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New Mexico Environment Department
DOE Oversight Bureau

2003 Annual Report

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

The 2003 Annual Report is a publication of the

New Mexico Environment Department DOE Oversight Bureau

2905 Rodeo Park Drive East
Building 1
Santa Fe, New Mexico 87505
(505) 827-1536

Executive Summary

This Annual Report highlights the activities of the Department of Energy (DOE) Oversight Bureau for calendar year 2003. It is posted on the DOE Oversight web page, http://www.nmenv.state.nm.us/DOE_Oversight/.

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, safety, and the environment. The Oversight Bureau's activities are outlined in the *Agreement-in-Principle between the State of New Mexico and the U.S. Department of Energy for Environmental Oversight and Monitoring*.

The New Mexico *Agreement* focuses on state oversight of environmental impacts at Sandia National Laboratories, and Los Alamos National Laboratory in Los Alamos. The *Agreement* directs the State of New Mexico to develop and implement a program of environmental monitoring and oversight, to coordinate with local and tribal governments, and to work to increase public knowledge of environmental matters relating to DOE facilities. Environment Department personnel funded by the grant are located in Santa Fe and at site offices in White Rock and Kirtland Air Force Base in Albuquerque. A total of 19 positions were supported in Federal Fiscal Year 2003.

The Oversight Bureau is funded by an annual grant from the U.S. Department of Energy. Funding to the New Mexico Environment Department under the *Agreement-in-Principle* was uncertain in 2003, and required a supplement from the National Nuclear Security Administration to reach the amount requested in the Financial Assistance Application.

Highlights for the year include the Oversight Bureau's continued efforts to communicate to the public an understanding of environmental restoration and monitoring activities and public health and environmental risks resulting from activities at New Mexico DOE facilities. Bureau staff worked with citizens of the Dixon community as they set up their own radiation monitoring system. White Rock staff worked with representatives of San Ildefonso Pueblo, collecting samples of water from wells and springs on pueblo property and working on issues relating to storm water runoff and contaminant transport. Sandia Oversight staff participated in a summer student academy that focused on issues relating to long-term environmental care at the facilities, and participated with DOE on planning for long-term environmental care at Sandia.

At Los Alamos National Laboratory, Oversight staff participated in a cooperative study to evaluate the distribution of polychlorinated biphenyls in the upper Rio Grande watershed, and in a performance assessment of improved methods for the analysis of water samples for perchlorate.

Oversight staff also worked to develop a method to assist the Laboratory in evaluating the effectiveness of erosion controls and other site stabilization measures at legacy waste disposal sites. The project results are being evaluated as a method for addressing compliance to an Environmental Protection Agency Federal Facility Compliance Agreement.

At the Los Alamos Radioactive Liquid Waste Disposal Facility, Oversight staff collected samples that showed that contaminated influent water was leaking into the treated effluent discharge line and being discharged to the watercourse. As a result of the investigations, the Laboratory replaced the pump that was causing the cross contamination and also rerouted the pipe that released treated water to the watercourse.

To monitor contaminant transport from Los Alamos National Laboratory property, Oversight staff collected samples during four storm events in Pueblo Canyon. The samples showed that storm water runoff from areas burned by the Cerro Grande fire contained five times more suspended sediment than samples collected at the eastern or downstream location, and that the average concentration of plutonium in water was twelve times higher at the downstream location than upstream. The data suggests that although the extensive wetland areas in Pueblo Canyon reduce the concentration of most constituents, storm water is mobilizing and transporting additional plutonium as it moves through the middle and lower reaches the canyon.

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Public Outreach and Information Transfer

Public Outreach

In December, the Oversight Bureau and Los Alamos National Laboratory (Los Alamos or the Laboratory) co-hosted a public meeting in the community of Dixon, about 21 miles northeast of Española. The subject of the meeting was *Health and Environmental Impacts of the Cerro Grande Fire in Northern New Mexico*. About 30 community residents attended and some expressed concerns about the lingering effects of the May 2000 fire. Santa Fe and White Rock Oversight staff participated, as well as the Chief of the New Mexico Environment Department Office of Emergency Preparedness, Dennis Pepe. Dennis discussed the Environment Department's emergency planning and responded to questions raised by Dixon-area residents about notification requirements relating to Los Alamos incidents. John Till of Risk Assessment Corporation discussed the results of Cerro Grande fire risk assessment. Ron Voorhees of the Department of Health talked about the impact of forest fire smoke and about the health advisories that were issued during the fire. Representatives of the Picuris-Peñasco Community Coalition and of Concerned Citizens for Nuclear Safety (CCNS) also made presentations.

The Oversight Bureau facilitated monthly meetings of the Community Radiation Monitoring Group, focusing on issues relating to the monitoring of radiation in the Los Alamos area. In the fall, Embudo Valley residents began monitoring gamma radiation using electret ion chambers provided by the Laboratory. Bureau representatives provided information on how to read the electrets and convert the readings to doses in millirem. They also provided monthly summaries of data from the NEWNET system, which is a Laboratory network of instruments for monitoring environmental gamma radiation.

In September, White Rock staff participated in a tour of Mortandad Canyon with members of the San Ildefonso Department of Environmental and Cultural Preservation, and Los Alamos and DOE representatives. The Laboratory arranged the tour to familiarize tribal elders with the locations of new monitoring wells to be installed near areas considered sacred by the pueblo.

Bureau staff provided information, data, and maps in support of the Los Alamos Risk Analysis, Communication, Evaluation, and Reduction study (the RACER study) being done by Risk Assessment Corporation under contract to Colorado State University. The Bureau also provided information to activist groups, including CCNS and the Los Alamos Study Group.

A representative of the Bureau from the White Rock office served as a Head Judge at the Northeastern New Mexico Regional Science Fair that was held at the New Mexico Highlands University during early March. The Science Fair encourages growth in technical excellence and sound scientific knowledge in high school and pre-high school students from the northeast corner of New Mexico.

In March, Sandia Oversight Bureau staff participated in the annual *School to World* event, which involves eighth and ninth grade students. The students learn about various careers including the environmental profession. Oversight Bureau staff served as judges at the Regional Science Fair in March and as judges for two science fairs in Rio Rancho.

Students at WERC Summer Academy

Each year, the Waste-management, Education and Research Consortium (WERC) sponsors a summer academy aimed at high school students and their teachers. The 2003 summer academy focused on long-term care issues. Oversight staff from the Sandia office participated as mentors during this weeklong program.

Data Releases and Technical Presentations

The Oversight Bureau received several requests for surface water and groundwater data in 2003. In response, White Rock and Santa Fe staff compiled surface water and groundwater data collected by the Bureau in the vicinity of Los Alamos over the previous ten years (1992 – 2002). Groundwater, storm water, and surface water data collected in 2002 was released to the DOE, the Laboratory, and San Ildefonso Pueblo. Surface water data collected in 1998 and 1999 were also released to DOE and the Laboratory.

Oversight Bureau staff presented a poster, *Preliminary Evaluation of Perchlorate in Youthful Waters and Precipitation in the Los Alamos Area*, as part of the Laboratory's Ground Water Protection Program meeting in Santa Fe. The poster described Bureau measurements of perchlorate, ranging from less than one to three parts per billion in deep ground water.

Dennis McQuillan of the Ground Water Quality Bureau and Oversight staff co-authored a Laboratory-related poster, *Ground Water Contamination at Los Alamos National Laboratory*, as part of the Española Basin Technical Advisory Group's Española Basin Workshop Meeting.

Bureau investigators collaborated with Laboratory staff to co-author a paper and poster at the Water Resources Research Institute 2003 New Mexico Symposium on Hydrologic Modeling. The title of the paper was *Aqueous Geochemistry of Uranium, Los Alamos and Surrounding Areas.* The title of the poster was *Ground Water Stations and Associated Uranium Concentrations from 1999-2000 Filtered and Non-Filtered Samples.*

Bureau staff presented a talk entitled *Use of LC/MS/S for Low Level Perchlorate Determinations – and Findings from Recent Performance Evaluations* at the New Mexico Environmental Health Conference.

Oversight staff provided technical information and maps used in the making of a documentary video production, *Water Warning: It's Not Just the Drought*, produced by the New Mexico Environment Department and CNS Communications.

Legacy Waste Cleanup and Waste Management

Multi-Sector General Permit Monitoring

DOE Oversight Bureau staff and a representative of SHAW Environmental, Inc. investigated and developed a method to assist Los Alamos National Laboratory in evaluating the effectiveness of erosion controls and other site stabilization measures at legacy waste disposal sites.

The investigators used site erosion potential scores together with Geographic Information System map coverage to choose appropriate locations on potentially contaminated hillsides for the installation of Environmental Liquid Samplers. The samplers were located on hillsides in two canyons within the Laboratory boundary. Some of the locations have erosion control devices, such as wattles, base course berms, rock check dams, and straw mulch; other locations do not.

Environmental Liquid Sampler

Two sets of samples were collected after storm events between June and October 2003. The investigators also collected and measured rainfall at each of the sampling locations. To allow for several types of analyses, the samples were split using a Dekaport sample splitter. The samples were analyzed for suspended sediment concentration and for site-specific tracer chemical parameters based on data from the Laboratory's evaluation of legacy waste constituents at each site.

Review of the analytical results indicated that certain sites are releasing tracer parameters during storm water flow. In most cases, the higher concentrations of tracer parameters were found at sites with high erosion potential and no stabilization. Sites where erosion controls and stabilization measures were present and no runoff samples were collected were considered for labeling as stabilized sites. The data will be prepared for a poster presentation at the 2005 International Erosion Control Association Conference. The project results are being evaluated by the Laboratory as a potential method for addressing compliance to an Environmental Protection Agency National Pollutant Discharge Elimination System (NPDES) Federal Facility Compliance Agreement.

In 2004, Oversight staff will work with the Laboratory to choose sampling locations and provide guidance on storm water sample collection methods, and will co-locate Environmental Liquid Samplers at several of the Laboratory's sampling locations in order to compare monitoring results.

Outfalls

The Department of Energy and Los Alamos National Laboratory jointly hold a NPDES permit issued by the Environmental Protection Agency in June 1978. The permit currently covers 21 industrial and/or sanitary outfalls. The Laboratory's Water Quality and Hydrology Group and the Environment Department's Surface Water Quality Bureau are responsible for monitoring compliance with the NPDES permit. The absence of any recent monitoring at NPDES outfalls by other state agencies prompted the Bureau to collect samples at eight outfalls during 2003.

The sampling results indicated that the Laboratory was generally in compliance with its NPDES permit requirements. However, there were several anomalies.

Perchlorate, which is required to be sampled at only three of the 21 outfalls as a "report only" parameter, was found at an elevated level at one of the three outfalls. The Laboratory responded to this discovery by installing a filtration system at this outfall to remove the contaminant. Perchlorate was also found at low levels in sludge at two of the three cooling tower outfalls. The NPDES permit, however, does not require that cooling tower sludge be analyzed. The Oversight Bureau plans to investigate the connection between perchlorate levels and cooling towers by proposing to sample all NPDES permitted cooling towers during 2004.

Results from samples collected at the Radioactive Liquid Waste Disposal Facility NPDES sampling location inside TA-50 indicated elevated levels of several radionuclides. Subsequent investigations conducted jointly by the Bureau and the Laboratory showed that contaminated influent water was leaking into the treated effluent discharge line leading to the NPDES sampling location and being discharged to the watercourse. As a result of the investigations, the Laboratory replaced the pump that was causing the cross contamination and also rerouted the pipe that released treated water to the watercourse by utilizing an existing abandoned pipeline. The Oversight Bureau expressed concern to the Laboratory over its decision to use the old abandoned line, and asked that the line be sampled in order to verify that no contamination was present. The Laboratory sampled the line and found that there was some leaching of radioactive material from the old pipe. Oversight Bureau staff therefore requested that the Laboratory make a modification to the NPDES permit to change the location for compliance sampling. They contended that sampling at the end of the pipe discharging to the watercourse was more representative and would allow for further monitoring of radioactivity leaching from the pipe. The Oversight Bureau plans to evaluate discharge from the end of this pipe and at the current sampling point that is located inside the facility, to determine which location would be a more representative sampling point for determining NPDES compliance.

In addition to monitoring results, Oversight Bureau observations of the 2003 NPDES outfall sampling resulted in the Laboratory repairing erosion problems above one of the outfalls and refining a field parameter testing method for Total Residual Chlorine.

Environmental Monitoring

Direct Penetrating Radiation and Airborne Radionuclide Monitoring

During the year, the Oversight Bureau evaluated electret ion chambers as an alternative to thermoluminescent dosimeters for monitoring gamma radiation. The electrets are co-located with the Laboratory's thermoluminescent dosimeters. The data from the electrets compared favorably with the data from the thermoluminescent dosimeters.

The White Rock office submitted airborne tritium data from five on-site locations at Los Alamos to the Department of Energy for calendar years 2001 and 2002. The data showed no values in excess of 3 percent of the Environmental Protection Agency Concentration Guide of 1,500 pCi/m^3. The office also reported to the DOE the values of the airborne radioactive particulate isotopic values for uranium, plutonium, and americium. The values were well below the EPA concentration limits of 40CFR61 and as required by the Clean Air Act. At the end of the year, the airborne radionuclide monitoring program for collecting and analyzing air samples for plutonium, americium, uranium and tritium was shut down due to funding shortages.

Watershed Storm Water Monitoring

To monitor the transport of contaminants from Laboratory property, Oversight investigators collected sixteen samples from four storm events in Pueblo Canyon. Six samples were collected from a location upstream from the Acid Canyon confluence, the major Laboratory influence on Pueblo Canyon, and ten were collected six miles downstream at the eastern end of Pueblo Canyon. Samples were collected using automatic water samplers programmed to collect multiple samples throughout a storm event. The whole water samples (unfiltered) were analyzed for metals, gross alpha/beta, isotopic uranium, isotopic plutonium, americium and suspended sediment concentration. In addition to whole water samples, the suspended sediment was separated from the samples and analyzed for isotopic plutonium.

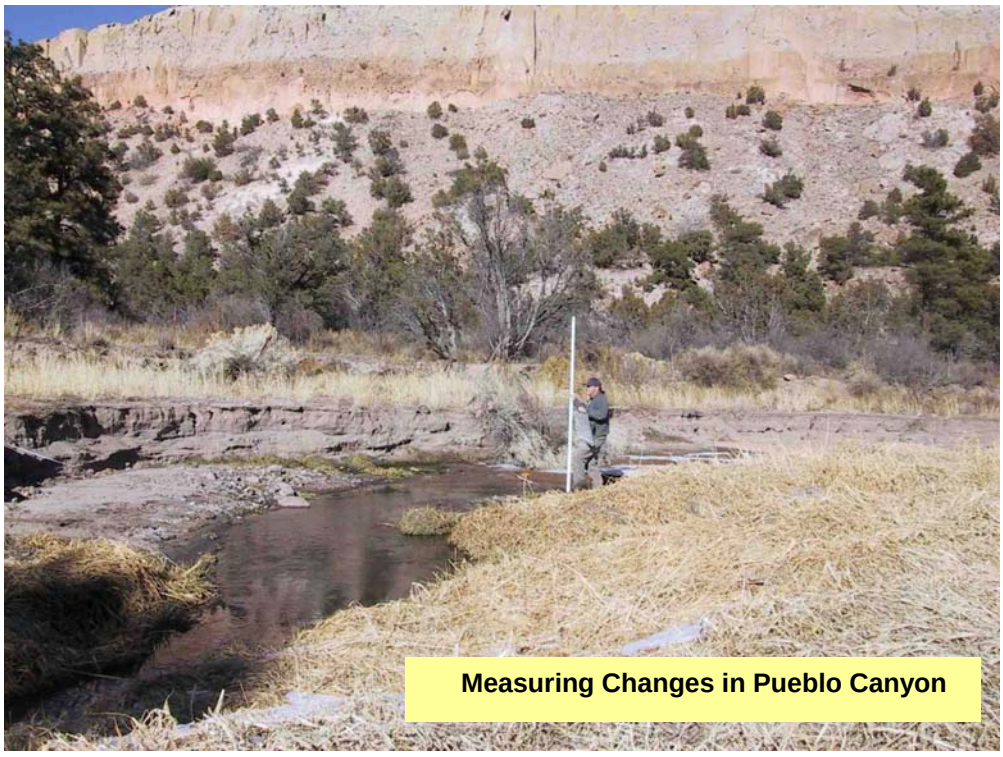
Oversight investigators compared data from the upstream samples to the data from downstream samples. The main observations are:

- Average adjusted gross alpha was nearly three times higher at the upstream location in Pueblo Canyon compared to the downstream location. All values exceeded the New Mexico Water Quality Control Commission (WQCC) livestock watering standard for gross alpha. Gross beta also averaged four times higher at the upstream location.
- Total metals averaged two and one-half times higher at the upstream location in Pueblo Canyon. Five of twelve samples for mercury exceeded the WQCC water standard for wildlife habitat.
- Average plutonium 239/240 in water was twelve times higher at the downstream location in Pueblo Canyon.
- Average plutonium 239/240 in suspended sediments was seventy times higher at the downstream location in Pueblo Canyon.
- Average suspended sediment concentration was five times higher at the upstream location in Pueblo Canyon.

Samples of storm water runoff from the burned portion of the upper watershed contained five times the suspended sediment than the samples collected at the eastern or downstream location. This accounts for the higher levels of most metals, gross alpha/beta, uranium, and americium in upstream samples versus those collected at the eastern end of Pueblo Canyon. However, the average concentration of plutonium in water was twelve times higher at the downstream location than found upstream. Though the average amounts of suspended sediment are lower in the downstream portion of the canyon, the suspended sediment itself had seventy times the plutonium 239/240. These data suggest that the extensive wetland areas in Pueblo Canyon effectively capture much of the sediment load, and reduce the concentration of most constituents. However, storm water is mobilizing and transporting additional plutonium as it moves through the middle and lower reaches of Pueblo Canyon. These findings are consistent with the Bureau's monitoring data collected in 2001 – 2002. Based on data collected in 2001 through 2003, indications are that offsite plutonium transport from Pueblo Canyon has increased significantly since the Cerro Grande fire.

Oversight staff made numerous presentations to the Pajarito Plateau Watershed Partnership and other public groups regarding their studies of contaminant transport in Los Alamos and Pueblo canyons. They recommended that the Laboratory and DOE implement stabilization measures in middle and lower Pueblo Canyon to control the migration of plutonium, and enhance monitoring efforts.

Geomorphic Investigations in Pueblo Canyon



Measuring Changes in Pueblo Canyon

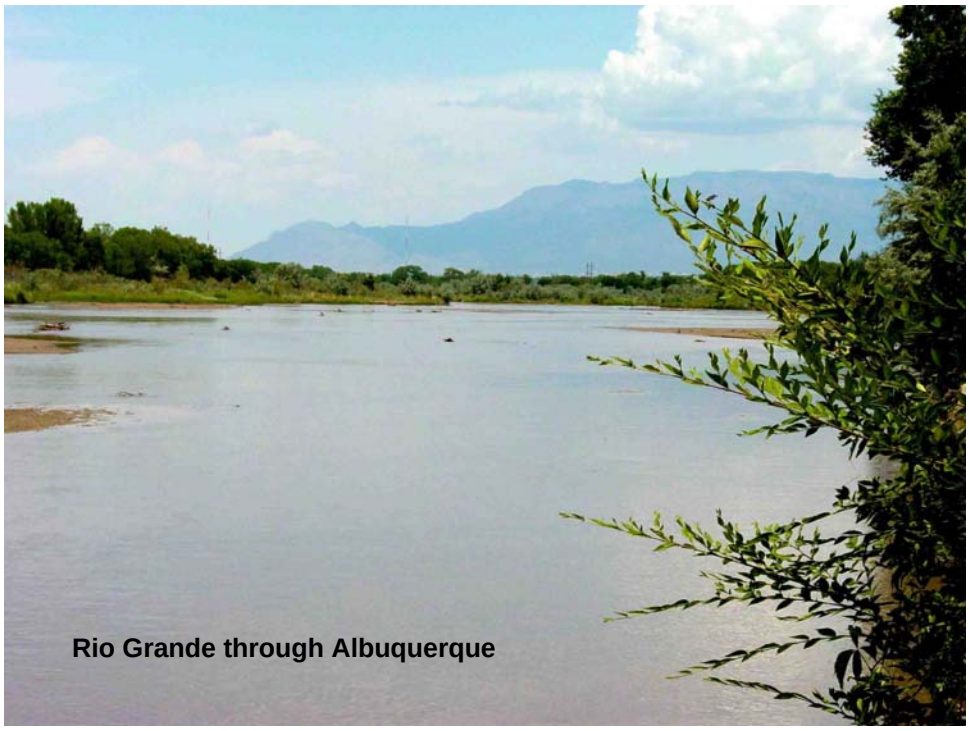
In 2003, Oversight investigators continued measuring changes in lower Pueblo Canyon as a result of increased erosion after the May 2000 Cerro Grande fire. They measured channel dimensions at 40 cross sections, established a 1.1-mile stream profile, and mapped the pattern of the channel bottom, floodplain, and terrace banks. The measurements were used to classify the stream channel and evaluate channel adjustments resulting from increased runoff since the fire. The investigators related channel dimensions, profile, and stream patterns to geomorphic units and associated plutonium inventories described by the Laboratory's Environmental Restoration Group. They also collected storm water samples in Pueblo Canyon to estimate the rates and volumes of sediment and plutonium transport.

The measurements show that stream channels in Pueblo Canyon are adjusting to increased storm water flows. Peak flows and total discharge in canyons on the Pajarito Plateau have increased due to the development of hydrophobic soil conditions as a result of the fire. The adjustments include channel geometry changes, increased sediment yield, and associated contaminant transport from canyons on Laboratory property. The investigators found that the rates of normal channel adjustments such as degradation, aggradation, and sediment mixing have accelerated since the fire. Destabilized channel banks are mostly limited to the pre-fire active channel and lower floodplain banks, where legacy waste contaminant inventories are the smallest. In some areas, floodwater has flowed over terraces, causing erosion, sediment mixing, and net deposition. Where floodwater returns to the main channel, bank erosion of older sediment units that contain higher plutonium concentrations and larger inventories is common.

The investigators calculated that 24 mCi of plutonium-239/240 in 6672 tons of suspended sediment were transported out of Pueblo Canyon in six runoff events from 2000 to 2002. Using sediment and plutonium rating curves based on those six events they estimated 87.1 mCi of plutonium-239/240 in 21,980 tons of sediment were transported beyond Pueblo Canyon in 37 runoff events from 2000 to 2002.

Cooperative PCB Study

In 2000 and 2001, Bureau investigators at Los Alamos National Laboratory collected storm water samples that showed high levels of polychlorinated biphenyls (PCBs). In 2002, the New Mexico Environment Department, the Laboratory, DOE, San Ildefonso Pueblo, and Los Alamos County formed the PCB Cooperative Study Group to study the distribution of PCBs in soils, sediments, and water in the upper Rio Grande watershed (Colorado through Albuquerque).


Rio Grande through Albuquerque

The group began its investigation in 2003 by compiling and reviewing all available fish tissue data from the Rio Grande for the last ten years. Then the group collected samples of soil, sediment, and water and analyzed the samples for PCBs. They collected soil samples from nine locations in the Chama and upper Rio Grande watersheds. They collected sediments at seven locations along the Chama and Rio Grande and in three tributaries to the Rio Grande. They collected water samples from five locations in the Rio Grande and Chama Rivers under normal flow conditions and during storm water flows, and collected storm water samples from seven tributaries to the

Rio Grande in Santa Fe, Albuquerque, and on Laboratory property. Oversight Bureau investigators in Albuquerque, working with United States Geological Survey personnel, collected samples from the San Jose Drain and the South Diversion Channel. In addition, they placed semi-permeable membrane devices at five locations in the Chama River and Rio Grande and at two locations at Los Alamos. The membrane devices are also known as "fat bags" and are designed to mimic fish tissue uptake of dissolved PCBs in water. At the close of 2003, the group was reviewing its data and plans to release its findings in 2004.

Cesium in Moss

In April, Bureau investigators accompanied representatives of CCNS on a raft trip through White Rock Canyon from Otowi Bridge to Cochiti Reservoir. They collected samples of water from springs, and Norm Buske of The RadioActivist Campaign (TRAC) collected samples of water and aquatic moss at and below several springs. TRAC then published a report claiming that their results showed cesiusm-137 in water and aquatic moss collected from White Rock Canyon springs, and that the cesium-137 was from the Laboratory's past waste disposal practices. The Laboratory and the Environment Department have analyzed water from the White Rock Canyon springs for cesium-137 for many years and have not detected it in water. However, the detection limits reported by TRAC were 1,000 times lower than those reported by the Laboratory or the Department.

As a result of the results reported by TRAC, the Bureau prepared a plan to sample aquatic moss and water from springs in White Rock Canyon and other locations along the Rio Grande in 2004. The purpose of the sampling will be to answer the question: are levels of cesium-137 and other contaminants in aquatic moss and water from White Rock Canyon springs different from the levels found in background springs?

The sampling is intended to duplicate the TRAC results in moss and water from springs in and near Pajarito Canyon, and will also include samples collected at two background springs. The intent is to reduce the normal detection limits in water by at least 100 times by filtering 100 liters of water through cesium-137 specific filters and counting for extended times. Washed moss samples will be dried for perchlorate analysis and reduced to ash and analyzed using larger sample sizes and longer count times to reduce detection limits for metals and radionuclides. Low-level analytical methods will be used for tritium, perchlorate, strontium-90, and plutonium in water.

Groundwater Monitoring

During the year, Oversight Bureau staff split samples with Los Alamos National Laboratory at 46 stations groundwater monitoring stations. Results will be compared to data generated by the Laboratory. They also collected independent samples at 45 stations on Laboratory property and at San Ildefonso Pueblo and other off site locations. Several wells that are not monitored by the Laboratory were sampled independently.


Sampling Springs along the Rio Grande

Spring 2B, or CCNS Spring, was discovered in 2002 during a raft trip with CCNS. In 2003, Bureau staff collected samples to characterize the water quality of the spring. The analytical results show that the spring water is contaminated. Because the chemistry of the spring water is different than that of sewage water, the source of the contamination is probably not the nearby White Rock sewage treatment facility.

For several years the Bureau has recognized that the chemistry of water from the 4-Series springs located in and near Pajarito Canyon on the west side of the Rio Grande is different than the chemistry of water from springs only a mile or so to the north and south. The 4-Series springs contain contaminants such as nitrate, chloride, sulfate, perchlorate, and tritium at levels below standards. In 2003, Bureau staff initiated a project to gather and evaluate data on these springs, including low-level tritium and perchlorate data. They compiled historical data collected at the springs during the last 10 years and joined it with data collected in 2003. The purpose of this work is to evaluate concentration trends and to compare contaminant levels to non-impacted springs located to the north and south.

During the early part of 2003, the water level in the Rio Grande was very low. The low water level exposed springs that are normally covered by the river water. Taking advantage of the low water level, Bureau staff surveyed the west bank of the Rio Grande and located four new springs, one of which was flowing at an estimated rate of 40 gallons per minute.

Groundwater Technical Oversight

Oversight Bureau staff played a major role in the development and production of the Laboratory's Mortandad Canyon Groundwater Work Plan, the Los Alamos Canyon Groundwater Work Plan, and the Site-Wide Groundwater and Baseflow Monitoring Plan. They also consulted to the Laboratory, DOE, and the Hazardous Waste Bureau on the implementation of the Hydrogeologic Workplan, the TA-16 high explosives plume delineation project, and the DP Canyon alluvial aquifer tracer study.

Perchlorate in Groundwater

The Oversight Bureau participated with the Laboratory in a performance assessment of an improved method for the analysis of water samples for perchlorate. The method, referred to as Liquid Chromatography/Mass Spectrometry/Mass Spectrometry, was shown to detect and quantify perchlorate at concentrations of less than one part per billion. Bureau investigators collected samples from Los Alamos County, the cities of Taos, Española, Santa Fe, and Albuquerque, and San Ildefonso Pueblo. Bureau representatives presented their results to the municipalities and the pueblo, and made a presentation at the 2003 New Mexico Environmental Health Conference.

Bureau staff worked with a DOE student intern to evaluate the concentration and distribution of perchlorate in the vadose zone beneath canyon bottoms that historically received effluent water. Archived core from borings taken from several canyons was retrieved and sampled for perchlorate analysis. The highest concentration of perchlorate was found in cores from beneath active and inactive outfalls in DP and Mortandad Canyons. Laboratory investigators are using these data to improve their groundwater flow and contaminant transport mathematical and conceptual models.

Sandia National Laboratories

Legacy Waste Cleanup and Waste Management

Sandia National Laboratories (Sandia) continued work to remediate contaminated or potentially contaminated sites. The facility proposed the removal of fifteen sites from its Resource Conservation and Recovery Act permit. The New Mexico Environment Department is reviewing the proposals, but at the end of 2003 had not approved permit modifications for any of the sites.

Spent Fuel

As reported in the 2002 Annual Report, Sandia Oversight Bureau staff investigated the disposition of spent fuels. The Bureau initiated the investigation because of public concerns that spent nuclear fuel had been disposed in the Mixed Waste Landfill. The investigation focused on the following items:

1) Records listing the sources of these fuels (commercial spent fuel or military reprocessing wastes)
2) Types of fuels (spent or fresh or a combination)
3) Total curies and amounts of fuels in vessels before and after exposure to reactor core
4) Final resting place for these fuels (storage both on and off site or disposal of fuel in another area).

Bureau investigators conducted a thorough review of information regarding the fuel and experiments associated with the concerns expressed by the public. In a report issued in 2003, the investigators concluded: "We could find no evidence that high-level waste was placed in the Mixed Waste Landfill." The report on the investigation can be found on the DOE Oversight web page, http://www.nmenv.state.nm.us/DOE_Oversight/.

Drains and Septic Systems

Sandia continues quarterly sampling at four monitoring wells associated with environmental restoration sites known as Drains and Septic Systems, as required by the New Mexico Environment Department. In mid-2003, after completing eight consecutive quarters of sampling at these monitoring wells, Sandia will reduce the sampling frequency to one time per year.

Sandia monitors groundwater in the following seven project areas:

- Chemical Waste Landfill
- Mixed Waste Landfill
- Technical Area III / V
- Tijeras Arroyo Groundwater Investigation
- Canyons Area
- Drain and Septic Systems
- Groundwater Protection Program (also know as Site- Wide)

The Sandia Oversight Bureau office routinely splits groundwater samples with Sandia. In 2003, the Bureau collected split samples at Chemical Waste Landfill, Mixed Waste Landfill, Technical Area V, Drain and Septic Systems, and Site-Wide wells.

A monitoring well at the Explosives Preparation Facility (Building 9960) continues to show elevated levels of arsenic. A sample collected at the monitoring well showed arsenic at a concentration of 70 parts per billion (ppb), which approaches the New Mexico human health standard for ground water (20.6.2 NMAC) of 100 ppb. It appears that the arsenic in the well is from Coyote Springs, traveling along the Coyote Springs fault since the spring also has high arsenic content. The monitoring well on EOD Hill, which is along the same fault, also has high a high concentration of arsenic, along with some of the same physical and chemical characteristics such as effervescence and high total dissolved solids.

Chemical Waste Landfill

In 2003, Sandia continued progress on the remediation of the Chemical Waste Landfill. By the end of 2003, nearly 80% of the excavated materials had been disposed at off-site commercial facilities. During the year, the Bureau split three groundwater samples with Sandia. The results compared favorably with Sandia's results.

Groundwater at Technical Area V

In 2003, Sandia started revising the Technical Area V site conceptual groundwater model to evaluate a variety of technologies to address trichloroethylene and nitrate groundwater contamination. One probable technology for further elevation is monitored natural attenuation. Sandia Oversight representatives attended meetings and reviewed preliminary reports on the conceptual model and Corrective Measure Evaluation Work Plan. An important issue associated with monitored natural attenuation is the use of institutional controls. The Sandia Oversight staff will continue to participate in the development and implementation of appropriate institutional controls.

> According to the New Mexico Environment Department, Monitored Natural Attenuation (MNA) is "a methodology for remediation of groundwater pollution that relies upon a variety of naturally occurring chemical, physical, and biological processes to achieve Target Concentrations in a manner that is equally protective of public health, safety and welfare, and the environment as engineered remediation methods and that is accompanied by a monitoring program to document the progress and results of the above mentioned processes."

In August 2003, the Oversight Bureau split groundwater samples at two Technical Area V monitoring wells. Two organic constituents (including trichloroethylene) and nitrate were elevated, consistent with average concentrations reported by Sandia during an eight-quarter monitoring period.

Development of the Sandia Site Hydrogeologic Conceptual Model

Oversight representatives attended meetings and reviewed preliminary reports on the site hydrogeologic conceptual model and work plan. Sandia revised the conceptual model to address the Corrective Measures Evaluation Work Plan to support using monitored natural attenuation for the trichloroethylene and nitrate plumes. Because the natural attenuation of contaminants may require decades, effective institutional controls will be needed for the life of the project. Oversight staff participated in discussions on development and implementation of appropriate institutional controls.

Long Term Care Planning

One of the more important planning activities at Sandia is related to long-term care or stewardship issues. Sandia has started a planning process to transition from environmental restoration long-term care management to "landlord" long-term care. The Oversight Bureau participated in a number of meetings with DOE and Sandia on planning for this transition. The Bureau also commented on Sandia's Risk Based End State (RBES) document. In the 1990's Sandia had citizen working groups providing recommendations on the end states for the hundreds of Sandia sites. These end state decisions were risk based. Since Sandia had already gone through a risk-based process, the RBES document was relatively straightforward. This is in contrast to other RBES documents throughout the DOE complex, where there were significant public protests about the process.

Institutional controls consist of land use or access restrictions and can be either legal restrictions imposed through covenants, easements, and the like or physical restrictions such as fences, warning signs or guards.

Environmental Monitoring

In 2003, Sandia Oversight investigators operated four independent continuous air monitoring stations, one at the Mixed Waste Landfill and three near the perimeter of Kirtland Air Force Base. They also monitored groundwater, surface water, vegetation, and soil.

Direct Penetrating Radiation and Airborne Radionuclide Monitoring

As reported in 2002, the Bureau began evaluating electret ion chambers as an alternative to thermoluminescent dosimeters for monitoring gamma radiation. For the entire year of 2003, the Bureau operated both technologies. The data from the electrets compared favorably with the data from the thermoluminescent dosimeters and with Sandia data. In 2004, the Oversight Bureau plans to use only the electret technology.

Air Monitor at the Mixed Waste Landfill

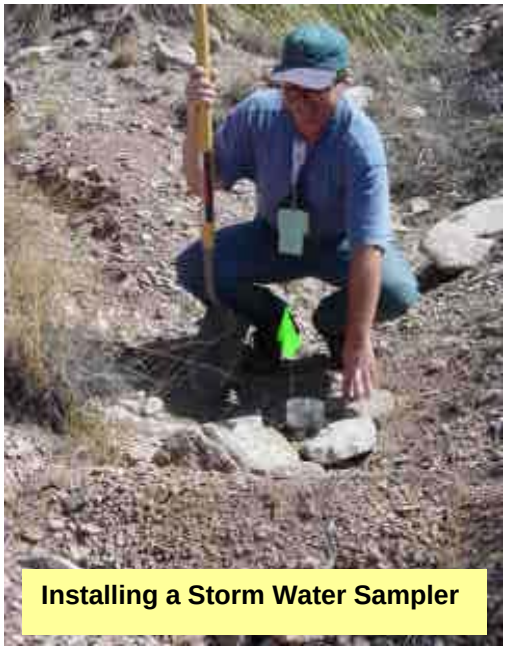
Oversight investigators continued collecting air particulate and tritium monitoring data. Tritium levels near the Mixed Waste Landfill are decreasing as expected due to the short half-life of tritium.

Terrestrial Surveillance

In June and September, the Oversight Bureau and Sandia split soil and vegetation samples that they collected at various locations on Kirtland Air Force Base and locations surrounding Albuquerque. A review of the data indicated that the Oversight results compared well with the Sandia values, and the trends were similar to previous years

Storm Water Monitoring

Although the summer of 2003 did not have many large rainstorms, Oversight investigators collected a storm water sample at a former explosives testing area (Site-87) that showed a concentration of 350 pCi/l of uranium-238. Additional sampling and isotopic analysis will be required to determine if this sample represents background or transport from a contaminated site.



Installing a Storm Water Sampler

Site-wide Monitoring Wells

Perchlorate is a constituent that Sandia is now required to analyze for in water, based on the draft Consent Order issued in December 2003. During the year, the Oversight Bureau analyzed water from four monitoring wells for perchlorate using the Liquid Chromatography/Mass Spectrometry/Mass Spectrometry method that has a lower detection limit than the older method. Three of the wells had concentrations of perchlorate less than or equal to the method detection limit of 0.36 ppb. The EOD Hill monitoring well sample showed a perchlorate concentration of 4 ppb. According to the Consent Order, any perchlorate detection at or above 4 ppb shall be evaluated and incorporated into a Corrective Measures Evaluation. Since a background concentration of perchlorate in groundwater has not been established at Sandia, the Oversight Bureau plans to collect additional samples in 2004.