of the public to more than 0.001 milirem, a tiny fraction of federal standards. Critics have questioned whether LANL's monitoring of emissions will be sufficient.

## Water emissions

About 250,000 to 300,000 gallons of so-called sanitary effluent and a similar amount of industrial waste are released by LANL into nearby

water.

The agreement gives the laboratory until July 1992 to come into compliance, and the EPA has threatened fines of as much as \$25,000 if the lab fails to meet the deadline.

LANL plans to begin work this year on a \$16.7 million sewer plant that will address the current violations, which relate to treated sewage discharged to canyons at four locations in the Los Alamos area.

Lab officials say another agreement probably will be necessary. They anticipate new compliance problems because they expect stricter regulations to be imposed when their permit is reissued this year.

According to laboratory figures, it committed 190 violations of its permit in the four years from 1985 to 1988, 93 violations of industrial waste limits and 97 of sanitary limits. Hundreds more violations occurred in the early 1980s.

Until about a year ago, the Environmental Protection Agency's only option when dealing with LANL violations was to implement a compliance agreement giving the lab time to address the problem, said Bob Hiller, an EPA environmental engineer. It was not possible to fine a federal agency such as the Department of Energy, which owns LANL, he said.

The permit recently was changed, however, to make the University of California, the contractor that operates LANL, part of the waste-discharge permit along with the Energy Department. The university does not share the department's exemption from fines.

The result was the EPA's first-ever fine against LANL, a \$12,500 levy because of a May 1990 acid spill.

The incident, which occurred at an electric power plant, spilled 1,000 to 1,400 gallons of concentrated sulfuric acid in three separate spills over two days.

The acid flowed for several miles but never came near the Rio Grande and apparently caused no long-term damage to area plant and animal life.

Tom Buehl, a LANL section leader, said that in addition to the fine, the laboratory has spent \$80,000 to \$100,000 on the cleanup and initial remedies and plans another \$100,000 for a long-term solution.

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ly moderate magnitude of 4.5 to 5 on the Richter scale, according to early studies.

A 1987 report by Los Alamos scientists Jamie Gardner and Leigh House, however, said new studies have shown that "is most likely a substantial underestimate."

And a 1988 report by House and Daniel Cash stated that such an estimate would be low by one or two magnitude units. Because the Richter scale is logarithmic, an increase of one or two magnitude units would mean an earthquake 10 to 100 times larger.

An increase of one to two units would mean Los Alamos' 100-year earthquake would have a magnitude between 5.5 and 7, not the 4.5 to 5 previously believed to be likely. The earthquake that shocked San Francisco during the World Series in the fall of 1989 was about a 7 on the Richter scale.

Several earthquakes with readings as high as 6 have been recorded in New Mexico in the past century, in Cerrillos in 1918 and in Socorro in 1906 and 1907. All earthquakes occurred on the Rio Grande rift, the same fault zone that affects Los Alamos.

Judging from even larger earthquakes that occurred thousands of years ago, Gardner and House conclude that "current best estimates of expectable earthquake magnitude are from 6.5 to 7.8." The earthquake that destroyed San Francisco in 1906 had a magnitude of 8.

Although more research is needed to determine how often a quake that size can be expected in Los Alamos, "the fault system is capable of an earthquake that will cause damage to the laboratory," Gardner and Cash wrote.

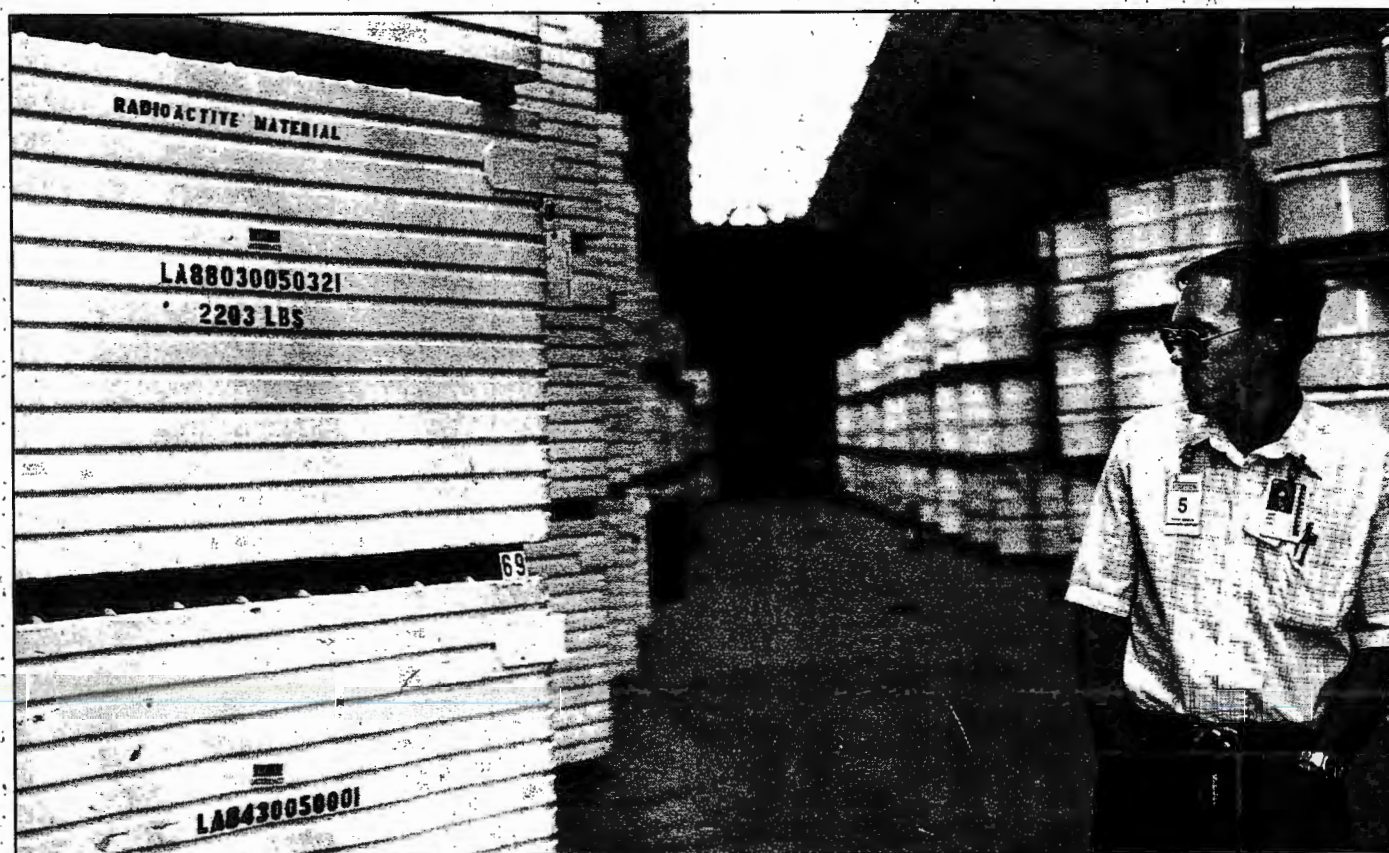
Dean Keller, a LANL engineer, said he estimates the 100-year earthquake would have a magnitude no larger than 6. The suggestion by Los Alamos scientists that the figure could be higher is "an untested concept."

House said in a recent interview the questions raised by the 1987 and 1988 studies are valid.

House wouldn't comment specifically on why LANL's engineering staff is skeptical of his studies but: "In general, scientists and engineers, particularly in geosciences, might have quite different approaches," he said.

Because of unanswered questions, House said, the laboratory can't be sure the design standards it's using are adequate to protect its buildings from the earthquakes they likely will face.

One laboratory hydrogeologist said that even a modern nuclear reactor would not be built in Los Alamos today because of the earthquake hazards.



Laboratory employee John Harper in a storage area of boxes that eventually could be sent to WIPP.