



New Mexico Environment Department DOE Oversight Bureau



2006 Annual Report

**Environmental Oversight and Monitoring
at Department of Energy Facilities**

Cover Photograph

Laurence Canyon at Sandia National Laboratories is where SNL's Burn Site is located. The Oversight Bureau conducts groundwater, storm water, and terrestrial (soils and vegetation) monitoring at the Burn Site annually.

Erratum: *noun, plural –ta*

An error in printing or writing, especially such an error noted in a list of corrections and bound into a book.

Environmental Monitoring at LANL, Storm Water Monitoring, Page 18, dioxin concentrations are correctly measured in **pg/L** (picograms/Liter).

Environmental Monitoring at LANL, Storm Water Monitoring, Page 18, PCB concentrations are correctly measured in **ng/L** (nanograms/Liter). Versions of the *2006 Annual Report* printed before March 4, 2008 incorrectly listed the unit of measurement for PCB concentrations as pg/L.

This document was last updated on March 4, 2008.

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List of Abbreviations and Acronyms Used

| | |
|-------------|--|
| AIP | Agreement-In-Principle |
| AIRNET | Air Radioactive Particulate and Tritium Monitoring Network at LANL |
| AQB | Air Quality Bureau (NMED) |
| BMP | Best Management Practices |
| BSL-3 | Bio-Safety Lab, Level Three |
| CCNS | Concerned Citizens for Nuclear Safety |
| CDC | Centers for Disease Control and Prevention |
| CEMRC | Carlsbad Environmental Monitoring and Research Center (WIPP) |
| CH Waste | Contact Handled Waste (WIPP) |
| CRMG | Citizen's Radiation Monitoring Group |
| CWA | Clean Water Act |
| D & D | Decommissioning and Demolition |
| DDT | Dichlorodiphenyltrichloroethane |
| DOE | U.S. Department of Energy |
| DOE-OB | DOE Oversight Bureau (NMED) |
| DPR | Direct Penetrating Radiation |
| EA | Environmental Assessment |
| EMIG | Effluent Monitoring Improvement Group (WIPP) |
| EIS | Environmental Impact Statement |
| EES-6 Group | Earth and Environmental Sciences Division at LANL |
| EMSC | Environmental Monitoring and Surveillance Committee (NNMCAB) |
| EPA | U.S. Environmental Protection Agency |
| EVEMG | Embudo Valley Environmental Monitoring Group |
| FFCA | Federal Facility Compliance Agreement |
| FFY | Federal Fiscal Year |
| GIS | Geographic Information Systems |
| HEPA | High Efficiency Particulate Air |
| HWB | Hazardous Waste Bureau (NMED) |
| IEER | Institute for Energy and Environmental Research |
| LANL | Los Alamos National Laboratory |
| LANS | Los Alamos National Security, LLC |
| LANSCE | Los Alamos Neutron Science Center (LANL) |
| LASG | Los Alamos Study Group |
| LA-UR | Los Alamos – Unclassified Report (LANL) |
| LC/MS/MS | Liquid Chromatography/Mass Spectrometry/MS (Tandem MS) |
| LVAS | Low Volume Air Sampling |
| MDA | Material Disposal Area |
| MW | Monitoring Well |
| NAS | National Academy of Sciences |
| NEPA | National Environmental Policy Act |
| NESHAPs | National Emission Standards for Hazardous Air Pollutants |
| NMDOH | New Mexico Department of Health |
| NMDOT | New Mexico Department of Transportation |
| NMED | New Mexico Environment Department |
| NMWQCC | New Mexico Water Quality Control Commission |
| MWL | Mixed Waste Landfill (SNL) |
| NNMCAB | Northern New Mexico Citizen Advisory Board |
| NNSA | National Nuclear Security Administration |

| | |
|----------|--|
| NRC | Nuclear Regulatory Commission |
| PCB | Polychlorinated biphenyl |
| QAPP | Quality Assurance Project Plan |
| RAC | Risk Assessment Corporation |
| RCRA | Resource Conservation and Recovery Act |
| RH Waste | Remote Handled Waste (WIPP) |
| RSRL | Regional Statistical Reference Level |
| R-Well | Regional Aquifer Monitoring Well |
| Ri-Well | Intermediate Aquifer Monitoring Well |
| SAP | Sampling Analysis Plan |
| SEIS | Site Environmental Impact Statement |
| SNL | Sandia National Laboratories |
| SWMU | Solid Waste Management Unit |
| SWQB | Surface Water Quality Bureau (NMED) |
| TA | Technical Area |
| TLD | Thermoluminescent Dosimeter |
| TMDL | Total Maximum Daily Load |
| VOC | Volatile Organic Compounds |
| UNM | University of New Mexico |
| USGS | U.S. Geological Survey |
| WIPP | Waste Isolation Pilot Plant |
| WQH | Water Quality and Hydrology (LANL) |
| WTS | Washington Tru Solutions (WIPP) |



Executive Summary

The New Mexico Environment Department DOE Oversight Bureau (Bureau) continues to develop and implement a vigorous program of independent monitoring and oversight at Los Alamos National Laboratory (LANL), Sandia National Laboratories (SNL) and the Waste Isolation Pilot Plant (WIPP).

The Bureau conducts radioactive particulate and tritium monitoring of the air at SNL and LANL and is implementing a similar monitoring network at WIPP. Results have correlated well with facility-generated particulate and tritium data. The Bureau conducts penetrating radiation monitoring at all three facilities and results correlate well with facility-generated data and fall within expected background ranges. The Bureau continues to collect samples from the exhaust stack at WIPP.

The Bureau conducts groundwater monitoring at LANL municipal supply wells, regional aquifer monitoring wells and springs. The Bureau provides stable isotope, tritium/helium, radiocarbon and noble gas data to support determination of contaminant-mixing fractions, diffusion-dispersion gradients, contaminant travel times, spatial variations in recharge and variability in recharge rates. The Bureau completed the collection of 141 low-level perchlorate samples from the Los Alamos area and surrounding region that will be used to develop a regional background perchlorate value. The Bureau also monitored over 25 springs along the Rio Grande below LANL for evidence of potential LANL impacts. The Bureau collected 75 split groundwater samples at SNL to validate and verify the SNL sampling program. The Bureau plans to develop a similar program at WIPP in 2007.

The Bureau conducts independent storm water monitoring at LANL and SNL. Monitoring at LANL focuses primarily on characterizing and quantifying offsite contaminant transport in the Los Alamos Canyon watershed. The Bureau provides estimates of the inventory of plutonium transported and compare total PCB and dioxin levels to State water quality criteria. Monitoring at SNL focuses on documenting storm water quality below solid waste management units and the burning ground.

The Bureau conducted biota monitoring at LANL and collaborated with the Embudo Valley Watershed Monitoring Group to collect ten samples of produce from household and Picuris Pueblo gardens. Results for metals, low-level isotopic plutonium, isotopic uranium, americium, and strontium are compared to LANL's regional statistical reference levels. The Bureau collected fish tissue from Cochiti and Abiquiu reservoirs for polychlorinated biphenyls, organochlorinated pesticides, polybrominated diphenyl ethers (flame retardants), dioxin/furans, arsenic, and methyl mercury analyses. The Bureau sampled the benthic macroinvertebrate (aquatic insect) communities in Water, Pajarito, Sandia and Los Alamos canyons at LANL to

evaluate post Cerro Grande fire watershed recovery. The Bureau is developing quality assurance project plans to initiate soil, sediment and biota monitoring at WIPP.

The Bureau monitors waste-water discharges at both LANL and SNL. The Bureau monitors effluent from the radioactive waste treatment facility at LANL and at one wastewater station at SNL. The Bureau evaluates legacy waste and construction sites at LANL and advises facility staff on erosion control using best management practices.



Background of the DOE Oversight Bureau

The mission of the New Mexico Environment Department (NMED) is to provide the highest quality of life throughout the state by promoting a safe, clean, and productive environment. The NMED, Department of Energy (DOE) Oversight Bureau mission is to help assure that activities at DOE facilities in New Mexico are protective of public health, safety, and the environment.

The DOE facilities in New Mexico are:

- Los Alamos National Laboratory (LANL)
- Sandia National Laboratories (SNL)
- Waste Isolation Pilot Plant (WIPP).

The Bureau's responsibilities are outlined in *Agreement-in-Principle (AIP) between the State of New Mexico and the U.S. Department of Energy for Environmental Oversight and Monitoring*. The AIP covering SNL and LANL was extended in October 2005 for a period of two years and must be renewed or extended in 2007. The Bureau receives 100% of its funding from the federal government in the form of a financial assistance award (grant).

As part of the federal grant process, the Bureau prepares and submits a work plan in support of the AIP objectives and outlines the specific projects to be funded at each site. The Bureau requested \$1,800,000 to support 2006 operations and was approved for \$1,600,000 by the DOE for the period of October 1 2005 through September 30, 2006. As of May 2006 DOE anticipated funding just \$1,187,000 of the approved amount significantly hampering Bureau operations.

The Bureau received \$460,000 of the approved amount on January 5, 2006 and \$350,000 on May 9, 2006. Grant Amendment number A037 distributed \$750,000 on June 27, 2006 of which \$373,000 was restored funding from the prior federal fiscal year. Amendment number A038 distributed an additional \$413,000. Including the restored FFY 2005 funds, the total amount awarded under the grant during the 2006 fiscal year was \$1,973,000. This level of funding allowed the Bureau to complete its objectives for the year.

In 2004, DOE and the State of New Mexico joined in discussions to establish a DOE Oversight Bureau office in Carlsbad, NM for the oversight of activities at the Waste Isolation Pilot Plant (WIPP). These discussions were the result of the loss of the Environmental Evaluation Group (EEG) which was established by federal law for the independent oversight of the design and disposal phases of the WIPP operations. In 2004, DOE and NMED established a separate basic Agreement-In-Principle for WIPP. In late 2005, a revised and comprehensive AIP was developed between the State of New Mexico and the DOE along with a separate Scope of Work and Statement of Joint Objectives to further specify the roles of NMED oversight for WIPP operations. The agreement between the NMED and the DOE provides for three years of funding

at \$600,000 per year, payable in equal quarterly installments, and this funding is in addition to the funding to support oversight operations at LANL and SNL. The agreement expires on June 30, 2008 after which the Bureau will apply to DOE for continued financial assistance for oversight operations.



LOS ALAMOS NATIONAL LABORATORY

Public Outreach at LANL

Citizen's Advisory Board (CAB) Environmental Monitoring and Surveillance Committee

The Bureau plays a vital role in the technical interaction between LANL, its sub-contractors performing environmental activities, and the Northern New Mexico Citizen's Advisory Board (NNMCAB), Environmental Monitoring and Surveillance Committee (EMSC). The EMSC briefs the Citizen's Advisory Board that reports directly to the DOE. The NNMCAB is charged to prioritize and scrutinize all environmental projects at LANL in addition to ensuring that early and ongoing community access to LANL monitoring and surveillance information is provided by the DOE. In past years, the EMSC addressed NMED's Consent Order (April 29, 2002), ground water, air, liquid discharge issues and facility budgets that affect environmental cleanup activities.

Bureau staff participated in both the planning and attendance of the EMSC Ground Water Workshop in May 2006. Workshop topics addressed recent controversial issues at LANL such as the "Well Screen Analysis Report" that summarized physical and chemical problems encountered by regional monitoring wells employing Westbay sampling systems. Also discussed was the chromium contamination found in regional monitoring well R-28 within Mortandad Canyon near the border with Pueblo de San Ildefonso.

Bureau staff also provided input to late summer and fall EMSC meetings where LANL presented the latest update on elevated chromium found in water samples collected from regional well R-28.

Bureau staff participated in a NNMCAB general meeting held at Santa Fe Community College to discuss an EPA and LANL overview of impacts of well construction practices at LANL. The presentations provided evidence that showed most of LANL's Westbay multi-screen wells are not producing representative samples from the aquifer material from which they are screened.

Bureau staff attended a phone conference with DOE, LANL, Hazardous Waste Bureau (HWB) (NMED), NNMCAB and EPA Region 6 concerning the issue of Westbay sampler ports in the LANL regional aquifer wells installed as part of the Hydrogeologic Drilling Program. The meeting covered the current status of knowledge over which wells were likely to be producing non-representative water samples from targeted zones of saturation via the installed Westbay systems. A strategy and a pilot test for well screen and saturation zone rehabilitation will be developed by DOE to discern whether many of the sample ports in wells can be saved for producing RCRA compliance data.

Technical Review

Bureau staff reviewed the LANL document titled, "Well Screen Analysis Report," dated November 2005 and made the following recommendations.

- Good flow-through conditions in and around the multi-screen wells should be determined.
- Decreases in permeability within the sampling zone (screen, filter pack, aquifer material) due to clogging of pores may inhibit the collection of representative groundwater samples.
- Measuring most field parameters at the surface rather than down-hole invalidates the measurements (especially dissolved oxygen).
- Perchlorate concentrations should be used for the Tiered Analysis Process to discern between good and poor well screen zones and determining the representativeness of groundwater samples.

Bureau staff also performed the following functions and tasks.

- Attended a formal meeting with HWB, DOE and LANL concerning the Well Screen Analysis Report;
- Participated with DOE concerning the Bureau's request for Westbay/Barcad field-derived properties data collected at R-16 and R-33;
- Participated with LANL and DOE concerning the Bureau's request for sampling dates for carbon 14 (^{14}C) results collected by LANL in the early '90s;
- Compiled and entered data collected by the Bureau and analyzed by LANL EES-6 Group to the Bureau's database;
- Observed LANL sampling well R-10a;
- Collected ^{14}C and tritium (^3H) samples at R-18;
- Assisted HWB, LANL, and DOE address Consent Order (April 29, 2002) activities regarding the chromium investigation plan, the Ground Water Background Investigation Report, the Well Screen Analysis Report and well rehabilitation at regional wells R-20 and R-12.

Interactions with Local Citizen Activist Groups

The Bureau, through outreach activities, routinely interacts with activist groups and the general public. The Bureau strives to find common ground among the interested parties concerning environmental issues that surround DOE facilities in New Mexico. Bureau staff maintains open communication and provides help to facilitate understanding of differing views or positions. Bureau staff assisted groups such as the Los Alamos Study Group (LASG), Concerned Citizens for Nuclear Safety (CCNS), Amigos Bravos (Friends of Wild Rivers) of Taos, residents of Los Alamos County through the Pajarito Plateau Watershed Partnership, and the Embudo Valley Environmental Monitoring Group (EVEMG) on various DOE-related environmental issues.

Bureau staff met with Los Alamos County and others and provided information on best management practice (BMP) standards from other states to the Pajarito Plateau Watershed Partnership Standards Development Team. The working group used the information to develop construction specification standards which are to be adopted by Los Alamos County.

Bureau staff developed a map for LANL and CCNS showing the southeastern portion of LANL with the major watersheds that ultimately drain to the Rio Grande. The map was requested in part as a guide for LANL investigators scoping the South Canyons Work Plan that took place in mid-2006.

CCNS also requested the map as part of its Rio Grande assessment during the annual raft trip conducted in White Rock Canyon by LANL, NMED and CCNS.

Bureau staff presented findings from its 2005 Embudo Watershed soil and produce sampling at a public meeting held by the Embudo Watershed Monitoring Group.

Bureau staff attended the CCNS-sponsored "Forum to Promote Effective Cleanup at Los Alamos National Laboratory." Arjun Makhijani, founder of the Institute for Energy and Environmental Research (IEER), gave presentations on radiation basics, epidemiology, RESRAD (the DOE code for calculation of dose), waste, plutonium, accountability and long-term stewardship, and a summary of "*Bad to the Bone*" an IEER report recommending that EPA lower the standard for plutonium in drinking water. George Rice provided a summary of the CCNS report "*New Mexico's Right to Know: The Potential for Groundwater Contaminants from LANL to Reach the Rio Grande*" and Bob Gilkeson presented an evaluation of the monitoring wells at LANL for the detection of contamination.

Bureau staff attended settlement negotiations between Air Quality Bureau (AQB) (NMED), DOE, LANL, CCNS, the EVEMG, and Centers for Disease Control and Prevention (CDC) to discuss environmental monitoring issues associated with two air-quality permits for open burning and detonation at LANL.

Bureau staff attended a Sierra Club meeting in Los Alamos that featured a LANL EES-6 Group staff member presenting an overview of the Pajarito Plateau hydrology with respect to age-dating and isotope geochemistry. The Bureau supported LANL with water data and GIS coverage for the presentation. The presentation was well-received by the public as well as by LANL and DOE members who were also in attendance.

Bureau staff trained LANL EES-6 Group staff on the use of the Bureau's nitrate HACH field test kit which was used during LANL's perchlorate investigation project at the Otowi-1 production well.

Bureau staff met with University of New Mexico (UNM) Provost Dr. Reed Dasenbrock and Dr. Peter White, Dean of UNM's University College, to discuss the process for finding a replacement for Dr. Michael Campana, Director of the Masters of Water Resources Program who left after accepting a position at Oregon State University. Mr. Erik Galloway of the Bureau's Santa Fe Site Office is the elected member representing the program's alumni on the program committee. Concerns include procuring additional funding for the Directorship and trying to keep the program inter-disciplinary by placing it in a college that will allow it to be autonomous.

Bureau staff participated in a joint effort with the New Mexico Department of Health (DOH) and New Mexico Game and Fish to establish fish consumption advisories for DDT in Brantley reservoir and PCBs in the Rio Grande. This is the first time the State has issued consumption advisories for these chemicals.

The LANL Risk Analysis, Communication, Evaluation, and Reduction (RACER) Project

The Bureau continued to support the RACER project headed by Risk Assessment Corporation under contract to Colorado State University. The project has proposed to evaluate various sets of environmental data that were collected at LANL over the past five years by different agencies. The data will be integrated under a singular format for ease of use for large site-wide multi-media risk assessment tools. Upgrades to NMED's current database and GIS capabilities at the LANL and Santa Fe Oversight Bureau offices were made during the year to accommodate RACER's database design.

Bureau staff beta-tested the latest version of the RACER-integrated database and used it to determine which contaminants should be monitored below sites that may have experienced releases in order to determine best management practice performance. The Bureau also used the database to provide storm water quality data for all watersheds on the Pajarito Plateau in preparation for the upcoming 2006 Total Maximum Daily Load (TMDL) study, conducted by the Surface Water Quality Bureau (SWQB) (NMED). In addition, Bureau staff provided the RACER team with feedback of problems and made recommendations for improving the database. This RACER database is proving to be very user-friendly and useful to all parties involved in the oversight of LANL and its facilities.

Bureau staff attended a public forum in February initiated by RACER and the New Mexico Community Foundation, administered by the Northern New Mexico Community College. The purpose of the meeting was to update the community on the progress of the RACER project and solicit public participation and comments.

Interactions with Local Pueblos

The 4-Accord Pueblos (Pueblo de San Ildefonso, Jemez Pueblo, Cochiti Pueblo and Santa Clara Pueblo) that surround LANL have a long-standing history of working with the Bureau on environmental issues. The Pueblos of Santa Clara and San Ildefonso remain significant players in the Bureau's long-term monitoring plan due to their location down gradient and down wind from LANL. In addition, the Pueblo de San Ildefonso border with LANL contains many of the canyons that have received much of the legacy wastes and current environmental releases from LANL.

Bureau staff met with Cochiti Pueblo representatives to discuss sampling strategies for fish tissue at Cochiti Pueblo. Sampling methodologies (numbers and types of samples), analytical needs, and data reporting and assessment protocols were discussed in detail for future joint activities.

Representatives from SWQB, DOE, DOH and the Bureau participated in a public meeting at Santa Clara Pueblo where Bureau staff presented data on PCB levels in Rio Grande water and fish tissue. Questions were fielded on levels of PCBs in various media (e.g., sediments, water, fish and bullfrog tissues) and health effects of PCB consumption. Through a Memorandum of

Agreement with Santa Clara Pueblo (similar to the Memorandum of Understanding between NMED and Pueblo de San Ildefonso), the entities initiated discussions for developing and executing cooperative sampling plans to fill data gaps.

Bureau staff met with the Pueblo de San Ildefonso chief database technician to clarify naming conventions and reduce redundancies in the Bureau's data release to the Pueblo. The meeting was in response to recurring problems with accurately retrieving environmental data for a location from the database. Environmental data from on-site or in the vicinity of LANL collected over the past 15 years by LANL, NMED and other agencies have different naming conventions or have different names for the same locations. The Bureau helped to identify that the problem existed primarily with surface water data. Bureau staff prepared a crosswalk chart to identify the most recent (or correct) name of a location in addition to linking it to the multiple names assigned to that location over the years.

Bureau staff assisted LANL's Water Quality and Hydrology (WQH) Group and Pueblo de San Ildefonso representatives in locating the New Mexico Department of Transportation (NMDOT) Totavi wells that are no longer in service. The field reconnaissance team was able to locate the following undamaged wells: MW-3, MW-4, MW-8 and MW-9. Sometime during January or February 2006, these wells were abandoned and plugged with concrete grout, presumably by the NMDOT. The Pueblo de San Ildefonso was not aware that this activity had taken place. The overturned pad for MW-7 was also located. In 1996, San Ildefonso Pueblo allowed the Bureau to inventory the wells and collect water level data. Two NMDOT publications concerning the old underground storage tanks at Totavi showed that there were nine monitoring wells drilled, MW-1 through MW-9. Bureau staff field work in 1996 indicated that MW-2, MW-5, MW-6, and MW-7 did exist but were severely damaged - probably by NMDOT road graders. Bureau staff was not able to locate MW-1. Information maintained by the Bureau showed that these wells had probably been last sampled in 1993. If MW-1 has not been properly abandoned it may present a direct conduit to the water table and is therefore a potential pathway for contamination. Pueblo de San Ildefonso is working with NMDOT to locate these wells and it is the ultimately the responsibility of NMDOT to verify they have been properly abandoned.

National Environmental Policy Act (NEPA)

DOE facilities in New Mexico are subject to the National Environmental Policy Act (NEPA). Under NEPA, the facilities must evaluate the environmental consequences of human activity on the environment and consider any environmental impacts during the planning and decision-making stages of a federally funded project. NEPA requires federal agencies to prepare either an environmental assessment (EA) or environmental impact statement (EIS). The Bureau frequently reviews and comments on significant EA or EIS documents that concern SNL and LANL because both are large operational DOE facilities that routinely implement major building renovation or mission/national security-related projects.

Bureau staff participated in public meetings in Santa Fe, Espanola and Los Alamos concerning DOE's development of a NEPA EIS to address a broader scope of operations for the Biosafety lab at LANL. The BSL-3 (biosafety lab, level three) was constructed at LANL's Technical Area 3 between 2002 and 2004 after the United States government identified an emerging threat to homeland security posed by the possible use of biological weapons. The BSL-3 construction

went forward following a finding of No Significant Impact associated with the NEPA EA in 2001. The BSL-3 labs are used to study agents that can be transmitted through the air and cause potentially lethal infection. Researchers perform lab manipulations in gas-tight enclosures. Other safety features include clothing decontamination, sealed windows, and specialized ventilation systems. The meetings at LANL and Espanola showed sparse public attendance; however, Bureau staff voiced concerns why LANL was host to a facility of this type that is so close to a populated area. Bureau staff also raised concerns associated with its inability to conduct environmental monitoring at such a facility.

Bureau staff with the HWB, SWQB and Drinking Water Bureau jointly reviewed the “Overview of the National Nuclear Security Administration’s (NNSA) Environmental Impact Statement for LANL” and provided many of the comments submitted to DOE. Bureau staff also participated in several EIS meeting sessions held at Los Alamos and Santa Fe where they also weighed commentary from activist groups as well as community members living in the vicinity of Los Alamos. An offshoot of this effort led the Bureau to work closely with EPA Region 6, the NNM CAB, and CCNS in developing a sampling plan to provide more data and providing consultation to the local municipalities of Los Alamos and Santa Fe regarding their drinking water supply quality. The Bureau will implement the special drinking water well sampling in early 2007.

Spill Investigations at Los Alamos National Laboratory and Sandia National Laboratories

The Oversight Bureau supports other bureaus and programs in the NMED by investigating spills through a voluntary consultation process at both LANL and SNL. Bureau staff trained to assess spills at the LANL and SNL facilities respond to required notifications and provide advice and recommendations as well as supplemental information to DOE and NMED regulatory bureaus. The Bureau documents site conditions and clean-up actions taken by the facilities and may collect environmental samples if necessary to identify potential contamination issues. The Bureau conducts follow-up investigations to verify that corrective actions taken by the facilities meet regulatory requirements and if they do, will recommend closure of the spill incident to NMED regulatory bureaus.

Bureau staff submitted two spill clean-up resolution reports to DOE Los Alamos Site Office in January 2006 for the TA-50 Pump House Water Spill and the Diesel Spill in Water Canyon. The reports documented that the LANL spill response actions were appropriate, adequate, and that no further actions were necessary on the part of DOE.

Pajarito Plateau Watershed Partnership

Bureau staff attended monthly meetings of the Pajarito Plateau Watershed Partnership to discuss water quality, Federal Facility Compliance Agreement implementation, Pajarito Plateau TMDL development, storm water pollution prevention, and the upcoming Clean Water Act 319(h) watershed grant.

Bureau staff participated with Los Alamos County and LANL personnel and other attendees in the Pajarito Plateau Watershed Partnership to help develop construction site storm water pollution standards for Los Alamos County.

Espanola Basin Technical Advisory Group

The Bureau participated in the 5th Annual Espanola Basin Technical Advisory Group Workshop hosted by the U.S. Geological Survey (USGS). The Bureau contributed to a joint NMED-LANL poster titled “Application of Helium and Tritium Isotopes for Dating Groundwater at Los Alamos, New Mexico.” The work was a collaborative effort of stable isotope data collection among LANL, the Bureau and USGS that showed a less-than-50-year-old component to the recharge into the aquifer below the Pajarito Plateau below LANL. The most significantly important aspect of the work implied that fast pathways for contamination predominantly exist in the canyon bottoms as expected and as shown by the relatively young component of water discharging at the spring end points in White Rock Canyon. Previous hydrogeological models for groundwater below LANL predicted very old ages for the regional aquifer with limited contamination pathways from surficial water recharge.

New Mexico Hazardous Materials Committee

Bureau staff accompanied HWB staff in attending the annual Joint Meeting of the Radioactive and Hazardous Materials Committee of the New Mexico state legislature held at the Los Alamos Research Park and hosted by LANL. The meeting has been designed to present New Mexico lawmakers with a yearly overview of LANL operations and environmental topics for discussion. Among key environmental highlights for 2006 were: environmental stewardship, Consent Order on Environmental Remediation and Cleanup, NNM CAB, Water Quality Program, Air Quality Program, WIPP shipments and Legacy Waste Status. Each scheduled discussion was followed by a question and answer period in which committee members of the State’s legislature were provided details of each presentation.

Community Radiation Monitoring Group

The Community Radiation Monitoring Group (CRMG) evolved during the late 1990s from a focus primarily concerned with monitoring real time gamma radiation in the vicinity of LANL to addressing broader environmental issues and more distant receptors. Currently, the CRMG operates in an ad hoc format and is intended to provide a technical discussion platform between LANL, NMED and communities that may be affected, or are perceived to be impacted by airborne and other radionuclide emissions from LANL operations. The CRMG routinely serves as a forum for tangent issues so it also serves as a government listening vehicle for interest groups to voice their concerns. The Bureau’s LANL Oversight Section facilitates monthly meetings of the CRMG. The mission of the CRMG is to understand and communicate public health issues relating to direct penetrating radiation and radiation from airborne radioactive materials that result from activities at LANL. During the year, the following meetings and discussions were conducted:

- At a meeting held at Picuris Pueblo, NMED gave a presentation on the revised Regional Emergency Preparedness Exercise and Response to a LANL Radiation Incident. Other discussions addressed air quality data not listed in LANL’s Annual Environmental Surveillance Report.
- At a meeting held at Northern New Mexico Community College, LANL provided an overview of the 2001 South Fork Acid Canyon cleanup that specifically addressed occupational radiation exposure to the contract workers who performed the excavation.

LANL produced results from personnel monitors that compared measured worker dose-levels to DOE occupational standards. NMED also collected data during the project but for a significantly different purpose than occupational exposure. All results presented showed that workers could potentially have been exposed to a maximum dose of 600 mrem during the 10-week operation compared to the yearly maximum allowable dose of 5,000 mrem. This exposure is approximately one-tenth of the yearly allowable dose. A member from EVEMG objected to LANL's presentation and fact-sheet and maintained that the workers should have been wearing masks or respirators during the entire operation. LANL supported its decision not to require masks for workers unless it was their personal preference to do so by referring back to the data collected by both LANL and NMED that showed the occupational exposure was within regulatory limits.

- A meeting in White Rock focused on the elevated release of radiation in 2005 from TA-53 (LANCE) due to an increase of beam-time operation over 2004 coupled with some maintenance problems that eluded operators of the site for almost 6 months. A microscopic leak was eventually discovered in a cooling line at LANCE. Replacement of the defective component brought the emissions back in line with the normal operational amount that meets the EPA NESHAPS regulations for LANL radioactive air emissions. The LANL Annual Environmental Surveillance Report data format (report text and data CD) was also discussed. An action was taken by LANL to provide CCNS and the EVEMG with a hardcopy of formatted data results that can more easily be reviewed by members of their groups and the public.
- A meeting in Espanola focused on an alternate power system option for Pueblo de San Ildefonso to operate an AIRNET (air particulate) station on Pueblo property adjacent to LANL's TA-54 radioactive waste disposal landfill.
- A meeting in Santa Fe was well-attended by approximately 30 participants of whom over one third were not affiliated with any government agency or organized group. The meeting focused on the concerns of the Romeroville community where WIPP trucks stop for rest, food, and fuel at the local service station. The local residents voiced their concerns followed by replies from government officials that included the DOE Carlsbad Field Office, NMED and the NM Department of Public Safety Motor Transportation Division. The overall wish of the Romeroville residents was that WIPP trucks not stop in their community. DOE staff followed with their technical and regulatory overview that covered many of the issues of the citizen concerns. The DOE officials maintained that the trucks are safe, continuously monitored and in compliance with transportation rules, and that the officials in attendance were not authorized to change the WIPP route to bypass Romeroville. Since many of the Romeroville issues were beyond the scope of the CRMG, the Bureau moderator suggested that they be addressed at the quarterly DOE and NMED meetings that focus specifically on WIPP issues. In response to the concerns of the Romeroville community DOE no longer allows the WIPP trucks to stop at the local service station there.
- One meeting in White Rock hosted a discussion on the status of the New Mexico North Central Regional Exercise Project.

Interactions with Facilities and Regulatory Bureaus

The Bureau continued to interact with facility and regulatory bureaus on activities pertaining to the characterization, corrective action, and monitoring of groundwater beneath LANL. To meet implementation requirements of the NMED Consent Order for LANL, 2005 marked the last year in which quarterly and annual meetings were held under LANL's Hydrogeologic Work Plan. All well drilling activities are now prioritized by canyon and material disposal area and directed by the Order and its requirements. Activities included the following:

- Bureau staff prepared and delivered the final draft of the Tritium/Helium ($^3\text{H}/^3\text{He}$) groundwater data spreadsheet for all samples collected by LANL and NMED to LANL EES-6. These $^3\text{H}/^3\text{He}$ data, along with ^{14}C data will be used to determine recharge sources and age of regional and local groundwater.
- Bureau staff assisted LANL and the USGS sample piezometer wells in Santa Fe. Two wells were sampled, and each well has 3 nested piezometers.
- Bureau staff provided a Visual Sampling Plan Monitoring Project to the HWB for monitoring of the Ash Pile solid waste management unit (SWMU 72-002) for contaminant hotspots.
- Bureau staff conducted a review and provided comments on the LANL Site-Wide Environmental Impact Statement (SWEIS) to NMED management.

Bureau staff provided the following reviews and assistance concerning the HWB Consent Order:

- Assisted HWB and LANL concerning the construction of characterization well LAOI-3.2a in Los Alamos Canyon;
- Conducted a review and commented on HWB's letter to DOE and LANL specific to the characterization (mineralogy) of solids being produced during purging and sampling at LANL characterization well R-34. (This is to determine if the solids are from the sealant and/or aquifer material and/or drill flour, etc.);
- Prepared a final draft for the review of the R-25 Validation Plan Report;
- Prepared a final draft for the review of the LANL Well Locations Map regarding the Consent Order;
- Corresponded with HWB concerning old USGS wells drilled in MDA T at TA-21 during the early 1950s that encountered perched water at less than 100 feet. The wells were designated as USGS test holes and collected information on radionuclides, notably plutonium, which was published in February 1967. These wells at MDA T were located between Pits 1 and 3 and perched groundwater was encountered at two wells at a depth of 24.2 feet and 50.3 feet, respectively. Since the early 1990s RFI Work Plan for OU 1106 does not mention this water occurrence, the information may be important for both LANL investigators and NMED regulators concerned with TA-21 as work under the Consent Order progresses in the next few years;
- Attended a meeting with DOE and LANL staff at the Pueblo Complex in Los Alamos concerning the recent detection of elevated chromium in some Mortandad Canyon wells. The meeting was one of many to guide LANL's development of its chromium

investigation work plan. The plan is to address monitoring for chromium in the vicinity of the initial detections, in addition to identifying historical chromium sources adjacent to, and upstream of the recent detections;

- Corresponded with LANL staff concerning their request for information and available data, etc., for the NMDOT Totovi wells located on Pueblo de San Ildefonso property. Because the Bureau has a copy of the old report in its LANL Oversight office library, it reproduced and submitted a copy to LANL's WQH Group.

National Academy of Science Groundwater Program Assessment at LANL

The Bureau was on the Committee for the Technical Assessment of Environmental Programs at LANL hosted by the National Academy of Sciences (NAS). The outside assessment by NAS was supported by DOE, LANL and the NNM CAB to provide an independent evaluation of the groundwater monitoring program at LANL since the late 1990s. Much of the publicity following the meeting focused on the reliability of LANL's ground water monitoring wells and protection of the Los Alamos drinking water supply in light of the recent chromium contamination found in some deep wells. The Bureau's LANL Oversight Section staff received an acknowledgment of appreciation from LANL and the NAS committee for the amount of site knowledge the Bureau brought to the flow pathway discussions.

Emergency Exercise Plan

The Bureau was actively involved in the New Mexico North Central Region Three Year Training and Exercise Plan Concepts and Objectives Meeting. The exercise was in its initial phase during 2006 and topics discussed included an overview of the Homeland Security Presidential Directive, National Preparedness Goal, Homeland Security Exercise and Evaluation Program, and the Multi-Year Training and Exercise Plan that involves planning future exercises, seminars, workshops, games, drills, and a full-scale exercise. The preliminary exercise scenario being discussed at these early meetings was a multi-plane mid-air crash and explosion that causes a large wildfire and releases airborne hazardous and radionuclide contamination to offsite receptors. Additional meetings are planned through 2007 that will include input from local citizens near LANL in support of a full-scale exercise sometime in 2008.

Training

The Bureau revised the LANL Site-Specific Health & Safety Plan (SHASP) to incorporate wildfire hazard precautions. The SHASP also specifies that an Integrated Work Document (IWD) is required for each activity as well as implementing a training matrix to be followed by all levels of management and technical personnel that perform field work at LANL. The IWD is a guidance document that evaluates potential job hazards and describes precautions to be followed along with training requirements. The Bureau developed IWDs for all field sampling activities.

Bureau staff completed fire safety training, and acquired necessary additional fire extinguishers, radios, and fire-fighting tools as required under activity IWDs and the SHASP.

Bureau managers attended training in "Public Sector Employment Law for Managers and Supervisors."

All Bureau staff members who possess a DOE security clearance attended the required annual security refresher.

The Bureau and SWQB personnel attended a 4-hour CPR/First Aid training course at the Bureau's White Rock office. This course is required under the Bureau's SHASP and IWDs.

Bureau staff attended Visual Sampling Plan training presented by Battelle Corporation of Pacific Northwest National Laboratory. The course was very beneficial to staff who need to develop statistically sound and legally defensible sampling plans.

Technical Reports

Bureau staff presented posters and gave formal speeches at the following technical venues:

- A Bureau staff member co-chaired the 2006 National Ground Water Association's Western Focus Ground Water Conference, Perchlorate Session in San Francisco, California. The session was titled "Perchlorate: Assessment, Remediation and Public Policy". In addition the staff member presented the Bureau's background perchlorate paper titled "Trace Perchlorate in Ground Waters within the Northern Rio Grande Basin, New Mexico".
- Bureau staff attended the Española Basin Technical Advisory Group and presented a poster titled: "Application of Helium and Tritium Isotopes for Dating Groundwater at Los Alamos, New Mexico".

Geographical Information System (GIS) Support

Bureau staff provided GIS support to various organizations and individuals as follows:

- New Mexico House Representative Thomas Anderson requested two maps, entitled: "Wells and Springs within 3,500 Feet of the Rio Grande" and "Regional Setting of Los Alamos National Laboratory." Representative Anderson is on the Los Alamos National Laboratory Oversight and the Energy & Natural Resources Committees;
- LANL requested and the Bureau provided maps of the Totavi wells located on Pueblo de San Ildefonso lands;
- The Bureau provided all maps for the joint LANL/NMED publication "Application of Helium and Tritium Isotopes for Dating Groundwater at Los Alamos, New Mexico";
- The Bureau provided a complete set of thirty maps depicting all Stormwater Monitoring Areas located in upper Los Alamos Canyon to the HWB. These maps depict the sub-watersheds and monitoring locations that LANL and the Bureau use to monitor SWMUs in Los Alamos Canyon; and
- The Bureau provided maps for White Rock Canyon raft trip field teams to aid in locating all the springs.

The Bureau interacts extensively with the public, local Pueblos, citizen activist groups, citizen advisory boards at DOE facilities, other bureaus within NMED, and other government agencies (e.g., Environmental Protection Agency, United States Fish and Wildlife, United States Geological Survey). The Bureau shares data and findings through written correspondence, poster and oral presentations at public meetings; engages in discussions with interested parties, and posts data and reports on the NMED web site at:
http://www.nmenv.state.nm.us/doe_oversight/pubs.htm

Environmental Monitoring at LANL

Storm Water Monitoring

In 2006, some LANL canyons experienced the highest storm water flows ever recorded. On August 8, 2006, Pueblo Canyon discharge reached approximately 2,000 cubic-feet-per-second (CFS) eclipsing the 1,460 CFS discharge shortly after the Cerro Grande fire. These high flows destabilized contaminated deposits in Pueblo Canyon by causing rapid advancement of head-cuts and re-routing of the stream channel through previously stable flood plains. While much of the upper watershed has recovered significantly from the fire, the urban landscape of middle Pueblo Canyon is contributing greatly to increased storm water flows and the destabilization of the stream channel in Pueblo Canyon.

In the six years since the Cerro Grande fire, the Bureau has demonstrated strong correlations between storm water peak flow, suspended sediment transport and plutonium-239/240 transport out of Pueblo Canyon. Based on these correlations, the Bureau estimates that 51.2 mCi of plutonium-239/240 in 11,701 metric tons of suspended sediment were released from Pueblo Canyon into the Los Alamos watershed due to the high storm water flows in 2006. This estimate only addresses suspended sediment transport and does not account for the bed load transport of sediment and associated plutonium transport. Bed load transport of plutonium may contribute to these estimates significantly.

The Bureau has also been tracking the concentrations of plutonium-239/240 in suspended sediment leaving LANL from Pueblo Canyon for the past six years. Plutonium concentrations in suspended sediment have steadily increased each year since 2003 from an average 2.8 pCi/g to 6.5 pCi/g in 2006. While on the surface this may seem like a problematic trend, the Bureau believes that this indicates a reduction in total off-site plutonium transport. Wetlands, located downstream from the Los Alamos County Bayo waste water treatment plant and upstream from our monitoring location are effectively reducing the amount of suspended sediment in storm water. As storm water passes through the wetlands, more coarse sediment is dropped from the storm water, and the proportion of fine sediments in the water increases. Because fine sediments carry a higher proportion of plutonium this has resulted in higher plutonium concentrations in the remaining suspended sediments. The Bureau believes that the suspended sediment load reduction occurring in the wetlands outweighs the plutonium concentration increase in suspended sediments and has resulted in an actual decrease in total mass of plutonium transported off-site. The Bureau recommends that wetland enhancement and repair of damage to the wetlands from high flows would increase this beneficial effect and reduce total off-site transport of contaminants even more.

The Bureau increased monitoring of dioxin and polychlorinated biphenyl (PCBs) in storm water runoff at LANL. The PCB results collected upstream from a solid waste management unit (SWMU) at TA-21 were 54 times lower than samples collected downstream from the same SWMU in 2003. This suggests that there may be an uncharacterized PCB source at that location. Levels of dioxin in storm water exceeded the State of New Mexico surface water quality criteria in both Cañada del Buey near White Rock and in Pueblo Canyon at the eastern boundary of LANL.



Ralph Ford-Schmid collects storm water samples from Sandia Canyon at State Road 4 below LANL.

The Bureau collected eight samples from seven storm water events in lower Los Alamos Canyon, downstream from the eastern boundary of LANL. All samples were analyzed for dioxin/furan and total PCB. All samples collected in lower Los Alamos Canyon exceeded the State of New Mexico surface water quality criteria for dioxin and total PCB. Dioxin/furan analyses provide concentrations of 17 dioxin and furan congeners. These compounds exhibit the same toxic mechanism as 2,3,7,8-TCDD (dioxin) but at varying strengths. Concentrations of each congener are converted to toxic equivalence quotients (TEQs) of 2,3,7,8-TCDD using the World Health Organization methodology and 2005 toxic equivalency factors and summed to

provide a dioxin TEQ. Dioxin TEQs in Lower Los Alamos Canyon ranged from 5.26 pg/l to 117 pg/l which exceeded the surface water quality criteria of 0.05 pg/l by 100 to 2,000 times.

Total PCB is obtained by summing concentrations of all the individual PCB congeners found in each sample. Total PCB in Lower Los Alamos Canyon ranged from 32 ng/l to 3,161 ng/l which exceeded the surface water quality criteria of 0.64 ng/l by 50 to 5,000 times.

The Bureau submitted 41 samples from 10 storm events collected at six stations in the Los Alamos/Pueblo watershed. Samples were analyzed for total plutonium-239/240 in water, plutonium-239/240 in suspended sediments, suspended sediment concentration, strontium-90, cesium-137, total metals, and gross alpha/beta radioactivity.

Due to unresolved budget constraints the Bureau discarded 34 samples from seven storm events at those six stations and was only able to analyze for subsets of the above analyses for the remaining 7 samples. The inability to develop complete data sets for each sampling event compromises the ability to evaluate contaminant transport inventories, and it increases the uncertainties in the transport estimates that are made.

NPDES Outfall Monitoring and Erosion Control Monitoring

The Bureau provides expertise to LANL and supports other NMED bureaus by performing National Pollutant Discharge Elimination System (NPDES) permitted outfall evaluations. Bureau personnel are trained to evaluate outfalls, and to provide advice and potential actions the facility may consider when deemed necessary. Additionally, the Bureau routinely collects a subset of LANL's regulatory samples to identify potential contamination issues and verify compliance with NPDES. The Bureau follows up on assessments to verify that corrective actions taken by LANL meet regulatory requirements and if they do, will recommend closure of an outfall or corrective action to NMED regulatory bureaus.

Bureau staff accompanied by LANL personnel evaluated the TA-15 PHERMEX site to verify outfall closure for the LANL NPDES Outfall Closure and Reduction Program. A report was submitted to LANL, EPA Region 6, DOE, and the SWQB recommending this outfall for final closure.

Bureau staff planned and implemented a quality assurance sampling event that tested whether NPDES outfall samples collected within the TA-50 facility are similar to or different from samples collected at the actual 051 outfall that discharges into Effluent Canyon (a tributary of Mortandad Canyon). This issue first arose in 2003 when Bureau personnel were made aware that compliance samples at TA-50 were being collected at a sink inside the facility rather than outside at the actual outfall that discharges to the environment. The TA-50 discharge pipe, which is approximately 40 years old, had high levels of radioactive contamination plated within it that were leaching contaminants that were not being monitored at the sampling sink. Elevated radioactive constituents in discharge water alerted LANL that a corrective action needed to be put on a fast track in order for TA-50 discharges to meet the DOE-derived concentration guidelines.

The Bureau and LANL conducted joint sampling events, and staff noted that the first water discharged had low pH (6.0), the water was stained brown, and analysis showed more radioactive contamination in the initial flow than later on during the discharge. The results of the three sampling events led to the Bureau's recommendation that the facility collect NPDES compliance samples at the outfall discharge located in Effluent Canyon.

Bureau staff attended a LANL site tour of all outfalls permitted under the National Pollutant Discharge Elimination System in preparation for monitoring in FFY 2007.

Evaluation of Erosion Control Measures at DOE-LANL Construction Sites and Legacy Waste Sites

The NPDES FFCA and NPDES General Permit for Large and Small Construction Activities (Clean Water Act, 33 U.S.C. §1251 et.seq.), requires LANL to implement erosion control activities at legacy waste and construction sites that have been identified as having high erosion potential. Trained Bureau staff routinely accompanies LANL Water Quality and RCRA personnel to evaluate sites within these two categories. Typically, the Bureau offers recommendations on various types of erosion control structures or best management practices that are used for slope stabilization and surface water run-on and runoff control. The Bureau also submits a summary of its findings that include observations in addition to any deficiencies found during the evaluations to DOE, LANL management and, after review and any comments, to NMED regulatory bureaus.

Bureau staff teamed with LANL personnel to perform site evaluations at a number of construction and Environmental Restoration remediation sites in 2006. Reports were submitted to DOE, LANL Management and SWQB on the findings for:

- Storm Water and Erosion Controls at the TA-3 Security Perimeter Project;
- Storm Water and Erosion Controls at the TA-55 Radiological Laboratory Utility Office Building Project;
- Storm Water and Erosion Controls at the TA-3 Gas Generator Project;
- Storm Water and Erosion Controls at the Power Grid Infrastructure Upgrade Project;
- Storm Water and Erosion Controls the TA-50 Pump House Project. This was a re-investigation to evaluate measures taken after a major potable water spill;
- Storm Water and Erosion Controls at the TA-21 MDA-V Environmental Remediation Project.

In general, the site evaluations documented positive findings. Documented problems and suggested corrective actions to improve the storm water management controls at the sites were provided to LANL Water Quality and RCRA representatives. Additionally, these erosion assessments resulted in DOE filing a Storm Water Compliance Corrective Action Plan Request to LANL to:

- Improve LANL contracting mechanisms such that NPDES storm water compliance is addressed to include all sub-contractor-managed construction activities;
- Establish clear lines of accountability at LANL with respect to oversight and ownership of day-to-day Permit requirements;
- Assure that sub-contractors are aware and informed of their Storm Water Construction General Permit obligations at pre- and post-bid award; and

- Formalize a process to ensure all design recommendations made by LANL Water Quality and RCRA representatives are addressed during project design, and implemented in a timely manner, as appropriate.

Embudo Valley Watershed Monitoring

The Embudo Valley Watershed Monitoring Group (EVEMG) represents public and agricultural interests in the Embudo region of Northern New Mexico that also includes organic farmers. EVEMG's chief concern is the contamination of their growing soils by any atmospheric or LANL-derived radionuclide fallout. A few years ago, EVEMG requested that the Bureau start collecting samples to determine local conditions in the Dixon area and to verify exceptional values measured after the Cerro Grande fire. Ash and smoke from the Cerro Grande Fire heavily impacted areas in vicinities east-northeast of the fire and multiple contaminants were found in excess of background references established by LANL. The particulates that originated from the fire potentially contained concentrated contaminants from global fallout as well as from past LANL operations. This year the EPA Region 6 provided approximately \$75,000 of analytical funding to the Bureau to sample storm water, air particulates, regional aquifer wells, produce and soils. Approximately \$12,000 of this total was used to continue the Embudo Watershed produce and soil sampling project.

Bureau staff met with EVEMG and developed a sampling analysis plan to evaluate radionuclides in local produce and soil. The Bureau collected 10 samples of produce from household and Picuris Pueblo gardens. Samples were submitted for metals, low-level isotopic plutonium, isotopic uranium, americium-241, and strontium-90. Bureau staff processed and shipped soil samples to NMED contract laboratories that were collected in late August to identify background constituents in the soils at selected locations within Embudo Valley, a known and popular organic farm region.

Results from the Bureau's contract laboratory showed americium-241 above the LANL 2000 and 2004 Regional Statistical Reference Levels in the one produce sample collected for this project, a plum sample at Llano de la Llegua. The result was approximately twice the 2004 LANL background reference level (note that for comparison purposes, LANL's 2004 RSRLs are generally higher in value than their 2000 RSRLs due to their use in 2004 of a 3 sigma standard deviation calculation to produce the RSRLs rather than a 2 sigma formula that was used in 2000 and previous years). Several trace metals were also measured at 1 or more times above LANL's 2004 or 2000 RSRLs in the six soil samples collected in the Embudo Watershed. Metals that exceeded the RSRLs were beryllium, cadmium, cobalt, copper, iron, mercury, manganese, nickel, lead, and zinc. The Bureau's data submittal to EVEMG and DOE included a recommendation that additional soil and produce samples be collected in the Embudo Watershed region. The Bureau would like to verify LANL's RSRLs and whether americium-241 and the trace metals mentioned consistently exist at levels above background.

Groundwater Monitoring

The Bureau conducts data verification and validation through split sampling of groundwater, focusing on new regional wells, springs, and monitoring wells on Pueblo de San Ildefonso and Santa Clara Pueblo, older Environmental Surveillance and regional aquifer wells known to contain contaminants, and LANL area and White Rock Canyon springs. Bureau staff collected

samples with LANL at 53 groundwater monitoring stations, including 15 springs sampled in September, as part of LANL's annual White Rock Canyon raft trip.

Bureau staff helped LANL to identify and sample spring locations in Pajarito Canyon. Bureau staff led surveillance hikes with LANL staff to accurately locate Kieling, Charlie, and Starmer springs that are all located below and south of MDA M at TA-9 within the Explosives Corridor. LANL is required to sample all springs at the LANL complex on a schedule specified by the NMED Compliance Order.

EPA Region 6 provided funding for radiological and non-radiological tracer and water quality constituents analyses at 2 wells involved in a regional rehabilitation study (R-20 in Pajarito Canyon & R-16 in White Rock). The two wells are a subset of many that show damage by drilling fluids as demonstrated by certain water quality parameters such as non-representative pH and dissolved oxygen. The Bureau, working under an EPA-approved sampling and analysis plan, collected only one round of samples at R-20 before the project was halted due to clogging of well screens. Samples from the first round were archived until the project resumes in 2007.

Bureau staff assisted LANL and the USGS in sampling piezometer wells in Santa Fe. There were two wells sampled and each well has three nested piezometers. The data collection will support a joint LANL and USGS regional ground water assessment project that will be published during 2007.

Bureau staff provided stable isotope data to LANL collected in Mortandad Canyon in past years. LANL requested the information to support an ongoing Mortandad Canyon ground water investigation involving chemical signatures and flow pathways associated with recent chromium contamination that was found in regional aquifer water near LANL's border with Pueblo de San Ildefonso.

Determining Aquifer Hydro-Geologic Characteristics at the Los Alamos National Laboratory

EPA Region 6 provided adequate funding that allowed the Bureau to continue collecting several phases of specific data to be used as hydrologic tools. These analytical methods such as tritium/helium, radiocarbon (^{14}C) and noble gas analyses help researchers compile the subsurface history of aquifers below LANL (age, pathway, flow-rate, recharge elevation and mixing component). The tritium/helium technique implemented during 2005 utilizes the decay of tritium to helium (half life of 12.4 years) to date the lapsed time interval since groundwater has been recharged. This interval is generally less than 60 years for "modern" ground water. This technique also provides constraints on mixing fractions between shallow (e.g., young) and deeper (e.g., older) ground waters, dates the time at which the young fraction mixes with older fraction waters, and in some cases, quantifies groundwater flow velocities. The following parameters are important for using and understanding hydrologic "tools":

- Recharge/discharge relationships associated with groundwater management practices (quantity issues, etc.);
- Hydraulic connections with the surface;
- Understanding of the fate and transport pathways of known subsurface contamination; and
- Acquired data supports numerical groundwater flow and transport models currently being implemented at LANL.

This year, Bureau researchers compiled and evaluated data associated with the joint (NMED-LANL-USGS) tritium/helium regional age dating project. Preliminary results for this project were reported at the February 2006 Espanola Basin Technical Assessment Group conference in Santa Fe. Bureau staff provided all illustrations, graphics, and maps to LANL for publication as a LANL technical report. In addition, Bureau staff provided LANL a tritium/helium ($^3\text{H}/^3\text{He}$) groundwater data spreadsheet for all samples collected by LANL and NMED. These $^3\text{H}/^3\text{He}$ data, along with radiocarbon ^{14}C data will be used to determine recharge sources and age of regional and local groundwater. A joint LANL, USGS and NMED publication is scheduled for July 2007. This completes the Bureau's commitment for the FFY 2005, tritium/helium regional age dating project.

Carbon 14

The Bureau initiated a radiocarbon age dating project and collected samples at many of the facility's deep regional wells. Radiocarbon age dating provides information for determining recharge sources and age of the waters in the regional aquifer (including drinking water). In all, 27 groundwater samples were collected for radiocarbon analyses. These data will provide direct evidence for quantifying contaminant-mixing fractions, diffusion-dispersion gradients, contaminant travel times, and spatial variations in recharge and variability in recharge rates. Findings from this project will be released in 2007 and will have implications for water-resource protection with respect to water quality and quantity.

Noble Gasses

The Bureau also began collecting ground water samples for noble gasses as part of an in-progress project. This method provides the most accurate information for identifying recharge elevations useful for locating contaminant inputs at the drinking-water aquifer. These data will lower the uncertainties in the Laboratory's conceptual and numerical groundwater flow and transport models, and will increase the remedial-action efficiencies. This characterization tool is also important in aiding hydrologists involved with such issues as specified under NMED's Consent Order. Noble gas collection requires a special sampling apparatus similar to that used for the 2005 joint LANL-NMED tritium/helium regional age dating project. Bureau staff collected noble gas samples at eight locations by year's end. NMED will secure a contract with the United States Geological Survey, Denver to analyze all project samples through 2008.

Background Perchlorate in Ground Water Project

In 2006, the Bureau completed the data-collection portion of the background perchlorate project. Fourteen samples were collected and analyzed for low-level perchlorate. The additional data were gathered to increase the data pool that will allow NMED and LANL researchers to more accurately refine the analytical precision and statistical upper tolerance levels that have been calculated to date for different groundwater regions within the northern Rio Grande corridor. For the study period, a total of 141 results were collected by the Bureau and LANL, including 120 results from the Los Alamos area and 21 from the Taos area. Thirteen results were also obtained from local precipitation at Los Alamos. The data set will allow NMED and DOE to provide scientifically defensible information on any perchlorate standard proposed by either EPA or the State of New Mexico Water Quality Control Commission. The calculated mean background perchlorate concentration for the Los Alamos ground-water flow system is 0.27 $\mu\text{g/l}$ with a one-

standard deviation of 0.06 µg/l. Evaluation of these data indicate background perchlorate concentration in the Los Alamos ground water is independent of aquifer location, recharge source(s), or age. Samples collected in the Taos area contain lower levels of perchlorate with a mean of 0.12 µg/l (+/-0.03 µg/l). Sampling stations were selected based on technical considerations such as aquifer location, age, and water quality (i.e., lack of anthropogenic contaminants such as nitrate).

The Bureau also re-submitted perchlorate and anion data collected over the past four years in the vicinity of Los Alamos to LANL's Chem-ACDI Group. The NMED data were requested by LANL for supplementary information for their response to a comment from the HWB regarding the perchlorate discussion in the LANL background report.

Chromium in Regional Aquifer

Bureau personnel became aware of elevated chromium in a regional (deep aquifer) well in late 2005 after reviewing LANL's regional well reports for R-28 and R-11. In late December, a LANL press release showed new measurements of chromium in the 6+ oxidation state at levels between 373 µg/l to 404 µg/l from regional aquifer well R-28 located in Mortandad Canyon. These levels are more than 8 times above New Mexico's WQCC groundwater criteria and more than 4 times above the EPA drinking water criteria. Bureau staff noted that the data reported in LANL's press release only indicated more recent data from 2005. Earlier chromium detections from 2004 referenced in their regional well reports for R-28 and R-11 were also above regulatory criteria, but apparently had been overlooked by LANL. Subsequently, LANL was cited by NMED for failing to notify the regulatory authority of its earlier findings.

The Bureau worked with both DOE and HWB investigators to evaluate historical operations at the laboratory in order to identify sources of the chromium contamination. LANL historically used chromium to prevent algal growth and mineral scaling in cooling towers. Many of these structures are known to have used chromium anti-scaling agents throughout the facility though chromium is no longer used for that purpose at LANL. The power plant cooling tower at TA-3 above Sandia Canyon is suspected to be the primary source of the chromium found in the regional aquifer.

Chromium measurements in the Los Alamos County drinking water production wells have not shown chromium concentrations above background levels that range between 3-5 µg/l.

The White Rock Canyon Environmental Surveillance-Sampling Event

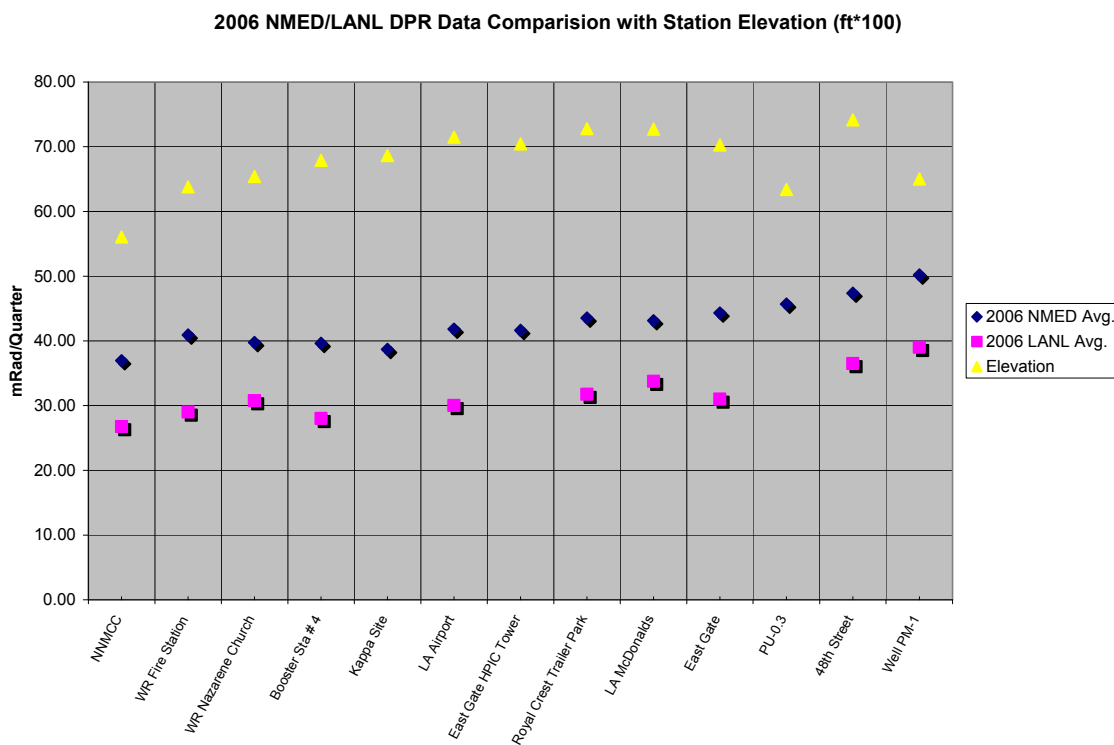
The White Rock Canyon environmental surveillance-sampling event is conducted each year to comply with DOE requirements and provide supportive water quality data under NMED's Consent Order. The event also provides the public with an annual assessment of the water quality being discharged (via springs) from beneath LANL to the Rio Grande. This public perception is paramount in light of the Santa Fe's Buckman Direct Diversion Project that will provide drinking water to the city in 2010. Bureau staff participated in the annual White Rock Canyon environmental surveillance-sampling event. The Bureau hired a rafting company for the 4-day event to bring six of its staff down the Rio Grande from Otowi Bridge to Cochiti Reservoir. NMED floated the Rio Grande along with LANL and Pueblo staff for the collection of water samples from over 25 selected river and spring locations. The Bureau collected samples for the

analysis of metals, ^{90}Sr , total uranium, ^{14}C (in support of supplementing LANL's 2005 regional age-dating project), high explosives, PCBs and perchlorate. Some additional ^{14}C samples were collected a week after the surveillance trip to replace several glass containers from the Spring 5 series broken during the shipping process. EPA Region 6 provided \$14,000 for sample analyses. The Bureau managed all the data and will provide results to DOE, EPA, NMED and the public during 2007.

Direct Penetrating Radiation Monitoring

The Bureau submitted direct penetrating radiation data to DOE for each quarter of calendar year 2006. The Bureau synchronized its reading with that of LANL in order to get a closer matching time interval when comparing our electret results with LANL's TLD results. The Bureau obtains its results using ElectretTM technology at the Bureau's 12 locations in the vicinity of Los Alamos, Santa Fe and Espanola. One non-perimeter station at the KAPPA NEWNET site was eliminated in 2006 due to the closing of the TA-18 Criticality Facility.

Even though the Bureau's DPR measuring technology is different than that used by LANL, the values may still be qualitatively compared to LANL values from their thermal luminescent devices (TLDs) that share the same or similar locations as the Bureau's Electrets. The following graph demonstrates how the Bureau's data tracks with LANL's data.



The DPR database was upgraded and user documentation was created to enable its adoption by other programs (for example our WIPP Program or the Embudo Community monitoring group). The Bureau values continue to be higher than LANL TLD results in part due to the sensitivity of our samplers to cosmic radiation. In general, the graph implies that the values track and LANL

values are valid. The dose levels at these stations are consistent with natural background radiation values.

The Bureau has acquired quarterly temperature and relative humidity information through its use of Hobo™ data loggers that were installed during the latter part of 2005. These data loggers were deployed at select Electret™ stations to determine the actual temperature to which the Electrets™ are exposed in their canisters. These data loggers are currently deployed at stations where the Bureau cannot use a nearby representative LANL weather tower.

Low-Volume Radioactive Particulates and Tritium Monitoring

The Bureau collected samples from its five facility perimeter stations located at:

- White Rock Fire Station;
- PM-1, located at the intersection of State Road 4 and the Truck Route;
- Royal Crest Trailer Park;
- McDonalds above TA-41, situated behind the Los Alamos McDonalds; and
- Los Alamos Airport near East Gate.

The analytical cost of operating the Bureau's five AIRNET stations is approximately \$6,000 per quarter. Fourth calendar quarter sample analyses were funded by EPA Region 6 because the Bureau did not have sufficient DOE funds.

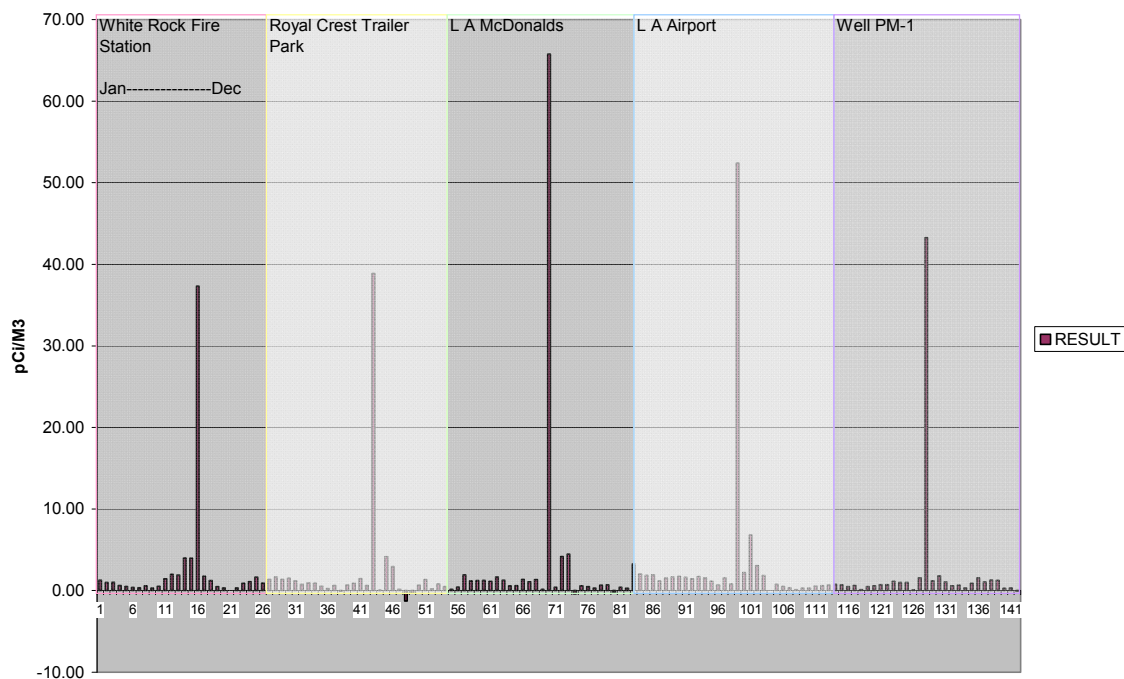
Funding for sample analyses came very late in the year and samples from the first three calendar quarters were not able to be shipped for analysis until September 2006. The results of 2006 particulate analyses will be submitted to DOE in early 2007. Tritium results will be submitted shortly after the particulate radioisotope data. Bureau data generally was within regional background levels. The tritium spike from July shown in the graph below had already been detected and investigated by the LANL AIRNET program by the time NMED received the results.

Tritium samples are collected for each 2-week period and are normally sent to NMED's contract laboratory for analysis at the end of the quarter. The particulate filters collected bi-weekly are composited quarterly and submitted for analyses for isotopic americium, plutonium and uranium.

The Bureau uses the same collection apparatus and absolute humidity method as used by LANL. This change in procedure made in 2005 offers a better comparison of the results between the Bureau and LANL.

The following graph illustrates characteristics of the raw tritium (³H) data set. Statistical analysis of the data will be performed during 2007 to compare NMED results to LANL's results and to publish statistically significant conclusions about the ambient environment.

H-3 Results for CY 2006, NMED AIRNET



The graph above does not allow for the individual sample numbers to be legible. Please do note that the high values are at each of the 5 stations for samples from the same two week period in July. LANL conducted planned tritium releases at TA-21 during this period and operations at TA-21 were stopped permanently in September 2006 as one of the TA-21 shutdown activities.

High-Volume Air Quality Monitoring

Particulate samples were collected during an initial 6-day run at the Los Alamos Airport Ash Pile cleanup site during the first quarter of 2006. Two portable air samplers were deployed adjacent to Bureau AIRNET sampling station for monitoring particulates in air during the site preparation and vacuum operations. The portable air samplers can collect air volumes at rate of up to 40 cfs as opposed to the stationary AIRNET stations that collect at a constant rate of 4 cfs. In late 2006, sampling resumed after a break in clean-up activities following a late-2005 operational shut-down that occurred because the DOE cleanup crew unexpectedly unearthed a small quantity of unexploded ordnance. Sample results for PCBs, dioxins and metals were submitted to DOE during the fourth quarter of 2006.

Bureau staff met with LANL personnel to scope out monitoring work-site air during the MDA B clean-up project at TA-21. Due to uncertain DOE revenue, EPA committed to fund the analytical costs of the project during 2006. Bureau management worked with personnel to develop cost estimates for background and operational sampling for the EPA funding source. The Bureau submitted an approved sampling and analysis plan to EPA Region 6 and prepared samplers to collect background level samples at the MDA-B cleanup site. Bureau staff also scouted and selected sample locations in addition to meeting with LANL and Los Alamos County personnel to secure permission for deploying its samplers. By year's end the MDA-B

cleanup was still in the planning stage, requiring the Bureau to re-schedule its MDA-B monitoring activities during 2007.

Contaminants in Fish Tissue Monitoring

The Bureau collaborated with the SWQB on the Fish Tissue Contaminant Sampling Program Sampling Analysis Plan (SAP) development. Multiple fish composite samples are used to provide more statistical power per analysis. Skin-on fillets from up to ten fish of the same species and size class are combined into one sample.

Samples of smallmouth bass, catfish, trout, walleye, and carp from Abiquiu and Cochiti Reservoirs were collected in October 2006. One five-fish composite sample of carp was also collected from McAllister Lake (background site) and submitted for analysis with the Abiquiu and Cochiti reservoir samples in late 2006. Tissue samples were analyzed for polychlorinated biphenyls, organochlorinated pesticides, polybrominated diphenyl ethers (flame retardants), dioxin/furans, arsenic, and methyl mercury. Fish tissue sampling results will be reported in the 2007 Annual Report.

Benthic Macroinvertebrate (aquatic insect) Monitoring

Bureau staff developed a Macroinvertebrate monitoring SAP. Sampling was conducted in September 2006 at four streams at LANL (Water, Pajarito, Sandia and Los Alamos) and will be submitted for analysis during 2007. Macroinvertebrate community evaluations will be used to evaluate post Cerro Grande fire watershed recovery. Sampling results will be reported in the 2007 Annual Report.



SANDIA NATIONAL LABORATORIES

Public Outreach at SNL

Bureau staff led the New Mexico Environment Department's effort to update the analytical laboratory services price agreements. The Bureau benefits by securing definitive pricing for the next four years for its analytical contracts. Staff reviewed seven offers for completeness and distributed the offers to the evaluation committee. Bureau staff and the Department evaluation committee responded to the written questions sent in by the potential bidders and attended oral presentations. The new contract was finalized in April 2006 and five laboratories, including three New Mexico labs, were chosen. One laboratory that was not selected filed a formal protest and State Purchasing is coordinating the appeal process.

Bureau staff provided over 100 comments on Sandia's Long Term Stewardship Implementation plan. Bureau staff also met with DOE and Sandia representatives to discuss long-term environmental stewardship and our comments on the plan. In addition, staff attended the DOE/Sandia long term stewardship public presentation at the Atomic Museum.

Other public outreach activities included a Bureau presentation of perchlorate data at the DOE/DOD quarterly meeting and attendance at a public meeting regarding the Mixed Waste Landfill at SNL.

Bureau staff participated in discussions with the HWB and citizen activist groups such as CCNS to discuss the competence of monitoring wells and their associated data at LANL and at the Mixed Waste Landfill (MWL) at SNL. One issue discussed was how the use of drilling fluids in well construction and development may have compromised the integrity of monitoring wells and the potential that water recovered from the wells may not be representative of the formation thereby putting the accuracy of monitoring data at both facilities into question. Another issue discussed was the sampling methodology used at SNL for low producing wells (pumping dry and waiting until the next day to sample) and potential effects on volatile compounds data.

Bureau staff assisted in judging the Rio Rancho High School science fair. There were 532 entries in the fair and over 50 projects in the Environmental/Earth Science category. The winning project for the Environmental category was titled "Insect Detection of Insecticide."

Bureau staff assisted in judging the NM Regional Science Fair. One project presented was by a student who developed a technique that determines the sex of salmon. The student has a patent pending and was chosen to go to the International Science Fair.

New Mexico State Fair

Bureau staff from all offices helped operate an informational booth for NMED at the New Mexico State Fair. At this booth, staff handed out information pamphlets and packets of 225 million year old salt from the WIPP depository as well as addressing questions from the public on the environmental impact of DOE activities at LANL, SNL, and WIPP. The Bureau is evaluating how to better use this venue to communicate with the public in 2007.

Environmental Monitoring at SNL

Penetrating Radiation Monitoring

Bureau staff conducted quarterly ambient penetrating radiation measurements at four SNL Electret monitoring stations. Electret ion chambers are passive devices used for the integrated measurement of ionizing radiation. Staff updated the field data spreadsheets to reduce transcription errors. The 2005 annual ambient radiation monitoring results were submitted to DOE for review and comment. The Bureau results trended closely with Sandia TLD (thermoluminescent dosimeter) network readings. Elevated results at one location (Los Lunas fire station) were attributed to the Village of Los Lunas having moved and modified our monitoring station without notifying us. The station was reconfigured and ambient penetrating measurements have returned to within their normal range. All other station readings were consistent with past measurements.

Low-Volume Radioactive Particulates and Tritium Air Monitoring

Bureau staff continued bi-weekly collection of radioactive particulate filters from four perimeter stations and at the SNL MWL. The filters were composited quarterly and analyzed for isotopic uranium and gross alpha/beta, and gamma radioactivity. The silica gel canisters from each site were analyzed for tritium. The new MWL motor was removed from the field and was replaced with a re-manufactured motor which has been running well although some issues with the power supply still exist. Staff modified the MWL instrumentation so that heat from the motor exhausts outside the station. This configuration is intended to prevent motor overheating and may improve data quality. Data results are pending and will be evaluated against available data and compared to long-term trends.

Groundwater Monitoring

Bureau staff attended monthly groundwater coordination meetings with SNL. Bureau staff collected 75 split groundwater samples with SNL and independently sampled for PCBs at the Chemical Waste Landfill. Twenty-three samples were analyzed for perchlorate, high explosives, volatile organic compounds, diesel and gasoline range organics under one-time-only funding provided by the U.S. EPA. Fifty-two samples were archived due to unresolved funding issues. Five samples were lost due to exceedance of holding time and the remaining forty-seven samples were submitted during the first quarter of FY07 when funding issues were resolved. Data results are pending and will be evaluated against available data and compared to long-term trends.

High Explosives Monitoring

Bureau staff split soil samples with SNL at SWMU 58/8 and the Coyote Blast Area. Each site was sampled for contaminants including high explosives, metals and radiological constituents.

All samples were submitted to analytical laboratories for analysis. Data results are pending and will be evaluated against available data and compared to long-term trends.

Storm Water Monitoring

Bureau staff met with Sandia staff to discuss storm water monitoring strategies, data assessment protocols, and FFY 2005 storm water findings.

All sides agreed:

- SNL will add gross alpha to storm water analysis suite;
- The Bureau will analyze for isotopic uranium using the ICP MS method to allow direct comparisons with SNL data;
- There is a need to standardized methods for analysis, such as count times between the Bureau and SNL;
- There is a need to standardize sampling protocol between the Bureau and SNL.

Bureau staff deployed the storm water monitoring network and collected 10 samples. Samples were submitted for analyses under a one-time funding grant by EPA Region 6. Results will be evaluated against available data and compared to long-term trends.



David Gallegos, a summer intern, deploys a single stage storm water sampler in Laurence Canyon below the Burn Site

Near record rainfall events in the SNL area produced high flows in Arroyo del Coyote causing erosion at Solid Waste Management Unit 58/8 which developed up to 7 foot deep channels on

the main road and washed out our sampling location. Sampling equipment was recovered downstream, rehabilitated and re-deployed.

Perchlorate Monitoring

Bureau staff sampled for perchlorate at the City of Albuquerque's Garfield regional aquifer monitoring wells, the Chemical Waste Landfill, Tijeras Arroyo Groundwater monitoring wells and at EOD Hill. Perchlorate was found at or slightly above 1 µg/l at LWDS-1 well located near TA-V and at 1,000 µg/l at EOD Hill. The source of the EOD Hill perchlorate is under investigation.

Bureau staff evaluated two different analytical methods, EPA SW-846, 8321A (Modified), also known as LC/MS/MS, and EPA method 314.0. The EOD Hill samples were analyzed by two separate laboratories using both methods. At low concentrations method 314.0 overestimates by about 27% and at higher concentrations, the method underestimates by about the same percentages. Inter-laboratory comparisons for both methods were comparable.

NPDES Outfall Monitoring (Waste Water Monitoring)/Spills

Bureau staff met with the DOE Water Quality Manager for SNL to conduct an inspection of a diesel spill site and to discuss spill reporting protocols at Sandia in general.

Bureau staff submitted three spill close-out letters to appropriate regulatory Bureaus and SNL recommending that these spills be administratively closed and taken off the books due to appropriate corrective actions taken by SNL.

Bureau staff evaluated the data from a 4-day composite sample split collected with SNL at wastewater station 11 in TA-3 in September 2005. A draft data release has been submitted to DOE POC for review and comment. The Bureau's Sandia Oversight Section staff collected a second composite sample at wastewater station 11 to develop data for trending analysis. The Bureau will use these samples to evaluate whether radiological constituents discharged by SNL meet State Radiation Protection standards.

Biota/Terrestrial Monitoring

Bureau staff compiled 2005 soil data and submitted draft results to DOE representatives for comparison of SNL Annual Terrestrial Sampling data and SWMU 58-8 RFI data. Staff began graphing metals and radioactive constituents in soils against vegetation concentrations to better understand bioconcentration of contaminants at SNL.

D & D Activities (Demolition and Decommissioning) Monitoring

Bureau staff met with DOE and SNL to discuss our proposal to perform air monitoring and sampling during the demolition and decommissioning of Building 806. The general demolition and decommissioning sampling and analysis plan, specific mini-SAP for building 806, and DOE checklist were submitted to and approved by DOE. The Bureau's LANL Oversight Section staff provided the Bureau's Sandia Oversight Section with equipment, calibration assistance and training in the use of high-volume air monitoring equipment.

Bureau staff collected five air particulate background (pre-demolition and decommission) samples at Building 806 along with six samples collected during demolition activities. Demolition activities were not continuous at the site with work stoppages lasting for weeks at a time. Sampling was discontinued on June 30 prior to site work being finished. Samples were archived until funding issues were resolved. Samples will be analyzed for asbestos, metals, total uranium, gross alpha/beta, and gamma radioactivity.



WASTE ISOLATION PILOT PLANT

WIPP Background

The Waste Isolation Pilot Plant (WIPP) is the nation's only active deep underground repository for the permanent disposal of radioactive waste. The WIPP is owned by the Department of Energy and has been authorized by the U.S. Congress to dispose of DOD legacy transuranic waste primarily generated during nuclear weapons manufacturing. Transuranic waste is defined as containing more than 100 nano-curies of alpha-emitting transuranic isotopes per gram of waste with half lives greater than 20 years. Construction of WIPP began in 1981 and received the first waste shipment in March of 1999. WIPP is located in southeastern New Mexico in Eddy County (Figure 1) and is managed in part as multiple use public land as well as for the exclusive use of DOE to meet the WIPP mission. Land ownership was formally transferred from BLM to DOE in 1992 with the passage of the WIPP Land Withdrawal Act as amended (P.L 102-579) (Figure 2).

During 2006 DOE disposed only contact-handled waste at WIPP with plans to begin disposing of remote-handled waste at WIPP in early 2007. Contact-handled waste is placed in new steel drums at generator sites (e.g., Los Alamos National Laboratory, Idaho National Laboratory, Hanford Site, etc.), shipped to WIPP in special transportation containers, and emplaced 2,150 feet below ground in mined Salado bedded salt formation. This salt formation is expected to contain the nuclear waste for at least 10,000 years (see EPA rulemaking specific to WIPP, 40 CFR Part 194). No extra shielding is required around the steel drums to prevent dosing workers during routine drum disposal activities. However, when remote-handled waste arrives at WIPP heavy shielding and remote-controlled equipment will be required due to gamma emitting waste potentially as high as 1,000 rem per hour on contact.

Public Outreach at WIPP

WIPP Quarterly Technical Meetings

The Bureau has joined the DOE and the NMED Hazardous Waste Bureau in hosting the quarterly technical meetings mandated by the WIPP originating documents. Bureau staff presented current WIPP radiation monitoring data at each of the quarterly meetings in 2006.

Environmental Monitoring at WIPP

Scope of Work

The Scope of Work developed between the DOE and State of New Mexico identified 10 program areas:

1. Monitor discharges and emissions from the WIPP facility;
2. Monitor water quality in the vicinity of the facility;
3. Monitor air quality in the vicinity of the facility;
4. Radiological surveillance in the vicinity of the facility;
5. Monitor soils, sediments, and biota;
6. Monitor transportation within New Mexico of transuranic waste to the WIPP repository;
7. Characterize transuranic waste at sites intending to ship waste to WIPP and their preparations for shipment;
8. Review of submittals to NMED and other agencies (e.g. the US Environmental Protection Agency and the Nuclear Regulatory Commission relating to the WIPP program);
9. Review current and historical data to assess contaminant pathways and risk levels; and
10. Provide information to Tribes, local governments and the public.

To meet the first program area, the Bureau developed an air-monitoring program based upon the past environmental assessments of the WIPP performed by the de-funded Environmental Evaluation Group. Bureau staff reviewed the WIPP Site Environmental Impact Statement and WIPP Site Environmental Impact Statement II and it was agreed that the primary pathway for exposure at the WIPP would be through an airborne release scenario. The primary air discharge points at the WIPP are stations A, B, C, and, in part, D.

Station A is on the surface at the top of the Exhaust Shaft (Figures 3 and 4). Station B is on the surface and resides in the exhaust ductwork after the HEPA filtration units and confirms the effectiveness of the HEPA units should an airborne release occur.

Station C is on the surface on the second floor of the Waste Handling Building and samples the exhaust air from waste handling activities. All Waste Handling Building air is HEPA filtered. Currently, the waste handling building utilizes a once through, negative pressure air circuit and station C samples air that will be released to the environment. Work is underway to modify the ductwork to a re-circulating system. Stations A and C are fitted with Continuous Air Monitors (CAM) that alert personnel of a potential release of radioactivity. At station D, a CAM alarm triggers a switch to HEPA filtering of ventilation air prior to release to the accessible environment. Station D is unusual in that it is located in the underground at the base of the exhaust shaft and monitors air flow from the waste disposal area of the repository (Figure 4). Station D is not sampled by the Bureau because it does not sample all the air circuits within the underground and thus is not suitable for collecting representative samples of total mine exhaust air.

Bureau staff have been collecting air filters from station A from August 2005 and continuing through all of 2006. Each day a staff member collects primary and back-up NESHAP filters at station A and loads the new filters into the collection ports (Figure 5). The primary filters have been composited monthly and are awaiting shipment to an approved state laboratory. Backup filters are not composited but rather are archived in case they are needed in the future. Staff have constructed a station A database to summarize the airflow data and for calculating source terms.

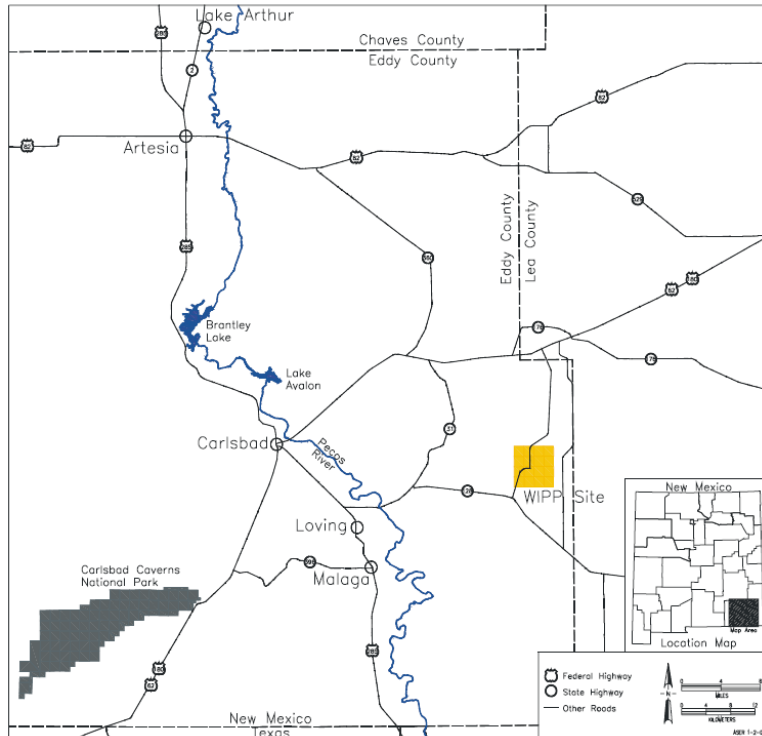


Figure 1. Map of WIPP position within New Mexico (WIPP ASER 2005).

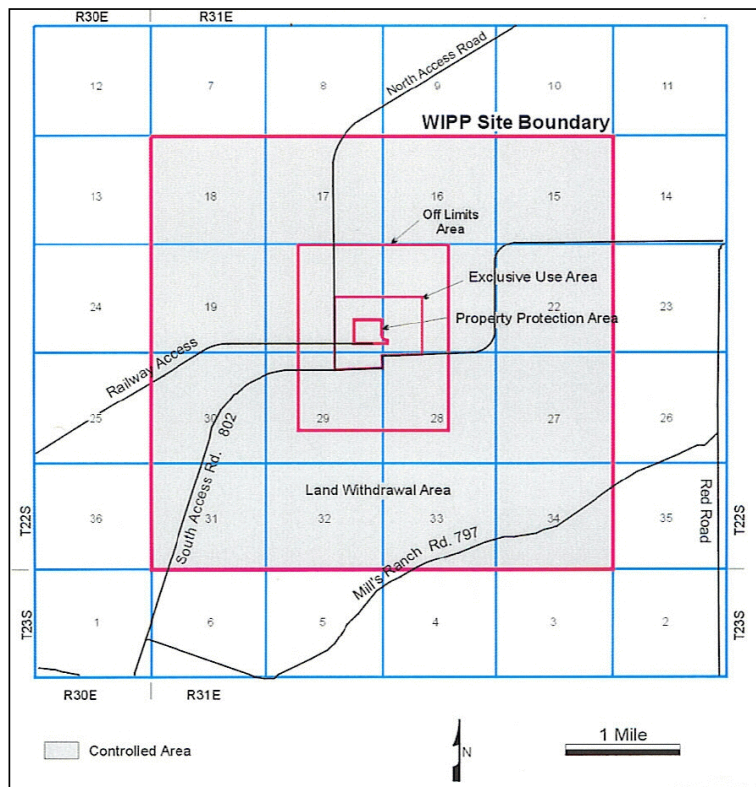


Figure 2. Legal description map of DOE's WIPP property with highlighted land management zones (WIPP ASER 2005).

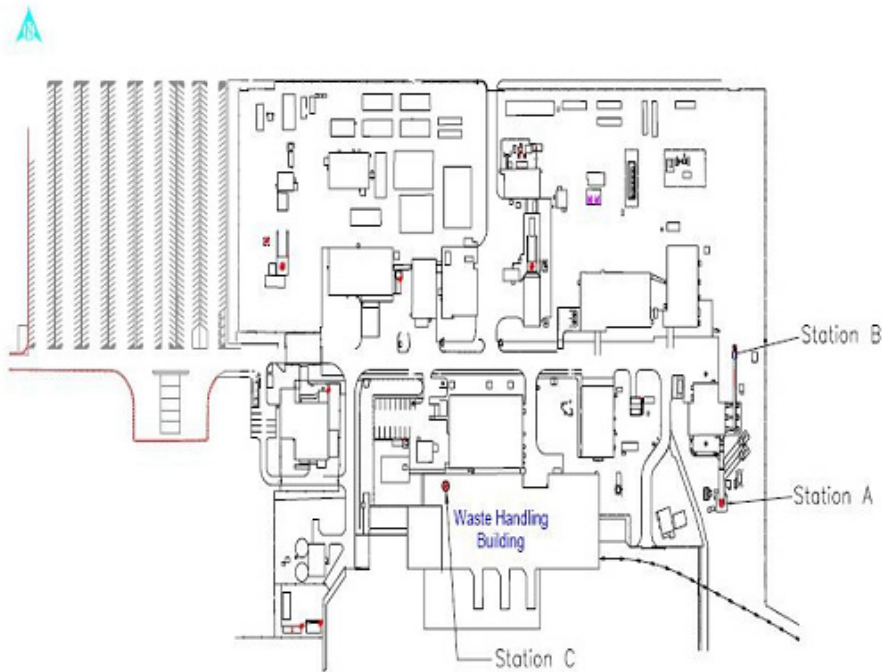


Figure 3. Aerial depiction of WIPP showing the location of Stations A, B, and C

WIPP Facility and Stratigraphic Sequence

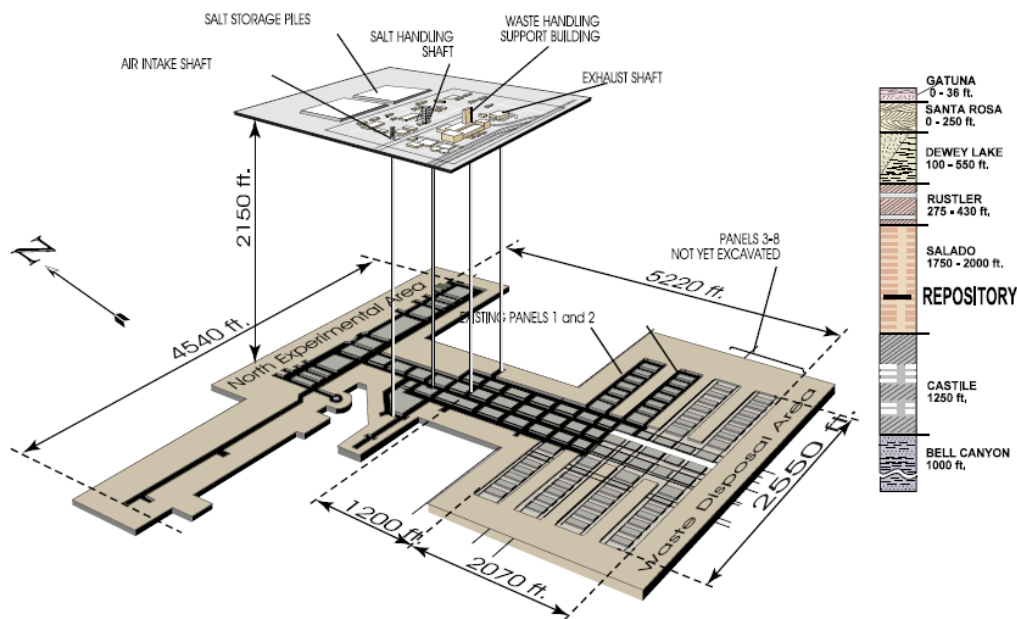


Figure 4. Cross-section of WIPP geology showing underground structures. Five panels are now mined with waste emplaced in panels 1-4

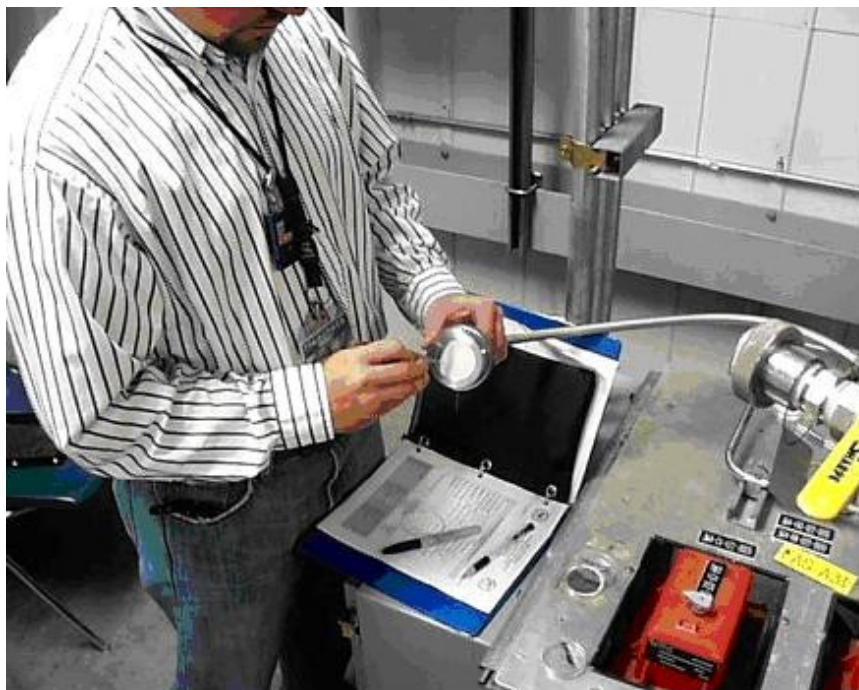


Figure 5. The Bureau's WIPP Oversight Office staff member, John Haschets, works with an air particulate filter.

The second program area involving monitoring water quality in the vicinity of WIPP is currently under development.

The third program area, low-volume air sampling, will validate both the area low volume air sample results reported by Washington Tru Solutions (WTS) and the results reported by Carlsbad Environmental Monitoring and Research Center (CEMRC). The Bureau is currently completing the quality assurance project plan (QAPP), procedures and job hazard analysis for the low-volume air sampling program. Plans to purchase sampling equipment, which will be located alongside the DOE and CEMRC sampling equipment, are underway.

To meet the fourth program area, Bureau staff have developed and deployed a perimeter Electrets™ monitoring program. Electrets are passive radiation monitors used to quantify doses from direct penetrating gamma radiation and are utilized by the Bureau at both Sandia and Los Alamos National Laboratory's. Fourteen electrets have been deployed at WIPP and one control was placed in Carlsbad (figure 6). The dose rate data measured at WIPP for the third and fourth quarters of 2006 did not differ from dose rates measured in Carlsbad (figure 7). Moreover, most dose rates measured during 2006 were within expected values of about 7-14 $\mu\text{R/hr}$.

The Bureau is preparing QAPPs to initiate soil, sediment, and biota monitoring in 2007 or 2008.

The Bureau cannot adequately address the program areas of waste characterization and transportation without access to the full WWIS database. At this time access to the WWIS database has not been granted by DOE.



Figure 6. WIPP electret locations. Control electret #15 is in Carlsbad

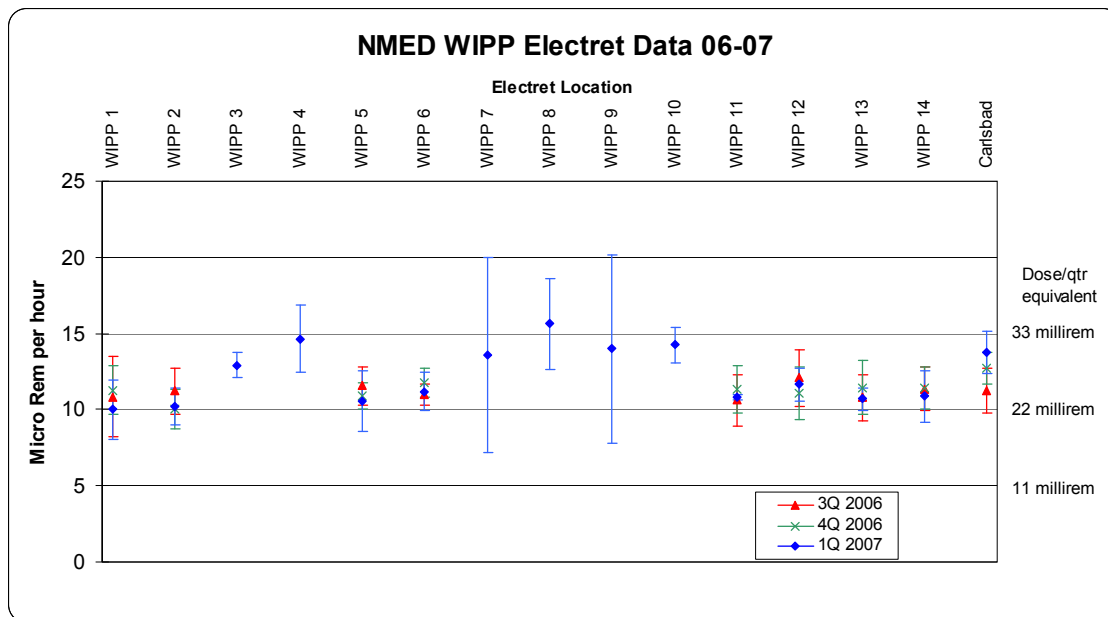


Figure 7. WIPP electret gamma doses during 2006 did not differ from the control dose rate. Gamma doses of ~11 µR/hr are typical of background dose rates.

Staffing

The Bureau’s WIPP Oversight office was fully staffed at the beginning of 2006. The staff included 2 environmental scientists, one engineer, one administrative assistant, and one staff manager. During the summer and fall three members left for private sector jobs within New Mexico. This left the office severely short-staffed and limited our capabilities at WIPP.

Training

Training has been another focus area for the Bureau’s WIPP Oversight Office staff, both for compliance to site requirements and compliance with State of New Mexico protocols and requirements. All scientists and the staff manager maintain current WIPP training to allow unescorted access to the underground mine and access to areas requiring personal dosimetry.

Effluent Monitoring Improvement Group (EMIG)

The EMIG is a group of all entities involved with effluent sample collection at the WIPP and is charged with the task of continually reviewing the effluent monitoring program for updating and coordination of sampling activities. This group consists of the DOE, WTS, CEMRC, Oversight Bureau and on-site contractors. The EMIG is currently evaluating “coatings” to be placed on the probe tips at Station A to decrease the effects of salt encrustation. The Bureau has also stressed to DOE contractors the need to evaluate methods to measure salt occlusion on the Station A shrouded probes to remove guesswork and visual estimation when they make probe performance pass/fail determinations.