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Fouling the Nest

A New Mexican Special Report on Los Alamos National Laboratory

The \$2 billion mess at LANL

Daunting task to clean up 48 years of neglect, accidents just beginning

WHAT'S COMING

Today: Overview and security

✓ Los Alamos National Laboratory officials deny the laboratory will take over plutonium processing from the closed Rocky Flats weapons plant, but the lab already has been doing similar work.

✓ The laboratory's security force is undertrained, underpaid and overworked; the scientists don't take security seriously; and laboratory management fails to supply the necessary money and support, critics say.

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✓ A security guard says financial concerns caused the laboratory to cancel some steps that would have strengthened security after Saddam Hussein invaded Kuwait in August.

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Monday: Cleanup

✓ Take a hike in a Los Alamos-area canyon and you're likely to cross a burial site for radioactive or hazardous waste. More than 1,800 sites — including some in downtown Los Alamos — must be inspected as part of a \$2 billion cleanup program.

Tuesday: 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.

Wednesday: Worker safety

✓ Los Alamos laboratory doesn't do enough to protect its workers from exposure to radiation, critics say. Laboratory officials disagree and point to daily monitoring of employees.

Thursday: Hot spots

✓ The laboratory's Omega West nuclear research reactor was criticized by a Department of Energy inspection team, which found dozens of safety problems. A laboratory official said the inspectors were nitpickers.

Friday: Oversight

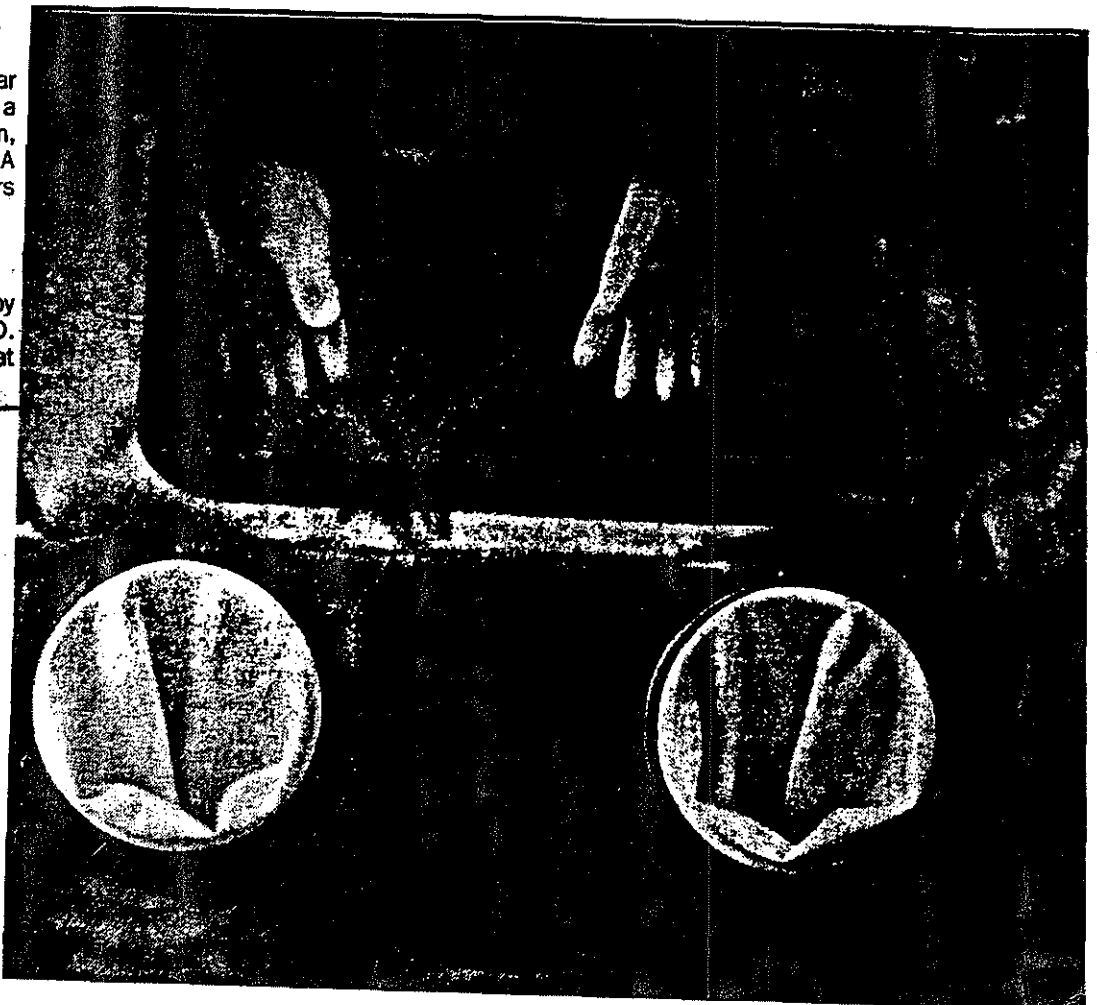
✓ The new culture of openness touted by Energy Department Secretary James D. Watkins has been slow in developing at the laboratory, critics say.



Closed area: Technical Area 55, surrounded by double rows of fencing and concertina wire, is bathed in light and patrolled by armed guards.

LAB: Just to study how to clean sites could take years

Gloveboxes, right, where workers insert their hands into gloves attached to shielded boxes to do various tasks, are often the only barrier between humans and extremely hazardous materials such as plutonium and uranium. The boxes receive heavy use at Los Alamos National Laboratory, which eventually must dispose of them.



LOS ALAMOS — Los Alamos National Laboratory has two monuments — one a tribute to its successes, the other a symbol of its failures.

The former, overlooking Ashley Pond in downtown Los Alamos, is a large gravestone-looking monument that proudly and publicly celebrates the laboratory's many scientific accomplishments, including development of the world's first atomic bomb.

The latter, strikingly less public, is a cluster of brass markers set among large ponderosa trees deep in Bayo Canyon just east of town at a former laboratory site contaminated with radioactive and chemical wastes. Each reads:

"Buried Radioactive Material. No Excavation prior to 2142 A.D."

The forested spot is only one of at least 1,857 sites that Los Alamos National Laboratory must investigate — and, possibly, clean up — as part of an environmental-restoration program expected to cost \$2 billion and take decades to complete.

Fact: The lab's work over the past 48 years has radioactively polluted everything from the town's main street, Trinity Drive, to the state's main river, the Rio Grande, and beyond.

Argument: Is there an immediate health threat? No, says the lab. Yes, say some environmentalists, among others.

Question: If it's not dangerous, why spend \$2 billion to clean up the fouled nest in and around Los Alamos and \$200 billion nationally on other weapons facilities?

The nearly 2,000 polluted sites are one legacy of the laboratory's five decades of work with a potpourri of the most dangerous radioactive and chemical substances known to humankind.

The often unwitting heirs to that legacy are the laboratory work force

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and the public, both of which have been and still are exposed to those substances.

For three months, *The New Mexican* has been investigating the impact of Los Alamos National Laboratory on the environment and the health and safety of those laboratory employees and the public.

Thousands of documents were examined, more than a hundred interviews were conducted and some consultants were retained by the newspaper. For six days beginning today, the results of that investigation will be detailed in more than 30 stories.

The highlights of those stories:

■ The list of sites to be evaluated for contamination by the laboratory includes most of the major canyons and mesa tops in the area, the golf course and ballfields, the airport, the main street through town, and 16 major dumps.

One of the largest concentrations of radioactive waste at LANL consists of about 385 pounds of uranium and 88 pounds of plutonium that are in shafts once used for test explosions. A typical nuclear bomb requires only nine pounds of plutonium, according to one national defense organization.

To put those amounts into perspective: An environmental activist says a speck of plutonium 1/1,000 the size of a grain of salt, if inhaled, would create a 50 percent chance of cancer.

The laboratory also apparently has buried highly radioactive spent fuel from nuclear reactors.

There is no evidence that any radioactivity from any source has reached ground-water supplies, although small amounts have been washed into the Rio Grande by rain and snow runoff.

■ The cleanup of the laboratory is a dangerous business for workers, and the U.S. Department of Energy, owner of LANL, has been accused repeatedly of not paying enough attention to employee safety in cleanup programs.

Worse, a congressional study released last week said the Energy Department has not assessed realistically the magnitude and cost of the cleanup at the nation's nuclear weapons labs and, in the words of one federal official, the agency "has neither the capability or credibility" for the task.

LANL says it is developing technology to aid in the cleanup and aggressively is reducing one environmental threat — electrical equipment-containing cancer-causing polychlorinated biphenyls, better known as PCBs.

■ Each day the residents of Los Alamos come into contact with radioactivity released into the environment by the laboratory.

Most of the exposure is direct from air emissions, but contamination also can come from eating garden produce or by just taking a hike in one of the area's many canyons.

LANL's experts say their own environmental-surveillance data show the threat to public health is slight or nonexistent.

But...

One study found a possible excess of deaths in the community from leukemia and other disorders, and a second study found Los Alamos residents generally had more plutonium in their bodies than people living in other parts of the country.

■ LANL each year emits hundreds of different air pollutants, dumps millions of gallons of contaminated

LANL each year emits hundreds of different air pollutants ... and buries enough solid waste to fill 20,000 refrigerators.

water and buries enough solid waste to fill 20,000 refrigerators.

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 categories, each of which is treated differently.

■ LANL scientists say the facility might be seriously underestimating the dangers it faces from earthquakes.

Los Alamos is part of an active fault system, and some scientists say it could be rocked by an earthquake nearly as powerful as the 1906 temblor that caused massive destruction to San Francisco.

So what? So this: A large earthquake in Los Alamos could lead to the release of significant amounts of

radioactivity.

■ Hundreds of radioactive and otherwise hazardous truck and air shipments move in and out of LANL each year, posing a threat to the public along the routes.

The shipments include nuclear weapons parts trucked in top-secret, unmarked tractor-trailers and spent fuel from the laboratory's research reactor.

There have been accidents, including the overturning in Colorado of a tractor-trailer carrying plutonium to LANL.

Also, federal investigators have found faults in the packaging and transportation program at the laboratory and in the Department of Energy's hauling program for the nuclear materials.

LANL and the Energy Department say they have moved to correct the problems.

■ In addition to the routine threat of radiation exposure, some LANL workers have been contaminated on the skin by radioactive materials and been contaminated internally by inhaling or otherwise ingesting particles.

Federal investigators repeatedly have criticized the laboratory for inadequate radiation-protection programs, and some workers say they have been subjected to retaliation when they raised safety concerns.

Deaths caused by radiation exposure are hard to identify because of the normal occurrence of cancer in workers. but such deaths are occur-

Medical researchers at LANL last year found what is believed to be the first identified death of a laboratory worker caused by radiation exposure decades ago.

Also, the bone cancer death last year of a man who was a military worker at the laboratory during World War II has been linked to his exposure to plutonium at the facility.

■ In the early 1980s, one worker at the Chemistry and Metallurgy Research Building (CMR) spread radioactive contamination outside the laboratory complex, and a second worker injected a plutonium solution into his locker in a dispute with other employees.

The incidents were possible because workers are given the responsibility of monitoring themselves for radiation when leaving their laboratories; no one checks to make certain that they do. Several years later, that self-monitoring program still is in place.

Laboratory officials say they see no need for health workers to supervise the monitoring of employees in the CMR Building.

The building is the largest at LANL and one of its oldest. About \$10 million is budgeted this year to upgrade the structure. Numerous safety concerns related to its age have been raised.

■ Some workers say they have developed supersensitivity to some chemicals, such as perfume and car exhaust, because of their exposure to chemicals at the laboratory.

LANL — like the medical establishment as a whole — doesn't recognize the diagnosis of multiple chemical sensitivities, saying the workers' physical problems are caused by psychological troubles.

■ The Department of Energy in the past year has given up much control of its worker health studies and the data collected on their exposure to radiation.

The complete department control over the studies and data had been compared to having the tobacco

Some studies of LANL employees and other nuclear weapons workers have found excess cancers, possibly caused by radiation exposure.

industry in charge of lung cancer research.

The release of the data on the exposure of nuclear weapons workers could help end the debate over whether low doses of radiation can cause cancer and other health problems.

Some studies of LANL employees and other nuclear weapons workers have found excess cancers, possibly caused by radiation exposure, but those studies are considered inconclusive.

■ LANL for years, and possibly decades, gave free cigarettes to plutonium workers.

The practice ended in about 1987, more than 20 years after the first surgeon general's report on the dangers of smoking and more than 40 years after scientists first became

concerned that plutonium could cause lung cancer in weapons workers.

LANL officials said they were unaware of any study showing cigarette smokers were at an increased risk for lung cancer because of work with plutonium, but there has been at least one study reported that effect.

■ A Department of Energy team of inspectors found dozens of safety problems with LANL's Omega West nuclear research reactor.

The inspectors said there was no immediate health threat but the potential for an accident was increasing. A laboratory official downplayed the criticism, saying the inspectors were nitpickers.

■ The Los Alamos Critical Experiments Facility was closed in November 1989 because of safety questions and has not been reopened.

The facility is the only place in the country where vital experiments and training can take place on how to avoid a criticality accident with nuclear materials. In a criticality accident, a nuclear chain reaction is triggered and large amounts of radiation released.

■ Only in recent years has the laboratory become subject to some environmental laws. Still, it is exempt from other environmental laws and occupational safety agency rules because the presumed need for secrecy permits LANL and its owner, the Energy Department, to be their own health cops.

The state Environmental Improvement Division is the main enforcer, but its power doesn't extend to some pollutants and its enforcement abilities are so limited that, for example, it cannot levy fines directly against the lab's federal owner.

The environment division also faces a high turnover of workers, including those wooed away by the promise of higher salaries offered by LANL or its contractors.

The laboratory last year paid \$30,000 to the state to settle \$1.1 million in possible fines.

■ James D. Watkins promised a new culture of openness when he took over the Department of Energy two years ago, but critics said that culture is slow in developing.

Energy Department headquarters in Washington insisted this year on pre-publication review of LANL's environmental-surveillance data for 1989. The report still has not been released to the public and when it is, some data will be more than two years old.

LANL officials repeatedly have told employees of the need to comply with all environmental and safety rules, but the officials don't hide their dislike for some of the regulations.

The laboratory is spending about \$60 million to prepare for a Department of Energy inspection later this year of health, safety and environmental programs.

GLOSSARY

What we are talking about:

■ **ALARA policy** — Policy of keeping worker exposure to radiation "as low as reasonably achievable."

■ **Alpha radiation** — Particles that emit radiation that cannot penetrate the skin. However, alpha-emitting elements such as plutonium and uranium can be fatal if inhaled or otherwise ingested.

■ **Background radiation** — Radiation in the environment that occurs from natural sources, such as the sun, elements found naturally in the soil and radon gas and from nuclear weapons tests and atomic power plants.

■ **Beta radiation** — Consists of particles that emit radiation that can penetrate the skin but can be reduced or stopped by aluminum, glass, plastic or wood.

■ **Corrective activities** — Official name for the work needed to bring nuclear weapons facilities into compliance with environmental regulations and agreements.

■ **Curie** — Measure of the amount of radioactivity.

■ **Environmental restoration** — Official name for the cleanup actions needed at nuclear weapons facilities to deal with contamination from radioactive, hazardous and mixed wastes.

■ **Epidemiology** — Branch of medicine that investigates the causes and control of major health problems in populations.

■ **Gamma radiation** — Does not consist of particles but of waves of energy that can pass through the human body. Three feet of concrete or two inches of lead are required to stop 90 percent of typical gamma radiation.

■ **Half-life** — The time required for a radioactive substance to lose half its activity. As a rule of thumb, 10 half-lives are required for a substance to decay to safe levels.

■ **Hazardous waste** — Official term for chemically hazardous waste. Also used as a generic term to describe any dangerous wastes, including radioactive and chemical.

■ **High-level radioactive waste** — The U.S. Department of Energy defines it as the waste produced in the reprocessing, or recycling, of spent fuel rods

from nuclear reactors. The Nuclear Regulatory Commission includes the spent fuel rods in its definition.

■ **Ionizing radiation** — Alpha, beta and gamma radiation. Named because it can knock electrons off the atoms it meets, creating atoms called ions. It causes cell damage in humans.

■ **Low-level radioactive waste** — Generally, waste that contains small amounts of radioactivity dispersed in a large amount of material. However, some can be highly radioactive.

■ **Multiple chemical sensitivities** — The controversial diagnosis that a person can become supersensitive to chemicals because of past exposure to chemicals.

■ **Mixed waste** — Radioactive waste that also contains chemically hazardous materials.

■ **Polychlorinated biphenyls, or PCBs** — A cancer-causing substance once widely used as a liquid insulator in electrical equipment.

■ **Plutonium processing** — A generic term for the production of plutonium in nuclear reactors, the recovery of plutonium from plutonium-contaminated waste and the recycling of plutonium used in retired nuclear weapons.

■ **Plutonium reprocessing** — The term used to describe the production of plutonium in nuclear reactors.

■ **Rem** — A widely used unit to measure doses of radioactivity received by humans. A millirem is 1/1000th of a rem.

■ **Safe secure trailer** — The trailers used by the Department of Energy to transport nuclear weapons parts and special nuclear materials, such as plutonium metal.

■ **Technical Area 55, or TA-55** — The complex at Los Alamos National Laboratory where plutonium is processed and fabricated into nuclear weapons for research and testing.

■ **Transuranic, or TRU, waste** — Contains man-made elements heavier than uranium, such as plutonium. TRU waste decays slower than low-level radioactive waste.

■ **Waste Isolation Pilot Plant, WIPP** — An underground repository near Carlsbad for transuranic waste.



Courtesy Los Alamos National Laboratory

Working inside a glove box

Report: DOE unqualified to clean its own houses

By KATIE HICKOX
New Mexican Washington Bureau

WASHINGTON — The Department of Energy has neither the information nor the qualified staff to clean up nuclear weapons facilities like Los Alamos National Laboratory, according to a recent federal report.

And the Energy Department virtually has ignored worker safety and public health issues in developing its 30-year decontamination plan for soil and ground water at the 13 weapons sites, says the report from the Office of Technology Assessment, a congressional watchdog agency.

The Energy Department's "stated goal — to clean up all weapons sites within 30 years — is unfounded because it is not based on meaningful estimates of work to be done, the level of cleanup to be accomplished or the availability of technologies to achieve certain clean-up levels," the report says. "Neither [the Energy Department] nor any other agency has been able to prepare reliable cost estimates for the total cleanup."

The Department of Energy says the findings of the Office of Technology Assessment are identical to those outlined in an agency report issued last October.

"The [Office of Technology Assessment] report adds independent confirmation of the fact that this is a problem of enormous proportions and will require yet unavailable technology and trained personnel to resolve it," Energy Secretary James Watkins said in a written statement.

Watkins has complained in the past that federal laws prevent him from hiring qualified personnel at competitive salaries for cleanup operations. A law backed by Sen. Jeff Bingaman, D-N.M., that goes into effect this year allows Energy Department defense program chiefs to tap into retired military personnel and other former government employees with

scientific expertise by waiving penalties against repeated federal service.

First opened in 1943, Los Alamos National Laboratory has not performed a sitewide assessment of dangers on its own grounds, the study said. Los Alamos has investigated environmental and worker health dangers at a few individual facilities within its boundaries, the report noted.

The lab might have several areas containing contaminated sediment because of Cold War-era discharge practices, which simply released tainted waste water into nearby canyons, the study said.

The Environmental Protection Agency, which has jurisdiction over hazardous waste issues at Department of Energy-owned facilities, has targeted 15 canyons in and around Los Alamos for evaluation, the study noted. Far below the topsoil at Los Alamos National Laboratory, earth located underneath a site where waste units were once stored also could be contaminated.

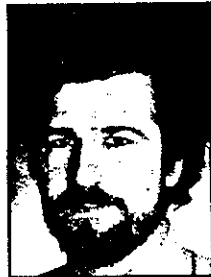
Substances released into the soil at Los Alamos National Laboratory in the past include americium, several grades of cesium and plutonium, tritium and uranium, the study said.

The lab also has released some metals, chemicals, and explosives such as TNT into the soil, the study noted. Cesium, several grades of plutonium, tritium, and uranium have been found in unused ground water on the site, the study said.

The Office of Technology Assessment garnered information of the lab's toxic and radioactive emissions from internal lab safety bulletins and Energy Department audits dated 1988 through last year. The study recommended the Energy Department relinquish responsibility for weapons complex cleanup to congressional overseers and other federal agencies.

OUR PROJECT TEAM

Thom Cole, 36, is the special projects reporter for *The New Mexican*. He joined the newspaper in July 1989 after more than seven years with United Press International in Pennsylvania, West Virginia and Ohio. His last position was chief of UPI's state capital bureau in Harrisburg, Pa. He also worked for several newspapers in Ohio and was graduated from Ohio State University.



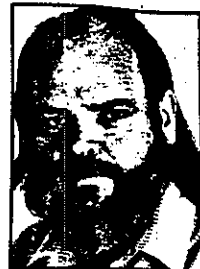
Kelly Richmond, 26, grew up in Los Alamos. A graduate of the University of New Mexico, Richmond worked for several small newspapers before joining the staff of *The New Mexican* in 1988. He regularly reports on Santa Fe city government.



Photographer Kitty Leaken, 32, has worked for *The New Mexican* for about five years, first as a free-lancer and then on staff. She is a graduate of Stanford University in California, where she majored in history. She was born and raised overseas.



Terry D. England, 41, has worked as a copy editor for *The New Mexican* since 1982. He received his undergraduate degree in journalism in 1976 from the University of New Mexico and holds a master's degree from St. John's College in Santa Fe. England has worked for newspapers in Tucumcari and Los Alamos, New Mexico, and Amarillo, Texas. He was born in Los Alamos and grew up there and in Santa Fe.



PLUTONIUM: Dangerous metal is everywhere at the lab

Plutonium processing a large part of operation

When the U.S. Department of Energy's troubled Rocky Flats plant in Colorado shut down in December 1989, some northern New Mexico environmentalists expressed fears that the plant's plutonium-processing operations would be shifted to Los Alamos National Laboratory.

Their worries were real — but years too late.

Some Rocky Flats plutonium processing already had been taken on by LANL long before that.

That has stopped, but it likely will begin again if and when Rocky Flats resumes making the triggers that set off nuclear bombs. Those triggers will be made, in part, with plutonium from LANL.

Citing LANL's role as a research and development facility, Energy Department and lab officials repeatedly have said Los Alamos would not take over Rocky Flats' production role of processing plutonium for use in nuclear weapons.

"I have no such plans and have no intention to even consider it," Department of Energy Secretary James D. Watkins said during a trip last year to LANL.

Watkins and other officials failed to note in those denials, however, that LANL for several years has had its own large-scale plutonium-processing operation.

Los Alamos officials say the lab assumed the production role because of system troubles at Rocky Flats and problems at other Energy Department plutonium-processing plants. They insist LANL only does

Please see PLUTONIUM, Page A-3

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the production work because of its research and development benefits.

"The product that comes out of here is technology. It is not some kilograms (of plutonium) sent to

'The Committee believes that the plutonium processing capabilities and expertise it saw at TA-55 are a significant but under-utilized asset ...'

Ahearne committee
1990 report

Rocky Flats," said Dana Christensen, deputy leader of the nuclear materials technology division.

Processing at TA-55

The plutonium-processing unit is located at Technical Area 55 at the lab. Opened in 1978, TA-55 has a work force of about 550. The facility made it possible for LANL to process large amounts of plutonium.

To understand what has gone on at Los Alamos, some background on plutonium and plutonium production is needed.

Plutonium is a metal that is fabricated into "pits," or triggers, for nuclear weapons.

The plutonium for weapons comes from three sources: nuclear reactors; retired nuclear weapons that are recycled; and the wastes of weapons production, such as shavings of plutonium and contaminated equipment.

The Energy Department since 1988 has not produced plutonium in reactors for three reasons: a large stockpile of plutonium; the ability to recover it from retired weapons and waste at a cost cheaper than making it in reactors; and safety concerns about the federal reactors at Richland, Wash., and Savannah, S.C.

Before that time, however, Los Alamos' TA-55 temporarily helped process plutonium produced in the reactors.

TA-55 also has recovered plutonium from the wastes of weapons production and processed that plutonium. Prior to its shutdown in 1989, Rocky Flats also did recovery work along with recycling plutonium from retired nuclear weapons.

Citing national security, LANL officials refuse to discuss how much plutonium has been processed at the lab in recent years but say the

amount continually has declined since 1986. The Department of Energy also doesn't release figures on plutonium production.

Production amounts

Oddly, in the face of such reluctance, the amount was published in the lab's annual report at least once.

The 1981 annual report shows TA-55 processed about 3,300 pounds of plutonium that year, enough metal to make 370 bombs. By comparison, the nation's entire weapons complex produced about 5,500 pounds of plutonium in 1984, according to the *Nuclear Weapons Databook*, which is published by an environmental group, the Natural Resources Defense Council.

Generally, the plutonium processed by the lab either is used by LANL to fabricate triggers for its test and research weapons or shipped to Rocky Flats for use in weapons for deployment.

Los Alamos officials say no plutonium is now being shipped to Rocky Flats because of the latter's shutdown. The Colorado plant was the Energy Department's only production facility for triggers. Los Alamos officials also say no plutonium is being stockpiled for future shipment to Rocky Flats. However, Los Alamos would resume shipments to Rocky Flats once it's reopened.

LANL officials say the lab makes fewer than 20 nuclear weapons a year for research and detonation at the Nevada Test Site.

Because of the shutdown of Rocky Flats, the lab has taken over a role normally performed by Rocky Flats in the production of LANL's research and test weapons, officials say.

Again, because of national security reasons, Los Alamos officials refuse to detail that role.

The lab's 1991-96 institutional plan describes it this way:

"The recent suspension of operations at Rocky Flats to allow the site to address operational concerns has created uncertainty over the availability of components needed to support the nuclear weapons test program in Nevada. Los Alamos has taken steps to assure that the components needed by the national test program are available by implementing an upgrade of its component fabrication capabilities."

Safety concerns

Environmentalists are concerned about a Los Alamos takeover of Rocky Flats' plutonium-processing work because of the possible impacts of that work on the environment and worker and public health and safety. At Rocky Flats, the impacts have been severe, including extreme plutonium contamination of ventilation



DELBERT HARBUR
Nuclear technology chief

duct work at the plant and high air emissions of plutonium, one of the most dangerous elements known.

"We don't want that going on here," said Santa Fe's Michelle Mero-la, executive director of Concerned Citizens for Nuclear Safety, an anti-nuke activist group.

Delbert Harbur, leader of LANL's nuclear materials technology division, said the plutonium-processing operations at Los Alamos have had no impact on the public.

Harbur, however, said the operations have increased the number of workers exposed to radiation, the amount of radioactive waste produced by LANL and shipments in and out of the lab of nuclear materials.

A 1987 Energy Department appraisal of TA-55 also noted the side effects of plutonium-processing at Los Alamos.

TA-55 "was not planned to be a plutonium production facility. However, primarily due to difficulties encountered at other Defense Program sites, it has been necessary to utilize the facility in a semi-production mode. This change in operational mode resulted in a greater plant population and greater plutonium throughout, with obvious health and safety implications, [for example], a greater-than-anticipated [worker radiation] exposure at the facility. TA-55 management has taken a number of actions to minimize these problems."

Randy Booker, a researcher for the Natural Resources Defense Council, said operations such as those at LANL to recover and process the plutonium from wastes produce large amounts of new waste.

"You're actually increasing the material, as far as we know, that is going to have to be shipped to WIPP,"

Booker said. WIPP stands for the Waste Isolation Pilot Plant near Carlsbad, a dump for long-lived radioactively contaminated materials from federal weapons facilities.

Energy officials have announced plans to restart Rocky Flats — no date has been set — but they say the plant eventually will be closed for good once its operations are transferred elsewhere.

Work transfer

The suspicions of environmentalists that at least some of Rocky Flats' plutonium-processing work would be transferred to LANL are based on a series of developments over the past few years.

Those developments include federal plans to transfer Rocky Flats' work to another place or places, favorable reports about LANL's plutonium-processing capabilities and a plan by Los Alamos to build a replacement support laboratory for TA-55.

At least three federal reports have pointed to Los Alamos as a possible new home for at least some of Rocky Flats' operations.

A 1988 report by Congress' General Accounting Office said Los Alamos had "existing [plutonium-processing] capabilities similar to those at Rocky Flats."

The National Research Council in a 1989 report referred to TA-55 as "exceptionally well run" and an "efficient and productive operation for scrap recovery." The report continued:

"This facility, operating for the most part on a one-shift, 5-day schedule, can process almost half as much plutonium as Rocky Flats can ... and turn out a purer product.

"If additional capacity beyond [the new plutonium-waste recovery plant at Savannah] is desired, institution of a three- or four-shift operation at the LANL facility should be more than adequate to handle the complex's plutonium recycling needs.

"Although there may be resistance at LANL to converting Building TA-55 into a full-scale production facility, an administrative solution should be possible. In any case, more extensive use could be made of this efficient operation with its exemplary operating history and its strong technical staff."

And the Energy Department's Advisory Committee on Nuclear Facility Safety, informally known as the Ahearne committee, had this to say in a report released in November:

"The Committee believes that the plutonium processing capabilities and expertise it saw at TA-55 are a significant but under-utilized asset to [the Energy Department]. ... We

recommend that serious consideration be given to how the capabilities at TA-55 could be used to provide broader benefits to the complex."

Another big concern of environmentalists is LANL's \$385 million plan to build a replacement for the

'This facility, operating for the most part on a one-shift, 5-day schedule, can process almost half as much plutonium as Rocky Flats can ... and turn out a purer product.'

**National Research Council
1989 report**

laboratory now providing support to TA-55 and clean up the old lab.

The new laboratory — known as the Special Nuclear Materials Research and Development Laboratory — also would take over some analysis work now being done at TA-55, a move environmentalists fear would increase plutonium-processing capabilities.

Findings disputed

LANL officials have disputed the findings of the National Research Council that TA-55 easily could take over more plutonium-processing responsibilities and do a better job than Rocky Flats.

Christensen said TA-55 is not designed for such production work and called the report a "bunch of hooey."

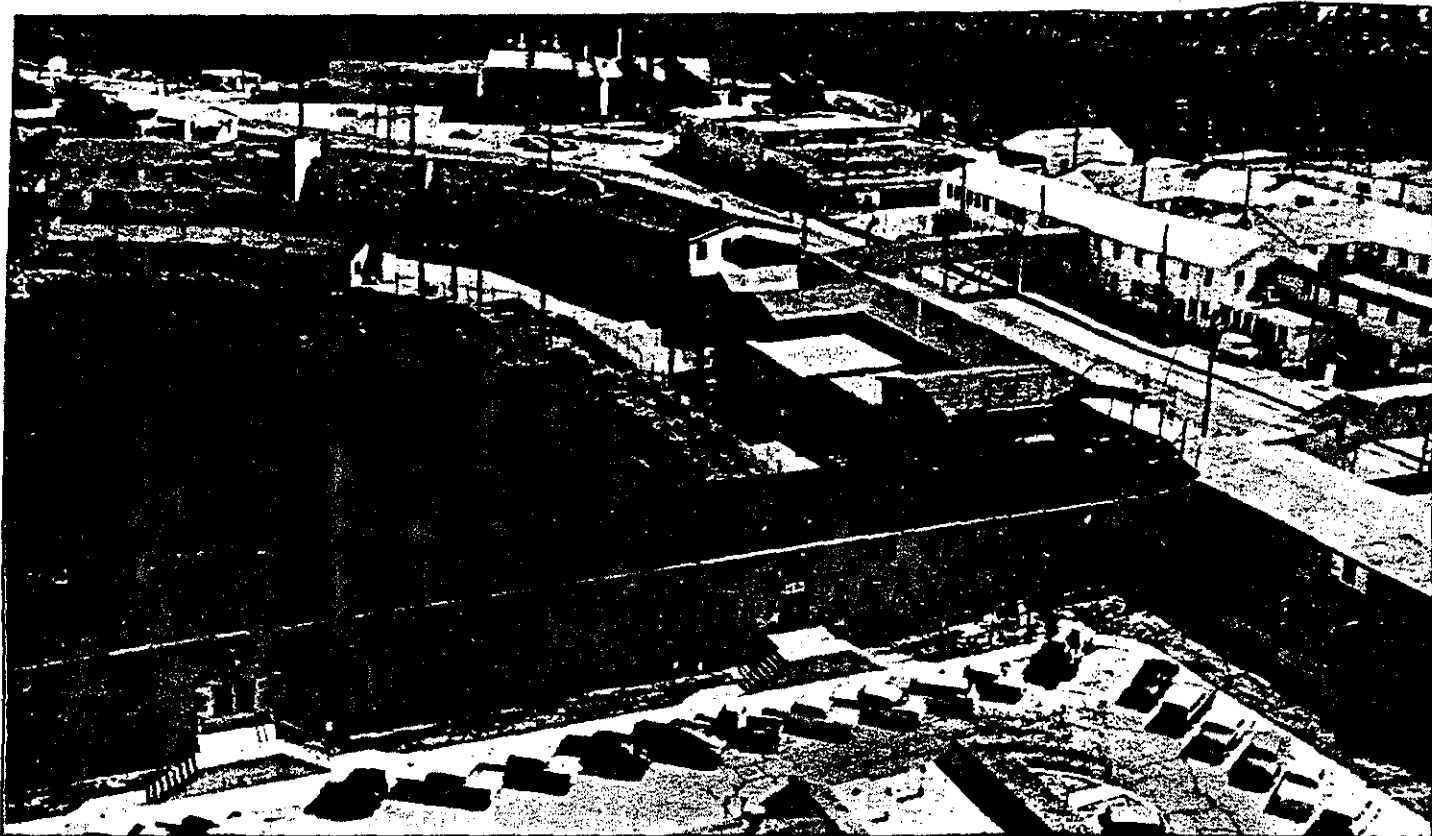
He said Los Alamos officials have contacted the National Research Council in an attempt to have the report changed. Rick Borchelt, a spokesman for the council, said no such contact has been made.

Borchelt added that the information in the report was based on a council committee visit to the lab lasting 2 days, briefings from LANL officials and the expertise of a former Los Alamos staff member.

Lab officials also have maintained that construction of the replacement support laboratory for TA-55 would not increase plutonium-processing capabilities at Los Alamos.

Congress last year suspended funding for construction of the support lab pending development of the Energy Department's plan to modernize the nation's weapons-making complex.

6



Courtesy Los Alamos Historical Museum

In 1956, the main laboratory surrounded Ashley Pond. The street behind is Trinity Drive.

Los Alamos lab started in time of war

Los Alamos, the city and the laboratory, in facts and figures:

■ Los Alamos National Laboratory consists of more than 30 active work sites spread over 43 square miles of the Pajarito Plateau, about 25 miles northwest of Santa Fe.

■ The lab site consists of a series of narrow mesas and deep canyons that are described frequently as resembling fingers on a hand or islands in a stream. The maximum elevation, where the plateau flanks the Jemez Mountains to the west, is 7,800 feet.

■ The laboratory was established in 1943 as one of the sites for the Manhattan Engineering District, the top-secret effort by the United States and its World War II allies to build an atomic weapon. It displaced the Los Alamos Ranch School for Boys, homesteads, grazing lands and U.S. Forest Service property.

■ The mission of the scientists sent to Los Alamos was to create the world's first atomic weapon, and

they succeeded. Their efforts resulted in the first atomic explosion, at Trinity Site near Alamogordo, and the creation of the bombs that were dropped on Nagasaki and Hiroshima, Japan, to end World War II.

■ LANL, one of four federal weapons labs, always has been managed by the University of California, but ownership has passed over the years from the Army to the Atomic Energy Commission to the Energy and Research Development Administration to the Department of Energy. In the process, its name was changed from Los Alamos Scientific Laboratory to Los Alamos National Laboratory.

■ The town first opened to the public in 1957, and land was released to Los Alamos County and to private individuals in the 1960s. The latest census shows about 18,115 people live in Los Alamos County, about three-fifths residing in the Los Alamos town site and the rest in nearby White Rock. The county grew by just 3 percent from 1980 to 1990,

while the rest of the state grew by 16 percent.

■ The laboratory employs about 7,500 people directly and several thousand more through subcontractors. About one-third commute to work from outside the county.

■ The laboratory's budget is \$933 million this year, 13½ times the annual budget of the city of Santa Fe. Nuclear weapons and other defense projects account for 76 percent of the lab's funding, with the rest spent on energy and other civilian research and development.

■ Los Alamos is the wealthiest, best-educated and most Anglo county in New Mexico. Its 1988 per capita annual income was \$22,614, compared to a state average of \$12,439. The average resident had completed 15.5 years of school, according to the 1980 census; no other county in the state has an average above 13 years. And the 1980 census showed that Anglos made up 86.4 percent of the Los Alamos population but just 53.1 percent of the state's.

Back in 1984, someone could have grabbed a real nuclear bomb

In the spring of 1984, the U.S. Department of Energy confirmed it was transferring something it called "a nuclear weapons sub-assembly plant" from Los Alamos National Laboratory to the Nevada Test Site.

In a syndicated newspaper column that made the issue public, investigator Jack Anderson said the Energy Department was worried about the theft of plutonium or weapons-grade uranium.

Here's what Anderson apparently didn't know and what the Energy Department didn't bother to mention: The items the Energy Department was worried about were complete, ready-to-fire nuclear weapons.

"It created a situation where it wouldn't have taken much effort for someone to go up there and help themselves to one of those (nuclear weapons) and then conceivably go blow up a city," said Jeffrey Hodges, a research analyst with a U.S. House subcommittee.

"At the time it was very highly classified," Hodges said. In the early 1980s, he said, LANL built "test devices" that were complete nuclear weapons. The devices were then taken to Nevada for underground explosion.

"These devices are nuclear weapons and one would think these would be safeguarded to the most stringent standards possible," Hodges said.

An Energy Department inspection team in early 1980 found the weapons were not adequately guarded, Hodges said.

"In fact, they could readily have been stolen," he said.

In a letter to then-Energy Secretary Donald Hodel, Rep. John Dingell, D-Mich., said at the time that the inspection found a guard force so depleted "it was totally ineffective and special nuclear material was stored in numerous locations over the site which could not be defended."

The site where the nuclear weapons were stored "was not adequately defended," Dingell wrote.

As chairman of the Subcommittee on Oversight and Investigations of the House Committee on Energy and Commerce, Dingell held a series of secret hearings that addressed the problems at Los Alamos.

During subcommittee questioning in 1980, an Energy Department official acknowledged that if LANL had been a sovereign nation he would have recommended "that no special nuclear material be shipped to Los Alamos until the security at the facility was substantially upgraded."

"That is the single most shocking admission possible," Dingell wrote Hodel.

Nevertheless, the Energy Department did nothing for four years, Hodges said.

In March 1984, another Energy Department inspection team conducted a full-scale test at Los Alamos. The results were a "shocking commentary" on safety at Energy Department facilities, Dingell wrote.

"In two tests, the mock terrorists would have been able to steal plutonium," he said. "In another test, a band of terrorists would have easily stolen a nuclear test device."

Dingell contended that, even after that test, the weapons were not transferred to Nevada until further pressure was applied by the subcommittee. Hodel disagreed, saying the weapons were transferred by Energy Department immediately upon receipt of the inspection results.

Today, Los Alamos National Laboratory officials say nuclear test weapons are fabricated at LANL but that they are never completely assembled in Los Alamos. Instead, the pieces are transferred unassembled to Nevada. ~~the officials say~~

Security continually gets short shrift, guards say

Backlog still clogs clearance mill works

The U.S. Department of Energy office that oversees Los Alamos National Laboratory has cut by one-half the number of employees overdue to have their security clearances reinvestigated — but still has a backlog of 16,000 cases.

The Energy Department has not been reinvestigating its employees on time, a series of reports by the General Accounting Office, the investigative arm of Congress, revealed in 1987 and 1988.

In 1986, the Energy Department's Albuquerque office had a backlog of more than 33,000 employees who needed to be reinvestigated to determine if they were still safe security risks.

The latest figures show that num-

ber has fallen to 16,000, or about one-third of all employees under the jurisdiction of the Albuquerque office, said Rush Inlow, assistant manager for safeguards and security for the Department of Energy-Albuquerque.

Specific figures on LANL's clearance backlog are not available.

Energy Department policy requires that employees with security clearances be reinvestigated every five years "because of the sensitivity and national security implications of its programs," the General Accounting Office said.

The federal report said failure to reinvestigate employees can have serious consequences.

For example, the agency found

some employees overdue for reinvestigation, including some in sensitive jobs such as security guard, who had developed alcohol and drug problems that included on-the-job drug use.

And John Walker, who engaged in espionage for the Soviet Union, never was reinvestigated in the 11 years after he initially was cleared by the Navy.

Inlow said the goal is to eliminate the backlog of clearance cases by the 1993 fiscal year, which begins in October 1992.

In an attempt to meet that goal, the Albuquerque office has increased by 50 percent the number of staff members who deal with security clearances and has hired additional contractors to assist.



Courtesy Los Alamos Historical Museum

A security gate in the early days of the Manhattan Project when the lab was young.

Los Alamos National Laboratory makes nuclear bombs and then worries about them.

Because of that and because it is on the cutting edge of nuclear weapons research and keeps large amounts of plutonium handy, the lab has hundreds of armed guards and miles of barbed wire.

The multi-million dollar security effort, to the casual observer, appears tight.

Is it?

Some of the laboratory's security people paint a portrait of an institution where the guards are under-trained, underpaid and overworked; where the scientists they're supposed to guard don't take them seriously; and where laboratory management fails to supply the necessary money and support.

"All the guard force does up here is check badges," said one of two veteran guards who spoke with *The New Mexican* only after demanding a guarantee of anonymity.

A series of federal investigations over the past decade appears to support this bleak view of security at Los Alamos.

Bleak picture

LANL security forces failed miserably last year when investigators staged a surprise test to gauge the guards' abilities. The test came in the wake of a 1989 walkout over job conditions.

"When a security force — the first line of human defense — cannot perform its duties, is ineffective or improperly trained, little assurance exists that sensitive facilities are appropriately safeguarded," said the resulting report by the General Accounting Office, the investigative arm of Congress. "Yet, this is the situation we found at Los Alamos before, during and since the 1989 strike."

The report charged that training was not adequately documented, security during the strike was questionable and that as recently as April 1990, three-fourths of the Los Alamos guards lacked essential skills.

That report was not the first to criticize security at Los Alamos.

Federal inspections from 1985 to 1989 found more problems at LANL than at any other U.S. Department of Energy facility. During that period, 24 problems were noted in 19 different evaluation areas, nearly twice the number found at any other Department of Energy facility.

Federal inspections in 1986 and 1988 revealed that guards at Los Alamos "could not effectively detain and/or arrest intruders," the federal report said.

Although the University of California, the contractor that operates the laboratory, assured the Energy Department that corrective actions had been taken after those inspections,

'When a security force — the first line of human defense — cannot perform its duties, is ineffective or improperly trained, little assurance exists that sensitive facilities are appropriately safeguarded.'

**General Accounting Office
Report about lab guards**

"We found that these problems still existed as of April 1990," the federal report said.

Los Alamos National Laboratory refused to answer any *New Mexican* questions on security-related matters. LANL's parent agency, the Department of Energy, and its security subcontractor, Mason and Hanger-Silas Mason, refused to comment on the federal report but granted limited interviews on a few security-related topics.

Not changing

One guard said LANL officials were angered by the federal report. "But that's about it. They're not changing anything. We haven't had any (additional) training since that came out. I've heard of plans for training but it hasn't gone through yet."

He blames LANL and the University of California for the security weaknesses because they have failed to supply adequate funding to Mason and Hanger, he said.

"But Mason and Hanger has the responsibility for national security. If they need to go to Washington to get what they need, then they should do that."

On the other hand, the guard said, Mason and Hanger is afraid it could lose its Los Alamos contract if it is too aggressive.

"They're threatened with, 'If you do that we'll pull your contract,'" he said.

In fact, Mason and Hanger's contract is up for renewal this year. The laboratory has opened the contract for bidding and is expected to decide

by October whether it will keep Mason and Hanger or go with a different company.

LANL and Mason and Hanger refused to say how much the security contractor is paid but information supplied to Congress shows the contract was worth about \$16.5 million in the budget year that ended Sept. 30, 1989.

Mason and Hanger employs nearly 400 people, including supervisors and trainees, said John Jennings, human relations manager for the company. He declined to provide a breakdown of how many are armed guards.

In addition, the laboratory employs about 125 people in its operational security and safeguards division, which oversees Mason and Hanger and provides internal security for such things as classified documents.

Modest salaries

Relatively modest salary — in the area of \$10 or slightly less an hour in many instances — is one of the biggest obstacles faced by the Los Alamos security force, one of the guards said. He said other Energy Department sites pay \$1 to \$3 per hour more than Los Alamos. For example, Rocky Flats, a federal facility near Denver, pays nearly \$2 more, he said.

That results in an overworked and inexperienced force, the guard said.

Overtime worked by guards was one of the central issues in the 10-week strike that ended in May 1989. Guards contended during the strike that they routinely were made to work 12- and 16-hour days and six- and seven-day weeks.

The overtime problem has not improved much since the strike, the guard said.

"Our overtime is still about the same as it was," he said. "The only change is they're not directing us; it's

on a voluntary basis. But you've still got to work overtime because otherwise you can't survive with the cost of living in this area." (Los Alamos has the highest cost of living in the state.)

Such wages also aggravate a traditionally high turnover rate, the guard said.

"We're losing people left and right to other sites," he said. "We lost five guys last month to Rocky Flats. I would say approximately half the guys on the force right now are pretty much rookies."

A second guard confirmed his colleague's views.

"Most (Energy Department) sites pay better for the same job," he said. "We just lost five or six guys to Rocky Flats and probably a dozen more are going to be leaving in the next month."

Training quality

The shortage of money also affects the quality of the training, he said.

"If funds get short they'll cancel our training before they do anything else," he said. "The lab doesn't seem real interested in giving us quality training. They're more interested in whatever looks good on paper."

Jennings, the Mason and Hanger spokesman, agreed Los Alamos guards could make more money elsewhere, but he said the natural beauty of the area made it unnecessary to pay more.

"What I've found is people who like northern New Mexico are not going to pick up and move to Denver," Jennings said. "I wouldn't leave northern New Mexico for a couple bucks more an hour."

Some overtime is an inevitable part of the job, he said, but Mason and Hanger now tries to limit it to no more than 12 hours per week per person, a figure that some private companies would find unacceptably

high.

Turnover is not excessive, Jennings said. Mason and Hanger recently cut its annual turnover rate to under 10 percent, he said.

Jennings acknowledged that he would like to add 50 more guards to the staff. The obstacle to increasing the staff's size is that all guards must receive "Q-clearances," the Energy Department's highest-level security clearance, and it can take up to 18 months for someone to be cleared, he said.

10



All guards receive 10 weeks of training before they begin work and all receive further training every year they are on the job, Jennings said. He also denied any suggestion that LANL has failed to provide enough money for the guards' training needs.

Jennings said he would like to express some complaints about the amount of money his company receives from LANL, but he wouldn't be specific.

"I could go on and on and bitch and bitch, but (LANL is) my client so I can't," he said.

Taking it seriously

The guards' jobs are not made any easier by the fact that the scientists and other civilian personnel at the laboratory "don't take security seriously at all," one of the guards said. "They think that in a scientific community they can keep things to themselves and it won't be a problem."

For example, some LANL civilians will leave security doors wedged open for easier access after the guards have locked them, the guard said.

Also, he said, some scientists have taken visitors without clearances into security areas by bringing them through automatic turnstiles that can be opened by a lab badge.

The lab employee can slide a badge through a slot similar to the one on an automatic teller machine and then use a palm print to open the turnstile, he said. "And then they bring their visitors through."

The other guard confirmed that the laboratory's civilian employees have weakened security.

"They've always pushed for a college campus-type atmosphere up there," he said. "They put a lot of restrictions up there on what we can and can't do, irregardless of (the Energy Department's) rules and regulations."

Jennings, however, said everyone at LANL is "security aware."

As for specific examples of scientists circumventing security, "I've heard of them," he said. "I haven't been able to prove any of them."

The quickest way to improve security might be to have the guards work directly for the Energy Department instead of for a contractor, the guards said.

The underlying problem they see with security at Los Alamos, they said, is the failure of the laboratory and the University of California to give the guards the money — and the

authority — they need to do their jobs.

"They'll institute a (security) policy and we'll implement it, and if it has any inconvenience for lab people they'll repeal it as fast as they instituted it," one of the guards said.

"It keeps the security inspectors frustrated. They're trying to do their job but if someone takes exception with it, (lab officials) change the rule to accommodate the person who complained.

"After a while, after you've bumped your head against the wall for so long, it's easy to get an attitude of, 'What does it matter? Why should I do anything if they just keep changing it when I try to do my job?'"

"There's really not that much support of the uniformed security people by the laboratory," he said.

Sometimes it seems laboratory security officials "are there to protect the laboratory from the guards" instead of helping the guards protect the lab from outside threats, he added.

The federal report released last November agreed that a federal security force might be better than using private contractors — but for a different reason. A federal force could save money, the report said.

The General Accounting Office concluded such a move probably would not have a significant effect on the level of safety but could save \$2.2 million per year at LANL and as much as \$14.8 million by also federalizing eight other Department of Energy security forces.

LANL security was provided by federal employees until 1981, when Mason and Hanger took over.

Findings

Other findings of the recent federal report:

■ During the 1989 strike, the Energy Department did not conduct the inspections and tests needed to judge if replacement guards were adequately protecting LANL.

The department waited two weeks into the strike to conduct its first inspection and waited six weeks before conducting performance tests, the report said.

After four weeks, a House subcommittee notified the department it had received "allegations of many instances of firearms horseplay by the replacement force." Two federal energy officials investigated the next day and found no horseplay but noted 12 of 30 replacements interviewed lacked proficiency with the weapons they were required to use.

■ Many of the replacement guards did not meet one or more of 12 basic skills.

■ Most guards failed a surprise test.

None of the auxiliaries was certified in physical fitness, use of billy clubs (batons) or night use of fire-

'If funds get short they'll cancel our training before they do anything else. The lab doesn't seem real interested in giving us quality training. They're more interested in whatever looks good on paper.'

Lab guard

arms. Problems with augmentees included 35 who were not certified in arrest procedures and 66 not certified in batons.

■ Training records were missing.

"We found that many training and certification documents for the security force before the strike were missing, incomplete, undated, changed or unsigned," the General Accounting Office said.

Because of the incomplete training records, the Energy Department conducted a surprise test at the General Accounting Office's request in April 1990. Only 12, or 22 percent, of the 54 guards tested could pass all nine skills tests.

The biggest failing was the apprehension test that checks six skills: force and arrest, security operations, communications, tactics, self defense and site protection. More than 70 percent of LANL's guards failed this test.

For example, when they encountered an adversarial situation, many guards failed to stay behind cover to protect themselves, the report said.

"Instead, they left their cover and walked up to the potential adversary to ask what they were doing. As a result, in many instances, the adversary took a visible weapon, 'killed' the participant or hostage, and left with the classified documents or government property," the report said.

"In total, 24 participants and hostages were 'killed' during this testing," it said.



A guard waves the photographer away from the gate of a lab building near the main technical area. Gates, barbed wire and guard stations are a way of life at the lab.

11

Iraq war alert 'a joke'

Heightened alert quickly fades away, guard says

When Iraqi President Saddam Hussein threatened to use terrorism against the United States as part of the Persian Gulf War, Los Alamos National Laboratory promised to step up its security.

One guard at the facility, however, says the supposedly increased security is "a joke."

The guard, who spoke on condition of anonymity, charged that financial concerns caused the laboratory to cancel a series of planned steps that would have strengthened security.

On Jan. 16, the day the war started, security at U.S. Department of Energy nuclear weapon facilities such as LANL was increased to level No. 2 from the level No. 3 alert that had been in effect since hostilities between Iraq and the United States began developing last year.

The new alert status required the laboratory's SWAT-like Rapid Response Team to live on site and for all other guards to be on call by their telephones, able to respond within the hour if needed.

The next day, however, the Rapid Response Team was sent home and guards were placed on a four-hour alert that allows them to travel or do whatever they wish as long as they can respond to a call within four hours.

"I've seen what (laboratory officials) have done to our alert status now due to the Persian Gulf crisis, and it's a joke," the guard said. "Currently, we're supposed to be on alert status 2, but the only thing that's changed is that if they call me I have to respond in four hours. What the hell good is that going to do?"

The reason the heightened security was canceled in just 24 hours: money, the guard said.

A one-hour alert requires that guards must be paid as if they are on duty while guards are paid nothing extra for being on four-hour alert, he said. And the difficulties of feeding and housing the Rapid Response Team can be avoided by not requiring them to stay on-site, he said.

Officials with LANL and Mason Hanger-Silas Mason, the contractor in charge of security, refused to discuss the lab's security response to the Gulf War.

Rush Inlow, assistant manager for safeguards and security at the Department of Energy's Albuquerque office, said that a level No. 2 alert calls for more guards to be on duty, for increased surveillance of perimeter areas and for more searches to be conducted.

The Los Alamos guard insists none of that has been done at LANL.

"We haven't added a thing to the staffing levels," he said. "A guard in some of these places out in the boonies, it could take him a half an hour to get any backup.

"It scares me a lot," he said.

On Jan. 7, as the U.N. deadline for Iraq to leave Kuwait approached, the Energy Department's Albuquerque office sent a message to the various facilities under its jurisdiction.

In the message, Los Alamos and the other facilities were instructed to comply with standard federal orders for increased security and also were ordered to implement special security "enhancements" explained in the message.

The enhancements for alert level No. 2 included a requirement that the Rapid Response Team stay on-site and that all guards be placed on a one-hour alert.

Nine days later, however, on the day the Gulf War began, the Department of Energy backed down.

A new message was sent. It replaced the one-hour alert for all guards with a four-hour response time and said the Rapid Response Team should be available within one hour but didn't have to stay on-site.

Although the original message said the enhancements "must be incorporated" into emergency planning, Inlow said they were only proposals.

"We asked our sites to consider what it would take to put those enhancements in place and let us know what it would require to do that," Inlow said.

The decision to amend the enhancements was "based on feedback from the sites that, 'Gee, we can't really accommodate those people living on site for long periods of time,'" he said.

A four-hour alert for guards is enough, Inlow said, because it provides for a greater margin of safety in case Los Alamos should have advance warning of an impending terrorist attack.

John Jennings, human relations manager at Mason and Hanger, wouldn't discuss specifics of lab security since the Gulf War but said, "Security's always been tough up here ever since it was a closed city. When you're good you can't get much better."

Here are some of the people you will meet during this six-day series on Los Alamos National Laboratory:

■ **Doug Barnes**, 40, of El Rancho. Barnes was removing buried diesel fuel tanks and fuel lines in a lab area when he hit a fuel line and was doused with cancer-causing benzene. His hands, groin and eyes were swollen. Deep cracks also developed in his groin and hands. The painful symptoms eventually disappeared, but they appear any time he is exposed to extreme heat or cold.

"I used to do a lot of skiing and hiking, but in the last two years, I haven't done anything," Barnes said. "I know it's taken years off my life."

■ **Ben Ortiz**, 53, of Nambe. He has insomnia, depression, dizziness, nausea, memory loss, breathing difficulty and a feeling of being disoriented. He can't tolerate the smell of his wife's perfume and nail polish, the smoke from cigarettes, and the exhaust fumes from cars.

His physician says his respiratory and neurological problems are the result of his 20 years of exposure to chemicals while working as a mechanical technician at Los Alamos.

Because of his illness, "I have no social life," Ortiz says.

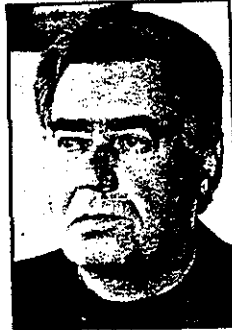
■ **David Salazar**, 54, of Hernandez took an early retirement from the lab this year after more than 20 years at the facility.

A machinist, he also was exposed to chemicals. He got sick in May 1989 and his symptoms are similar to those of Ortiz.

"I'm only sleeping 2 or 2 1/4 hours



BARNES



ORTIZ

a night," Salazar said. "I'm tired all the time."

■ **Jerry Taylor**, 34, of Keokuk, Iowa. He thinks he's going to die of cancer because nearly 11 years ago he was badly contaminated with plutonium in a Los Alamos lab accident at Los Alamos National Laboratory's plutonium-processing facility.

"I feel I might die a lot younger because of this accident," he said.

■ **Socorro Trujillo**, of Pojoaque, widow of Victor, 48. Victor died of lung cancer last May. He had worked for 17 years at the lab.

His job meant potential exposure to low doses of radiation and possible inhalation of radioactive plutonium. But Trujillo also smoked, and cigarettes are known to cause lung cancer. His wife says he didn't smoke at home. At work, however, he did. The cigarettes were free — courtesy of Los Alamos National Laboratory.

"It doesn't sound like they are very smart up there," Socorro Trujillo says.

Stories are about
the people
as much as
buildings, places

12



Fouling the Nest

A New Mexican Special report on
Los Alamos National Laboratory



The canyons identified in this aerial view of the Los Alamos lab have been contaminated.

The places needing attention now number in the thousands

The term "waste dump" usually suggests an isolated, dusty site with bulldozers, mounds of stinking, covered garbage and blowing trash.

Not in Los Alamos.

There, as the result of Los Alamos National Laboratory's decades of work with radioactive and hazardous materials, the list of waste sites includes most of the canyons and mesa tops, the golf course and the ballfields, the airport, the main street through the center of town and more than 1,800 other places.

About 16 of those sites are major waste dumps that always were meant to be waste dumps. The rest are things such as old underground tanks, septic systems, burn sites, experimental areas, storage facilities, sewer drains, chemical leaks and spills — 48 years worth of messes spread over the laboratory's 43 square miles.

Like a homeowner who has neglected a piece of property for far too many years, the laboratory now faces the expensive and time-consuming task of getting rid of its buried garbage.

The first problem: Figuring out what is buried where.

The laboratory plans to spend nearly \$1 billion just getting ready to begin the cleanup, which won't really start until 1999. Actual cleanup costs could double the price tag.

Improving current waste-management practices and bringing the lab into compliance with environmental laws is expected to add hundreds of millions of dollars more.

The U.S. Department of Energy, which owns LANL, faces similar tasks at its sites all over the country.

LANL has one very important ally

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

THE SERIES

Sunday: Overview and security

Today: Cleanup

✓ More than 1,800 sites of hazardous or radioactive waste — including some in downtown Los Alamos — must be inspected as part of a \$2 billion cleanup program.

✓ Laboratory officials say Los Alamos doesn't produce high-level radioactive waste — but whether that is true depends on whose definition of high level is used.

Tuesday: Public safety

Wednesday: Worker safety

Thursday: Hot spots

Friday: Oversight

CLEANUP: A thousand-plus sites tagged

Continued from Page A-1

on its side as it launches this expensive battle — volcanic tuff. About 600 to 1,200 feet of it.

If the laboratory had been built someplace else, such as California, an early alternative, it would be much closer to the ground water and the cleanup would be a much different ballgame.

Los Alamos, luckily, is built on mesa tops in the high desert, with 600 to 1,200 feet of solid rock, mostly volcanic tuff, between it and the drinking water used by area residents.

So when the lab sticks a few hundred pounds of extremely deadly materials such as plutonium and uranium in the ground — which it has done — it's not an immediate health threat.

However, when talking about material that still will be capable of causing mass deaths hundreds of millions of years from now, there's more to consider than the immediate health threat.

The lab has to worry about buried waste someday being disturbed and kicked into the air, where particles of deadly chemicals could be inhaled.

It has to worry about sediments and shallow water — both of which are contaminated — being carried to the Rio Grande by spring runoff or summer floods.

It has to worry about the contamination slowly reaching the groundwater in a gaseous state or by leaking through rock cracks.

And the biggest worry is the unknown.

Laboratory officials are adamant that the contamination does not pose an immediate health threat because that's what the available information tells them.

It's the unavailable information that scares others.

"Because the Department of Energy has done such a poor job of characterizing the nature of the problems throughout the complex, we still don't fully know what the problems are," said Daryl Kimball, associate director for policy with a private group, Physicians for Social Responsibility.

Energy Department officials "will be the first to tell you they are unable to carry out many cleanup jobs because they don't know the full extent of the job they have to undertake.

"So it's very premature to say one facility or another doesn't have as many problems," he said.

That's why it will take years and \$1 billion just to get ready to begin the

cleanup in Los Alamos. The lab must investigate each of the 1,857 potential waste sites, known bureaucratically as "Solid Waste Management Units," although they include liquid waste as well.

At this point, what the laboratory has is a four-volume document listing what is known about each site. Or, more often, what isn't known.

For example, Solid Waste Management Unit No. 13-004 is at a site used in the 1940s for explosive tests. All the lab knows about No. 13-004 comes from a 1951 memo that mentions burning pits in the areas.

"The number of pits and the locations are unknown," according to the lab's *Solid Waste Management Unit Report*.

"The type of waste in the pits is unknown," it states.

"It is unknown if a hazardous release has occurred from these pits."

The Department of Energy concedes these unknowns make it impossible to evaluate the health risk at Los Alamos.

"No immediate health hazard is known to exist; however, the risk ... cannot be quantified until a major portion of the characterization work associated with the (investigation) is complete," said the department's *5-Year Plan*.

The laboratory is completing its investigation and cleanup under the supervision of the Environmental Protection Agency, said Bob Vocke, head of the laboratory's cleanup program.

In order to manage hazardous wastes, the laboratory needs a Resource and Conservation and Recovery Act permit. In order to get that permit, the laboratory had to agree to clean up the old waste sites.

Under that permit, the laboratory has divided its 1,857 waste sites into 24 units, Vocke said.

For each of the the 24, the lab will prepare a plan for the EPA's approval that details exactly how the waste sites will be investigated to determine if they are hazardous. The EPA must approve every detail, such as where and how deep to drill sample holes, he said.

The first investigation plan must be submitted by May and all investigation plans must be turned in by May 1994.

Once the plans have been approved, the laboratory will do the actual investigations. Based on the results, the EPA can delete a site from the cleanup list. If the EPA determines a site must be cleaned, the laboratory will submit for EPA approval a plan for exactly how the

site's problems will be addressed.

Only after the cleanup plans are approved will the actual cleanup begin.

The laboratory has 10 years to submit all its cleanup plans, but it already has asked for an extension, Vocke said. Because of the size and expense of the task, the lab has asked for 12 years instead of 10, he said. No decision on the extension request has been made by EPA.

The major cleanup effort will begin in 1999, while investigation work continues on other sites. The only cleanup planned before then will be a handful of hazardous waste sites that must be closed immediately.

The lab's priorities early on will be the major disposal areas with the most contamination, canyons that have received radioactive waste and dump sites on land that has been turned over to private ownership or Los Alamos County.

Rich Mayer, an environmental engineer with the Environmental Protection Agency, said the laboratory has been very thorough in identifying possible waste sites. He agreed the biggest problem is a lack of knowledge about what's in each site.

Although the Resource and Conservation and Recovery Act permit addresses only toxic chemicals and not radioactivity, asbestos and PCBs, the laboratory has decided to include everything in the permit program to avoid future troubles with EPA.

Of the 1,857 sites, 603 are priority ones chosen by EPA, 1,103 are non-priority or have been discovered recently, and 151 are one-time spills.

There's no guarantee yet that the Energy Department will provide the billions of dollars needed to complete the cleanup, but Vocke said he is optimistic the money will be received.

The Energy Department's funding priority, however, might be sites on the EPA's National Priority List, a list of the spots across the country with the worst contamination.

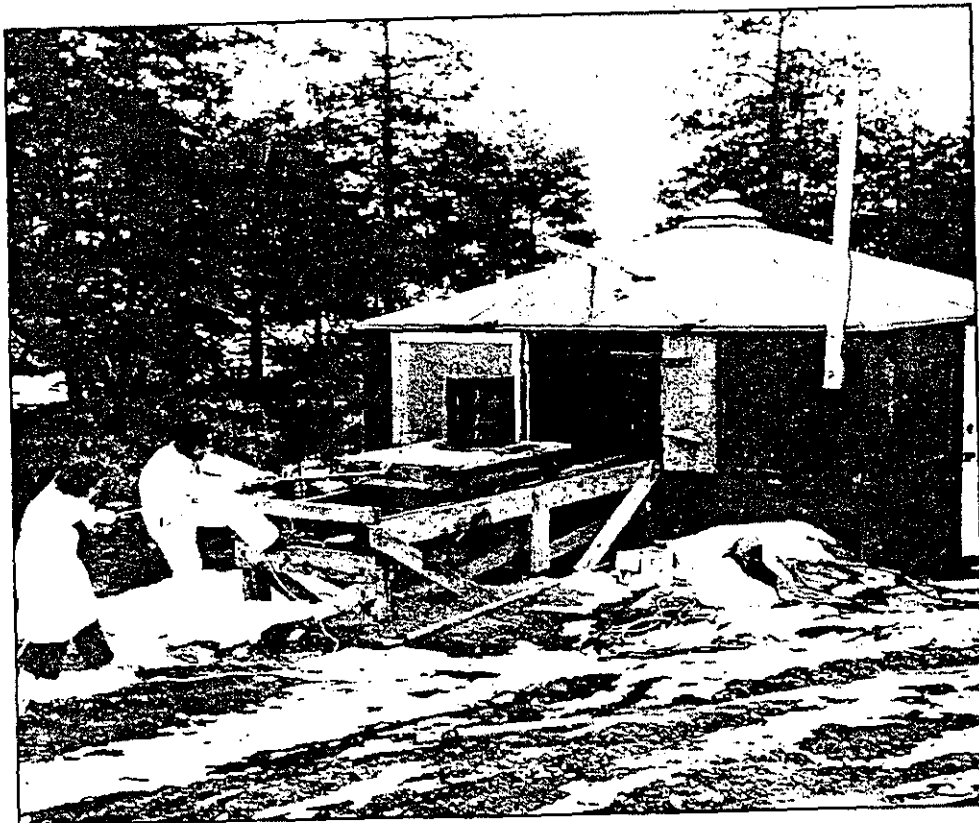
Laboratory officials often point to the fact that LANL isn't on the National Priorities List as evidence that the lab's problems aren't that bad.

Energy Department critics, however, have ripped the list.

It was first developed in the early 1980s, when Energy Department sites were closed to outside inspections, said Jim Werner of the environmental group Natural Resources Defense Council. So there is no outside guarantee that the information that formed the basis for the list is accurate, he said.

What is high-level waste?

That depends on who's defining it



In the early days, the working equipment and lab buildings often took on a primitive aspect, with muscle providing the power to move things.

At a public meeting last October, Los Alamos National Laboratory officials were asked how the lab was disposing of its high-level radioactive waste.

The lab has no high-level radioactive waste, came the response.

Deputy Division Director Tom Gunderson said high-level waste can be generated only by nuclear power plants, and he assured the crowd that none of the laboratory's reactors has produced such waste.

It was a position that had been stated many times by the laboratory.

Because the definition of high-level radioactive waste can be tricky, however, it doesn't tell the whole story.

The U.S. Department of Energy, which owns LANL, defines high-level waste as only that liquid or solid waste resulting from the reprocessing of spent nuclear fuel.

The Nuclear Regulatory Commission, which regulates commercial atomic reactors, has a broader definition that includes spent nuclear fuel itself.

LANL's Omega West atomic research reactor does produce spent nuclear fuel, but the fuel is reprocessed, or recycled, at the Idaho National Engineering Laboratory.

"We stand by that position, that we've not generated high-level waste as de-

fined by the (Nuclear Regulatory Commission) or the (Energy Department) and those definitions are very specific," Gunderson said in a recent interview.

The laboratory has "high levels of radioactive wastes" but no "high-level waste," said Tony Drypolcher, leader of the lab's waste management group.

Los Alamos National Laboratory during its more than 40-year history apparently has buried spent nuclear fuel, according to a 1977 laboratory report that included an inventory of materials buried in shafts in Material Disposal Area G on Pajarito Road a few miles west of White Rock.

On May 22, 1970, the lab buried "235-U, 239-Pu reactor fuel," the report said. 235-U is enriched uranium and 239-Pu is high-grade plutonium.

On Jan. 24, 1975, the lab buried "irradiated 239-Pu and 235-U fuel." "Irradiated" means it had been used, or spent, in a reactor.

There also are numerous references in the report to the burial of "fuel elements." According to a Nuclear Regulatory Commission spokesman, "fuel element" is essentially synonymous with fuel rods, which contain reactor fuel.

In addition to its primary research reactor, Omega West, the laboratory has in the past run two other research reactors and numerous experimental reactor programs.

When confronted with the inventory, Gunderson acknowledged the lab has buried "small pieces" of fuel rods.

"This was a research activity," he said. "You would take a fuel rod and do research on that fuel rod at Omega West (Reactor) or wherever. You would take a small piece of the rod to do research on.

"Those samples were disposed of in Los Alamos," he said.

Although reactor fuel is high-level waste under the (Nuclear Regulatory Commission) definition, Gunderson maintained that the lab actions do not constitute burial of high-level waste.

"It's the volumes that make the difference. You're talking about very small amounts as opposed to large amounts from a reactor," he said.

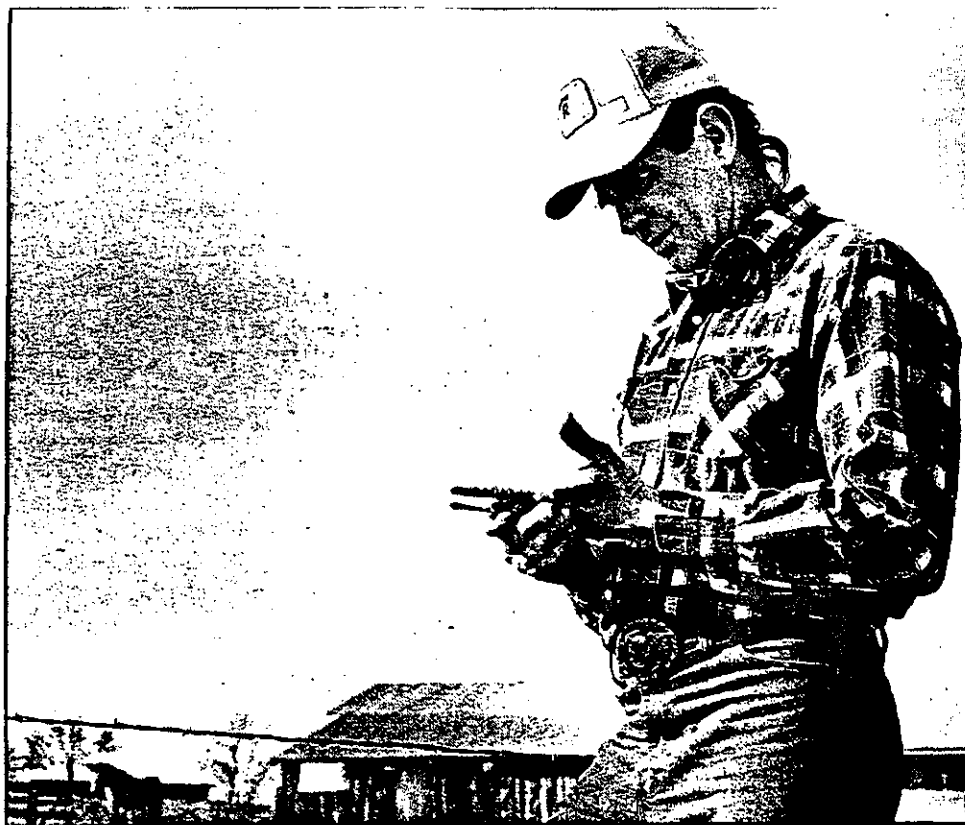
He acknowledged that the public might view his argument as semantics.

"It is the same material," he said. "It's the same thing from the public's perspective."



Don Hull, a group leader at Omega West, the lab's nuclear reactor, holds a mockup of

a fuel rod. Real rods are injected with uranium and used as a power source.



Doug Barnes' hands and face are extremely sensitive to the sun, and an hour outside near his El Rancho home is his daily maximum.

Critics contend lab doesn't do enough to protect workers

On June 2, 1988, Doug Barnes was operating a track hoe as part of a project to remove old buried diesel fuel tanks and fuel lines in a Los Alamos National Laboratory area.

He struck a fuel line that he says wasn't on the blueprints and was splashed with a liquid containing cancer-causing benzene.

In just a few days, his hands, groin and eyes were swollen. Deep cracks also developed in his groin and hands. The painful symptoms eventually disappeared, but they appear any time he is exposed to extreme heat or cold.

"I used to do a lot of skiing and hiking, but in the last two years, I haven't done anything," Barnes said. "I know it's taken years off my life."

Barnes, 40, of El Rancho is a heavy equipment operator for Johnson Controls World Services, formerly Pan Am World Services, a support contractor for the laboratory.

What happened to him is the sort of thing that has caused congressional critics to charge that the U.S. Department of Energy is not paying enough attention to worker safety as it begins a 30-year effort to clean up contamination in its nuclear weapons,

The Energy Department's environmental cleanup plan, known officially as the 5-Year Plan, makes no provision for worker health and safety, U.S. Sen. Jeff Bingaman, D-N.M., said at hearings in the fall of 1989.

"Since these jobs are inherently dangerous, why would a 441-page document ... neglect to mention worker health and safety?," he asked.

Energy Secretary James D. Watkins responded, "Worker protection is a recurring theme throughout the document since the worker is, in most cases, the closest to the problem and, therefore, the first to be affected."

The controversy continues.

In a report released last week, the Office of Technology Assessment, a congressional agency, said worker safety issues during the cleanup have been virtually ignored by the Department of Energy.

However, LANL officials say they

have made worker safety a key part of their ambitious program to clean up the laboratory's many waste dumps and spills, some of which date to the 1940s.

"Workers at (cleanup) sites may encounter conditions that result in injuries or illnesses from chemical, radiological, physical or biological hazards," according to the laboratory's *Installation Work Plan*.

The 28-page section that covers worker protection spells out protection standards and guidelines for such things as training, records, reporting and monitoring.

Workers will avoid inhaling hazardous materials by wearing breathing filters and will wear outer clothing — generally a disposable, chemically resistant garb — along with gloves, the plan states.

"As the investigation proceeds, the laboratory will propose how it intends to clean sites that need to be cleaned and the federal Environmental Protection Agency will make the final decision.

"When deciding what remediation is appropriate, part of the evaluation will be worker safety," said Bob Vocke, head of the lab's cleanup program. "That has to be considered."

An example would be a site where high explosives were once disposed of, he said.

"Since you know high explosives are not that mobile in the environment — it's buried, it has a cap on it, it's in a stable site — do you risk going in there to clean that up?" he asked.

The answer is probably not, he said. The laboratory probably would propose "stabilization and monitoring," meaning the explosives would be left in place undisturbed and watched for possible movement of the contamination.

The biggest threat will be at "material disposal areas" — the large waste dumps that received radioactive and toxic trash, Vocke said.

Luckily, large waste dumps represent only 16 of the 1,800-plus sites that have to be examined, he said.

Those sites would be candidates for work handled by remote means — machines and robotic equipment.

One victory: PCBs almost vanquished

Los Alamos National Laboratory in the past few years has moved aggressively to address the threat of electrical equipment containing cancer-causing polychlorinated biphenyls, or PCBs.

The danger was one of the biggest concerns of investigators from the U.S. Department of Energy who conducted an environmental survey of the laboratory in 1987.

"Widespread use of PCB fluids in electrical transformers and capacitors represents a potential for the release and transport of PCBs into the environment and, in some instances, the potential for direct contact" with workers, the survey said.

The federal investigators complained about inadequate inspections and repairs of leaking transformers and capacitors; the absence of curbs and berms to contain leaks; the poor condition

and old age of some of the equipment; and the location of some of the equipment indoors in areas heavily used by workers.

Since that time, hundreds of transformers and capacitors containing PCBs have been replaced or refilled with non-PCB liquids at a cost of several millions of dollars.

"The easiest way to comply and the best way to comply (with PCB rules) is to get rid of the equipment," said Kenneth Hargis, chief of the environmental protection group at Los Alamos National Laboratory.

U.S. companies began producing PCBs in 1929, primarily as insulating liquids in electrical transformers and capacitors. Production was stopped in 1977 because of growing environmental concerns.

PCBs are especially harmful because, once released into the environment, they tend not to

break apart into other substances. Because of that, they pervade soils, wildlife and humans.

A March 1987 study showed Los Alamos National Laboratory had 133 PCB transformers and 2,796 PCB capacitors in use, with tens of thousands of gallons of PCBs.

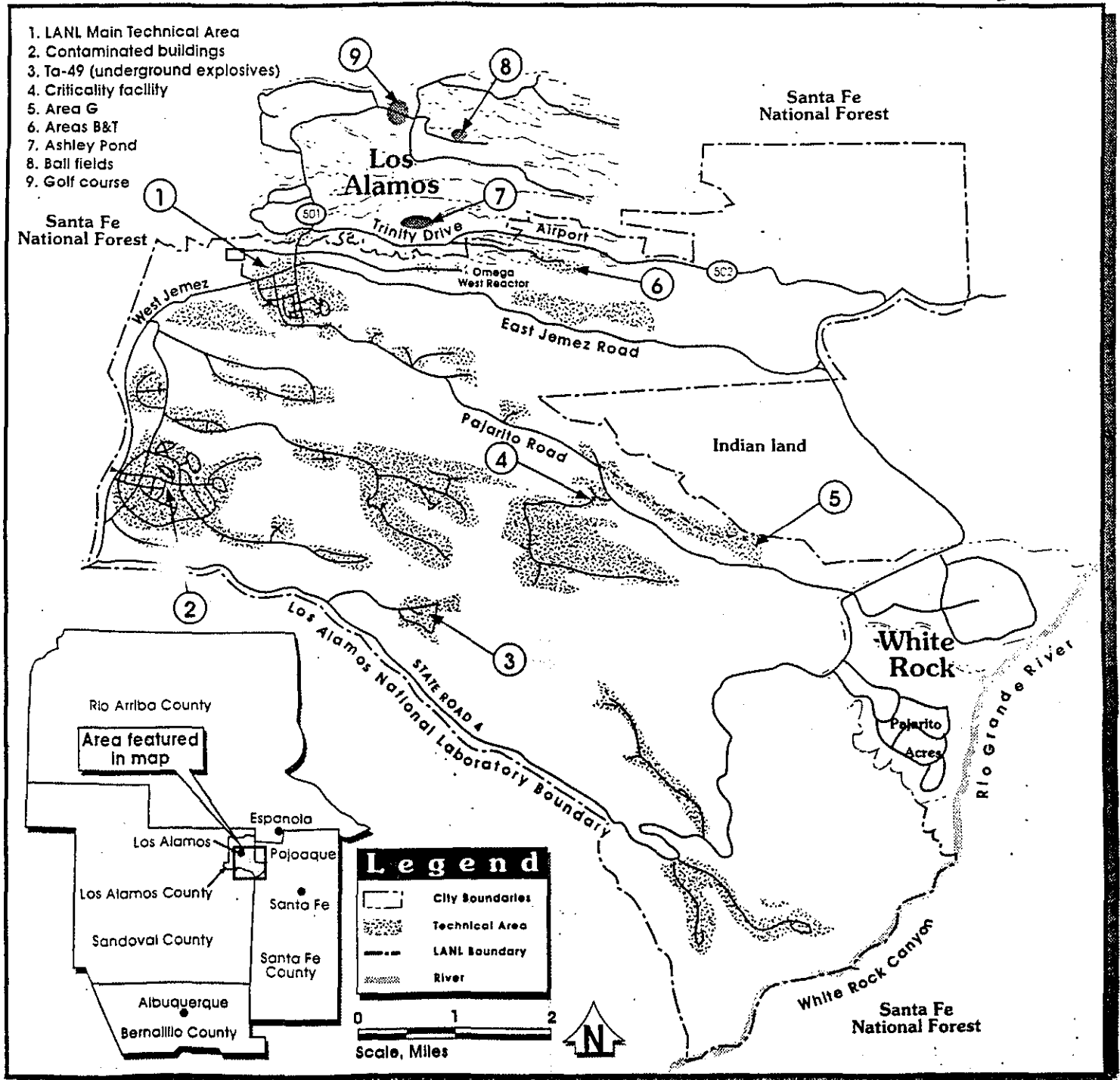
Hargis said the number of PCB transformers has since been cut to 78 and should be down to 47 by the end of this year. PCB capacitors have been reduced to 174. The equipment also is inspected more often and all have curbs or berms to prevent spills, he said.

"I think the program has been aggressive and it shows," Hargis said.

The remaining PCB transformers are scheduled to be taken out of service or refilled before the fall of 1996. Many of the remaining capacitors, however, cannot now be replaced because of their specialized designs.

Clearing the bad spots could be dangerous, lengthy

Los Alamos National Laboratory



Bill Spencer/The New Mexico

Uranium that could explode, stalactites formed from the residue of high explosives, a radioactive truck, shafts containing 88 pounds of plutonium.

That's the sort of stuff found in a sampling of the 1,857 waste sites Los Alamos National Laboratory must investigate for possible cleanup.

Up close and impersonally, a look at some of those sites:

The original laboratory site

When the laboratory was constructed beginning in 1943, it was built around Ashley Pond and covered what is today a central part of the town's business district.

Known as Technical Area 1, it has been the site of two major decontamination efforts, first in the 1960s when the area was transferred to private and county ownership and again in the mid-1970s.

More work might be required.

The second decontamination began in 1974 when a lab survey found high concentrations of radioactive substances. The survey found 125,000 picocuries of plutonium per gram of soil, millions of times higher than the background level of 0.04 picocuries that naturally is present in northern New Mexico as a result of fallout from nuclear weapons tests.

After two years of excavation — and the removal of about 20,000 cubic yards of dirt and debris — the lab concluded it had done as much as was practical, considering the "high cost of further action and the insignificant health and safety benefits anticipated," a LANL report said.

Recent studies show that high radiation levels remain. On some nearby canyon rims, plutonium concentrations are as high as 8,900 picocuries per gram, still hundreds of thousands of times higher than background levels.

Bob Vocke, head of the lab's cleanup program, said there are two reasons why the elevated levels of plutonium are not an immediate health threat.

First, despite its proximity to the town site, "the area is basically inaccessible," he said. "That doesn't mean that if someone wants to they can't get down along the canyon rim. They can do that. I've walked along there."

Second, the average contamination level is 840 picocuries per gram, which is just three times higher than the level that would be acceptable under Department of Energy guidelines even for an area that included a home with a garden, Vocke said.

There are no homes or gardens along the canyon rim, though, and the radiation dose to someone passing by would be relatively low.

New Mexico has no state standards for plutonium in soil, but the levels at LANL are far above the standards adopted as safe by the state of Colorado.

The Colorado standard is 0.9 of a picocurie of plutonium per gram of soil, said Robert Terry, senior health physicist with the Colorado Department of Health.

Colorado regulations require that special precautions must be taken during construction any place there is a higher level of plutonium than the standard, he said.

Another potential contamination area is Trinity Drive, a main road through Los Alamos, and nearby land.

Soil and construction debris used for fill material under the road during a 1966 repaving and widening project was taken from contaminated areas. The fill under the road from Los Alamos Inn to Trinity Village Apartments is believed to contain uranium and fission products, the highly radioactive remnants of a nuclear reactor.

The soil of nearby private land might contain radioactive tritium contamination.

The airport

The Department of Energy-operated airport is built virtually in the middle of an inactive, contaminated landfill.

The landfill never was meant to contain anything but non-radioactive trash from the lab and the town of Los Alamos. But on April 3, 1953, about 125 pounds of highly radioactive uranium were dumped there by mistake. Only 25 pounds could be recovered, and the

remainder was covered with several loads of dirt.

Although uranium essentially is dangerous only if inhaled, a complicating factor is the possibility that the landfill could explode if disturbed.

"In 1959, a memo noted that disposal practices could cause an explosion, thus indicating that the trash may have contained small quantities of high explosives," the laboratory's *Solid Waste Management Unit Report* said.

The airport landfill also is near the edge of a mesa, making erosion toward the canyon edge a concern.

"We consider the whole airport area" a waste site, Vocke said.

Energy Department employees at the airport monitor the area and would halt any erosion toward the canyon edge, said Vocke, who doesn't anticipate that major efforts will be needed to address the contamination.

"We think we can do pretty much what we're doing now," he said, although more investigation and Environmental Protection Agency approval of any or no cleanup will be required.

"We don't know a lot about it, but from what we know there's not a health risk out there," Vocke said.

Buildings contaminated by explosives

Buildings are not normally considered waste dumps, but a complex in the lab's Technical Area 16, off West Jemez Road and about 2 miles south of the current main laboratory area, is so badly contaminated by high explosives it could blow up.

About 30 buildings at TA-16 were used for high-explosives work during World War II. Most are in poor repair and have been abandoned, although a few are still used as storage facilities.

High explosives residues have re-crystallized as stalactites under the floors of some of the buildings.

"There is a continual threat that detonation will occur as the buildings continue to deteriorate and collapse," according to the lab's report on waste sites. "Stabilization of the structures is not practical as the operation could endanger workers."

Adding to the difficulty of the situation is that the roof shingles on the buildings contain asbestos, a cancer-causing material that would be dispersed if the buildings exploded.

"Somebody might say, 'It's an old building, it has high explosives contamination, just burn the building,' but it has asbestos," Vocke said.

Golf course, ballfields

Los Alamos County Golf Course and a baseball/softball complex on North Mesa Road might have been watered with radioactive effluent.

Effluent from the laboratory's Central and Pueblo wastewater treatment plants from the 1940s to 1964 is believed to have contained radioactive waste and laboratory chemicals. Engineering drawings show that water pipes extend from these plants to the golf course and ballfields.

Vocke said no monitoring ever has been done of radioactivity at those facilities, but he downplayed the possibility of serious contamination.

"We need to do more work in that area, but at this point we don't think there's a problem," he said. "It looks like the possibility of anything (dangerous) being there is very remote."

Area G

One of the largest major radioactive waste dumps at LANL, Area G has been used since 1957 and is still the main active dump. The area, on Pajarito Road a few miles west of White Rock, covers 63 acres and includes pits, shafts, trenches and storage buildings.

Name a type of radioactive garbage and chances are it's been buried in Area G at one time or another: plutonium, uranium, cesium, tritium, barium, nuclear reactor parts, reactor fuel and all types of contaminated trash and construction debris.

The area's soil, air and stream sediments are contaminated with plutonium.

Surface soil contamination "may have occurred ... as a result of fires caused by incompatible wastes or from re-

leases from vehicles hauling waste to the shafts and pits," according to the lab report on waste sites.

Monitoring programs since the 1970s have revealed that tritium is leaking away and that the air, soil and stream sediments have elevated levels of plutonium.

Areas B and T

Area B is an inactive, six-acre landfill on DP Road and south of the airport that dates to the early days of the Manhattan Project. Among the waste it received: plutonium, uranium, americium, curium, and a variety of solvents and toxic chemicals.

"At least one truck, contaminated with fission products from the Trinity Test, is buried in the pit," the lab's waste sites report said.

Part of the area has been paved and sold to Los Alamos County, which rents it to Los Alamos residents as parking space for long-term trailer storage.

Previous investigations of the area have found intrusion into the closed pits by plant roots and burrowing animals. The area is now monitored for radioactive leakage.

Area T, equally as old as B, is located nearby and was used for liquid waste disposal.

More than 14 million gallons of plutonium-processing waste were

Our project team:

THOM COLE
and
KELLY RICHMOND
Staff Writers

KITTY LEAKEN
Photographer

TERRY D. ENGLAND
Design

dumped in Area T. From 1945 to 1952, the waste was untreated. From 1952 until a waste treatment plant was built in 1967, the waste was treated to remove most of the radioactivity. Toxic chemicals also might have been present in the waste.

Radioactive americium waste was poured into 62 nearby shafts.

"Subsurface migration of radionuclides and surface overflow have been documented," the lab's report on waste sites said. "According to LANL staff, hazardous releases are suspected."

Canyons

The federal Environmental Protection Agency, which is overseeing the cleanup, is requiring the laboratory to investigate 15 canyons for possible contamination.

The laboratory releases about 250,000 to 300,000 gallons per day of sanitary effluent and a like amount of industrial waste, said Steven Rae, a LANL section leader.

Among the canyons currently receiving either radioactive or chemical waste are Los Alamos, Sandia, Water, Pajarito, Valle, Ancho, Two-Mile, Mortandad and Canada del Buey.

Two canyons, Los Alamos and Pueblo, received radioactive effluents in the past but no longer do so. Los Alamos Canyon received waste from 1952 until 1988, and Pueblo Canyon received waste from 1943 to 1964.

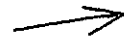
The sediments and shallow water of both canyons are contaminated, which has caused radioactive sediments to reach the Rio Grande in small amounts barely above background levels from nuclear bomb testing.

Mortandad Canyon currently receives radioactive waste from a LANL wastewater treatment plant.

Although Mortandad Canyon's sediments and shallow water also are

contaminated, LANL officials insist that none of the radioactivity has escaped laboratory property and that even the worst spots are not contaminated badly enough to pose a health threat.

"Even if someone went in and had a picnic there they would get an insignificant dose" of radiation, Vocke said.



Underground tests

Between January 1960 and August 1961, laboratory scientists conducted 44 experiments in which they detonated high explosives along with plutonium or uranium at the bottom of shafts on the Frijoles Mesa off State Road 502 near the lab's southwest boundary.

Today, the remnants of those explosions make up one of the largest concentrations of radioactive material in LANL dumps.

Still at the bottom of those shafts is 88 pounds of plutonium and 385 pounds of uranium, along with 33 pounds of beryllium, a non-radioactive but cancer-causing substance.

In late 1960, scientists found "a measurable surface concentration of plutonium. Apparently, plutonium had been dispersed throughout fractures in the tuff (rock) by the detonation of an experiment in an adjacent shaft," a Energy Department report said.

The surface-soil contamination was removed and placed back in a shaft, which was filled with clean sand and capped with a concrete plug. The area was then covered with six feet of compacted aggregate and four to six inches of asphalt.

Nevertheless, tests have found sediments with plutonium have migrated to the surface soils of Water and Ancho canyons.

LANL officials say that because the area is 1,200 feet above the groundwater there is no possibility of contaminating the aquifer and that no contamination has moved off lab property.

Researchers turning to magical science to help effort

A poisonous plant that decontaminates water.

Microbes that eat waste explosives.

Oil and gasoline spills turned to water and gas by heat and pressure.

With that kind of magical science, Los Alamos National Laboratory is turning the nation's nuclear cleanup effort into an opportunity rather than a problem.

Decades of work with radioactive materials and hazardous chemicals have contaminated Department of Energy sites all over the country, including such places as Rocky Flats near Denver; Savannah River, S.C.; Hanford, Wash.; and Los Alamos itself.

At least one program at Los Alamos,



BERGER

however, stands to benefit by using its expertise to help solve that.

"The Department of Energy recognized this is going to cost a lot of money and said we need a research and development program to find ways to do it better, faster and cheaper," said Mike Berger, director of Los Alamos' environmental research program.

The dollars for environmental research at Los Alamos have increased dramatically, Berger said, with both Department of Energy and the Department of Defense loosening their purse strings. The program's budget — \$10 million last year — is expected to rise by 50 to 100 percent this year, he said.

Making new discoveries is only the first step in environmental research. Just as important is making sure that the discoveries are produced and marketed by private industry.

"If we don't get the technology into their hands, we're not doing our jobs," he said.

Some examples cited by Berger of recent research at Los Alamos that could help make the cleanup "better, faster and cheaper":

■ Before the cleaning can get underway, someone has to determine the extent of the mess. That means lots of soil testing must be done — perhaps hundreds of thousands of samples.

And because each sample must be tested for the full spectrum of organic, inorganic and heavy metal chemicals along with radioactivity, it could cost up to \$5,000 and take five or six weeks for each sample.

So the laboratory has invented "the mini-midget mass spectrometer," which can be taken into the field and will finish a test for organic chemicals in 20 minutes.

Although the sample still will have to be shipped off for the other tests, the field testing will halve the cost and time spent waiting, Berger said.

■ Another problem is finding ways to treat liquid wastes. One method devised by laboratory researchers is called "super-critical water oxidation."

The scientists found that certain kinds of waste can be eliminated by subjecting them to a great deal of heat (about 700 degrees Fahrenheit) and pressure (3,200 pounds per square inch).

Under those conditions, organic chemicals such as oil, gasoline and solvents break down into harmless substances such as water and carbon dioxide.

The Department of Defense is helping pay for the research because the new method can be used to destroy propellants of old missiles that are being taken out of service.

■ Another troublesome type of liquid waste is water that has been contaminated by high explosives.

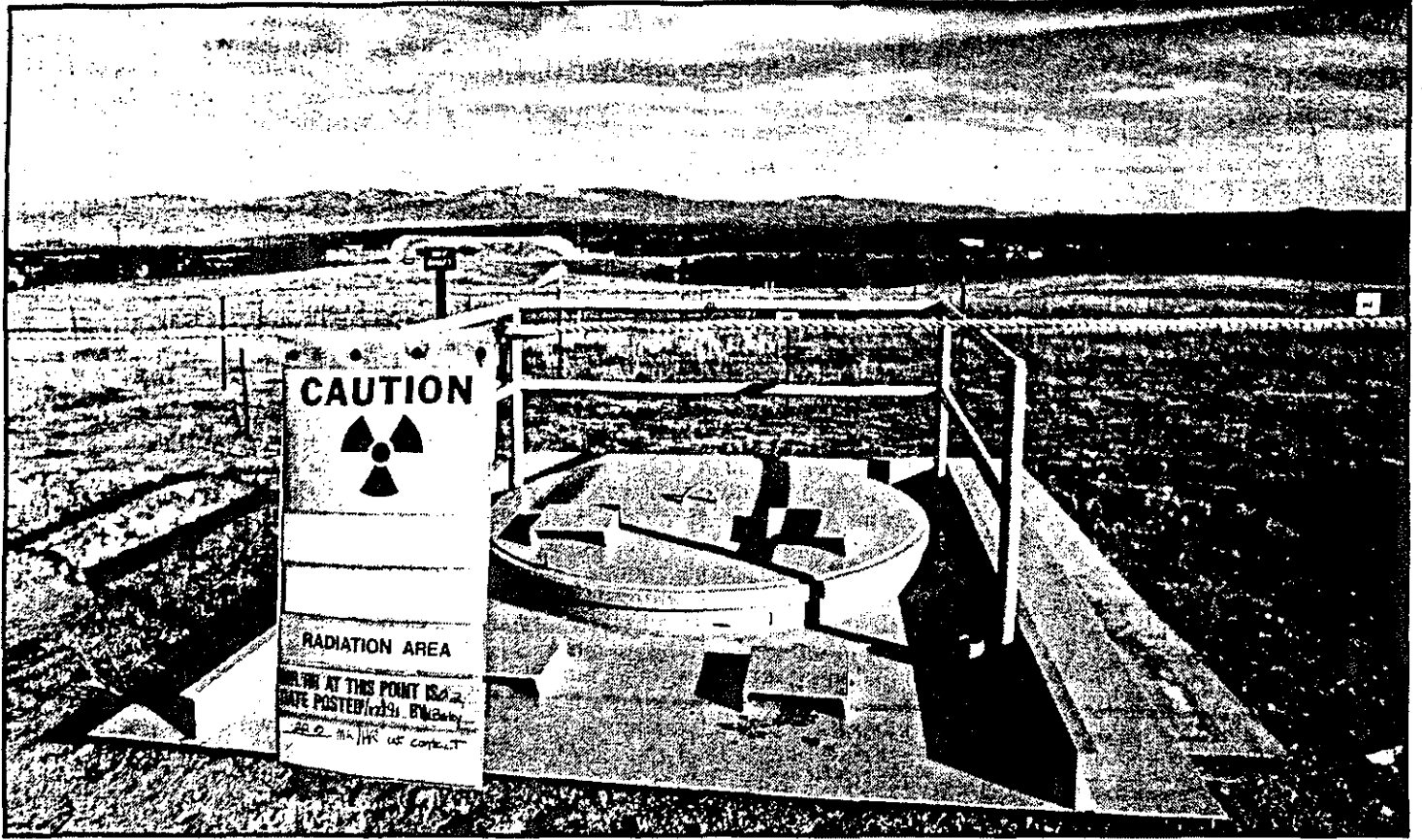
A consortium of researchers from Los Alamos, New Mexico State University and several other colleges has been working on crops that survive where the soil has been overgrazed or is full of nasty chemicals.

They noted that jimson weed, a poisonous plant, thrived in areas where the soil is full of heavy metals and that cells from this plant will grab onto heavy metals — such as high explosives.

So "pink water" — water that has been contaminated during the machining of high explosives — can be poured over cells from jimson weed "and the water comes out clear," Berger said.

The cells themselves are then contaminated, but the contamination is in a much smaller, more manageable form.

Similarly, another research team has found several types of microbes adapted to soil with heavy metals that literally will eat the high explosives.



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 of concern in the facts."

Mercier last year set up his own

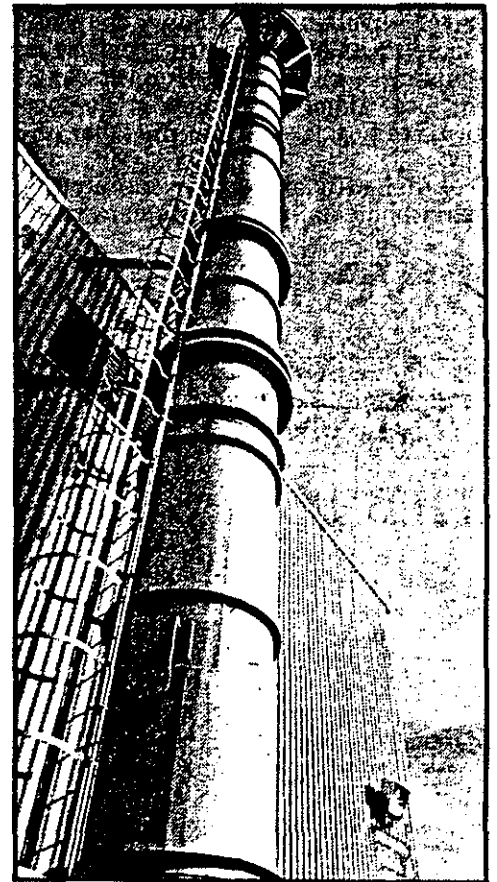
monitoring stations for radioactive air emissions. He and his wife and their 8-year-old son also wear devices to measure the radioactivity they receive.

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



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.

Please see AIR, Page A-2

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

Continued from Page A-1

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.

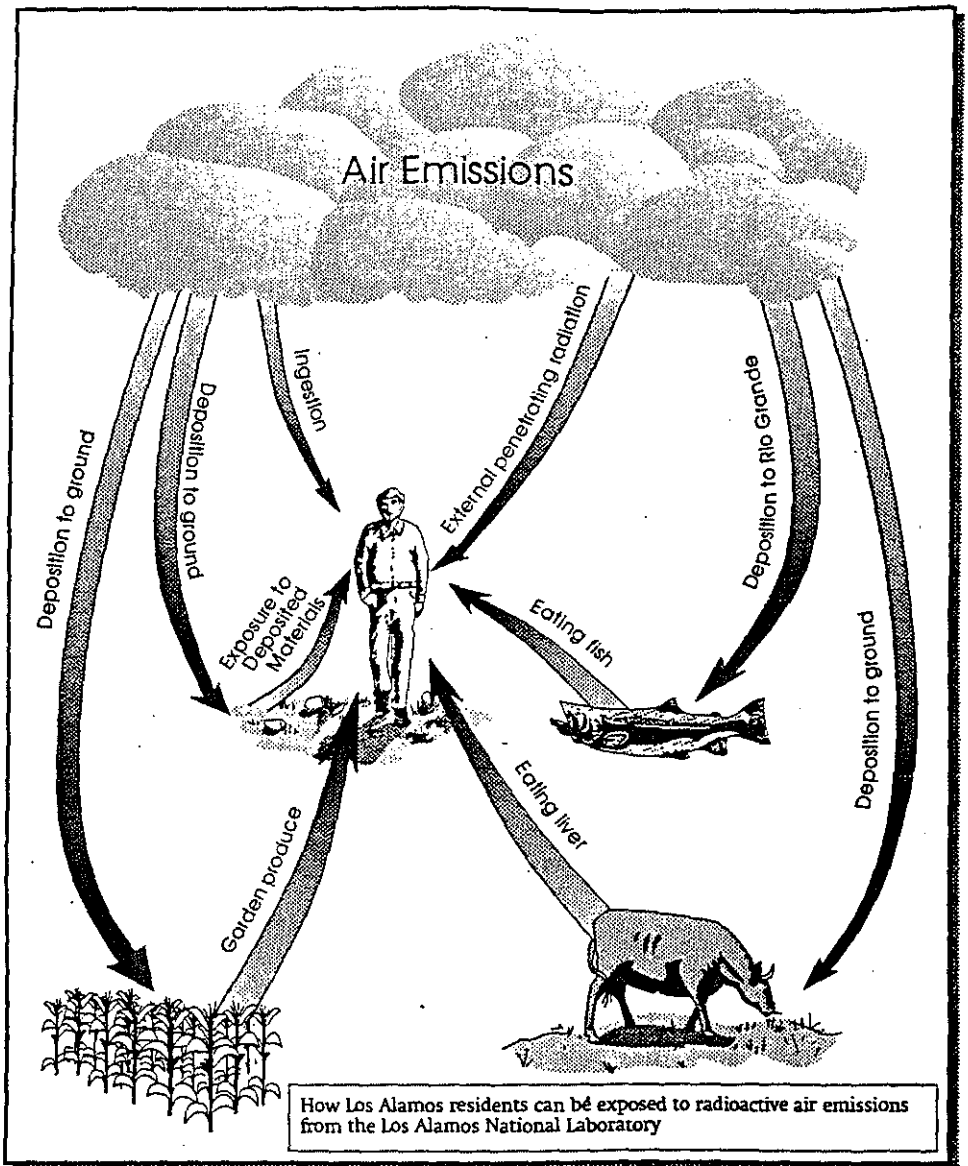
The doses of radiation received by Los Alamos residents from the air emissions aren't the only way in which residents are exposed to radioactivity from the laboratory.

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 Pueblo 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.

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.

Long before WIPP, radioactive material has rolled through town

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

Thirty more spent fuel rods are stored at LANL's Omega West research nuclear reactor awaiting shipment to the Idaho National Engineering Laboratory for reprocessing, or recycling, officials say.

All told, the lab last year made 339 shipments of radioactive materials and 710 shipments of hazardous materials, officials say. Figures for incoming shipments were not provided.

In addition to making or receiving shipments by truck, inbound or outbound freight for Los Alamos can go by air. The main air carrier in and out of the town is Ross Aviation, a contractor for the Department of Energy.

Shipments of radioactive and hazardous materials also are made among the widely scattered buildings at LANL.

Those on-site shipments total a few hundred a day, says Nathaniel King Jr., leader of the hazardous materials packaging and transportation section 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.

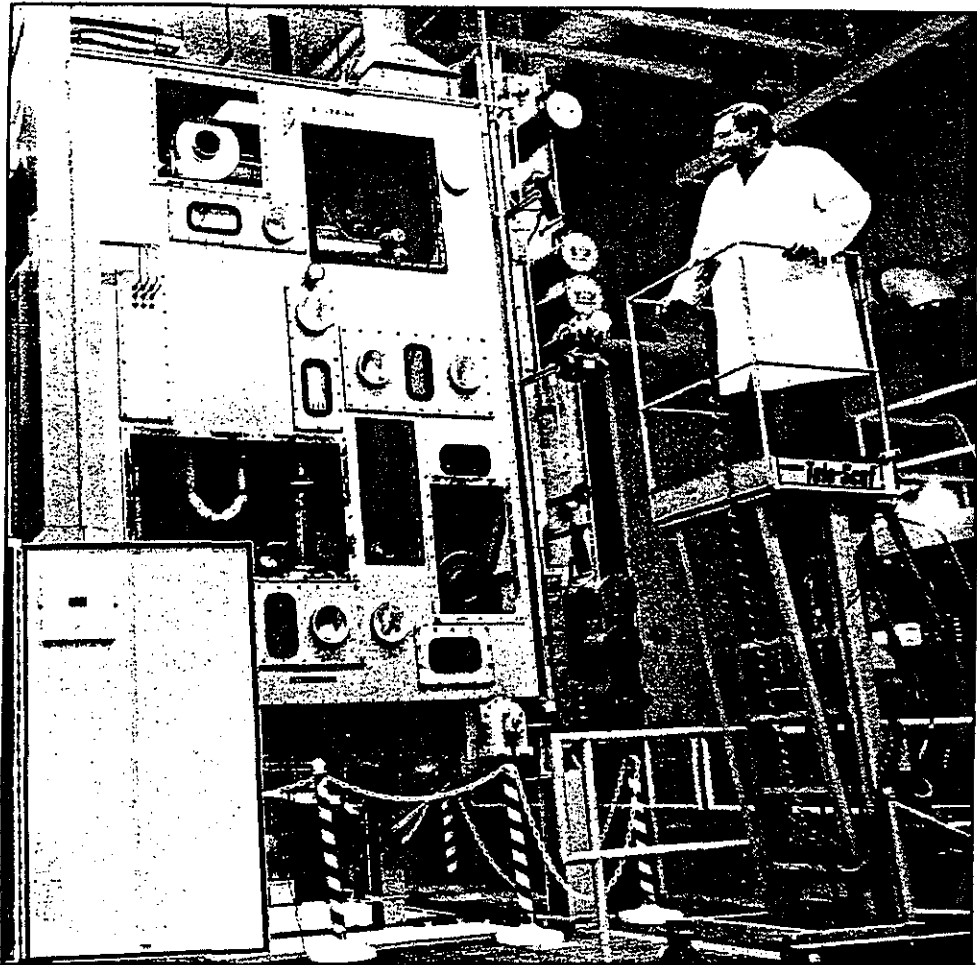
The report said:

"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.

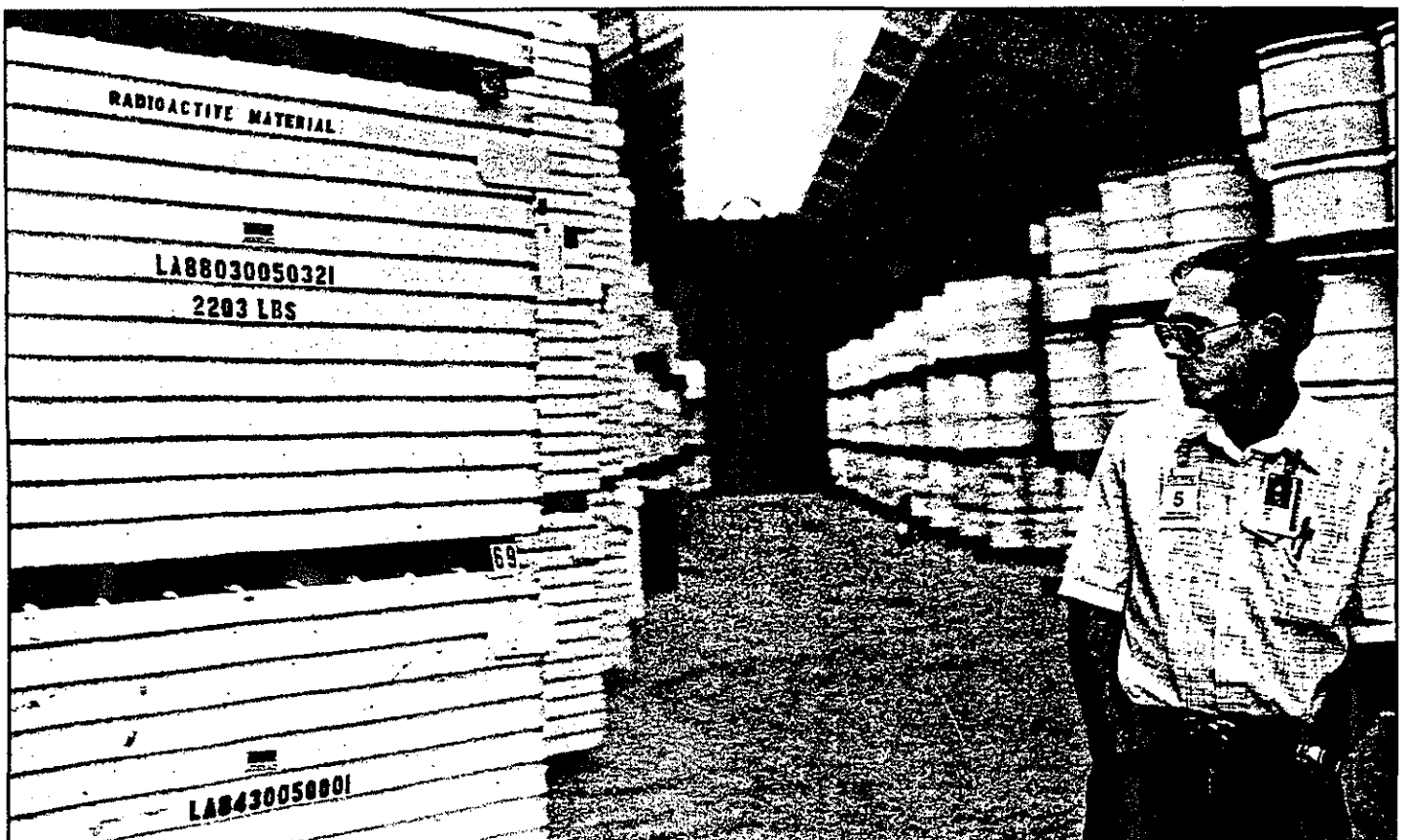
WASTE: In air & water



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

**'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**



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

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 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 waste, for a total of 10,730 cubic meters. A cubic meter is roughly equal to two 20-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.

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.

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

Radioactive releases are monitored 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.

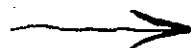
New clean-air regulations that took effect last year give the state authority over 600 additional chemicals, including most of the ones produced by Los Alamos, but only for new

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 dangerous 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 millirem, 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

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.

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.

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 relatively moderate magnitude of 4.5 to 5.0 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.

Lab workers at risk?

'You get exposed whether you want it or not'

Jerry Taylor thinks he's going to die of cancer.

Nearly 11 years ago, Taylor, 34, was badly contaminated with plutonium in an accident at Los Alamos National Laboratory's plutonium-processing facility.

"I feel I might die a lot younger because of this accident," he said in a telephone interview from his home in Keokuk, Iowa. "I'm shaking right now talking about it."

Taylor was fresh out of the Navy in October 1980 when he got a job at LANL as a technician, essentially an unskilled job. Just a few months later, on Good Friday, he got hurt.

Taylor was working with a nitric acid solution containing plutonium and americium, both radioactive elements. A knife slipped, slicing through his protective gloves and puncturing his hand. Plutonium, one of the deadliest elements known, was in his blood stream.

Doctors operated twice to remove some of the flesh of the wound and the contamination it contained. For a year, Taylor also was given a drug designed to encourage the body to excrete plutonium. The drug can have serious side effects, and no other worker at LANL has been given it for more than a few days.

The surgery and the drug removed about 85 percent of the plutonium from Taylor's body, according to laboratory records. Taylor has had to live with the rest and the possibility it would cause cell damage. He said his last tests showed he had about five times as much plutonium in his body as is permissible under occupational rules.

Taylor, who eventually resigned from LANL, said he has suffered no apparent physical problems but there have been emotional ones.

When his wife became pregnant a few years ago, he began drinking a lot because of fears the plutonium had damaged his genetic material and that damage would be passed to the child.

"I didn't know how the child would turn out," Taylor said. "I was emotionally just nuts."

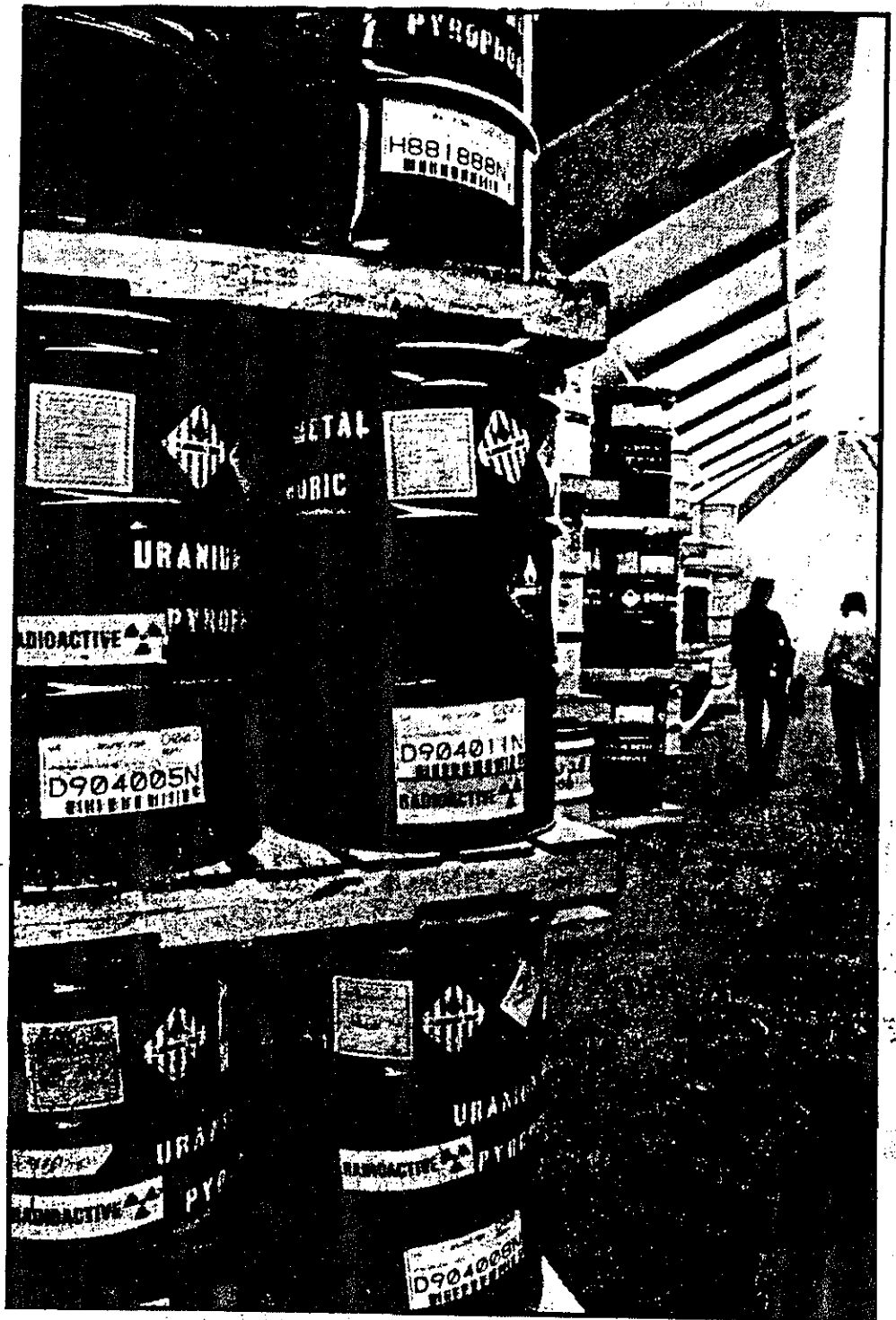
He said his wife suffered a miscarriage because of the stress that he put on the marriage. She became pregnant a second time and gave birth to a healthy boy.

Taylor said he tries not to think about the contamination accident but when he does: "I feel I will get cancer."

The contamination of Taylor was one of the most severe radiation accidents in recent years at Los Alamos National Laboratory, but there have been hundreds of others at the facility owned by the U.S. Department of Energy and operated by the University of California.

Some workers also are exposed to radiation on a routine basis, and the laboratory has been criticized by outside and internal investigators for not doing enough to protect its employees from the hazard.

"You get exposed whether you want it or not," said a worker at LANL's plutonium-processing facility.



Barrels of radioactively contaminated items await shipment to WIPP at the Los Alamos lab's Area G. Preparing the material can expose workers to hazardous material.

Between October 1989 and November of last year, there were 11 contamination accidents serious enough to be reported to U.S. Energy Secretary James D. Watkins, according to Department of Energy records.

In 1989 and 1990, 20 workers at the lab were contaminated on the skin with radioactive materials, according to LANL. Another seven were found to have inhaled or otherwise ingested measurable amounts of plutonium.

Most of the affected employees worked at the laboratory's plutonium-processing facility or in the group that does analysis of special nuclear materials for the processing facility. Those workers total about 625.

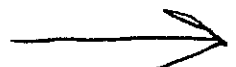
Generally, radioactive particles can be scrubbed easily from the skin if they are detected. When inhaled or otherwise ingested, plutonium can damage cells and organs, possibly causing cancer, genetic defects and other health problems.

The most common radiation risks faced by LANL workers are the inhalation of small, unmeasurable amounts of radioactive particles and exposure to radiation emitted by radioactive substances.

The lab tracks the total radiation exposure of workers, and figures for 1990 show two received between 2 and 3 rems, 31 between 1 and 2 rems, and more than 1,000 received a measurable dose less than 1 rem.

A rem is a unit for measuring absorbed doses of radioactivity. The Energy Department exposure limit for a worker is 5 rems a year, but that ceiling is expected to drop to 2 rems within a year or so because of new studies on the possible effects of low doses of radiation.

Some studies have linked low doses with cancer in nuclear weapons workers, but those studies are considered inconclusive.



The National Research Council's Committee on the Biological Effects of Ionizing Radiations estimates the excess cancers that could occur in a population depending upon its exposure to low doses of radiation.

LANL employs about 7,000 people and if all were men and if all were exposed to one rem of radiation each year from age 18 to age 65, about 201 excess cancers could occur in that population, according to the committee's estimates.

Possible excess cancers drop to about 20 if the population had a continuous lifetime exposure of one-tenth of a rem. The rates are slightly higher for a population of all women.

The committee cautions that excess cancers in such populations could be 50 percent or less of the estimates.

The committee's estimates are based in large part on the health effects of high doses of radiation suffered by survivors of the U.S. atomic bombing of Japan in World War II.

Some scientists say the committee overestimates the effects of low doses of radiation, but others say it

'We can cite the historic experience of the laboratory that the policy is in everyone's job jargon. People all over the lab have found ways to reduce their exposure.'

Joseph Graf
Group leader

underestimates.

In only the past year, medical researchers at Los Alamos have found what is believed to be the first identified cancer death in a lab worker exposed to radiation decades ago. Also, the cancer death last year of a military employee at the lab during World War II has been found to be related to his radiation exposure at the facility.

Such deaths are hard to identify because cancer deaths caused by radiation are masked by the normal occurrence of cancer among nuclear weapons workers.

Three other men at Los Alamos have been killed in accidents in which they were exposed to high doses of radiation. The last such accident occurred in 1958.

James Jackson, deputy director of LANL, described the laboratory's efforts to limit radioactive exposure to workers as "very good."

"We worry about every (contamination case) we see," he said. "They're going to find (contaminated) people. They're looking hard all the time."

Under Department of Energy regulations, Los Alamos National Laboratory is required to have a program to keep worker radiation exposure "as

low as reasonably achievable."

The ALARA concept, as it is known, essentially means that LANL should protect workers from radiation as much as possible without spending unreasonable amounts of money to reduce exposure.

ALARA has been an Energy Department policy since 1981, but in April 1989 and again in August of last year, Energy Department inspectors cited the laboratory for not having an adequate ALARA program.

Joseph Graf, group leader for radiation protection at Los Alamos, said the laboratory is about ready to start a formal ALARA program. ALARA has been a policy at the laboratory for years but its implementation has been "more informal," he said.

"We can cite the historic experience of the laboratory that the policy is in everyone's job jargon," Graf said. "People all over the lab have found ways to reduce their exposure."

Federal inspectors also criticized the lab for not training its employees to deal with radiation properly.

Graf said new procedures have been developed — although they are not yet in operation — to address the concerns.

Although Graf said he agrees with the Department of Energy that radiation training is important, "There are some features (of the criticisms) that I would say are not as important as the main training goal" of protecting workers.

As an example, Graf listed the criticism that the training program did not test its students.

"It's questionable how terribly important that is," he said.

And the instructors used by the laboratory are qualified "whether or not they have a piece of paper to prove it," he said.

Department of Energy investigators in August 1990 also found Los Alamos National Laboratory did not have an adequate contamination-control program at the Chemistry and Metallurgy Research Building.

Among other things, the facility analyzes special nuclear materials, such as plutonium.

The investigators said 1989 and 1990 records showed as many as 25 cases of contamination of personnel or clothing each month at CMR.

Another team of Energy Department investigators in October 1989 criticized the contamination-control program at Technical Area 55, the lab's complex for processing plutonium and making triggers for research and test nuclear weapons.

The investigators also called for a review of processes and practices at TA-55 to reduce high worker exposure to radiation.

'We worry about every (contamination case) we see. They're going to find (contaminated) people. They're looking hard all the time.'

James Jackson
Deputy director of lab

They cited "a very large number of personnel contamination incidents, area contamination incidents and failed glove incidents on a regular basis."

Lab officials say they have developed plans to address the shortcomings cited by the Department of Energy investigators at the CMR Building and TA-55.

LANL, however, has been criticized in the past for not moving quickly enough to solve problems.

Congress' General Accounting Office said last year that 67 of 124 health and safety problems identified by the Energy Department at Los Alamos in 1986 had not yet been corrected.

A report by Energy Department investigators last August also said work had not been completed on several recommendations made during previous investigations.

Some employees at the lab have said their superiors retaliated against them after the workers expressed concerns about safety problems.

Citing retaliation and racial harassment, four workers at the Chemistry and Metallurgy Research Building successfully sued the lab in 1984, winning a settlement totaling \$500,000.

Radiation: When do low-level doses cause illness?

For nearly a century, since the discovery of the X-ray, scientists have known that large doses of ionizing radiation can cause health damage.

The debate that still rages is about whether low doses can lead to cancer, genetic defects, developmental abnormalities and degenerative diseases.

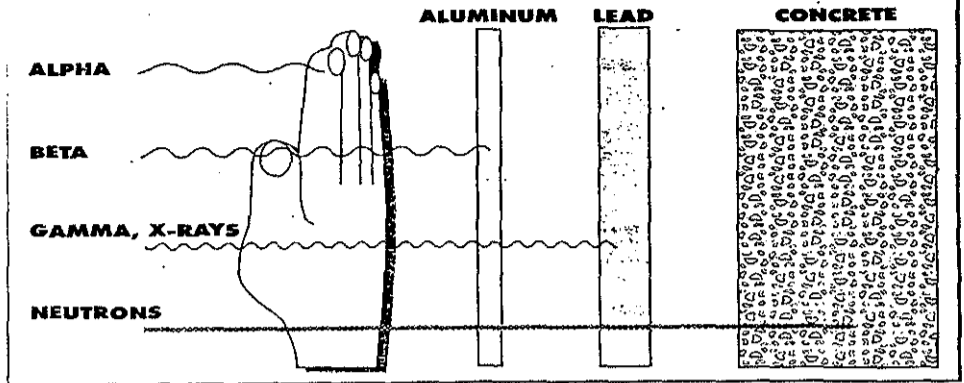
One conclusion can be drawn: Federal exposure limits for workers and the public are being lowered as scientists learn more about how even low doses of radiation might affect humans.

The question of low-dose effects is important for workers at Los Alamos National Laboratory and the people living nearby because their exposure to low doses of radiation is increased by lab operations.

Like people elsewhere in the world, lab workers and Los Alamos-area residents receive low doses of radiation from such sources as the sun, the naturally occurring gas radon, X-rays and fallout from nuclear weapons tests. The annual whole-body dose of radiation for Los Alamos residents from these sources is estimated to be about 390 millirems a year.

A rem is a unit for measuring radioactivity. A millirem is 1/1,000th of a rem. So, 389 millirems is about

TYPES OF RADIATION



four-tenths of a rem.

Under U.S. Department of Energy regulations, workers at LANL can receive an additional whole-body dose of radiation each year of up to five rems, or more than 12 times what they would receive if they didn't work at the laboratory.

A resident of Los Alamos can receive a whole-body dose of up to 10 millirems a year from LANL. That limit is set by the U.S. Environmental Protection Agency and only increases by a fraction what a person in Los Alamos would receive if LANL didn't exist.

Generally, a low dose of radiation is considered to be fewer than 10 rems, even though the federal gov-

ernment has set the acceptable level at 5 rems a year, a figure the Energy Department is likely to drop to 2.

Theories about the health effects of low doses of radiation abound, including one that low doses actually might be good for humans and another that a large number of cancers might be caused by low doses.

There is such a wide spectrum of opinion because of the difficulties in trying to determine with certainty whether low doses of radiation cause health problems.

The health effects, if any, suffered by the general population because of low doses of radiation are masked by the normal occurrence of cancer and

other disorders. For example, one in four people contracts cancer.

Nuclear workers are exposed to greater doses than the general population, but so far the studies of the workers have been limited in number and scope. Some studies have shown some possible excess cancers, but the scientific community considers the evidence of possible health effects inconclusive.

The Department of Energy and the Environmental Protection Agency set exposure limits for nuclear workers and the public based on the recommendations of the International Commission on Radiological Protection and its U.S. sister body, the National Council on Radiation Protection.

In making their recommendations, the ICRP and NCRP consider the findings of the National Research Council's Committee on the Biological Effects of Ionizing Radiations.

That is where the scientific dispute comes in. Some scientists believe the BEIR Committee overestimates risk from low doses, while others believe it underestimates.

In December 1989, the BEIR Committee adjusted its estimates, saying the risk of cancer from low doses of radiation might be three or four times higher than previously estimated by the committee.



Charlie Villareal, a technical supervisor at the lab's Area 3, checks to see if he has contamination on his vehicles and personal belongings of anyone leaving the site by placing them in an electronic monitor. In the background are Geiger counters used to check G site.

Plutonium workers once got a freebie: cigarettes

Socorro Trujillo never will know for sure what killed her husband — but she blames Los Alamos National Laboratory.

Victor Trujillo, 48, of Pojoaque, died of lung cancer last May, two months after being diagnosed with the disease.

Trujillo worked for 17 years at LANL. At the time of his death, he was working at TA-55, the complex where plutonium is processed for use in nuclear weapons.

His job meant potential exposure to low doses of radiation and possible inhalation of radioactive plutonium, one of the deadliest elements known. Both low doses of radiation and inhaled plutonium are suspected of causing lung cancer.

Trujillo also smoked, though, and cigarettes are known to cause lung cancer. His wife says he didn't smoke at home. At work, he did. The cigarettes were free — courtesy of Los Alamos National Laboratory.

"It doesn't sound like they are very smart up there," Socorro Trujillo says. "It doesn't sound like they care about their employees."

For several years and possibly decades, the laboratory provided free cigarettes to plutonium workers because the employees can't take their own cigarettes into processing areas.

"It's a crazy thing to do," says Dr. David Coultas, a physician in the pulmonary division at the University of New Mexico medical school. "It just doesn't make any sense."

The practice of providing cigarettes ended in about 1987.

"It was a growing realization ... that smoking was bad," says Delbert Harbur, leader of the nuclear materials technology division at Los Alamos National Laboratory.

In hindsight, Harbur says, it was bad policy to provide the cigarettes.

The practice was ended nearly a quarter-century after the first U.S. surgeon general's report on the hazards of smoking.

In the earliest days of the Manhattan Project during World War II,

researchers were concerned about possible lung cancers among nuclear workers caused by inhaled plutonium.

One of Victor Trujillo's fellow workers, who spoke on condition of anonymity, says the free cigarettes were a "good gesture" at the time, but he agrees now they were a mistake.

Because the workers couldn't smoke on the job, "when we went on break, we smoked more than our share," the employee says.

Another of Trujillo's fellow workers, again speaking on condition of anonymity, says he quit smoking for 10 years, then started again while at TA-55.

Those kinds of possible cases — where a worker began to smoke or took up smoking again because of the free cigarettes — are the most troubling aspects of the policy, says Coultas of UNM.

Anna Christensen, deputy leader of nuclear materials technology division, says there are no studies that show a smoker is at an increased risk for lung cancer if he works in a plutonium facility.

In fact, there is at least one such study.

The study was published in 1975 by Dr. John W. Gofman, former director of the Biomedical Research Division at LANL's sister lab, Lawrence Livermore National Laboratory in California.

The study says that cigarette smoking causes damage to the respiratory system, and that results in plutonium particles being retained for long periods and increasing the risk of cancer.

The study was mentioned in an environmental impact assessment of Los Alamos in 1979 published by the Department of Energy. The department, however, said the study had been rejected by other scientists and scientific organizations.

Scientists still are trying to determine if low doses of radiation and inhaled plutonium can cause cancer in humans.

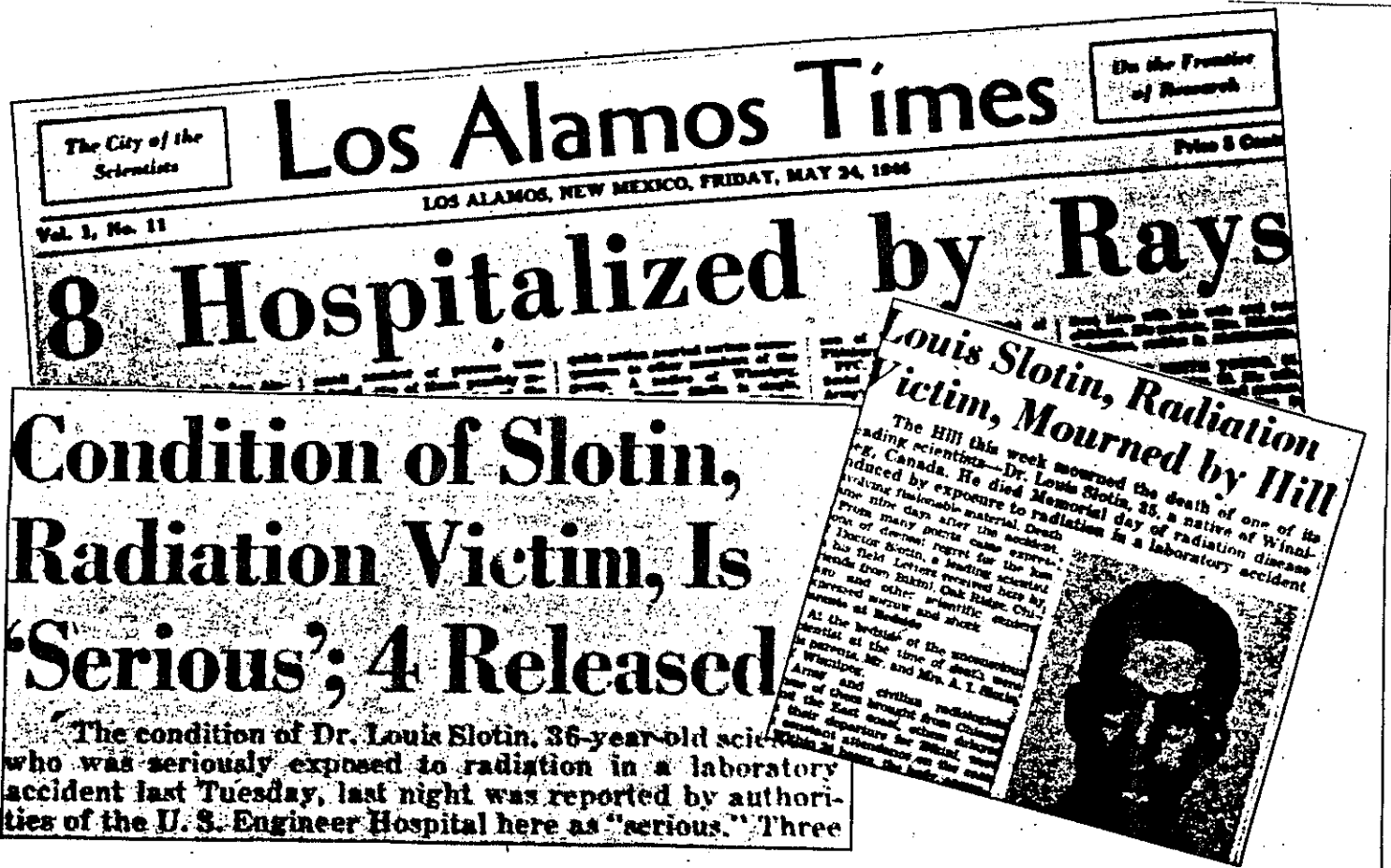
James McInroy is head of a program at LANL that analyzes tissue from dead plutonium workers.

McInroy says that while plutonium has been shown to be an effective carcinogen in laboratory animals, no links have been made with lung cancer in humans. He says a link hasn't been ruled out either.

While scientists continue to study the effects of plutonium, Socorro Trujillo is trying to deal with the uncertainties about the death of her husband of 27 years.

"Some days you just have to live with it, but it's hard," she says. "You have to go on."

Dramatic radiation deaths have captured headlines



In a memorable scene from *Fat Man and Little Boy*, the Paul Newman movie about Los Alamos National Laboratory during the Manhattan Project, a young scientist dies a slow, painful death after an accidental radiation exposure.

That scene is based on three such incidents in the history of the lab.

Although long-term exposure to radiation actually might present a greater threat to lab employees, there have been more dramatic accidents — with more immediately visible results — at Los Alamos.

A 1986 study by the lab lists 29 on-the-job deaths between 1945 and 1979, 16 from industrial accidents other than car and airplane crashes. Three were caused by exposures to large doses of deadly radiation.

Although the film's version takes place during the Manhattan Project's drive to invent the atomic bomb, all the real-life incidents happened later.

The first case occurred on Aug. 21, 1945, a few weeks after the atomic bombing of Japan. It involved a junior scientist named Harry Daglian who was conducting a "criticality experiment," in which scientists bring together uranium or plutonium to determine at what point the mass becomes critical and creates a nuclear chain reaction.

Scientists compared criticality experiments to "tickling the tail of a sleeping dragon."

Daglian's dragon awoke with a roar. While he was building a small wall of uranium bricks around two plutonium hemispheres, a brick slipped from his hand, sending the assembly supercritical and exposing him to a massive dose of radiation.

The book *City of Fire*, a general history of Los Alamos by New Mexican James W. Kunetka, describes what happened next: "Very shortly second degree burns developed on his body where the radiation had been most intense, on his hands and abdomen. A fever developed and after two weeks the burns blistered and he lost his hair."

Daglian was dead 25 days after the accident.

His family received the maximum payment of \$10,000 from the "welfare fund," a secret insurance fund set up at the demand of early atomic workers.

The next man to be killed in a criticality accident was Louis Slotin, who had served in the Abraham Lincoln Brigade in the Spanish Civil War before getting his doctoral degree and going to work at Los Alamos as head of the critical assemblies group.

On May 21, 1946, Slotin was conducting a criticality experiment in which he brought two hemispheres of plutonium together slowly, using a screwdriver to keep the two halves apart.

The screwdriver slipped, sending the mass supercritical.

Although Slotin quickly knocked the two hemispheres apart, saving the lives of seven others in the room, it was too late for him. He already had received a dose of 1,000 rads — 200 times more radiation in a second than today's nuclear workers are allowed to receive in a year. The other seven were hit with lesser doses; some became sick, but all recovered.

Slotin died nine days later. His family received the standard \$10,000.

The third radiation accident was the worst in the lab's history.

Near the end of the work day on Dec. 30, 1958, a lab technician named Cecil Kelly was conducting an operation in which small amounts of plutonium were recovered from liquid waste stored in a large tank.

Laboratory officials believed that it was impossible for enough plutonium to be present to create a critical chain reaction.

They were wrong.

Somehow, plutonium-rich solids ended up in the tank.

When Kelly hit a switch causing an automatic paddle to begin stirring the mixture, there was a bright flash of light and Kelly fell to the ground.

He received a dose of 12,000 rads to his abdomen and an average dose to his whole body of about 4,500. He suffered severe abdominal pain, chills and vomiting before dying 35 hours later.

In non-nuclear accidents at the laboratory, a smoke bomb explosion killed one man in 1946, four laborers were killed in 1959 by an explosion while unloading materials for routine scrap burning, and a man died in 1978, possibly because of oxygen deprivation while performing routine maintenance on an accelerator.

Records of the U.S. Department of Energy, which owns Los Alamos National Laboratory, show about two dozen accidents involving radioactivity occurred from October 1989 to November 1990 that were serious enough to be reported to Energy Secretary James D. Watkins.

In nine of those incidents, lab employees received a measurable dose of radiation but an amount less than the Energy Department's annual exposure limits.



Harry Daglian, pictured above at Trinity Site in 1945, died when a criticality experiment went out of control. Louis Slotin, below, was killed in 1946 in another such experiment.



Decades after their exposures, two men succumb to cancers

In only the past year, medical researchers at Los Alamos National Laboratory have found what are believed to be the first identified cancer deaths of laboratory workers caused by exposure to radiation decades ago.

The deaths were those of Jay E. Hammel of Los Alamos, a physicist at the lab, and a second man who was a Manhattan Project military employee at the lab during World War II. The name of the second man has not been released.

Hammel, 69, died of thyroid cancer July 19.

His cancer likely was caused by his exposure to radiation during nuclear bomb tests in 1956 in the Marshall Islands in the West Pacific Ocean, said Dr. George Voelz, former long-time chief of epidemiology at Los Alamos National Laboratory.

Hammel was one of several hundred workers from the lab on the islands for the tests. He apparently was exposed twice to significant levels of radiation, Voelz said.

The first was a trip to near ground zero, the point of detonation of a bomb, the researcher said. In the second exposure, he and several hundred others were caught in a heavy rainstorm that was contaminated with fallout from a test.

A dose reconstruction of the rainstorm — done since Hammel's diag-

nosis — showed that one or two thyroid cancer deaths were possible among the Los Alamos workers, Voelz said.

Hammel's family said the physicist was given no warning that he could develop cancer.

"Dad felt it could have been handled in a better way," said his daughter, Leslie Hammel-Turk of Santa Fe.

The second cancer death was that of a man who ingested plutonium. His health had been tracked for decades as a part of a study of plutonium workers from the Manhattan Project.

The man died last year of bone cancer, an uncommon disease. The body's bone structure attracts plutonium.

That case offers the first evidence of human bone cancer occurring after exposure to plutonium, one of the deadliest elements known. The metallic element is used in making nuclear bombs.

Excess cancers due to radiation exposure are difficult to identify in nuclear weapons workers because they are masked by the normal occurrence of cancer. One in four people contracts cancer.

Also, because of the long latency periods for some cancers caused by exposure, some cases only now are showing up.

Phobias or allergies?

Victims say illness stems from work with chemicals

No one disputes that Ben Ortiz is sick; the disagreement is over the cause.

Ortiz's troubles include insomnia, depression, dizziness, nausea, memory loss, breathing difficulty and a feeling of being disoriented.

He can't tolerate the smell of his wife's perfume and nail polish, the smoke from cigarettes or the exhaust fumes from cars.

"I have no type of social life," said Ortiz, 53, of Nambe.

His physician, Jacqueline Krohn, said Ortiz's respiratory and neurological problems are the result of his 20 years of exposure to chemicals while working as a mechanical technician at Los Alamos National Laboratory.

The diagnosis is known variously as multiple chemical sensitivities, environmental illness, total allergy syndrome or 20th-century illness.

Los Alamos National Laboratory — like the medical establishment in general — doesn't recognize the diagnosis of multiple chemical sensitivities.

Those authorities don't dispute the people are sick, but they blame the troubles on the physical manifestations of anxiety and fear — not on exposure to chemicals.

"You've got a phobia, not an allergy," said Dr. William Greendyke, chief of occupational medicine at Los Alamos National Laboratory. "These people are prisoners of their psyches."

The diagnosis of multiple chemical sensitivities is a relatively new one.

Some physicians believe that single or multiple exposures to certain chemicals can cause supersensitivity to a broad range of thousands of common chemicals, foods, molds and even electromagnetic waves, the sort given off by, for example, heating pads and television sets.

According to these doctors, multiple chemical sensitivity results when a patient's total body load of chemical, biological, psychological and physical stress reaches a certain threshold at which point very low levels of added exposure trigger illness.

The tasks of daily living can be difficult, with even the slightest whiff of chemicals in the outside air, home furnishings, food or clothing making patients sick.

Ortiz said he was forced to take a medical leave from Los Alamos National Laboratory in 1988. He returned to work later that year in

another job where his exposure to chemicals was reduced, but the symptoms persisted.

He requested another job, but the lab said it could not find another position and terminated Ortiz in 1989 on medical grounds. He now has a workers' compensation claim pending.

"The lab thinks it can quiet you down by telling you that you are crazy," Ortiz said. "But I'm not the only one who is sick."

David Salazar, 54, of Hernandez took an early retirement from the lab this year after more than 20 years at the facility.



BEN ORTIZ

"I have no type of social life."

A machinist, he also was exposed to chemicals. He got sick in May 1989 and his symptoms are similar to those of Ortiz.

"I'm only sleeping 2 or 2 1/2 hours a night," Salazar said. "I'm tired all the time."

Another lab worker, Ruth Fuyat,

also said she developed multiple chemical sensitivities. Her claim for workers' compensation benefits is pending before the state Appeals Court. The ruling could set a precedent in New Mexico for future rulings on such claims for workers' compensation.

Krohn said that over the past seven years, she has treated six to 10 lab workers with chemical troubles.

"There have been illnesses missed and people unfairly labeled as having psychologic and psychiatric problems," the physician said.

Although the laboratory doesn't recognize the diagnosis of multiple chemical sensitivities, it does acknowledge cases where there is physical evidence of solvent damage in a worker's body or extreme solvent exposure in the work place.

Last year, 52 workers complained to LANL's occupational medicine staff of symptoms of solvent exposure, but only 13 were diagnosed with a solvent problem, according to figures supplied by the lab.

Josephine Rohr, an Albuquerque lawyer, represents Ortiz in his bid for workers' compensation benefits. She said she has more than 200 other clients, mostly from Albuquerque, suffering from multiple chemical sensitivities.

Rohr said the medical establishment is slow to recognize such new diagnoses.

"Doctors are very conservative people, and scientists in general are very doubting people," she said. "It's not malice on their part. It's the nature of the beast."

Rohr said multiple chemical sensitivities does have a psychological component but that the psychological troubles are the result of the disease, not its cause.

Greendyke, the occupational medicine chief at Los Alamos National Laboratory, said the diagnosis of multiple chemical sensitivities isn't recognized by lab physicians and most other doctors because tests of the patients' livers and kidneys show no evidence of chemical troubles.

Also, in the case of lab workers, air samples from their workplaces don't show levels of chemical fumes that would cause ill health, he said.

That lack of evidence has led to the conclusion that the health problems are the manifestations of psychological troubles. Greendyke said, though he can't discount the possibility that the diagnosis of multiple chemical sensitivities might be recognized after further research.

A recognition of the diagnosis of multiple chemical sensitivities could have financial implications for employers because of a likely increase in workers' compensation payments and other insurance claims.

Greendyke said economics don't play a role in LANL's position on the diagnosis.

"Actually it costs more to prove our case than to go ahead and pay" the benefits for a claim of multiple chemical sensitivities, he said. "Nobody's ever squeezed me on dollars for any reason."

Some studies of people diagnosed with multiple chemical sensitivities have been conducted, but they have been inconclusive.

One study by the New Jersey Department of Health supported the diagnosis, but another by the University of Washington linked sufferers to psychological problems.

At Los Alamos National Laboratory and other facilities in the nation's weapons complex, studies on worker health have focused for the most part on the effects of radiation, not chemical exposure.

"There is more intense concern about radiation because of the R word," Greendyke said.

For example, he said, the group responsible for protecting workers from radiation has 150 employees compared to 50 in the group overseeing industrial hygiene.

The physician agreed with a 1989 finding by the National Research Council that in the weapons complex, more consideration should be given to chemical exposure in health study programs.



DOE gives up control of worker health studies

For nearly 50 years, the U.S. Department of Energy, the agency that makes nuclear weapons, also was in charge of studying the effects of radiation on weapons workers.

The setup was compared to having the tobacco industry in charge of lung cancer research or notorious bank robber Willie Sutton as supervisor of the banking industry.

Over the past year, however, reforms have been made in the arrangement, including:

- The Energy Department for the first time began making the health and occupational records of weapons workers available to independent researchers.

- The department began a program to computerize the records and make them available to researchers at a central repository.

- The department transferred to the Department of Health and Human Services its program of studying the effects of radiation on weapons workers.

The steps taken by the Department of Energy already have stirred additional research. And that research could help solve the riddle of whether low doses of radiation can cause cancer in nuclear weapons workers such as those at Los Alamos National Laboratory.

The reforms followed more than a decade of pressure from members of Congress, worker unions, independent researchers and others. They said the department's efforts were flawed and changes would increase public confidence in the research.

The pressure resulted in part from allegations by government researchers that the Energy Department and its predecessor, the Energy Research and Development Administration

(ERDA), had attempted to suppress findings linking radiation and cancer in some workers.

Researcher Thomas Mancuso, an epidemiologist at the University of Pittsburgh, charged that he was dismissed by the ERDA in 1976 after he and two other scientists found radiation was causing cancer in some workers at the Hanford nuclear reservation near Richland, Wash.

Dr. Gregg Wilkinson, chief of epidemiology at the Department of Energy's Los Alamos National Laboratory, also has charged that his superiors in 1986 tried to prevent publication of a study linking radiation and cancer in workers at the Rocky Flats, Colo., weapons plant.

The Wilkinson study was published, and LANL officials have denied any harassment of the researcher. Wilkinson resigned his position at the lab in 1987.

Critics of the Department of Energy say intimidation of researchers was just one way that the department retarded health studies of workers to avoid any curtailment in the production of nuclear weapons.

They say the government's studies also have been limited in scope and number and poorly designed. About three dozens studies have been published since the program began in 1964.

Even Energy Secretary James D. Watkins, who took office in January 1989, has described the research program as understaffed, underfunded and underused.

He said that when he took control of the department, only one full-time professional was assigned permanently to oversee the agency's \$26.6 million epidemiological program.

Dr. Alice Stewart, a noted British

Low-level link or not? Studies differ

Since the beginning of a program to study the health of nuclear-weapon workers in 1964, the federal government has paid for about three dozen such studies.

Some of the studies have found no links between exposure to low doses of radiation and cancer in workers, but others have found possible connections. Thumbnail sketches of those studies:

- A continuing study of about two dozen Manhattan Project workers who ingested plutonium found one worker contracted — and died of — bone cancer, an uncommon disease. Researchers think the cancer was caused by plutonium.

- A study of workers at the Hanford plant in the state of Washington found an excess number of tumors of the bone marrow and cancer of the pancreas.

- A study of workers at the Rocky Flats plant near Denver found a high rate of brain tumors.

- A study of workers at Los Alamos National Laboratory found a high rate of cancer of the rectum and colon, but researchers said the excess was better explained by socioeconomic than occupational factors.

- A study of workers at Lawrence Livermore Laboratory in California found a high rate of skin cancer.

- A study of the offspring of some parents at the Hanford plant found a relation between birth defects and parents with radiation exposure.

- A study of workers at Los Alamos found possible increased risks for several types of cancer.

researcher in the field of radiation science, said the federal government had a motive for its actions.

"I think the reason for it was this enormous sort of combination of war, ministry of war and the ministry of energy all saying, 'You're trying to say we can't go after nuclear energy,'" Stewart said in a recent interview on public television.

Watkins initially refused to give up the department's research into nuclear weapons workers, saying it was critical that the agency retain control so that any health troubles could be identified before production had to be curtailed.

After a committee appointed by Watkins recommended he surrender

the programs, the secretary did so.

In December, the department transferred to the Department of Health and Human Services the program for studying the effects of radiation on 600,000 people who have worked in the nuclear weapons industry. The Centers for Disease Control will do the research.

The transfer was done through an administrative procedure, not by law, as proposed by the prominent medical group Physicians for Social Responsibility.

"It's reversible and our position is this ought to be a statutory change," said Dr. H. Jack Geiger, co-director of the group's Task Force on Nuclear Weapons Production and Public

Health. "While it is an improvement for (the Centers for Disease Control) to be doing the worker epidemiology, the (Energy Department) continues to control the budget. Any scientist knows if you control the budget, you control the work."

In another reform last summer, the Department of Energy began turning over to the Three Mile Island Public Health Fund the records of 200,000 workers in the nuclear weapons complex, including employees at Los Alamos National Laboratory.

Although 600,000 people have worked in the complex, the data on only one-third of them have been compiled for analysis. TMI Public Health Fund fought three years for the data.

The worker records are considered the world's best raw data on the effects of low doses of radiation. Some Department of Energy studies have linked low doses with cancer, but the results have been inconclusive.

Stewart is analyzing the data and results could be released later this year. Her work could advance the knowledge of the effects of low doses of radiation.

"I am not presumptuous to think this will solve the question once and for all," said Daniel Berger, lawyer for the TMI Public Health Fund in Philadelphia. The fund, a medical-surveillance group, was set up as part of litigation following the 1979 near-meltdown at the TMI nuclear power plant.

The central repository being set up by the Department of Energy for independent researchers to examine worker health records will include data on all 600,000 employees in the weapons complex.

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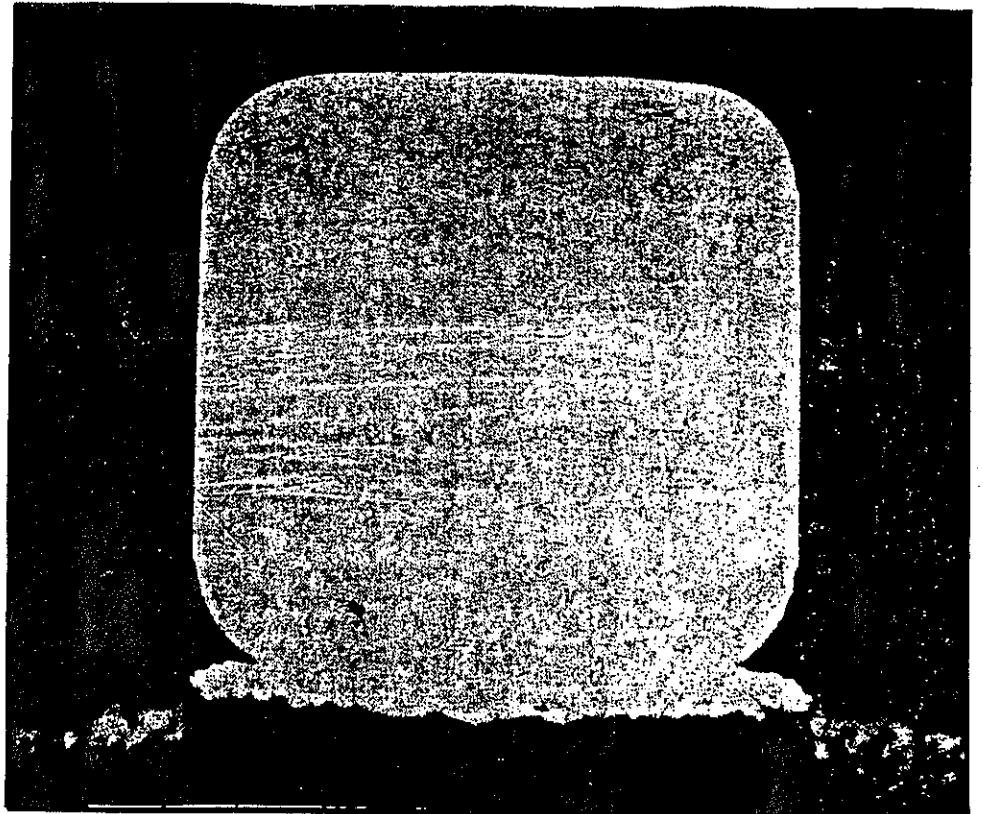
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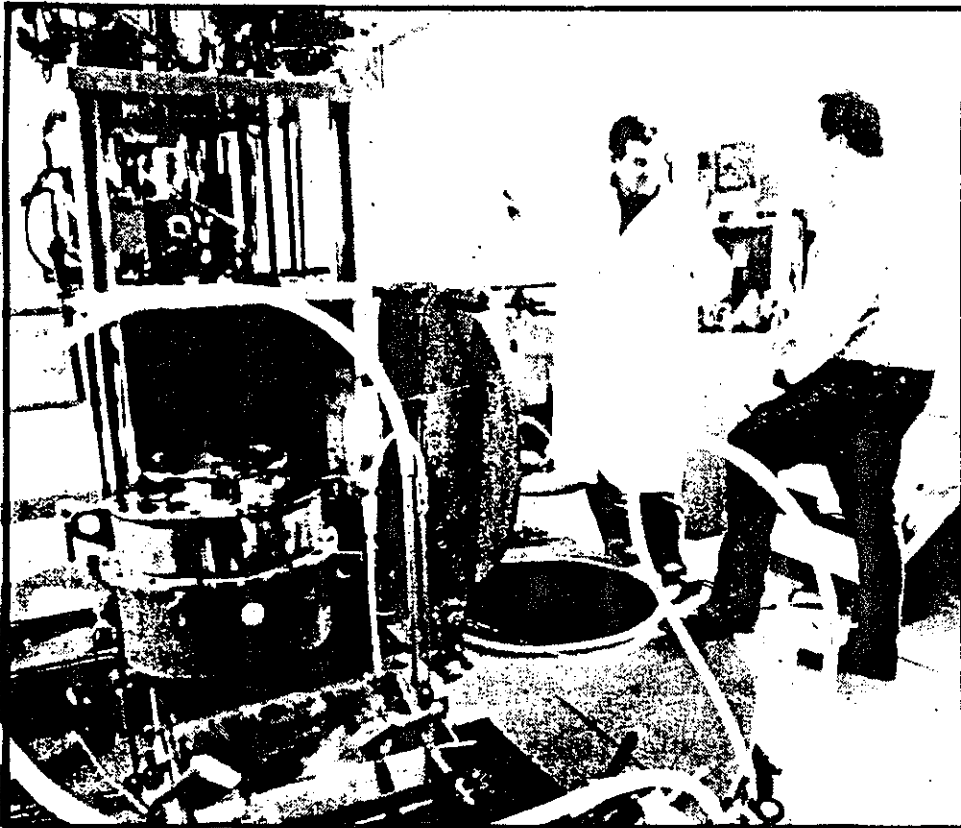
IN LOS ALAMOS

A self-fluorescing plutonium-dioxide pellet, right, glows with its own heat, putting out 62.5 watts of thermal energy. Such pellets power space probes, including the Galileo Jupiter-exploration spacecraft and the Ulysses mission to the Sun.

Courtesy Los Alamos National Laboratory



Lax rule enforcement norm at 3 lab sites, critics charge



Technicians, left, at the lab's Omega West Reactor stand near the access hatch to the core. Lab officials say safety is an important concern in the operation of the reactor.

CRITICALITY:

Student scuttles lab facility

Criticality facility

Few aspects of nuclear energy and nuclear weapons are as frightening as a criticality accident, in which elements of plutonium or uranium are accidentally brought too close together, creating an unplanned chain reaction and releasing large doses of radiation.

The Los Alamos Critical Experiments Facility at Los Alamos National Laboratory is the only place in the country where vital experiments and training can take place to help avoid such accidents.

Not now, though: The facility has been shut for more than a year.

It was closed in November 1989 when a student in one of its classes alleged there had been a host of safety violations.

Los Alamos officials say they have addressed all the issues raised by the student and have been ready to allegations "sounded very serious," Malanify said.

Among the student's accusations: Out-of-date procedures were used during criticality experiments; procedures were violated; instructors had a casual attitude about safety; students were not properly monitored for radiation; and protective clothing wasn't worn in potentially contaminated areas.

"I find little real basis in his allegations," Malanify said.

Most of the complaints were due to misunderstandings, he said. For example, the student clearly didn't understand who was in charge of the class, he said.

Lab instructors work closely with the students. The instructor, while knowledgeable about criticality, is not a certified operator and is not responsible for safety. It is the staff of the facility that actually runs the experiments.

"The student could conclude the instructor is in charge," Malanify said, "But, he's not."

So, the student was shocked to see the instructor using an out-of-date procedure guide, when in fact it didn't matter because "the guide was being used as teaching notes only," Malanify said.

A review board established to investigate the incident agreed that misunderstandings were to blame for many of the accusations. The board "did not find a calloused attitude toward radiation protection or nuclear safety," its report concludes.

However, the board did find "a casual attitude toward procedural formality" and recommended changes such as updating plans and writing new procedures.

"There are good reasons for that,"

reopen since last April. The reopening has been delayed by a regulatory morass at the U.S. Department of Energy, which owns LANL, they say.

The closure is ironic, the officials say. The same increased safety concerns at the Energy Department that have kept the facility closed also have also increased the demand for its services.

"The entire (nuclear) community is trying to improve on safety, and lots of facilities are trying to improve their training of people who handle nuclear materials," said John Malanify, deputy group leader for the criticality unit.

"This is the only place in the country where you can do these student classes, where you can approach criticality with hands-on experience," said the lab's deputy associate director, Michael Stevenson.

There is a criticality facility near Denver, but it is tied up with work relating to problems at the nearby Rocky Flats plant, leaving Los Alamos as "the only remaining general-purpose facility," according to a report by the National Research Council.

The trouble at Los Alamos began in September 1989, when 15 students, all employees of the Department of Energy or federal contractors, attended a two-day criticality class.

During courses taught at the facility, students assist in bringing together plutonium or enriched uranium to slowly approach — but not reach — a state of criticality.

No complaints were registered by



JOHN MALANIFY

"Trying to improve on safety."

any of the students during the class.

Nearly two months later, in November 1989, the Department of Energy's Albuquerque office was notified that one of the students had gone back to his office in Richland, Wash., site of the heavily contaminated Hanford Nuclear Reservation, and filed a report claiming safety infractions during the class.

Los Alamos officials said they could not explain the two-month delay, nor did they know whether the student had been sent to the class by the Energy Department to secretly investigate the facility. Federal officials did not respond to questions about the matter.

Los Alamos management shut the facility the next day because the

gy Secretary James D. Watkins released new rules on reopening a facility, Malanify said.

"It was decided (the department) wanted further reviews" of the facility's readiness to open, he said.

And more reviews, and more reviews.

The facility has prepared reviews for laboratory management, the Los Alamos Energy Department office, the Albuquerque energy office, the Defense Programs Office at federal energy headquarters in Washington and the federal department's Office of Nuclear Safety, Malanify said.

The facility happened to be closed at a time when more notorious closures, such as the one at Rocky Flats, were causing the Energy Department to revamp its rules.

If the closure had happened a year later, "the (Energy Department) would have had the procedures better defined and it wouldn't have taken as long," Stevenson said.

Stevenson said he has not received final word but hopes the final review has been completed and the facility can reopen soon.

The impact of the closure will be felt for some time to come.

"At a minimum, there is some set of potential students having their training delayed by a year or more," Stevenson said. There already is a yearlong backlog of students signed up to begin taking the classes when they begin again.

Even once it reopens, the facility will have to bring its own employees back up to speed before resuming classes for others, Malanify said.

"When we can't operate, it's like a pilot who can't fly," he said. "He can work on the simulator all day long, but ..."



MICHAEL STEVENSON

"Research and development"

Stevenson said. "We're used to operating as research and development, as a laboratory, and the idea of formality of operations is sometimes foreign. We're more concerned with safety and the real hazards involved. We're not as concerned with dotting the i's and crossing the t's."

The facility always has had safe procedures and policies, but as a result of the board's recommendations it now has a paper trail to prove it, Malanify said.

By April 1990, "we thought we had addressed things adequately at that point to reopen," Stevenson said.

Lab officials quickly learned, however, that while they had made the decision to close the facility, they could not reopen it without Department of Energy approval.

While the facility was closed, Ener-

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OMEGA: Age of reactor a concern for doubters

Nestled in a deep canyon that divides the town of Los Alamos to the north from Los Alamos National Laboratory to the south is a historic site that doesn't appear on the usual tourist maps.

The Omega West Reactor, a small nuclear reactor used for research, is there at the base of the cliffs of Los Alamos Canyon, a few miles down the road from a well-stocked reservoir and an ice-skating rink.

After creating the world's first sustained nuclear chain reaction at a University of Chicago squash court in 1942, famed scientist Enrico Fermi came to this canyon, known as Omega Site, and set to work helping to build "the water boiler" — an evasive name for the laboratory's first nuclear reactor.

Omega Site was placed in a canyon for a simple reason: So little was known about nuclear reactors when work started in 1943 that Los Alamos officials wanted it out of the way should something go wrong.

The feared accident never occurred, not at the water boiler and not at its replacement, the Omega West Reactor.

Today, though, questions are being raised about the aging Omega West Reactor's ability to sustain that safety record.

An inspection team from the U.S. Department of Energy, the agency that owns Los Alamos National Laboratory, investigated Omega West in July 1989.

The team concluded that although the facility posed no immediate health threat, "an aging facility, coupled with informality in operations, maintenance and emergency readiness, constitutes an increasing potential for accidents."

Lab officials dispute that finding. Safety always has been Omega West's top priority, and the inspection team's findings are the result of nitpicking, a reactor official says.

Omega West is one of two small reactors in the state (the other is at the University of New Mexico). It generates eight megawatts of power but no electricity; it is used strictly for research.

The Energy Department report found weaknesses in several areas, including:

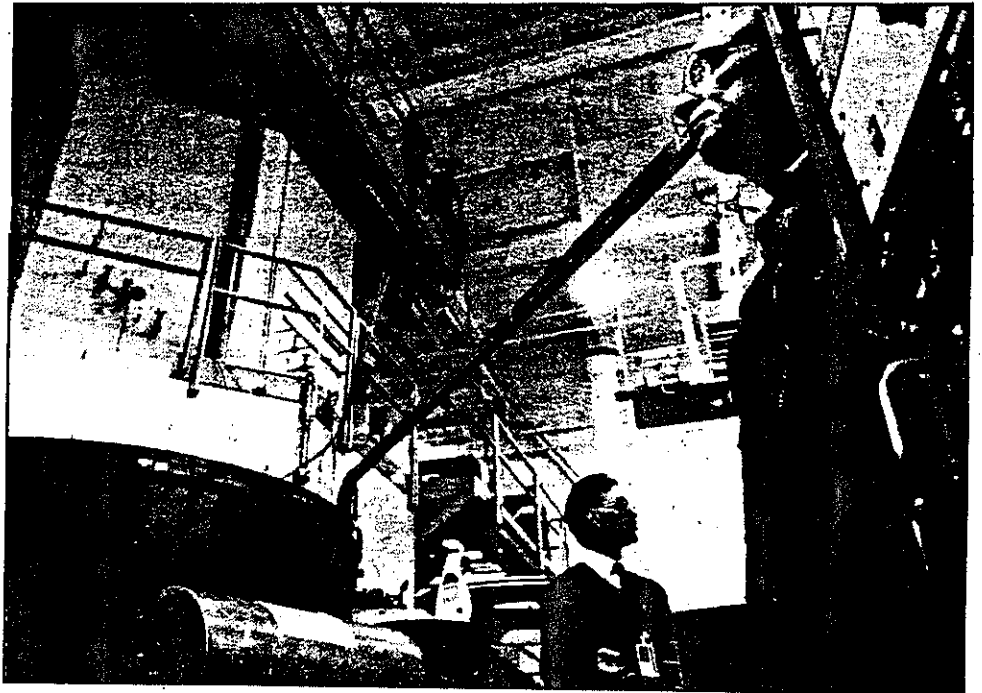
■ **Operation.** "[There is] informality in the conduct of operations that is inappropriate for any reactor in today's safety environment but particularly for an aging nuclear complex such as the Omega West Reactor."

■ **Training.** "Instructors are not well versed in teaching techniques, formally developed and reviewed curricula are absent and training records are inadequate for independent evaluation."

■ **Incident reporting.** "The threshold (for determining which incidents must be reported) is set too high. Frequent occurrences, such as reactor or system shutdown due to lightning strikes, have been rationalized out of the reporting system."

■ **Emergency preparedness.** "The facility cadre does not accept the possibility of a serious accident, all of the hazards of fuel-handling operations have not been analyzed and procedures to respond to associated emergencies have not been developed."

■ **Preventive maintenance.** "Anticipated replacement of the [Omega West Reactor] could result in reluc-



Alexander Gancarz, left, one of the leaders of the reactor division, and John Webster, a spokesman for the lab, in the reactor building. The core is housed in the structure to the left.

tance to make repairs or replace equipment. This progression could lead to an unacceptable fix-after-break maintenance program."

■ **Contamination safety.** "Even though there is considerable potential for radioactive contamination... the facility is not prepared to handle a serious contamination incident."

The 200-page report lists 169 findings covering 43 different concerns. Of the 169 findings, the laboratory decided 112 required action. About 85 of those have been completed.

Merle Bunker, a former group leader in charge of Omega West until his recent retirement, acted as the laboratory's spokesman on the report.

"These guys were struggling to make negative comments about our facility down here, despite the fact that when they were here they said our (inspection) was the best of the 20 places they had done," Bunker said.

The inspectors don't feel like they're doing their job if they don't find something wrong, he said.

"That's what they're paid for."

Much of the actions undertaken by the laboratory to address the report's concerns relate to "formality of operations," an issue that is of concern laboratory-wide.

By improving formality of operations, the facility will have written procedures, training requirements and documentation to prove that it is safe.

For example, Bunker said, the report criticized Omega West for not having a written procedure on what to do if one of the reactor's highly radioactive fuel elements began leaking.

"We knew exactly what to do if there was a leaking fuel element," Bunker said. "We had the procedure prepared, but it wasn't where they expected to find it."

Omega West officials were surprised when their training program was criticized.

"Before (the inspectors) came, we thought one place where we would do exceptionally well was our training

program," he said. "That turned out not to be the case."

Why?

"Mostly because the guy who looked at our training was a professional trainer himself and he liked to pick away at our training plan," Bunker said.

Omega West agreed to make some changes in its training plan as a result of the investigation. However, "making the training plan considerably more formal and comprehensive than the present one would require additional staff, which cannot be justified at this time," the laboratory said in its response to the report.

"We think the training program we have in any case is quite adequate for the size of facility we have," Bunker said. "The (inspectors) that came in to talk to us are used to much larger facilities with many more complexities than we have here."

The report said the fact that the reactor is designed to permit the reactor's operating staff to simply walk away after an emergency shutdown had caused the staff to become complacent about safety.

Bunker said that just isn't the case.

"Our first priority down here is safety," he said. "We never run the reactor a minute without taking all the safety procedures and following all the rules. We don't take any shortcuts."

The investigators also said the staff had adopted a "fix-after-break" repair philosophy because the unit is old and scheduled to be replaced.

Bunker also flatly denied that charge.

In the first place, he said, the idea that Omega West will be closed any time soon appears to be dead. A recent reassessment of the facility's anticipated lifetime concluded:

"There's no reason the reactor shouldn't run another 10 years."

CMR: Self-monitoring still procedure despite incidents

CMR Building

In October 1981, a worker in the Chemistry and Metallurgy Research Building at Los Alamos National Laboratory left work without knowing he was contaminated with radioactivity.

The worker spread the contamination to a van he drove in a car pool, his home, a friend's home and a dog.

Eight months later, in June 1982, another worker at the CMR Building injected a plutonium-laden solution into his locker in what he later told the FBI was a demonstration of the facility's lax rules for the handling of special nuclear materials.

The contamination incidents were possible because the workers ignored rules that they monitor themselves for radioactivity when leaving their laboratories.

Today, that self-monitoring still is the rule.

Officials at Los Alamos say incidents like those in 1981 and 1982 could occur again, but they say improvements have been made in the self-monitoring program, including better training of workers.

"Our awareness certainly has been heightened by those problems" of the past, said Donald Sandstrom, leader of the Materials, Science and Technology Division at LANL.

Just last August, though, a team of investigators from the U.S. Department of Energy found that workers at the CMR Building often monitored themselves too rapidly and incompletely.

Workers in the building are supposed to check themselves for contamination at three different stations before leaving the facility. Additional monitoring is optional at two other stations.

However, unlike at least one other facility at Los Alamos where special nuclear materials are handled, there are no health workers to make sure the employees are checked.

Workers leaving the CMR Building must pass through two door-like

monitors, but those monitors are for detection of special nuclear materials being taken from the facility, not to catch radioactive contamination. Officials, however, say they can detect some contamination.

With 550,000 square feet, the CMR Building makes up about 10 percent of the total square footage of Los Alamos National Laboratory. Analyses of special nuclear materials is just one of the jobs performed by its 300 workers in 150 laboratories.

The building, however, was occupied first in 1952 and as it ages, problems are cropping up.

Congress this budget year suspended funding for a \$385 million project to build a laboratory to take over the work with special nuclear materials and decontaminate and refurbish the CMR Building.

A total of \$10 million already budgeted for the new laboratory was reallocated to pay for improvements to the structure.

"We're either going to have to put money in that building or build a new one," said Ronald Stafford, deputy chief of the health, safety and environment division at LANL.

The \$10 million being spent this budget year on improvements to the building is eight or 10 times what was spent last budget year, lab officials said.

The major area needing upgrading is the building's heating, cooling and ventilation system, officials said. A failure there could shut down operations at the building; work at the lab's plutonium-processing facility also would be slowed because the CMR operations include analysis of certain materials for the plutonium unit.

The problems at CMR have been well documented over the years.

Budget requests by LANL for the

'We're either going to have to put money in that building or build a new one.'

Ronald Stafford
Health division deputy chief

new special nuclear materials laboratory have cited several troubles, including corroded and breached air ducts, inadequate supply of filtered air, marginal building-wide filter systems and corroded glove boxes. The boxes are used by workers in the handling of nuclear material.

Without the new laboratory, LANL officials wrote in the budget documents, "Continued long-term reliable, safe, and secure operations of critical chemistry and metallurgy [research and development] services cannot be ensured. A system failure could pose danger to the workers and force the facility to shut down.

"Many areas in the building are radiologically contaminated and beyond economically viable cleanup. In short, the CMR building is at the end of its useful life.

"The safety risk of continued operation of the present facility is becoming unacceptable."

And in another budget document, LANL officials wrote:

"While the safety record in the building has been outstanding, the deteriorated condition of many of the systems no longer ensures their proper functioning under accident conditions."

The federal energy investigators who inspected the building last summer also found safety problems, including air flow problems with glove boxes that could lead to contamination of workers.

The investigators were so concerned with conditions they requested an immediate plan by LANL to deal with them.

Despite those findings, Sandstrom, who oversees the building's operations, said the building has "reliability problems. It doesn't have safety problems.

"It is still a very good building."



Courtesy Department of Energy

JAMES D. WATKINS

"What I have established is for my management responsibility for health."

Ex-admiral's quest for 'ground truth' in DOE a hard slog

By **KATIE HICKOX**

New Mexican Washington Bureau

WASHINGTON — Nearly two years ago, retired naval operations chief James D. Watkins undertook a mission unlike any he had ever encountered in his 37-year military career.

He was appointed U.S. energy secretary and given a formidable task: Clean up the nation's aging 13-facility nuclear weapons production complex and make it safer for people who worked there along with the general public. While the challenge seemed overwhelming, the Alhambra, Calif.-born Watkins said it would take him just two years to turn the troubled agency around.

As his self-imposed deadline nears,

the 63-year old Watkins is falling short of that ambitious goal, according to reports and interviews with state officials, members of Congress, environmentalists and scientific experts from across the nation.

Watkins, himself, agrees with their assessment of his performance so far.

He still is considered by many lawmakers to be the only man for a mission that Senate Energy Committee Chairman J. Bennett Johnston, D-La., once called "the most daunting task that anybody ... in government" has attempted.

"I don't agree with everything that he's done, but there's no question that he's knowledgeable about our nuclear weapons program," said Sen. Jeff Bingaman, D-N.M. "I think he is more knowledgeable than any secretary in my recollection. He has jumped into these difficult problems with a real will to resolve them — but I think there's a long way to go."

Bingaman sits on two of three Senate committees with jurisdiction over environmental cleanup and worker safety issues at nuclear weapons complex facilities.

No stranger to nuclear machinery himself, Watkins was the son of a priest-turned-vintner who rose through the ranks of the U. S. Navy from the 1950s through the 1980s. An unabashed supporter of nuclear power, Watkins has said he was first seduced by high-tech during the Korean War as a naval officer under the command of a skipper who later would pilot Nautilus, the first nuclear submarine.

Known as a conservative and a staunch Catholic, Watkins came to the Energy Department after heading a national AIDS commission that shocked the country with its candor towards the disease and its sympathy towards AIDS victims.

As he prepared to take over a weapons complex that was leaking radioactive and hazardous waste into the environment at incalculable rates, Watkins compared his new job with his role on the AIDS commission.

"We simply couldn't solve it with clean needles and condoms in the case of AIDS," he said. "It was a much broader issue. And that is what I think we have here."

The admiral needed more than clean needles and condoms as he took office on March 1 1989, facing two recent reactor accidents at the South Carolina-based Savannah River Site and a Federal Bureau of Investigation inquiry into safety conditions at the Denver, Colo.-area Rocky Flats weapons production plant.

He since has shut down both sites and recently proposed moving the weapons production plant.

He since has shut down both sites and recently proposed moving the Rocky Flats operations to a less populated area.

Promising to search for the "ground truth" about the aging weapons complex facilities — "ground truth" is a military phrase that describes the combination of first-hand reports and management views — Watkins unveiled a 10-point strategy after only four months in office.

The battle plan included many tactics borrowed from the nuclear Navy, Watkins' former haven and the federal operation with the best record for handling radioactive materials. The main tenets of Watkins' 1989 strategy included:

- Pumping additional money and manpower into the Energy Department program charged with cleaning up thousands of tons of contamination from soil, buildings, water, and other areas around and in nuclear weapons complex facilities.

- Improving cooperation with states hosting Energy Department-owned nuclear weapons facilities.

- Forming "tiger teams" — another term borrowed from the military — to scour federal weapons production and research facilities for environmental and worker health violations.

- Tightening up the Energy Department's compliance with federal environmental and worker safety laws.

- Strengthening the accountability of Energy Department officials in Washington and on the field for health, environmental, and safety disasters at weapons complex facilities.

- Inventorying federal worker health records or epidemiology studies.

Epidemiology refers to the study of diseases — in the case of the Energy Department, diseases related to working with dangerous radioactive materials.

Nearly two years later, Watkins is the first to admit that his campaign has yet to reach the front lines of Energy Department-owned weapons complex facilities.

Asked recently about the success of his 10-point plan, Watkins chuckled and said he hopes to have "50 percent" of his strategy in place by March. He says his plan has been "implemented" — he has drilled his mandate into a new management team and tightened his reins over contractors responsible for weapons complex facilities — but has yet to change attitudes among the rank and file.

"My interest is getting the culture self-sustained so if I were to leave then it doesn't change — that people really believe that health is a critical part of Department of Energy narration," he said.

When outsiders are asked how Watkins is doing, however, some say the Energy Department still does not show a strong enough commitment to protecting the environment and the health of its workers.

"We expect more of private facilities than we do of federal facilities," said Dan Reicher, an attorney with the Washington-based Natural Resources Defense Council.

Watkins and his management team say they are working to bring federal weapons facilities into compliance with environmental and worker safety laws after four decades of neglect.

So far, Watkins's 18 tiger teams have identified thousands of worker safety and environmental law violations at federal nuclear facilities throughout the nation.

Watkins said recently his department has written 12 "Corrective Action Programs" to respond to the findings and submitted the programs to the Occupational Safety and Health Administration for review.

Earlier this year, Watkins fulfilled another battle plan initiative by turning over the study of long-term, radiation-linked illnesses among weapons complex workers to the federal Centers for Disease Control in Atlanta.

Critics say that bureaucratic change does not have the strength of law passed by Congress and still leaves the Energy Department regulating itself on the day-to-day treatment of its nuclear weapons complex workers.

and morale of Energy Department and contractor employees.

Watkins's naval mentor, the late Admiral Hyman Rickover, had insisted on safety first in a Pentagon operation that suffered no reactor meltdowns, radiation releases or other failures in more than 30 years.

Watkins remains steadfastly against any other federal agency taking over the day-to-day health monitoring of the more than 100,000 employees of civilian contractor firms in the nuclear weapons complex. He says he has established an internal "Office of Health" that will oversee worker health and safety.

"What I have established is for my management responsibility for health," Watkins said, emphasizing the "my."

"This means 24 hours a day, round the clock, every shift, there are people on watch worrying about employees, worrying about their health practices, worrying about their health records, worrying about the work that's being done there at the lab or at the site to make sure it's being done in a proper fashion," he said.

Watkins has followed another tenet of his 1989 strategy to combat chaos in the weapons complex by steadily increasing spending for cleaning up leaking radioactive and hazardous materials at federal facilities stemming from over 40 years of bomb production with little regard for health and environment. Cleanup requests have grown from \$2.3 billion in 1990 to \$3.5 billion in the current year to an estimated \$4.2 billion next year.

Environmentalists and federal officials have said that Watkins' cleanup plan is still underfunded, poorly executed, and based on faulty, outdated information.

A report released this month by the Office of Technology Assessment, a congressional watchdog agency, blasts the Energy Department's multi-billion dollar cleanup plan as lacking in scientific underpinnings and recommends that other federal agencies become more involved in a massive operation that Watkins' agency might not be qualified to complete.

Watkins has said he agrees in part with the Office of Technology Assessment report, acknowledging that cleanup will take new technologies and highly trained personnel that the Energy Department has yet to acquire. Leo Duffy, cleanup czar at the Energy Department, has said the EPA fines are not justified.

Highlighting another point in Watkins' 1989 strategy, Duffy said recently that weapons complex facility oversight agreements between states and the Energy Department went from one (with Colorado) two years ago to eight by the end of last year.

Yet many state officials and lawmakers say they feel that the Energy Department has bypassed state and congressional approvals of plans to expedite projects that could

prove dangerous to public health.

"The (Energy Department) has once again shown that it can't be trusted. . . . (The Energy Department) has shown that they're ready to open (WIPP) without any regard to safety," said Rep. Bill Richardson, D-N.M.

He spoke after the Energy Department bypassed congressional approval of a public land exchange key to opening the Waste Isolation Pilot Plant, a mid-level radioactive waste dump under construction near Carlsbad, N.M., and scheduled to receive scrap from the Idaho National Engineering Laboratory as early as this summer.

Watkins's conservative colleagues say that he is hamstrung by too many rules, regulations, laws, and proclamations by federal, state and congressionally mandated oversight groups.

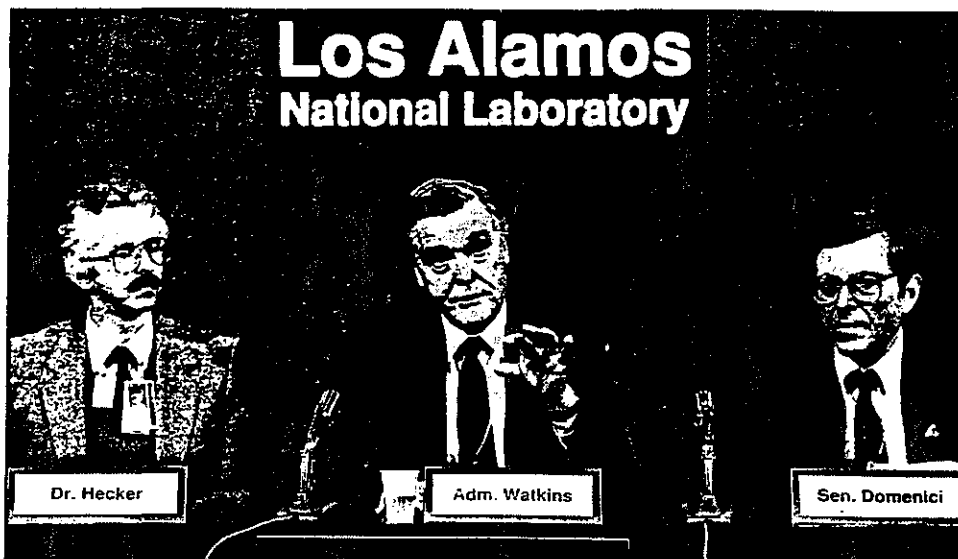
Sen. Pete V. Domenici, R-N.M., who has called for legislation allowing for an additional state oversight group for WIPP, nonetheless expressed confidence in Watkins' overall ability to untangle the Energy Department's massive radioactive waste, environmental, and health problems.

As he was two years ago in his Senate confirmation hearing, the man who was dubbed "Radio Free" Watkins for his candor on the AIDS Commission remains upbeat about his quest for a safe, open Energy Department, saying: "1991 is going to be a great year," he said. "It's going to be a neat year, everybody's going to come on line, everybody's going to be happy in their work."

Environmentalists and even the staunchest supporters of the Bush Administration say Watkins is, once again, too optimistic about navigating a bureaucracy that is reviled by some states hosting weapons complex facilities.

Said former Sen. James McClure, R-Idaho, who retired in 1990 after nearly two decades on the Senate Energy Committee: "(Watkins) hasn't recognized what drives people to points of opposition and recognized early enough that opposition was going to be there, no matter how much his charm and his logic."

Katie Hickox is a reporter for States News Service.



James Watkins, center, with lab director Sig Hecker, left, and U.S. Sen. Pete Domenici during a tour by the secretary in February 1990.

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Our reports: A review

For thousands of years and countless generations, people have inhabited the Pajarito Plateau in the eastern shadows of the Jemez Mountains.

In the past half-century, though, the plateau has been fouled — possibly forever — by the operations of Los Alamos National Laboratory.

In a series of stories published over six days, *The New Mexican* has detailed the impacts of the lab on the environment and the health and safety of its workers and the public.

The highlights of the series:

■ More than 1,800 sites of suspected or confirmed radioactive or chemical contamination — ranging from dumps to the county golf course — must be inspected and possibly cleaned up as part of an environmen-

■ **OVERTIME SUIT:** Guard supervisors sue the contractor that supplies security at the lab. **Page B-1**

tal-restoration program projected to cost \$2 billion and span 20 years.

Some of that waste — if left in the ground — could be dangerous for hundreds of millions of years.

■ Lab researchers are trying to find better, faster, safer and cheaper ways to clean up the mess.

■ The lab each day releases large amounts of radioactive and chemical contamination into the environment. Lab officials say the threat to public health is slight or nonexistent.

One study of Los Alamos residents

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

LAB: Seeking a way to clean the mess

Continued from Page A-1

found a possible excess of deaths due to leukemia and related disorders, but the cause is not clear.

■ More than 1,000 lab workers were exposed to radiation in the work place last year, and seven employees inhaled or otherwise ingested plutonium, one of the deadliest elements known.

Some workers and the Department of Energy, which owns the lab, have accused LANL officials of not doing enough to protect employees from radiation exposure. Lab officials dispute that criticism.

■ Some employees say they have become supersensitive to some chemicals because of longtime exposure to chemicals at the lab. LANL officials say the employees' troubles

are psychological.

■ For years — despite the known lung cancer risk from smoking and plutonium inhalation — the lab provided free cigarettes to plutonium workers.

■ The lab, because it is owned by the Department of Energy, is exempt from many environmental and occupational health laws. The state Environmental Improvement Division is responsible for enforcing most of the environmental laws that do apply to the lab, but division is ill-equipped for the job.

■ Each year, hundreds of shipments of radioactive and chemical materials move in and out of the lab. The shipments include top-secret truckloads of nuclear weapons parts and highly radioactive fuel for the

lab's nuclear reactor.

■ Some lab scientists say LANL might be underestimating the chance of a devastating earthquake.

■ Although a research-and-development facility, the lab in the last decade has taken on a production role in the processing of plutonium for nuclear weapons.

Environmentalists fear that role could become bigger because of the troubles at the Rocky Flats weapons plant near Denver.

■ Security has been a long-running problem at the lab. Some guards say the force is underpaid, understaffed and overworked. Only 12 of 54 guards passed required skills tests in a surprise visit last spring by the General Accounting Office, the investigative arm of Congress.

Iraq war might save 'Star Wars'

There might be no such thing as a good war, but the war against Iraq could be good for the business of Los Alamos National Laboratory.

With the end of the Cold War and the resulting cuts in national defense spending, the laboratory faced the possibility of further reductions in government funding and more worker layoffs.

The war against Iraq, however, has renewed interest in the Strategic Defense Initiative ("Star Wars"), high-tech weaponry and ways to make the United States less dependent on foreign oil.

And because it is in the Star Wars, weapons and energy research business, the lab stands to benefit from those renewed interests.

James Jackson, deputy director of the laboratory, says the Persian Gulf war has demonstrated that the end of the Cold War against the Soviet Union didn't mean all threats to U.S. security had been removed.

"Now I think people realize we are moving from a bipolar world ... to a multi-polar world that may be more dangerous ...," Jackson says. "The world has changed, but the need for national defense is still there."

The future of the government-funded Los Alamos lab had been looking pretty bleak.

Lab Director Siegfried Hecker announced in December that the lab's budget for the current spending year totals \$933 million, down from \$950 million in 1989-90 and the first budget cut in 20 years.

Layoffs and early retirement programs have become a part of regular business at the laboratory.

The lab's number of full-time workers is projected to fall by 330 to 7,420 this budget year. That is nearly 700 fewer employees than the laboratory had in 1986, its peak year for employment.

And if the hard times continue for one of the state's largest employers, the ripple effects could be felt in communities throughout the northern Rio Grande Valley.

During the Carter administration, from 1977 to 1981, LANL's funding from the government was about evenly divided between defense programs and other initiatives, including energy research.

Under President Reagan, support for defense programs rose to about 80 percent of the laboratory's government funding.

With money for defense programs now being cut, LANL hoped government funding for energy research, environmental programs and other areas would be increased to make up the difference.

Because of the war against Iraq, money for some of LANL's defense programs could stabilize or even increase. There also could be more for research on new energy sources.

With its work on neutral particle beams and free-electron lasers, LANL has been a center for research on the Strategic Defense Initiative.

The goal of the initiative is to develop a system to knock out intercontinental ballistic nuclear missiles fired at the United States.

Since the start of the war against Iraq and its use of the Scud missile, President Bush has directed the Star Wars technology also be used in developing a system to intercept short-range missiles like the Scud.

Jackson says the Patriot anti-missile missile has helped convince people of the need for such a system.

The success in the war of the United States' high-tech weaponry — such as the Patriot, the Stealth and F-15 fighter airplanes, and the cruise missile — also appears to have at least partly restored public confidence in defense programs and demonstrated that such technology can save lives of U.S. soldiers.

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'A new culture' slow to get going

"This country has always relied on advance technology" on the battlefield to reduce the number of needed soldiers, Jackson says.

In addition to defense work, energy research and environmental programs, the laboratory has identified other possible growth areas for the facility. They include initiatives to better train youth in the sciences, health and science research and programs to improve the world competitiveness of U.S. companies.

Jackson says the lab hopes to help companies make the transition from idea to manufacturing, rather than selling that idea to a foreign company for use on a production line.

"We (in America) seemed to have lost the knack for turning research into products," he says.

Jackson says the laboratory always will be in the nuclear weapons business — the business that made it famous 45 years ago.

"Nuclear deterrence will change, but it won't go away ...," he says. "We believe nuclear weapons will still play an important role in national defense for some time to come, certainly for the foreseeable future."

When retired Admiral James D. Watkins agreed in early 1989 to take command of the U.S. Department of Energy, he knew he faced a formidable task.

Because of a string of safety and environmental scandals at its nuclear weapons facilities around the country, the department had little or no credibility with the American public.

"For too long, the underlying management and operating philosophy within the Department of Energy was that adequate production of defense nuclear materials and a healthy, safe environment were incompatible objectives," Watkins told a Senate committee in October 1989.

His goal was to change all that. His plan was to recapture the public's trust by instilling "a new culture" at the Energy Department, a culture in which the safety of workers and the protection of the environment would

be more important than the production of nuclear weapons.

During his confirmation hearings, Watkins said he would need two years to establish this new culture.

That was two years ago and while officials with the Department of Energy and the Los Alamos National Laboratory, a part of the department, are claiming the program has been a success, plenty of critics disagree.

While acknowledging that efforts have been made, most of the watchdog groups that deal with the department and Los Alamos on a regular basis say the new culture looks a great deal like the old one.

"We're certainly disappointed in the progress the Department of Energy has made in those areas where Secretary Watkins has initiated reform," said Daryl Kimball, associate director for policy of Physicians for Social Responsibility.

"There's not too much to celebrate," he said. "The problems at the weapons plants continue, and the Department of Energy still has a long way to go toward changing this culture."

Part of the problem with the old culture was the department's unwillingness to come clean with the public over the extent of its problems, and that hasn't changed, said Jim Werner of the Natural Resources Defense Council.

"Overall, I think it's taken a step backwards," Werner said. "I think people at various operations offices are very reluctant to give out information they used to give out freely."

Outside activist groups aren't the only ones who have trouble with the department's version of *glasnost*. Even Congress sometimes finds the department less than forthcoming.

When a subcommittee of the House Committee on Energy and Commerce tried to obtain documents last year relating to nuclear weapons safety and other issues at the department, it was snubbed repeatedly.

The subcommittee's powerful chairman, Rep. John Dingell, D-Mich., finally issued a subpoena in August to flush out the information.

"The department was just totally resisting in some cases and stalling in others; it was a big problem," said Jeffrey Hodges, a research analyst with the Subcommittee on Oversight and Investigations.

"Since that time, we've seen a lot better cooperation but it took that subpoena," he said. "It took a sledgehammer."

The problem, Werner said, is that the Department of Energy has tried to centralize its decision-making in

its Washington, D.C., headquarters rather than in the various operations offices around the country.

"One of the things we hear when we ask for (information) is they say, 'It's on the admiral's desk.' We hear that so often we think the admiral must have a desk the size of an aircraft carrier," Werner said.

Historically, the laboratory has released an annual environmental surveillance report. Local groups that keep an eye on the lab use the report to get an idea of what kind of an impact Los Alamos has had on the environment in the past year.

The most recently released report, however, is for 1988. Information on 1989 has not been released even though some of the data from that year are now two years out of date.

The delay in releasing environmental information was one of the very few areas singled out for criticism during a visit to Los Alamos last year by the Energy Department's Advisory Committee on Nuclear Facility Safety.

"We believe that it is important for the general public and those most directly exposed to have timely access to this environmental monitoring information," the committee said in a letter to Watkins.

Watkins never responded to the letter, according to the committee.

Tom Buehl, a section leader at the laboratory, said the environmental surveillance report is drafted by Los Alamos each April, and it used to be released every May.

That was when the report was approved by the Energy Department's Albuquerque office. Beginning with the 1988 report, department headquarters in Washington took over the approval function, which has added months to the delay, Buehl said.

Kenneth Hargis, chief of the lab's environmental protection group, said he asked for more money so more frequent reports possibly could be released, but laboratory management denied the request.

Laboratory Deputy Director Jim Jackson said he wasn't sure why the request was denied, but he said it probably was because of a tight budget.

Years of laboring under national security rules have made it difficult for the department's defense facilities to be more open, Energy Department spokesman Fred Lash said.

"There is the old culture, the old mentality that still exists within the defense program," he said.

There's no doubt, though, that the public is better informed today than it used to be, Lash said. The public controversy over the opening of the Waste Isolation Pilot Plant near Carlsbad is an example, he said.

"In the '50s or '60s we would have opened that thing near Carlsbad and never told New Mexicans about it."

WIPP, which has not yet opened, is designed to be a permanent disposal site for radioactive garbage.

Los Alamos officials also argue strenuously that efforts to build a

new culture have been successful.

"Very definitely. No question about it," said Jackson, the No. 2 official at the laboratory. "There have been important changes already and we're going to have to continue to work on it. We've made a lot of headway and we're going to get there."

Laboratory Director Sigfried Hecker also has made it a priority to improve environmental and safety consciousness.

In an article on the subject written for an employee publication, Hecker said he has heard much grumbling among Los Alamos employees about environmental compliance.

"I realize that laws may not always appear to be right, but they are always the law. You can argue about them all the way to the jail house," he wrote.

He also told employees he shares their frustration with the "overly stringent" regulations in place today.

Some regulations are overly

stringent "based on today's documented knowledge of adverse health effects," but employees have to realize that the cumulative effects of their actions could have a significant impact on the environment, Hecker said.

Al Tiedman, associate director for operations at Los Alamos, said the laboratory isn't showing disrespect for laws when it questions their wisdom.

Scientists can be expected to question bad regulations, he said.

Tiedman was unable to give an example of a bad regulation.

There has been an onslaught of new environmental regulations since the early 1970s, Tiedman said. And federal defense facilities such as Los Alamos have been subject to such laws only since a court ruling in the early 1980s, he said.

Los Alamos has spent more than \$60 million for an in-depth Energy Department inspection, known as a tiger team inspection, scheduled for later this year, Tiedman said.

EPA, DOE, EID, LANL:

Who's on first in regulation game?

Picture a town marshal.

He's eager to take on the duties of his new job, and he has the backing of his neighbors.

Suppose he's allowed to enforce some laws but prohibited from enforcing others. He can stop burglary, let's say, but not robbery.

And suppose that even with the laws he is supposed to enforce he's not allowed to stop the perpetrator in the act or even fine him afterwards.

Finally, suppose the marshal can double his salary and move into a nice, clean office by going to work for the people he's supposed to be policing.

Sounds like a town that's in trouble.

State officials say that's the situation New Mexico faces when it tries to regulate the environmental impacts of U.S. Department of Energy facilities such as the Los Alamos National Laboratory.

For years, the department was a kingdom unto itself, running its massive, nationwide nuclear weapons complex as it saw fit.

Thanks to the Atomic Energy Act of 1946 and 1954, the civilian agency that eventually became the Department of Energy was placed in complete control of its own destiny with no requirement to follow a host of federal rules that governed private businesses and most other parts of government.

In the early 1980s, a hole was hammered in that armor when a federal court ruled that Energy Department facilities such as Los Alamos would have to submit to some environmental regulations.

The Energy Department, however, remains exempt from oversight by the independent federal agencies that protect such things as worker health and nuclear safety.

And while it is now subject to environmental laws, the department is a formidable foe for the agencies charged with oversight of the department's compliance.

The bulk of that job in New Mexico has fallen to the state's Environmental Improvement Division. In addition to enforcing state laws, the division is responsible for various federal rules as well. The federal Environmental Protection Agency, which has no staff members in New Mexico, has delegated much of its authority to the state.

The state faces major obstacles in attempting to regulate a facility as large and elaborate as Los Alamos National Laboratory:

- The state lacks the authority to regulate some significant environmental emissions by the laboratory, including most radioactivity.

- Even where it has legal authority, the state has limited enforcement power. The Department of Energy cannot be fined directly when its facilities violate environmental laws.

- Because of low pay and numerous frustrations, the state has a difficult time keeping its environmental enforcement employees.

"We're definitely overmatched when it comes to a facility like some of the Energy Department facilities," said state Environmental Improvement staff member David Coss. "With just the size and the complexity of the things going on in this state, EID is overmatched for the size of the job it's been handed."

The Environmental Improvement Division has an annual budget of \$18.4 million and 359 full-time employees but must keep track of thousands of polluters from Hobbs to Farmington.

In the division's Hazardous Waste Bureau, for example, 17 staff members keep watch on about 12 to 15 large facilities that store and dispose of toxic chemical waste, another 80 to 90 that are large generators of it and as many as 7,000 that generate small quantities.

Keeping track of the interconnections between the state and federal agencies that regulate Los Alamos isn't easy.

The state has authority to regulate current sources of solid waste if the wastes are toxic chemicals or a combination of toxic chemicals and radioactive waste. If it's purely radioactive waste, or concerns an old dump site, the state is powerless. That's the EPA's job.

The EPA also has retained responsibility for ensuring that the laboratory doesn't pollute surface water. The state helps the federal agency by doing inspections and assisting in administering the water laws. Radioactive emissions into bodies of water are not covered by either the state or EPA, and are subject only to internal Department of Energy rules.

Of the hundreds of toxic chemicals produced by Los Alamos, the state and EPA have authority to regulate

"We're definitely overmatched when it comes to a facility like some of the Energy Department facilities. With just the size and the complexity of the things going on in this state, EID is overmatched ..."

David Coss
EID staff member

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only asbestos, beryllium and radioactivity. Air emissions are the only pollution sources where the state has legal authority over radioactivity.

The mixture of environmental laws can be confusing even to the experts, said state EID attorney Gini Nelson.

"There are different statutes that can put different requirements on the federal government," Nelson said. The Hazardous Waste Act "has authorization that deals with them in one way, and the Clean Air Act deals with them in another way."

Even in those areas where the state is sure it has authority, there are strict limits on its power when dealing with a Department of Energy facility.

For example, the state clearly is in charge of chemical waste. However, could the state go in and close a hazardous waste program at Los Alamos that was damaging the environment?

"No, no, I don't think we could," said Boyd Hamilton of EID's Hazardous Waste Bureau.

If violations are identified at Los Alamos during the annual hazardous waste inspection — and there have been in six of the past seven years — state law requires EID to write the laboratory giving it 30 days to correct the problems.

EID tried to change that law during the legislative session two years ago and will try again this year because the 30-day figure "has no regard for the seriousness of the violation," Hamilton said.

Some might be so minor there is no need to fix them in a hurry, while others might be too serious to wait even 30 days, he said. The proposed change was defeated because some regulated facilities in the state lobbied their legislators against the change, he said.

If the laboratory fails to address its violations within 30 days, the state can issue a "compliance order," telling the laboratory to fix the problem either immediately or by some deadline, said Nelson, the EID attorney.

The law provides for fines of up to \$10,000 per day for the original violations and up to \$25,000 per day for failure to meet the terms of a compliance order, Nelson said.

Collecting those fines from the Department of Energy, however, is not easy.

The federal court district that includes New Mexico has ruled that because the federal government enjoys sovereign immunity, the state cannot assess a fine directly against LANL's owner, the Department of Energy.

That leaves the state with two options when it wants to collect from LANL: Take the Energy Department to court and hope to persuade a judge to levy the fine, or else take an indirect route by assessing the fine against the University of California, the contractor that operates LANL.

The inability to fine the Energy Department directly means "there is one less tool to make the department comply with the law," Nelson said.

"I don't feel as good about the state's ability to enforce its laws when we can't go as strongly after the people who are in fact equally responsible and may in fact have control of the situation," she said.

Or as Kirkland Jones, EID's deputy director, puts it, "DOE is the decision-maker. I would prefer to influence the decision-maker directly."

Given all that, it's not surprising that the state has levied just one fine — for \$30,000 — against Los Alamos National Laboratory, despite numerous violations in the past 10 years.

The state notified Los Alamos in 1984, 1985, 1987, 1988, 1989 and 1990 that it had found violations of the lab's hazardous waste permit. The laboratory also has violated its water emissions permit on numerous occasions.

A compliance order issued after the 1984 hazardous waste violations set deadlines for fixing the problems, but the lab was 100 days late in complying.

With a potential fine of \$10,000 per day — the maximum at the time — for 100 days, LANL was on the hook for as much as \$1 million, but EID said it would accept \$100,000 to avoid a court battle.

While the state and the laboratory haggled over that fine, the state again charged LANL with failing to comply with environmental rules and proposed a second fine of \$100,000.

Both fines eventually were settled last year with a \$30,000 check to the state.

State and LANL officials said they decided to compromise because the matter had dragged on for too long.

The state settled for a reduced amount of money because its case was weak, Jones said. The earlier violation had not been well documented, and the state staff members involved in the 1984 violation since have left, he said.

Although it was for less money than originally hoped, the settlement did serve to set a precedent.

"It was the first time EID ever extracted money from LANL," Jones said.

The EPA is in the process of levying its first-ever fine against Los Alamos as well, a \$12,500 assessment because of an acid spill last year. Los Alamos officials have agreed to pay the fine.

The high staff turnover that weakened EID's case when it tried to fine the laboratory is a chronic problem for the state agency.

Jones said the agency loses as much as one-third of its technical staff every year.

Salary and frustration are the main causes for the turnover, said Coss, the EID staff member.

"Folks making \$23,000 at EID can get \$40,000 and up working for a company in Albuquerque or working at the (Los Alamos) lab," he said.

State employees also are worn down by the "slowness of the bureaucracy, not being able to enforce the regulations as they think they should be able to or in a fashion as strong as they would like to," Coss said.

There never are enough employees to keep up with the workload, said Hamilton of the Hazardous Waste Bureau.

Hamilton said his bureau easily could assign as much as half of its 17-member staff to keep up with activity at Los Alamos, but because of other demands on its time, it assigns only two or three people to cover all Energy Department facilities in the state.

Jones said many former EID employees go to work for Los Alamos, the very facility they might have been regulating a few days earlier.

The drain on EID's staff has been even worse than usual lately because consultants are anxious to hire people who can help them obtain some of the lucrative contracts LANL will be issuing soon as part of its billion-dollar cleanup effort.

Cleanup contracts totaled less than \$5 million this year, said Bob Vocke, head of the laboratory's cleanup program.

That figure soon will begin increasing dramatically as the cleanup effort intensifies, Vocke said. The laboratory is in the process of awarding two three-year contracts worth a total of \$80 million, he said.

The brightest hope is a deal completed last year in which the Department of Energy will give the state \$3 million annually for at least the next five years to improve the state's oversight of federal energy facilities.

New Mexico is one of 10 states where the Energy Department has struck such a deal in an effort to improve its public image.

In addition to the money, the deal grants the state significant new authority over such facilities, Jones said.

"DOE has committed to providing us significant new information beyond what we have the regulatory authority to require of them, literally every environmental document they or their contractors have prepared or prepare in the future," he said.

The state will hire 31 employees with the money, five of whom will be stationed at the lab, Jones said.

The new money and authority is strictly for monitoring and reviewing environmental data, not for better enforcement of environmental laws.

with the money, five of whom will be stationed at the lab, Jones said.

The new money and authority is strictly for monitoring and reviewing environmental data, not for better enforcement of environmental laws.

But, Jones said, "If we're there and we're generating information, then that information is available to our enforcement staff. Our ability to find problem areas is enhanced."

Some laboratory critics are skeptical of the deal.

Greg Mello, a former EID employee who now works with the Santa Fe activist group Concerned Citizens for Nuclear Safety, questions how aggressive the state will be in regulating facilities that are now paying it \$3 million per year.

"Whether the state will be willing to alienate the source of that funding is another question," he said.

Jones acknowledged the concern, but emphasized the money is guaranteed for the first five years and the Energy Department would risk public embarrassment if it tried to back out of the agreement.

Mello said the Energy Department would not have to risk a nasty public fight to influence the state.

"In many important cases, EID can be intimidated at a much lower level, so doing something publicly wouldn't be necessary," Mello said.

Jones said another potential problem will be to keep the EID employees who will be stationed at Los Alamos from becoming too chummy with the people they're supposed to be regulating.

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They came, they oversaw, they went away

Los Alamos National Laboratory was inspected last year by two separate oversight committees that were formed because of safety problems in recent years at the U.S. Department of Energy's nuclear facilities.

One of the committees stayed for two days and issued a 1½-page report. The other stayed for one day and issued no report.

Neither has plans to revisit the lab in the near future.

The two committees are:

■ The Advisory Committee on Nuclear Facility Safety. Created in 1988, it is strictly an internal advisory body with members who are appointed by and report to the

secretary of energy. It is frequently referred to as the Ahearne committee, after Chairman John Ahearne.

■ The Defense Nuclear Facilities Safety Board. Formed in 1989, it has a few more teeth. It was created by law, its members are appointed by the president and confirmed by the Senate, and the secretary of energy must respond formally to the board's recommendations.

Both boards have several problems that limit their effectiveness, according to Daryl Kimball, associate director for policy of Physicians for Social Responsibility, a private watchdog organization.

First, the boards are concerned only with problems that pose an

immediate health risk or that threaten to close a facility, he said. Failure to comply with health regulations and other longer-term risks are for the most part outside their purview, he said.

Secondly, the environmental problems at federal nuclear installations in Rocky Flats near Denver, Savannah River, S.C., and Hanford near Richland, Wash., are so severe that other facilities such as Los Alamos tend to fall by the wayside, Kimball said.

"They should worry about them but they don't have the resources that are necessary to do what's necessary, which is to investigate these problems," he said.

Domenici, Bingaman believe LANL has high interest in health, safety

By By KATIE HICKOX
and AMY BROOKE BAKER
New Mexican Washington Bureau

WASHINGTON — New Mexico Republican Sen. Pete Domenici said this week Los Alamos National Laboratory gives public and worker safety "a high priority" in daily operations.

Domenici and Democratic Sen. Jeff Bingaman, also of New Mexico, spoke after reviewing a six-part series on environmental and health issues at the lab published last month by *The New Mexican*.

The result of a three-month investigation, the newspaper series reported the lab has released radioactive and chemical contamination into the environment. Lab officials say the threat to public health is slight and the contamination levels are well below federal limits.

The newspaper also reported more

■ **ANOTHER VIEW:** Dr. Harold M. Agnew questions the series by *The New Mexican* on Los Alamos National Laboratory. Page A-7

than 1,000 lab workers were exposed to radiation at Los Alamos last year and seven employees inhaled or otherwise ingested plutonium, which studies show can cause cancer in sufficient amounts.

The series profiled four former Los Alamos workers who suffered medical conditions that the employees say stem from their work with dangerous substances at the lab. One of the workers blamed chemical exposure.

Los Alamos officials and the medical establishment have disputed the connection between heightened chemical sensitivity and work with dangerous substances, a type of medical case investigated in the series.

Domenici — who was in the Senate when the Energy Department was created more than 14 years ago — said he believes Los Alamos officials have made an effort to make the facility hospitable to its 7,400 workers and its neighbors in Los Alamos County.

"If the question is 'Could they do more?' — of course," said Domenici, a member of the Senate Energy and Appropriations Committees — panels with jurisdiction over Energy Department-owned facilities like Los Alamos.

"I gather that we are in an arena where they could spend almost all their money on the environment. But I think that would be asking for more than is justified.

"So long as there is no serious risk to life or no violation of law or regulation, I think the balance that they've got up

LANL: Senators see no reason to fear environment near LANL

there indicates a pretty good understanding of the maintaining of an enormously important laboratory and its activities and the well being of the employees' community," he added.

Bingaman, who also serves on the Senate Energy Committee, agreed: "I think that they give worker health, and safety and environmental issues a high priority now, I don't know if that came through in the (*New Mexican*) articles."

Bingaman said the series raised "some valid issues" about the laboratory, which first began operations with radioactive materials in 1943, when scientists met at Los Alamos to design the world's first atomic weapon.

"I do think there are undoubtedly some valid issues raised in the articles, particularly about past practices at the lab," Bingaman said.

"We've had indications from sources other than these articles on these problems, and I think the laboratory is aware of that."

Some workers and reports compiled by the Energy Department accuse Los Alamos officials of not thoroughly protecting employees from radiation. In a response published Feb. 24 by *The New Mexican*, Siegfried S. Hecker, director of Los Alamos, said that during the last year lab employees participated in 59,000 hours of health and safety training.

"Worker radiation doses average 1 to 2 percent of the permissible limit of 5,000 millirems annually," Hecker said. "The group within the laboratory with highest exposures currently averages 20 to 25 percent of the limits."

The newspaper series said reports from the General Accounting Office, the investigative arm of Congress, have criticized the lab's security forces and efforts

to clean up more than 1,800 contaminated sites scattered throughout the facility and the county.

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Bingaman said he disputes a GAO report released last fall that said that, as recently as April of last year, three-fourths of the Los Alamos guards lacked essential skills. The GAO report came in the wake of a 1989 security walkout over job conditions.

"My impression was that the lab had in place very good security procedures, and that in fact the evidence of any breach of those procedures was hard to come by," Bingaman said. "The GAO report did not reflect an up-to-date point of view."

Bingaman said he and his staff inquired into security conditions at the lab after the GAO report was released.

"One problem that we've had with the guard force has been the amount of overtime," James Jackson, deputy director of the laboratory, said in a telephone interview last week. "The reason is that (lab officials) are waiting for newly hired guards to get their security clearances."

Security clearances can take up to a year, Jackson said. To compensate for overtime, Hecker said his lab security force receives "the highest pay of any police force in the area."

Hecker said the series dealt unfairly with security, worker health, and environmental issues.

"I thought the series was very fair and it painted a terrible picture of the laboratory — and of the town for that matter," he said in a telephone interview last week. "Nothing was put in perspective, everything was done to scare the public."

Laboratory emissions of radioactive and hazardous materials are "minimal" and well below federal limits, Hecker said. "It really overplays the danger, especially in terms of radiation — and radiation is a concept that the public doesn't understand terribly well."

Hecker acknowledged past laboratory practices have resulted in an as yet incalculable amount of cleanup needed in and around the lab.

"Certainly there are things to clean up, just as there are in all of industrial America," he said. "Every gas station in Santa Fe will have to clean up its leaking tanks."

Domenici said those who have read *The New Mexican* series should take into account Hecker's assessment of safety at Los Alamos.

"I think that Dr. Sig Hecker is a conscientious, reputable scientist who also is a family man," Domenici said. "He has a house in Los Alamos and children and a wife. . . . I think that's pretty typical of the people in Los Alamos. The ones that work there, live there."

"And I don't hear very many scientists saying they are afraid," he continued. "Frankly, I think that's a very important consideration for anyone investigating the conditions of the environment in Los Alamos."

"I would suggest to the people in the area that what Dr. Sig Hecker and his experts have to say about . . . this series and the contentions therein should be given very significant weight," Domenici said. "They should be given every opportunity to have input and to indicate to the people of New Mexico and the surrounding areas their position on many of these issues."

Jackson added: "The series was designed to sensationalize problems and really prey on the public's concern for things unclear," he said.

Katie Hickox and Amy Brooke Baker are reporters for States News Service



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Silencing dissent is not the answer

Around the nation war protesters are increasingly being vilified as unpatriotic and selfish — basically un-American.

But they are not. They aren't because American patriotism has nothing to do with agreeing with a majority that endorses a president's policies that led to war. Patriotism has nothing to do with supporting war, any war.

Dissent, in fact, is a critical piece of the patchwork that is the America are forefathers envisioned. American patriotism is believing in this nation, a nation that stands for every freedom every man and woman can expect in life. It is an ideal that we are continually striving for. And while protesters are testing those freedoms they are pleading for their ideal America.

It's easy to dissent in silence. To openly challenge a nation's mission is not easy. To some it's offensive. Others believe it insults the men and women fighting the war. Protests can be clumsy and antagonistic. But whenever possible dissent should be met with understanding, at least dialogue.

The congregation and pastor of President Bush's church in Maine, and the president himself, had a golden opportunity Sunday. Instead, a protester in the congregation was forced to leave the service after he stood up and demanded an end to the Gulf war and the allied bombings of Iraq. His comments came after the pastor asked if anyone had any special concerns to express.

Whether the war protester was

right or wrong, and questions about the wisdom of where he chose to make his pronouncements and how he made them, are not the issue here.

What he said, however, reflects what many Americans feel. Yet his shouts — indeed pleas — however irrational, were met with chilling uncertainty and anger. Where was the reason and calm of conviction and certainty from a nation at war? Where was a sense of community?

Children in the church were ushered away to keep them from seeing the scuffle when the dissenter, a Massachusetts lawyer, was escorted out. His words were drowned out by what some observers said was a spontaneous rendition of *God Bless America* by the congregation.

How blessed America would have appeared had the congregation showed a willingness to talk. As insulted as some were, how blessed they would have been had they turned the other cheek. Wouldn't Americans have been proud had the pastor, or even the president himself, who kept a face-forward stoney silence, responded and asked for others in the congregation to contribute intelligently.

A person in the church cried out: "This is not a political forum. This is a church of God. Get out of here."

Americans are digging deep to find answers at a time like this. This is a time for religion and faith. And the church of God should be a place where anyone can find some answers, at least some solace.

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Another view of the Los Alamos labs from a former director

I've heard about "in depth reporting" but never realized to what depths reporters would stoop to misrepresent facts in order to promote their own prejudices.

It is no secret that Los Alamos has been in the forefront of nuclear research for over 45 years. In no small part this research led to the recent favorable events in Eastern Europe. Their nuclear power sources have supplied the power for all of our deep space probes. Nuclear medicine is widely used as a diagnostic tool and directly in treatment. All of these activities involve working with radioactive materials and result in radioactive waste material, but at all times safety of those involved and of the environment has been of paramount concern. Those involved clearly have an interest in their own safety and the effect on their environment.

St. Vincent Hospital and many other hospitals worldwide use radioactive material and are very careful in disposing of their wastes. In a normal treatment, less than five percent of the radioactive material ends up as hospital waste. Where does the 95 percent go? It goes out the door in the patient. *The New Mexican* horsemen may well demand in the future that such patients have lead-lined urinals installed in their homes or lead-lined septic tanks on their properties. Such is the depth of their logic.

It may be hard for present-day reporters to appreciate that in the '40s we knew very little about the effects of radiation. Personal radiation monitors were very crude and provided only qualitative information. I can personally remember focusing an accelerator beam by hand, maneuvering a quartz

plate in the beam and yelling instructions to the operator at the console. Something we would never do today. At the time we handled waste and residue as best we understood. Since that time, tremendous progress has been made in the handling of all nuclear materials.

The early waste dump practices in Leadville, Colorado would never be allowed today. Originally we used carbon tetrachloride for cleaning purposes; as we learned of the potential hazard, we switched to trichlorethylene and then switched to a less toxic material. In the early days we openly worked with beryllium. I used to make beryllium powder by hand, filing beryllium blocks. Some of us had so much tritium in our systems that it could be detected in our perspiration using a detector. When we learned of the potential hazards, we changed our procedures but we didn't panic and blame our peers.

Unfortunately *The New Mexican* hatchmen in their fervor to discredit Los Alamos have chosen to ignore the facts and not to recognize the progress made during the past 40 years. They use as references such known anti-nuclear activists as John Gofman, Physicians for Social Responsibility and the Natural Resources Defense Council, along with other unnamed local self-proclaimed experts. These individuals have made a career out of nuclear bashin. Appealing to natural human fear built on ignorance has created a profitable cottage industry for these individuals who couldn't compete in the mainstream of science and have elected to feed on the fear of the uninformed. With over 7,000 employees, it isn't difficult to find a few unfortunate individuals whose physical problems may or may not be associated with their work place.

Dr. Harold Agnew



Commentary

Dr. Harold Agnew served as director of Los Alamos National Laboratory from 1970 until 1979.

He worked on the staff of the U.S. Army's Manhattan Engineer District and alongside Enrico Fermi on the first nuclear fission chain reaction at the University of Chicago in 1942.

In 1942, he joined LANL, then called Los Alamos Scientific Laboratory where he made significant contributions to the development of the first atomic bomb.

He worked at LANL for almost four decades, interrupting his service for four years to serve as scientific advisor to the supreme allied commander in Europe at NATO headquarters in Paris in 1961.

In 1979, he resigned from LANL to head a private nuclear energy research, development and manufacturing company in San Diego, where he now lives.

Among his professional awards, Dr. Agnew was elected to the National Academy of Sciences and received the NASA Public Service Award for his work on the Apollo space program.

Any activity creates wastes. Making a dinner salad, baking a pie, burning coal, cleaning bed pans in a hospital, and handling nuclear materials. Nuclear

wastes are no more dangerous than many other wastes. The much repeated statement that plutonium is the most toxic substance known to man is pure nonsense. There are chemicals in every college chemistry laboratory which are tremendously toxic, and many chemicals and biological agents are much more toxic.

The Middle East conflict has brought to our attention toxic materials, a drop of which the size of a pinhead on one's skin can cause immediate death. A piece of plutonium of that size on one's skin could be picked off and would have no physical effect. Similarly, plutonium taken orally would simply pass through the gut having no physical effect. Similarly, plutonium particulates in the lungs of non-smoking Los Alamos workers have had no discernible effect on their overall health or expected life span.

Many of the statements of *The New Mexican* article with regard to plutonium are technically incorrect and simply play on the fear of the unknown. In any activity there are risks. One learns from experience, and Los Alamos has never engaged in an activity without attempting to evaluate the risks versus the benefits. They have never knowingly placed an employee at risk. Accidents have happened, but the Laboratory's and the whole nuclear industry's track record is better than any other industry of a similar magnitude.

If the people in the area surrounding Los Alamos are worried about the movement of radioactive materials from the burial sites, they should examine the data from the country of Gabon and the data from the Nevada test site, which clearly show that the earth has a great affinity for these

materials and they stay put. The recent asbestos hysteria clearly has shown that it would have been better to leave the materials in place than to have engaged in the wholesale removal, which was attempted at great expense and potential danger to the workers. Many want waste materials of all sorts to be picked up from their backyards, but no one wants them put down in theirs.

The New Mexican articles correctly report that nuclear materials are transported in and out of Los Alamos. In this era of potential terrorist activity the reporters do not serve *The New Mexican* well by describing the methods and routes used for these shipments.

One editorial suggests that the LANL should work on "civilian" activities and cease "making bombs." They don't seem to understand how closely the two are linked. If the START treaty is implemented and there are deep reductions in nuclear warheads, a practical solution must be developed to utilize the plutonium in the thousands of warheads to be retired. Nuclear power stations using mixed oxide fuels may be one solution.

In any event Los Alamos will continue to play a vital role in the future wellbeing of our nation in spite of the poison pen endeavors of *The New Mexican* team. If Thom Cole is so concerned about the effects of radiation, perhaps he should go to sea level where the exposure to cosmic radiation is greatly reduced. He should also travel there by car since radiation exposure at high altitude aircraft is even greater than in Santa Fe. If the Los Alamos circulation and advertising decreases, hopefully *The New Mexican* publisher will understand why.



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Fouling the nest

Los Alamos National Laboratory has been our neighbor on the hill for 48 years. Every northern New Mexican vaguely understands that its proximity presents benefits and risks. Some have accepted the risks and learned to live with them because of the benefits — a multimillion-dollar per year payroll and the finest scientific minds in our own backyard.

The lab brings us a tremendous legacy, both positive and negative. That legacy ranges from major scientific advances to deadly poisons.

When Robert Oppenheimer and the federal government established the lab to develop the atomic bomb, they did not clearly foresee that darker side of the legacy. Some New Mexicans, federal officials and scientists still are unwilling to accept it and would continue on a business-as-usual course.

No one can dispute that Los Alamos and its environs, the magnificent canyons and mesas of the eastern flanks of the Jemez Mountains, home to the American Indians and their descendants for thousands of years, have been altered permanently in just 50 years.

For the last five days in "Fouling the nest," *The New Mexican* has delivered a view of the lab's legacy to future generations, a legacy of nuclear contamination and the challenge to clean it up. The series ends Friday.

Anyone who cares about reclaiming Los Alamos from contamination and about plotting a course for nuclear waste disposal knows that changes must begin now. The same is true of anyone who understands the benefits LANL's research can reap for the future.

In coming days, four editorials will outline what we think needs to be done, and why. They include:

■ **Cleaning up the mess:** The cost of cleaning up the lab and

areas around it has been conservatively estimated at \$2 billion — \$200 billion for all U.S. weapons facilities, equal to the cost of the federal bailout of S&Ls. Before the lab adds to the nearly 2,000 suspected polluted sites and increases the cost of clean up, federal officials must step in, bring in experts to investigate the problem and fund a clean up. It could take decades, but it must be done.

■ **Knowing what is there:** How can we believe environmental reports on LANL when the Department of Energy both owns the facility and monitors its environmental effects; it's like the fox guarding the chicken coop. Studies by an independent watchdog agency funded by the federal government are needed to tell the DOE what to do and how to do it. In addition, there are no studies of LANL's impact on the ecology of the canyons and mountainsides that crisscross the area. That work must begin soon.

■ **What's next for the lab?** LANL's future should be to expand development of nuclear and other energy sources for civilian uses — as power sources to replace fossil fuels. Plutonium processing, which has been a concern among critics of the lab, will have to continue, but purely for LANL's research. In the past the lab has processed plutonium for use in weapons. That must stop.

■ **Paying the tab:** Like so many problems facing the United States today, cleaning up LANL, improving its security and health reports and developing alternative energy research programs will cost billions of dollars. But that bill represents only a minuscule slice of the larger U.S. debt pie. After 75 years of urbanization and growth, America is at a crossroads. Everything from our schools and cities to our rivers and highways need help — and money. Can the nation even pay the bill? It must.



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Robert M. McKinney, Editor and Publisher
Billie Blair, Associate Editor and Publisher
David N. Mitchell,
Managing Editor

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Cleaning Up the nest

Name a type of radioactive waste and probably it has been buried in Area G at Los Alamos National Laboratory.

The 63-acre area just west of White Rock is riddled with contaminated pits, shafts, trenches and storage buildings. The area's soil and air are contaminated with plutonium.

Area G is but one of many sites that are known to be contaminated, and one of almost 2,000 LANL sites that must be assessed for possible cleanup. Some, like Area G, are major waste dumps that always were meant to be waste dumps. Others are the leftovers of 48 years worth of messes spread around the lab's 43 square miles.

When will the necessary cleanup begin and how will it proceed? The Department of Energy, LANL's owner, has made the cleanup pledge that should have been made years ago.

When Energy Secretary James D. Watkins was appointed two years ago, he promised that LANL and sites like it across the nation would, for the first time ever, be forced to comply with federal and state environmental laws. To that end, LANL plans to spend about \$1 billion just to gear up for the cleanup. The entire cleanup bill is estimated at \$2 billion but undoubtedly will cost much more. LANL officials have also said they intend to improve waste management practices so that what has happened in the past five decades will not happen again.

Although these promises are reassuring, they are not enough.

They are welcome signs of good faith. But the DOE hasn't been exactly trustworthy. Here's how:

■ The public will not soon forget that LANL never had to comply with environmental regulations, because federal laws granted nuclear weapons manufacturers substantial immunity. That is changing, but only because the courts say it must. Beyond that, there is only Watkins' word.

■ LANL officials have consistently been able to hide waste and health hazards behind what has been called a necessary veil of secrecy, in the interests of national security. Records on waste sites in and around the lab are incomplete and sometimes inconclusive, either because some have been lost or destroyed. That doesn't inspire much faith. Some of the records are not available to the public.

When it comes to nuclear waste and pollution that affects us all, what does a national facility have to hide?

The public wants protection. Federal laws that force LANL to comply with all environmental regulations must be passed. It is up to Watkins, the Environmental Protection Agency and our legislators to push Congress and President Bush to create and pass them.

Furthermore, as LANL and the Department of Energy enter a new phase of environmental compliance, they must not be left to their own devices. A panel of governor-appointed experts, representing a cross-section of people with relevant skills and appropriate skepticism, in the mold of the state panel that oversees the Waste Isolation Pilot Plant, is needed to oversee the cleanup of LANL.

It's about time state officials, especially the governor, and state legislators, turned their sights on potentially the most lethal waste sites in the state. The Department of Energy and LANL need to be shadowed constantly. Their reports and cleanup efforts need to be second-guessed. And the public must be kept informed at every turn.

LANL is going through a transition from its wartime and Cold War roots to peacetime. Inevitably its objectives will change from weapons to civilian-oriented research.

As that conversion takes place, the public's understanding and confidence in LANL and its mission must grow. That will be difficult, but it could happen if the cleanup inspires confidence.