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Environmental Oversight and Monitoring at Department of Energy Facilities in New Mexico

1998 Annual Performance Report

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DOE Oversight Bureau

John Parker, Chief
Jeanne-Marie Crockett, Editor

2044 A Galisteo Street
Santa Fe, New Mexico 87505
(505) 827-1536

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Executive Summary

The mission of the New Mexico Environment Department's DOE Oversight Bureau is to help assure that activities at the U.S. Department of Energy facilities in New Mexico are protective of the public health and safety and the environment. The state's oversight activities are funded though a five-year agreement between the state and the Department of Energy that became effective on October 1, 1995. This report describes the activities of the DOE Oversight Bureau for calendar year 1998.

One of the bureau's goals in 1998 was to bring technical and regulatory concerns to the attention of decision makers at Los Alamos and Sandia National Laboratories earlier in the process to promote more efficient investigations and effective cleanups by the environmental restoration programs. These earlier and more frequent communications helped the facilities complete work and generate final documents with a higher potential for regulatory approval. Additionally, we began to examine issues involved with the management of low-level mixed waste required by the Federal Facilities Compliance Act.

This year we worked more closely with the site-specific advisory boards for Sandia and Los Alamos National Laboratories by not only attending the monthly meetings, but also participating in various committees. We continued to facilitate the community program for the Neighborhood Environmental Watch Network, and assisted with the development and implementation of a formal training program for citizen station managers. Staff members gave presentations at environmental conferences and released five technical reports. We worked more closely with the environmental offices of San Ildefonso, Jemez, Santa Clara and Cochiti Pueblos, coordinating our sampling programs, and expanding our collective geographic information systems.

At Sandia National Laboratories we analyzed waste management and operational issues associated with the excavation of the Chemical Waste Landfill and the construction of the associated Corrective Action Management Unit. With our input, Sandia developed a list of environmental restoration sites that are in or near watercourses and rated their erosion potential. Based on this rating and a priority schedule, the laboratory is working to minimize erosion at these sites. Sandia incorporated recommendations the bureau had made over the past few years when it updated its conceptual models describing ground-water conditions related to laboratory activities.

At Los Alamos National Laboratory we helped to develop a watershed-based approach to addressing contaminant migration and Clean Water Act permitting issues. We worked closely with canyons investigators and other laboratory personnel as regional monitor wells were installed under the *Hydrogeologic Work Plan* and worked with laboratory investigators at

high-priority sites. We also participated on a team that prepared documentation to remove 99 sites from the laboratory's HSWA permit. In addition, we continued our routine monitoring of water, air, soil, sediment, flora and fauna in the vicinity of the laboratory.

The results from our ongoing environmental monitoring programs at Los Alamos and Sandia National Laboratories were consistent with historical measurements and did not exceed federal or state standards. Results from samples taken at sites with documented contamination verified levels of contaminants reported by the facilities, some of which did exceed standards or health-based reference levels. We broadened the scope of our storm-water monitoring program by improving our coordination with Sandia to complement rather than duplicate each other's sampling efforts.

Samples taken from monitoring wells near the former ITRI facility between 1988 and 1998 show six of 23 wells consistently exceeding drinking-water standards and ten wells consistently below drinking-water standards. Samples from a well installed by Sandia, were down gradient of the Lurance Canyon Burn Site, contained fuel components.

In November, the Department released a second version of the draft hazardous waste storage and disposal facility permit for the Waste Isolation Pilot Plant. Our evaluation of the solid waste management units listed on the draft permit found the potential for surface water-caused erosion to be low. We also continued to monitor gamma radiation monitors at the WIPP on a quarterly basis to maintain our background data set.

Introduction and Program Overview

The mission of the New Mexico Environment Department's DOE Oversight Bureau is to help assure that activities at DOE facilities in New Mexico are protective of public health and safety and the environment. The DOE Oversight Bureau's activities are funded by a grant from the U.S. Department of Energy in accordance with the provisions set forth in the *Agreement-In-Principle between the State of New Mexico and the U.S. Department of Energy*. This agreement focuses on state oversight of environmental impacts of the DOE facilities: Sandia National Laboratories in Albuquerque, Los Alamos National Laboratory in Los Alamos and the Waste Isolation Pilot Plant near Carlsbad.

The Agreement-In-Principle resulted from an initiative by the DOE to improve its accountability concerning public health, safety and environmental protection. States hosting DOE facilities were provided funding and staff security clearances needed to develop and maintain a credible oversight program. The first Agreement-In-Principle was effective from October 22, 1990 through September 30, 1995. The second five-year agreement became effective on October 1, 1995. The agreement consists of four primary objectives:

- To assess the Department of Energy's compliance with existing laws including regulations, rules, and standards.
- To participate in the prioritization of cleanup and compliance activities at the Department of Energy's facilities.
- To develop and implement a vigorous program of independent monitoring and oversight.
- To increase public knowledge of environmental matters about the facilities, and coordinate with local and tribal governments.

Personnel and Administration

To meet the State of New Mexico's obligations under the Agreement-In-Principle, the New Mexico Environment Department had a total of 27 positions in 1998 funded by the Department of Energy.

Environment Department employees funded by the DOE grant are located at "site offices" in White Rock and on Kirtland Air Force Base in Albuquerque, and at state offices in Santa Fe.

Environmental oversight and monitoring of the Waste Isolation Pilot Plant are performed by staff members based in the Santa Fe office.

INTER-AGENCY MANAGEMENT GROUP

In April 1998, the Environment Department Secretary and senior management from the U.S. Environmental Protection Agency, Department of Energy and Los Alamos and Sandia National Laboratories developed and signed the following vision statement for environmental management at New Mexico facilities:

> *We complete all environmental restoration and stabilization efforts and ensure long-term maintenance and monitoring programs are in place at all New Mexico DOE facilities by 2006, SNL by 2001 and LANL by 2006. Legacy waste, identified for removal, is shipped for permanent disposal. Effective waste minimization/pollution prevention programs are in place. These completions are cost-effective, approved, and comply with applicable regulations, ensure acceptable risk, and are implemented in a trust and partnership manner with the regulatory agencies and with public participation for the communities of New Mexico.*

The DOE Oversight Bureau participated in meetings of an inter-agency management group charged with overcoming technical, administrative and regulatory barriers to achieving this vision. The "Management Implementation Group" is composed of representatives from the Environment Department, U.S. Environmental Protection Agency, Department of Energy and Los Alamos and Sandia National Laboratories. The group meets every other month in Santa Fe. While the target dates provided in the vision statement may not be met, the ongoing meetings have facilitated greater levels of trust and understanding, and a framework for ensuring adherence to the spirit of the vision is being developed.

Los Alamos National Laboratory

The Oversight Bureau's resources were focused on helping to assure that pathways for the migration of contamination from Los Alamos National Laboratory are identified and monitored. Our efforts helped to guide the laboratory to develop a watershed-based approach to addressing contaminant migration and permitting issues under the Clean Water Act. We worked closely with laboratory investigators as regional monitoring wells were installed under the *Hydrogeologic Work Plan*. We worked with laboratory investigators at cleanup projects in the Los Alamos town site and other high priority locations. As part of an effort to remove low-risk sites from the regulatory process, bureau staff participated in a team that completed the technical reviews leading to the removal of 99 sites from the laboratory's HSWA permit. We continued monitoring water, soil, sediment, and biota in the vicinity of the laboratory. Our communications with nearby pueblos were expanded and formalized as their environmental monitoring programs continue to develop.

We reviewed the *Draft Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory*, which was issued to fulfill the requirements of the National Environmental Policy Act. The document outlined four alternatives, ranging from continued operations at current levels to expanded operations at higher levels of activity. We found that this EIS failed to provide a sufficient range of alternatives with respect to impacts on human health and the environment.

The following sections describe our work in the areas of legacy waste cleanup, management of discharges and emissions, and environmental monitoring. The narrative reflects the difficulty in separating the three areas of environmental management. The relationship between cleanup, management, and monitoring is demonstrated by recent findings of contaminants in the regional aquifer. The contaminants, high explosives, are probably the result of discharges from a site that is now being investigated and cleaned up by the laboratory's Environmental Restoration Project. As this site is cleaned up, the wastes generated will have to be managed properly. The great depth of the contaminated ground water portends difficulty in achieving cost-effective remediation and the probable need for continued monitoring.

Legacy Waste Cleanup

During 1998, we interacted with the laboratory's Environmental Restoration Project on technical and regulatory concerns in an effort to promote efficient and thorough site investiga-

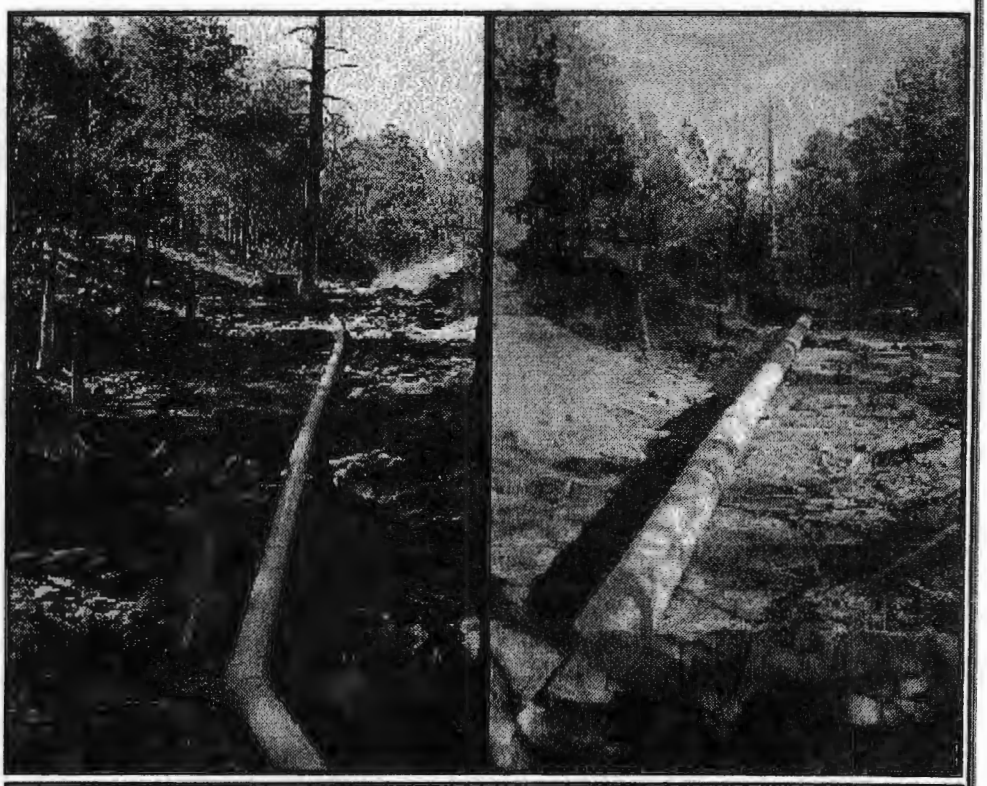
tion and cleanup. We communicated primarily with project personnel to facilitate timely completion of work and regulatory approvals. Our efforts had the most success when we became involved early in the process of developing and implementing investigation and cleanup plans.

Remedial Actions

Bureau staff acted as advisors to project personnel during the development and implementation of remedial actions. We commented on a corrective measures study plan for an inactive effluent release site, the building 260 outfall at TA-16, and on a laboratory proposal regarding modifications to a high priority closure at an inactive laboratory waste dump, MDA-P. We transmitted recommendations to the laboratory regarding sampling and analysis plans for the inactive wastewater lagoons at TA-53, and the septic tank/leach-fields at TA-18. We observed sampling and cleanup activities at several locations within the Los Alamos town site.

Investigations at the 260 Outfall

The bureau participated in an investigation of the building 260 outfall, which is a site associated with a high explosives machining building that has been in operation since 1951. During weapons processing, large volumes of high-explosive-contaminated wastewater were discharged to the 260 outfall drainage. The site includes sumps, drain lines, the effluent discharge point or *outfall*, and contaminated soil and rock. Today, dead pine trees in the drainage are evi-



The 260 outfall at Los Alamos National Laboratory is pictured before (left) and after (right) the installation of erosion controls and the diversion of the waste stream.

dence of years of contamination. In 1996, the outfall was shut off and no longer discharges wastewater.

The laboratory's environmental restoration project began investigating the site in 1993. Early studies in the early 1960s and 1970s showed evidence of contamination from the outfall in Cañon de Valle, the receiving drainage, and more recent investigations show that contamination extends downstream about three miles. In 1994, we began collecting samples in the area. Our data showed that springs in Cañon de Valle near the 260 site are contaminated with high-explosives. During 1998, our field activities near the 260 site included sampling wells, springs and stream water in Cañon de Valle. We routinely sample at such sites to verify the laboratory's data — and to supply additional information to investigators for use in evaluating contaminant transport and pathway processes. With this in mind, our data will help both parties evaluate the connection between the contaminated stream and shallow ground water system in the canyon bottom.

We discussed our findings with laboratory investigators, who then incorporated additional characterization of the canyon springs, streams and shallow ground water into their investigation plan.

Canyons Investigations

Previous investigations have shown that environmental contaminants resulting from past laboratory activities on the mesa tops have migrated into the adjacent canyons. The canyons investigations currently being conducted by the laboratory's Environmental Restoration Project are intended to systematically characterize contamination within these canyons. This information will be used to determine the potential for contaminant transport to aquifers or through canyon watersheds, and to evaluate the potential for exposures to humans and wildlife. We participated in the development of work plans and collected independent and verification samples of ground water, storm water, and sediment.

This year we reviewed the work plans for three canyons and participated in the work plans' implementation. We suggested that the work plan for Los Alamos and Pueblo Canyons include DP Canyon, a tributary canyon that received radionuclide effluent from the processing of plutonium and uranium at TA-21 during the cold war years. During the work plan implementation, we collected verification samples that will be evaluated before the release of the laboratory's final report.

For the Mortandad Canyon investigation, we recommended the relocation of proposed monitor wells and the installation of additional wells. We also suggested adding, upgrading, and relocating some surface water monitoring stations. In most cases, the work plan was adjusted to include these suggestions. We collected water samples in Mortandad Canyon, which continues to receive liquid effluent from the Radioactive Wastewater Treatment Facility at TA-50.

Upper Sandia Canyon drains TA-3, the laboratory's 112-acre core administrative and research complex. Storm water runoff from roads, parking lots and roof drains at TA-3, as well as effluent discharges from a power plant, runoff from a motor pool, asphalt batch plant, and the 36-acre Los Alamos County Landfill, have all contributed contaminants to Sandia Canyon. Sediments within the canyon's wetland have been found to contain elevated levels of metals and PCBs. During 1998, bureau staff worked with the laboratory and Environment Department regulatory staff to develop a sampling and analysis plan for this heavily impacted portion of the canyon.

LANL's Hydrogeologic Investigations: Year Two

During the past six years, we have participated in the development and implementation of the laboratory's *Hydrogeologic Workplan*. Under this plan, the laboratory is now in its second year of placing wells strategically on mesa tops and canyon bottoms. Drilling these wells will provide information on the underlying geologic units, particularly those which are water-bearing, so that ground water flow paths, flow rates and interconnections within the subsurface are better understood. Additionally, these wells will provide information about possible ground-water contamination.

Monitor well R-25 was installed on a mesa top within the explosives corridor known as S-Site along the western boundary of Los Alamos National Laboratory.

This year, we were part of a team that reviewed data objectives, well design and siting criteria for the installation of two monitor wells penetrating the regional aquifer. The first well,

designated R-12, was drilled in Sandia Canyon near the eastern boundary of the laboratory. The second well, R-25, was located on a mesa top within the explosives corridor known as S-Site along the western boundary. Although neither of these two wells was completed by year's end, both have already revealed a wealth of information. Well R-25 showed for the first time in the laboratory's history, measurable high-explosives contamination in the regional aquifer. Our preliminary data verified this finding with high-explosive constituents, TNT and RDX, at or above federal health advisory levels. To date, analyses of samples from drinking water production wells in the regional aquifer have not detected these contaminants.

Under the *Hydrogeologic Workplan* the laboratory is doing what the Environment Department has requested it to do: provide greater understanding of the hydrologic system at Los Alamos and monitor for ground-water contamination. We are hopeful that the rate at which the *Hydrogeologic Workplan* is being implemented can be accelerated. This project is funded by several organizational entities within the Department of Energy because the information that is being generated is vitally important to both the ongoing cleanup of legacy wastes as well as continued operations of Los Alamos National Laboratory.

Watershed Management Plan

As the year came to a close, the laboratory was in the process of preparing a draft watershed management plan to "...focus management efforts on elements of the watershed system..." Our bureau stressed the importance of watershed management and the value of incorporating a watershed-based approach to addressing issues of contaminant migration and the permitting requirements under the *Clean Water Act*.

We helped to develop a method for evaluating the potential surface water erosion from contaminated sites and joined the Surface Water Assessment Team that evaluated the results and prioritized the sites. To date, the laboratory has assessed more than 1000 sites for erosion potential. Based on these assessments, sites were recommended for erosion control measures and cleanup actions.

To help provide information that is useful in watershed management, the bureau applied its Geographical Information System capabilities to the problem of locating stream gages and storm-water sampling equipment. The idea was that gages and samplers should be placed at optimum locations based on geographic information and knowledge of erosion potential and contaminant distribution. The laboratory incorporated many suggestions into their implementation plan and has committed to install additional gaging and monitoring stations.

Floodplain study

Because of the potential for flash flooding within the laboratory boundaries, the laboratory conducted a flood study and mapped the floodplains within the canyons. The subsequent report, *Determination of 100-year Floodplain Elevations at Los Alamos National Laboratory* was completed in 1993. This report is cited in many other laboratory documents and provides a basis for decisions regarding flooding potentials within the canyons.

A 100-year flood is a severe storm event that has only a 1 percent chance of happening in any year. The 100-year flood standard was originally developed for use in floodplain mapping. It is the "at risk potential damage area" defined by the highest and widest points in a canyon, stream or arroyo channel where floodwater will reach at the peak of a 100-year flood.

In 1998, we decided to review the laboratory's report. Our review was based primarily on a bureau study of one canyon, which we then compared to the results reported for that canyon by the laboratory. We found that our results supported interpretations different from the laboratory's. According to our review, a number of buildings were found to be potentially within the 100-year floodplain (some had actually been flooded before during storms of less-than-100-year intensity), and that some technical requirements may not have been adequately addressed. As a result of our findings, we recommended that the report be updated and that automated alert gages be installed upstream of buildings in the canyons.

Erosion Control at the 260 Outfall

In 1995, the laboratory installed erosion controls at the 260 outfall drainage, the site of historical high explosives wastewater discharges from weapons production. The laboratory placed sandbags and straw bales at the site to prevent contaminated water and sediment from flowing into Cañon de Valle. However, we observed that, particularly after heavy rain storms, water still flowed from the discharge pipe into the contaminated drainage. To investigate this, we took samples of the water flowing from the pipe and trickling past the straw bales. This storm water contained high explosives.

Based on these findings and our recommendations, the laboratory replaced the sandbags above the drainage with a concrete curb, and rerouted any water coming out of the pipe away from the drainage. However, these measures are still only temporary and the removal of contamination at the 260 outfall and adjacent drainage is the best means for preventing further contamination from entering Cañon de Valle. The laboratory is proceeding with the next step of the cleanup project which is expected to include the removal of contaminated sediments and bedrock from the drainage.

Water Quality Standards

The Oversight Bureau provided information to Environment Department regulators for their presentation to the Water Quality Control Commission for the 1998 Triennial Review of the New Mexico Water Quality Standards. The information included compilations of data collected by the bureau and the laboratory, primarily documenting findings of mercury and selenium in surface waters in the vicinity of the laboratory.

ENVIRONMENTAL MONITORING

The Los Alamos National Laboratory environmental surveillance program monitors air, water, soil, sediment, flora, fauna, and ambient radiation to identify trends and to assess compliance with appropriate standards. Data from the program are published in the laboratory's annual *Environmental Surveillance* report. To verify the laboratory's data and to evaluate their sample collection and analytical methods, we observe their sampling programs in the field and independently collected samples. These samples are selected to provide an adequate representation of the locations and media sampled and are analyzed by an independent contract laboratory. In addition, we collect samples independent of the laboratory's environmental surveillance program to support our own investigations of locations and media not routinely sampled by the laboratory.

Gamma Radiation and Airborne Radionuclides

The laboratory maintains a radiological air monitoring program called AIRNET that measures levels of airborne particulate radionuclides and airborne tritium at regional, perimeter and on-site stations. The laboratory also measures levels of ambient gamma and neutron radiation at 93 sites located throughout the laboratory and surrounding communities.

The Oversight Bureau maintains our own network of gamma radiation and airborne particulate monitors collocated with a subset of the laboratory's stations to verify the laboratory's data. Data collected by both the laboratory and the bureau can be viewed on the Internet at *http://www-airquality.lanl.gov.*

We monitored for gamma radiation at 12 locations (11 stations at or near the laboratory boundary and one station in Santa Fe) using thermoluminescent dosimeters. The dosimeters are read on a quarterly basis. Levels of gamma radiation were found to be consistent with the levels measured by the laboratory and were in the range of background.

We monitored airborne radionuclides at five stations in communities surrounding the laboratory. Filters were collected from the samplers every two weeks and composited for analysis

every three months. They were analyzed for isotopic uranium, isotopic plutonium and americium-241. In addition, a gamma spectroscopy analysis was performed to determine the presence of any other gamma-emitting radionuclides.

Plutonium and americium results were very low, often below the analytical detection limit. Values for uranium, a naturally occurring radionuclide, were somewhat higher but still two to three orders of magnitude below the applicable health standard.

We monitored airborne tritium at four of the stations. A tube containing hygroscopic silica gel, which absorbs the moisture from the air, is used to collect tritium. The silica gel is then sent to a contract laboratory for analysis. The levels of tritium measured were two to three orders of magnitude below the applicable health standard.

A technical report, *Gamma Radiation and Airborne Radionuclide Surveillance at Los Alamos National Laboratory, New Mexico, During 1996*, was published which provided a comparison of our results to the laboratory's. As noted in the report, our measurements of gamma radiation were consistently lower than those reported by the laboratory. This finding was attributed to differences in the type of dosimeters that were used. Levels of airborne radionuclides were generally similar and within the range of the measurement uncertainty. We found slightly higher levels of airborne uranium than the laboratory, but the difference was attributed to natural uranium in the glass-fiber filters used by the bureau. All measurements were at background levels and below regulatory limits.

Soil and Sediment

During the year, we collected samples from 19 soil and sediment sampling stations. In some cases, we analyzed samples for chemical constituents, such as metals, that the laboratory did not. Although our data are preliminary, they appeared to be consistent with the laboratory's data. Excluding a few areas impacted by historical laboratory releases, the levels measured are consistent with regional background.

In our publication, *NMED/LANL 1996 Sediment Results: Data Evaluation and Statistical Comparison,* we reported concentrations of measured constituents in the sediments below health-based standards and guidance. We found that the laboratory's results were consistent with ours, except those for total uranium. Statistical comparisons indicated that our total uranium results in sediments were greater than those reported by the laboratory. In response to our recommendations, the laboratory is reviewing the analytical methods used to measure total uranium.

White Rock Canyon Sediment Survey

In the fall, we began an independent investigation of sediments along the banks of the Rio Grande in White Rock Canyon. Sediment cores were collected at three locations that were selected using aerial photos and topographic maps to identify areas where fine-grained material had been deposited between 1975 and 1987. This is the time period following the completion of Cochiti Dam when Cochiti Lake was filled to near capacity, flooding the lower portion of White Rock Canyon. Fine-grained deposits were targeted because of their ability to trap contaminants. The samples were analyzed for radioactive and metal constituents. Analytical results from this study are currently under review.

DOE Oversight Bureau staff stopped along the river to collect samples from a tributary canyon.

Water

The bureau collected a total of 28 water samples from wells, springs, and streams. We collected two independent water samples—one of effluent below the Liquid Waste Treatment Facility outfall, and one from the Rio Grande immediately following a major storm.

We have recommended that the laboratory collect surface water samples from specific sections in Pajarito Canyon and Cañon de Valle during their annual environmental surveillance sampling. To support our recommendation, we collected surface water flow and quality data in selected sections of Pajarito Canyon and Cañon de Valle between 1995 and 1997. A report published in 1998, *Flow and Water-Quality Characteristics of Perennial Reaches in Pajarito Canyon and Cañon de Valle, Los Alamos National Laboratory*, summarizes the results of our investigation. Perennial flow was found to occur in two canyon reaches along the western portion of the laboratory. Laboratory-derived contaminants are present in Cañon de Valle surface water.

Animals and Plants

Bryan Vigil (left) collected samples of goat milk in Pajarito Acres in the Fall of 1998.

During the year, we collected 24 samples of biological materials to monitor uptake of environmental contaminants by animals and plants and to evaluate the laboratory's biological monitoring program. Most of our samples were split with the laboratory. Eight samples of produce collected on laboratory property and at off-site perimeter locations were analyzed for plutonium, uranium, strontium, and gamma emitting radio-isotopes, as well as for barium, chromium, mercury and selenium trace metals. Two samples were analyzed for PCBs. We collected samples of fish from Cochiti and Abiquiu lakes, eggs and milk from communities around the laboratory, domestic cows from El Rito and Cochiti Pueblo, and elk from road kills on and around the laboratory. These samples were analyzed for different combinations of radionuclides, metals and PCBs. Our preliminary evaluations indicate that the results are consistent with the laboratory's results and within the range of historical data.

Bee and honey samples were collected from the laboratory's hives in Pueblo Canyon in the Fall of 1998.

Sandia National Laboratories

As in previous years, our efforts were focused on oversight of environmental restoration and monitoring at Sandia National Laboratories. We became involved earlier in the process of making decisions on legacy waste cleanups. Instead of reviewing final documents, we were frequently able to review draft documents. We discussed our comments in meetings with facility representatives rather than submitting them formally to the Department of Energy. These discussions allowed for real-time exchange of ideas and information resulting in greater ease of modification of activities and documents. Ongoing discussions between bureau staff and state regulators also assured that the proposed actions would have a higher potential for regulatory approval.

Our discussion about soil and soil vapor sampling at an environmental restoration unit within the Lurance Canyon Burn Site is a good example of this early involvement. A reduction of sample points was achieved while still ensuring adequate characterization. The plans for operations, sampling and analyses, and waste management at the Chemical Waste Landfill excavation were also evaluated before final planning documents were generated. Several voluntary corrective measures were refined in this manner prior to implementation.

We analyzed the complex waste management and operational issues associated with the excavation of the Chemical Waste Landfill and the construction of the associated Corrective Action Management Unit, better known as the *CAMU*.

The scope of our storm-water monitoring program broadened. Coordination with Sandia to complement rather than duplicate each other's sampling efforts is providing a more complete picture of storm water on the base. For example, we sampled storm-water runoff below a site with PCB contamination. We shared our data with the laboratory, which was not monitoring storm water at the location.

We continued monitoring ground water at the former Inhalation Toxicology Research Institute facility, but we no longer oversee activities at this site. The current operators, Lovelace Respiratory Research Institute, have a contractual agreement with the Department of Energy that excludes state oversight under the *Agreement-in-Principle*.

Cooperative Data Sharing

Bureau staff need to have access to current and accurate information about the sites or locations that they are charged with monitoring. This information includes accurate location data (geographic coordinates and elevation), physical attributes of the site (for example,

slope, vegetative cover, and structure), and any data that might be associated with the site as a result of sampling or field observations.

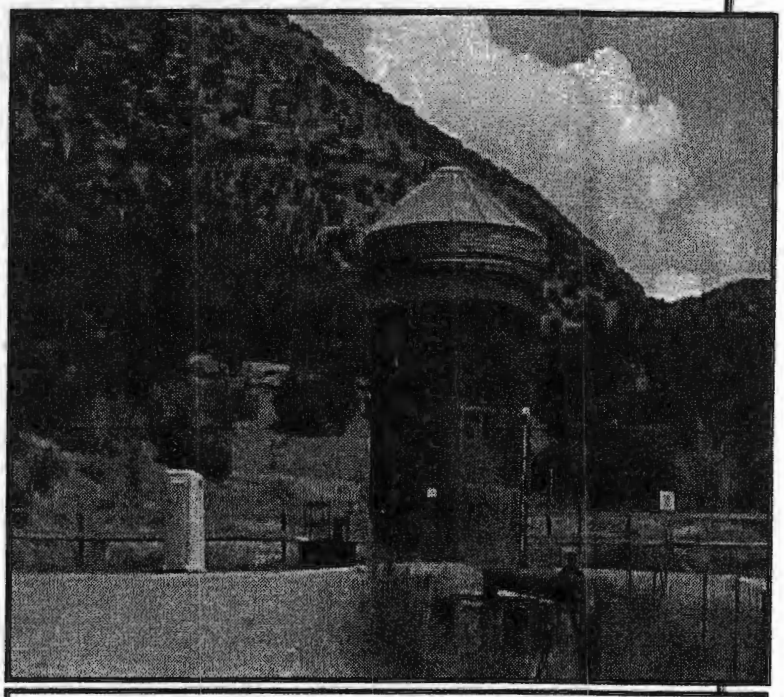
Computer applications using Geographic Information Systems are used by Sandia to manage their environmental data and produce detailed maps. To effectively share these data, the laboratory has established a cooperative agreement with the bureau. This year Sandia provided us with a GIS workstation and electronic access to current environmental data and maps.

LEGACY WASTE CLEAN UP

Cooperation on Soils Investigations

In February, bureau personnel offered suggestions on improving Sandia's passive soil vapor survey of the Lurance Canyon Burn Site. The survey was intended to refine the investigation of the various environmental restoration sites within the Burn Site. Passive soil vapor survey techniques use samplers containing activated carbon that are inserted from six inches to several feet into the ground. The activated carbon absorb the vapors of any volatile (gasoline and solvents) and semi-volatile (jet fuel, diesel, and oils) compounds in the soil. The samplers are left in place for about three weeks then removed for laboratory analysis. We suggested reducing the density of samplers in some places and spreading the samplers across a broader area. Results of the analysis of soil samples collected at one location show jet fuel components in the soil.

In November Sandia conducted additional soil and soil vapor sampling at the *Light Airtransport Accident Resistant Container* unit. We collected a limited number of sample splits for verification analyses. Sandia's soil samples were analyzed for volatile organic compounds—benzene, toluene, ethylbenzene, and xylene represent the lighter and more mobile constituents of jet fuel. Our split samples were also analyzed for diesel fuel–comprised of the heavier constituents found in jet fuel. Laboratory analyses of these samples are still pending; however, based on earlier results, Sandia plans to excavate the contaminated soils and install



The *Light Airtransport Accident Resistant Container* unit. The pipe was used to drain water from the LAARC burn pan to a buried 55-gallon drum.

two additional monitoring wells near the site. The most recent soil and passive soil vapor survey results will be used to guide the excavation.

Waste Removal at the Chemical Waste Landfill

Sandia National Laboratories began removing wastes from the Chemical Waste Landfill where contaminated soil and ground water have been detected. The goal of the project is the removal of the original waste from the 1.9-acre landfill. This is the largest and most complex cleanup undertaken at Sandia and is expected to generate approximately 27,000 cubic yards of waste. The removal will probably continue through 1999, and possibly longer, depending on funding. Approximately 2,200 cubic yards of waste were removed this year. The bureau was involved in the early review of planning documents for the excavation project. One of our recommendations was that the storm water should be controlled at the site to prevent further downward migration of contaminants. In response to these concerns, Sandia graded the site to divert storm water away from the excavation and constructed a storm water retention basin and a berm around the excavation site at the end of each day's activities. Other concerns included challenges posed by the plethora of information requiring appropriate management and the quality assurance procedures required to successfully undertake such a complex and large remedial program. Since the project began we made frequent site visits to observe progress and found that the daily excavation activities are being conducted in a satisfactory manner.

Photograph by Sharissa Young, Sandia National Laboratories

At Sandia's Chemical Waste Landfill, the Oversight Bureau was concerned about how storm water will be managed during the excavation program.

Methods for Seepage Pit Investigations

Seepage pits at Sandia were used to dispose of waste water from industrial activities. The waste water may have included solvents, metal particles, explosives cuttings, and test

residues. Because of difficulties involved with drilling directly through the pits, many of which were filled with rock or cobbles, Sandia sampled some of the pits by drilling two boreholes outside each pit, one on each side. In 1995, the bureau began expressing concerns that this sampling approach might not be appropriate for evaluating the downward migration of contaminants, and recommended that a single borehole be drilled down the center of the pits.

With input from state regulatory staff and Sandia investigators, we suggested an investigation to evaluate whether different results would be obtained if the pits were sampled through the center. We selected five environmental restoration sites with seepage pits for investigation with a single borehole drilled inside the pit. Selections were made based on the bureau's priority ranking of the sites and the depth to bedrock.

Except for the location of the borehole, each pit was sampled using the same methods and procedures that were used to collect samples outside the pits. Each sample was then analyzed for the same parameters using identical laboratory methods as were used in the previous investigation. At three of the sites, we split samples with Sandia and analyzed them for the same parameters except for semi-volatile organic compounds.

Out of 15 comparisons between "inside" and "outside" data, all of the data indicated a good correlation between Sandia's previous sampling results and those of this effort. Although the results of the study were inconclusive regarding differences in data obtained from sampling inside versus adjacent to the pit, we recommend that future investigations sample through the center of the pit as this method would be most likely to detect contamination.

Discharges and Emissions

Wastewater Monitoring

Sandia National Laboratories' sanitary and industrial waste streams discharge to a sanitary sewer system that connects to the City of Albuquerque's sewer system. This waste flows to the city's wastewater treatment plant, and is finally discharged to the Rio Grande. The city regulates the laboratories' wastewater through pretreatment requirements. Wastewater discharged by Sandia must meet physical and chemical standards defined by the city in its permit. The permit requires periodic sampling and analysis of wastewater at designated locations.

We accompanied Sandia personnel on four occasions to collect a split sample for independent analysis for radionuclides. We did not find any radionuclides above analytical detection limits.

CAMU Ready for Waste

During 1998, Sandia National Laboratories nearly completed the final construction phase of the only corrective action management unit in the state. Upon completion in January 1999, this CAMU will begin to receive waste generated from the cleanup of contaminated sites at Sandia. Most of the hazardous waste that will be managed at this unit will be generated by the cleanup of the Chemical Waste Landfill. Not only will the CAMU facilitate the cleanup of contaminated sites at Sandia, it is expected to save millions of dollars in waste treatment disposal costs.

Roger Kennett, SNL Oversight Office Manager, is pictured standing next to the Department of Energy's first corrective action management unit or "CAMU."

Our involvement in this project began with comments on the various permit applications and modifications that lead to the current construction configuration. During the year, we observed construction activities and worked with the principal Sandia and Department of Energy staff to ensure compliance with all pertinent regulations. One of our earlier recommendations was that a quality assurance program be developed to ensure that the unit was constructed in accordance with approved design plans. Our oversight of the project has found the quality assurance procedures to be exemplary.

Mixed Waste Compliance Achievements

As a result of the land disposal restrictions of the Resource Conservation and Recovery Act, most Department of Energy sites had quantities of low-level mixed hazardous and radioactive waste that were stored out of compliance with these restrictions. This was addressed in 1992 by the Federal Facility Compliance Act, which authorized a nationwide program to develop mixed-waste treatment technologies. In October 1993, Sandia issued *a Site Treatment Plan* that set schedules for the treatment of legacy and currently generated low-level mixed waste. In 1995, the New Mexico Environment Department issued a compliance order to enforce the provisions of the plan.

Sandia currently has approximately 88 cubic yards of low-level mixed waste. There are approximately 25 active generators. The majority of the waste consists of radioactive sludges, organic debris, paper, plastic debris, and metallic objects. The radioactive component includes tritium and isotopes of cesium, strontium, plutonium, americium, and uranium. The hazardous component includes solvents, heavy metals, and toxic chemicals.

We examined Sandia's progress in treating and disposing of the waste and compared it to the *Site Treatment Plan* requirements. During the year, approximately 15 cubic meters of legacy waste was shipped off-site for treatment, and all treatment plan requirements were satisfied. Currently-generated waste is being sorted according to treatability groups at the Radioactive Mixed Waste Management Facility. Out of 18 treatability groups of waste at Sandia, five groups have been "worked off" according to plan's protocol and schedules. Eleven onsite treatment processes are listed in the treatment plan. Deactivation, solidification, macroencapsulation, mechanical processing, and pH neutralization are the major processes being considered. Other options include commercial off-site treatment and treatment at Department of Energy incinerators.

ENVIRONMENTAL MONITORING

Gamma Radiation and Airborne Radionuclides

Ionizing radiation in the form of gamma rays originates from both natural and man-made sources. Thermoluminescent dosimeters can be used to measure total ionizing gamma radiation. The bureau has 12 gamma radiation monitors or dosimeters located in the Albuquerque area. Six are located on Kirtland Air Force Base; six are located in the surrounding community and serve as background monitors. To validate Sandia's data, our

David Beach is checking one of the bureau's 12 gamma radiation monitors which are located adjacent to Sandia's monitors. Levels of gamma radiation measured by our monitors this year were consistent with those measured by Sandia and with regional background levels.

dosimeters are located adjacent to Sandia's. The dosimeters are read on a quarterly basis. Levels of gamma radiation measured by our dosimeters this year were consistent with those measured by Sandia and with regional background levels.

We collect samples of airborne particulates and water vapor to monitor levels of radionuclides in air. Based on the analysis of the samples and the volume of air that passes through the samplers, the concentration of radionuclides in air can be calculated and compared to relevant standards and guidelines.

Each air-monitoring station draws the same amount of air as 12 adult humans breathe over the same period of time.

The bureau operates three air samplers on the perimeter of Kirtland Air Force Base, and one on the campus of the University of New Mexico. On a quarterly basis, an independent laboratory analyzes the particulate filters for gross and isotopic radioactivity and the cartridges for tritium in water vapor. The results of our sampling are consistent with historical data. No values exceeded federal or state standards for radionuclides in air.

Surface Water

Flowing water from rain or melting snow can cause erosion and the transport of contaminated materials away from legacy waste sites. To find out which sites were most susceptible to erosion, a procedure for ranking erosion potential was developed by Los Alamos National Laboratory with input from bureau staff. This procedure is general enough to be applied at many other locations. To demonstrate its application at Sandia, we coordinated a field demonstration on the use of the procedure at Kirtland Air Force Base. Representatives from the Environment Department's Surface Water Quality Bureau, the Air Force, the Department of Energy, and Sandia participated in the demonstration.

With our input, Sandia developed a list of 94 environmental restoration sites in or near watercourses, and used the procedure to rank the erosion potential. Based on this ranking the laboratory is taking measures to minimize erosion at these sites.

To monitor the possible transport of contaminants from a particular environmental restoration site, we collected samples of storm-water runoff. We coordinated with the Department of Energy and Sandia to place a storm-water sampler adjacent to Environmental Restoration Site 30, which has concentrations of polychlorinated biphenyls in soil above action levels. Erosion controls are in place at this site, and we thought our samples might indicate the effectiveness of those controls. The sampler collected water draining from the site during storms. The water was analyzed for metals and PCBs. The results of analysis showed no significant concentration levels for priority pollutant metals, and no detection of PCBs.

Ground water

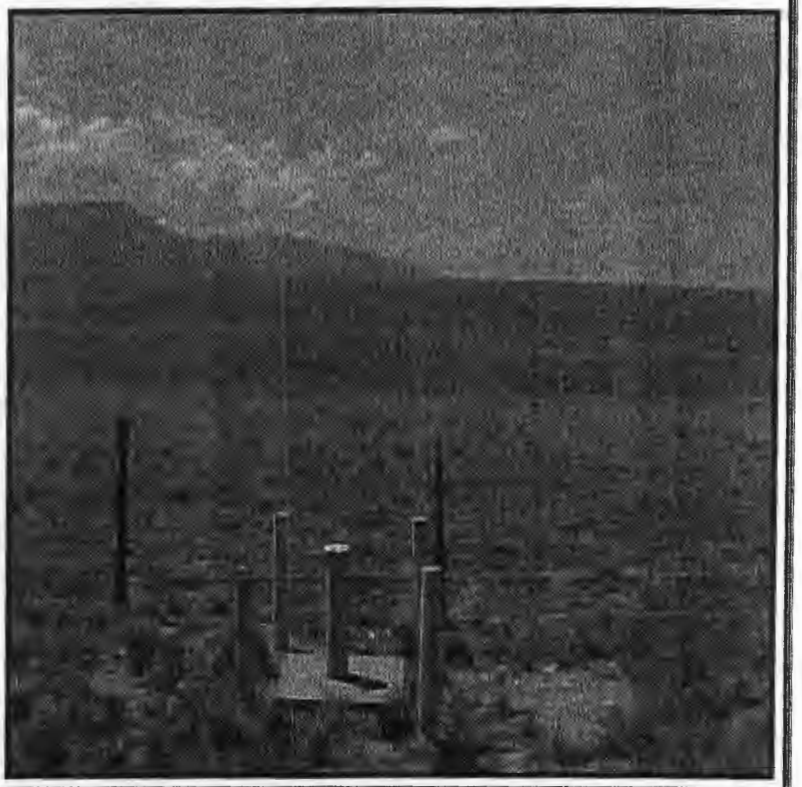
Understanding Site-wide Ground Water

Early in the year, Sandia updated the conceptual and numerical models describing ground-water conditions for the Kirtland Air Force Base area. The update took into consideration recommendations the bureau made over the past few years. Our review of this latest version indicates an accurate representation of the occurrence and movement of ground water underlying the various sites and activities controlled by the Department of Energy and Sandia within Kirtland Air Force Base. We feel this work is essentially complete, but as new information comes to light, the models will need to be adjusted accordingly.

Independent Hydrogeologic Investigation at ITRI

We have been monitoring ground water at the former Inhalation Toxicology Research Institute facility since 1993. We also have been tracking the level and movement of ground-water contamination related to the wastewater lagoons previously operated at the facility. In 1998, we sampled ground water from four monitor wells previously drilled by the bureau, three of which are located on Isleta Pueblo land. We also sampled seven of the 19 monitor wells at the facility.

The ITRI was a Department of Energy contractor-operated research facility located adjacent to the Pueblo of Isleta on the southern boundary of Kirtland Air Force Base. The facility is now privately-operated and is known as the Lovelace Respiratory Research Institute. In 1988, elevated levels of nitrates, chloride, sulfate, and total dissolved solids were found in ground water beneath waste-water treatment lagoons that served the former facility. Subsequent sampling by ITRI and Environment Department personnel also found dissolved diesel fuel constituents, Freon, and increased gross alpha and beta activity in the ground water.



Ground water monitoring well located south of the former Inhalation Toxicology Research Institute facility.

Trends in water quality from data collected between 1988 and 1998 show levels of nitrate, chloride, sulfate, and total dissolved solids contamination remaining relatively stable. Of the 23 monitoring wells around the facility, six consistently exceed drinking-water maximum contaminant levels for nitrate, chloride, sulfate, and total dissolved solids and ten, including the bureau's four monitoring wells, remain consistently below the drinking-water levels. Low levels of Freon and volatile organic compounds from diesel fuel are found in monitoring wells close to and west of the lagoons.

Our investigations suggest that buried channels cut into bedrock locally control ground-water movement at this site. These buried features can direct ground water and associated contaminants north to Kirtland Air Force Base and south to Isleta Pueblo lands. We discussed our findings and possible future investigations with a representative of the Pueblo of Isleta Environmental Department.

Ground-water monitoring at the Burn Site

For several years, the Oversight Bureau has been involved with ground-water monitoring at the Lurance Canyon Burn Site in the eastern portion of Kirtland Air Force Base. The Burn Site has a 34-year operational history beginning with ammonium-nitrate explosive testing in 1965 and continuing with burn tests today. There are 20 identified environmental restoration sites located in this area. We encouraged Sandia to install a monitor well and an underflow piezometer down gradient of the Burn Site to detect potential contamination from the activities at this site. The well, dubbed the Narrows Well, and the piezometer were completed in 1998. Sandia's sampling of the Narrows Well found contamination by fuel constituents and nitrate. Nitrate was found at concentrations above state drinking water standards.

Soil, Sediment, Water and Vegetation

Sandia has a comprehensive program for monitoring surface water, soil and sediment. Based on our observations, the program is sufficient to monitor changes in levels of metals and radionuclides, and to detect any off-site impacts. However, until recently, the laboratory has not had a storm-water monitoring program. This year the laboratory began monitoring for the possible transport of contaminants by storm water.

We sample soil, sediment, and vegetation to verify data collected by Sandia, to compare concentrations of radionuclides to health-based levels, and to compare off-site concentrations to on-site concentrations. During a two-week period in July, we coordinated with Sandia to sample at various locations on the perimeter of Kirtland Air Force Base and in the surrounding community. We sampled at approximately ten percent of the designated Sandia sampling locations, and collected a subset of media including soil, sediment, vegetation, and

water. This allowed us to compare analytical data with Sandia. The samples were analyzed for gross alpha and beta, radionuclides by gamma spectroscopy and tritium by liquid scintillation. The radiological data was similar to published background levels at the locations sampled, and all values were consistent with data reported in the *Sandia National Laboratories 1997 Site Environmental Report.*

Waste Isolation Pilot Plant

In November, the Department released a second version of the draft hazardous waste storage and disposal facility permit for the Waste Isolation Pilot Plant. The proposed permit is in response to an application from the U.S. Department of Energy and Westinghouse Electric Company for approval to store and dispose transuranic mixed waste at the Waste Isolation Pilot Plant. Public hearings on the draft permit were scheduled for the spring of 1999.

There are several *Solid Waste Management Units* listed on the draft permit. We evaluated these units for their potential for contaminant migration, using a modified version of the erosion potential evaluation developed at Los Alamos. Because of the generally flat topography in the area, we found the potential for surface-water-caused erosion to be low.

We continued to collect gamma radiation monitors on a quarterly basis to maintain a background data set in anticipation of the first shipments of transuranic waste.

Ralph Ford-Schmid assessed the erosion potential of the mud pits near the Waste Isolation Pilot Plant.

Aerial Photograph of the Waste Isolation Pilot Plant

Intergovernmental Coordination and Public Awareness

Coordinating our activities with local, state and tribal governments continues to be a priority of the Oversight Bureau. A routine part of our work involves responding to community concerns and sharing our findings with the public. This is accomplished through public meetings and workshops, publication of our newsletter, technical reports and Internet home page: *http://www.nmenv.state.nm.us*.

Site-Specific Citizen Advisory Boards

Both Sandia and Los Alamos National Laboratories have site-specific advisory boards that are supported by the Department of Energy. Oversight staff members regularly attend and participate in the monthly meetings of each of these boards. Additionally, bureau staff members participate in the various committees and when called upon, present information related to the issues before the boards.

NEWNET and the Community Radiation Monitoring Group

The Neighborhood Environmental Watch Network program promotes better understanding of the environment through collaboration between the public, government, educational institutions, and industry. Developed by Los Alamos National Laboratory, NEWNET provides timely gamma radiation and meteorological information to anyone with access to the Internet. Monitoring stations located in New Mexico, Nevada, Alaska, Mississippi and Utah collect the information which is transmitted by satellite to earth stations at Los Alamos and Las Vegas, where the data is made available through the Internet.

In New Mexico, we facilitate the community program for the NEWNET project through the Community Radiation Monitoring Group that is comprised of citizen volunteers and staff members from the DOE Oversight Bureau, environmental activist groups, the Department of Energy, Los Alamos National Laboratory and several northern New Mexico Pueblos. This group helps develop policy and direction for the NEWNET program. Last spring, we

announced the group's selection of Los Alamos High School and Santa Clara Pueblo as new community hosts for radiation monitors. Additionally, a new station was installed on Los Alamos National Laboratory property at the west end of DP Site and another station located at Technical Area 54 was moved. (The station is still adjacent to where low-level radioactive waste is stored.) In autumn, a station that was located in Albuquerque was temporarily moved to Los Alamos. We worked with teachers, community leaders, local government, and Los Alamos and Sandia laboratories to find a new community location and station manager in Albuquerque. After deciding appropriate selection criteria, two possible sites were selected in the south valley area of Albuquerque.

Members of the Community Radiation Monitoring Group toured Technical Area 54 where low-level radioactive waste is stored at Los Alamos National Laboratory.

We assessed the training needs of the station managers, which assisted the laboratory in developing a formal training program. At least one member of each of the station's host communities attended training sessions held in Santa Clara Pueblo, Ohkay Owingeh, San Ildefonso Pueblo and Los Alamos High School.

Students at Los Alamos High School attended the NEWNET station manager training classes along with their science teacher and station managers from other locations.

ENVIRONMENTAL CONFERENCES

At the *1998 New Mexico Environmental Health Conference*, we gave a presentation on the use of Geographical Information Systems in selecting stormwater monitoring locations. We also presented a poster that described the modeling of peak flood flows and the determination of floodplain elevations in a Los Alamos area canyon. In collaboration with another bureau, we presented a poster that described a draft *Risk-Based Decision Tree*, which outlined the steps involved with the evaluation of human-health and ecological risk in the legacy waste cleanup process.

PARTICIPATION IN ENVIRONMENTAL ORGANIZATIONS

Other interactions with federal and local governments along with academic and industry representatives took place with two groups that meet regularly in Albuquerque. The Albuquerque Ground Water Group is an informal gathering of ground water professionals for exchange of ideas and new information regarding ground water resources in the Albuquerque area. The New Mexico Chapter of the Air and Waste Management Association meets monthly to discuss developments and issues in environmental management facing government and industry, including Sandia National Laboratories. Staff from our Albuquerque office bring a state perspective to these discussions.

TECHNICAL REPORTS

Reports produced by the DOE Oversight Bureau are a source of reliable technical information for the writers of facility proposals, decision makers at regulatory agencies and members of the community. This year, five new technical reports were released:

Flow and Water-Quality Characteristics of Perennial Reaches in Pajarito Canyon and Cañon de Valle, Los Alamos National Laboratory.

Chromium and Major Element Content of Rocks in the Kirtland Air Force Base Area, Bernalillo County, New Mexico

Hydrochemistry of Springs in the Central Arroyo del Coyote Area, Kirtland Air Force Base Area, Bernalillo County, New Mexico

NMED/LANL 1996 Sediment Results: Data Evaluation and Statistical Comparison

Gamma Radiation and Airborne Radionuclide Surveillance at Los Alamos National Laboratory, New Mexico, During 1996.

EDUCATIONAL OUTREACH

Educational outreach ranged from encouraging elementary school students to pursue environmental careers to providing tribal elders

with an overview of ground-water issues. One bureau staff member organized a group of state environmental professionals to participate in a career day at Gonzales Elementary School in

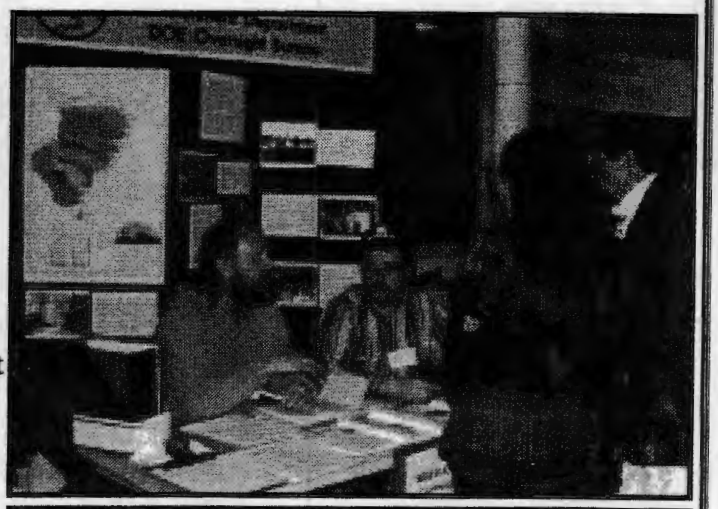
Santa Fe; while another worked with educators at Santa Fe Indian School to set up a new digitizer and instruct students in the use of computer drafting programs used in map making. We also provided training and data to the Santa Clara Pueblo Office of Environmental Affairs and the San Ildefonso Pueblo Department of Environmental and Cultural Preservation to

improve and expand their use of Geographic Information Systems. Staff presented an overview of ground-water issues at Los Alamos to the Eight Northern Pueblo Council.

WORKING WITH LOCAL AND TRIBAL GOVERNMENTS

Each of the Pueblos of San Ildefonso, Jemez, Santa Clara and Cochiti has cooperative agreements with the Department of Energy and Los Alamos National Laboratory that include provisions for environmental monitoring. During the year, we shared sampling strategies and collected samples with tribal staff on pueblo property and provided technical assistance to their environmental offices. Additionally, we established protocols for our interactions with their environmental offices to address such issues as tribal land access and sampling. One of our more interesting projects was providing Santa Clara Pueblo's environmental office with geographical information displays of the watersheds west of the Rio Grande near Los Alamos National Laboratory. These displays helped the tribal office in prioritizing their environmental monitoring.

We presented our program overview at the *Eight Northern Pueblos Environmental Conference* in Española and at the annual meeting of the Four Accord Pueblos and the Department of Energy at Santa Fe Indian School. As host to a group of Pueblo environmental management personnel, a representative of our Sandia oversight office described our air monitoring program at the facility. The information was intended for consideration in designing air programs at their respective Pueblos.



David Englert and Bryan Vigil answered questions at the DOE Oversight Bueau information booth during the *Eight Northern Pueblos Environmental Conference* in Española.

We continued to work with Los Alamos County to address erosion and runoff concerns related to the operation of a landfill adjacent to Sandia Canyon. We reviewed the corrective action plans for the site where high storm-water flows caused excessive erosion, inundating a wetland with sediment. We provided our comments and suggestions to the county as well as the Department of Energy, the administrative authority and the Army Corps of Engineers.

WORKING WITH COMMUNITY GROUPS

Throughout the year, we were called upon by community groups and concerned citizens to provide information or an independent view on such issues as airborne radionuclide releases, tainted ground water, or accessible areas of Los Alamos suspected of being contaminated. We worked closely with community groups to provide radiation surveys using hand-held radiation detection meters on private property such as mobile homes or in areas known to be contaminated. Our staff accompanied citizens who used their own detection meters. Comparing the measurements and explaining radiation theory in the field proved to be a very valuable aspect of these excursions.

David Englert of the DOE Oversight Bureau provided an independent radiation survey of a trailer on Picuris Pueblo property.