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LANL General: Acid Canyon

OVERSIGHT DOE BUREAU

The New Mexico Environment Department's Environmental Oversight and Monitoring Program of the Department of Energy

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DOE Cleanup of Acid Canyon Tributary

By Steve Yanicak

On September 10th LANL's Environmental Restoration Project began a cleanup project in a small tributary of Acid Canyon. This cleanup of radioactive contamination culminates years of investigations by DOE and Los Alamos National Laboratory, and more recently by the New Mexico Environment Department and the U.S. EPA. Contamination in the canyon bottom is a result of wastewater discharges from a radioactive liquid waste treatment facility (the former TA-45) located in Los Alamos, northeast of the intersection of Canyon Road and Central Avenue. The facility discharged untreated and treated radioactive effluents from 1944 until it was decommissioned in 1964. The site was then decontaminated, cleaned up, and all of the buildings were removed except a vacant sewage lift station. The County of Los Alamos now owns the property and maintains recreational facilities in the area including an aquatics center, skate park, and hiking trails through the canyon.

Workers remove contaminated soil in the South Fork of Acid Canyon. Note the vacuum pipe in the foreground.

In 1999, the Oversight Bureau investigated contamination in the South Fork of Acid Canyon using a methodology developed by LANL's Environmental Restoration project. The method relies heavily on detailed geomorphic mapping and radiation screening to identify sediments most likely to contain the bulk of the contamination. We were surprised to find that high levels of plutonium contamination still existed in discrete "sediment packages" or "hot spots," despite extensive sampling and several cleanup efforts by DOE over the past thirty-five years. Our samples, and samples later collected by LANL, found levels of plutonium on the order of 8,000 pCi/gram. While the average concentration, taken over the length of the tributary was significantly lower, we were concerned with the existence of such hot spots of contamination in a publicly accessible area. The Environment Department recommended that DOE clean up these hot spots and similar recommendations soon followed from the Northern New Mexico Citizen Advisory Board and local advocacy groups, most notably Concerned Citizens for Nuclear Safety (CCNS).

The clean-up strategy, developed by LANL with stakeholder input, targeted the removal of 228 cubic yards of plutonium-contaminated hotspots.

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Development of Cleanup Levels for Acid Canyon

By Steve Yanicak

Most cleanups at DOE facilities are performed on a risk-basis, that is an analysis of risk to human health is conducted which takes into account many factors such as land use (i.e., agricultural, industrial, residential, or recreational), exposure pathway (e.g., inhalation, ingestion), and toxicity of the contaminants. This "risk assessment" can then be used to determine what level of contamination is allowed to remain at a site. When radionuclides are the contaminants of concern, an assessment of radiological dose rather than risk is used by DOE to assure the cleanup is protective of public health.

A team of DOE, LANL, and NMED representatives came to consensus on the many parameters used in the dose assessment for the South Fork of Acid Canyon. The dose assessment concluded there was no unacceptable dose to individuals jogging or hiking the trails through the Canyon. However, due to the proximity of the site to residential areas and recreational facilities, both NMED and EPA questioned whether the "trail user" scenario used in the assessment was conservative. The team then developed a scenario called the "extended backyard" which recognizes that children could use the canyon as an extension to their backyard and play along the stream channel. Using LANL, NMED, and EPA sample data averaged throughout the entire site, the model calculated a potential dose for such a child (age 6–12, with a total exposure duration of 6 yrs) of 12.7 mrem/yr. This dose was less than the 15 mrem threshold DOE had chosen, based on their examination of the literature. Given the uncertainties with the extended backyard scenario (a child could play repeatedly in one location), and the distribution of contamination in hot spots, we questioned the appropriateness of averaging the data. Were one to average only the data for the hot spots, the calculated dose would far exceed the 15 mrem/yr threshold.

An independent risk-based assessment was performed by NMED's Hazardous Waste Bureau using a screening approach developed by LANL's Environmental Restoration project to calculate single radionuclide soil guidelines. Based on a one in one hundred thousand (1:100,000) cancer risk, and the same parameters used in the dose assessment, NMED calculated a single radionuclide soil guideline for plutonium-239 of 290 pCi/g. This result is virtually identical to the 280 pCi/g level for plutonium-239 derived from the 15 mrem/yr annual dose threshold. The real difference between the two approaches is how the calculated levels are applied. NMED uses the calculated value as a remediation goal, which samples taken to verify attainment of cleanup goals should not exceed, whereas DOE/LANL applied their value as a threshold that a weighted average of all sampling data should not exceed.

Ultimately, our different approaches to applying the results of assessment of dose or risk were overcome by other factors. LANL proceeded with the cleanup in response to stakeholder concerns and DOE's desire to remove the hotspots and reduce potential public exposures. The cleanup levels actually achieved are expected to be well below the original cleanup goal based on circumstances involved with the cleanup operation (see the article on Cleanup of Acid Canyon).

DOE Oversight Bureau Contacts

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Oversight Bureau Evaluates Los Alamos Watersheds

In September, two Bureau scientists attended a weeklong course in Pagosa Springs, Colorado, to learn methods for characterizing stream channels. The ability to characterize and evaluate changes in stream channels will be useful in monitoring the effects of the Cerro Grande fire on Pajarito Plateau watersheds.

Course participants learned how to collect field measurements of key features within a watercourse, and how to characterize the watercourse using the Rosgen method of stream classification. This method consists of establishing permanent, benchmarked measurements of stream dimensions that can be used to document stream channel adjustments (down cutting, deposition or eroding new channels) to changes in stream flow and sediment supply.

Shortly after the Cerro Grande fire, the U.S. Geological Survey established cross sections across stream channels in many of the Pajarito Plateau watersheds. We have begun to resurvey these locations to measure changes in the watercourses due to increased stormwater runoff and sediment loads because of the fire. We are using the standard methods taught at the course to sample bed-load sediment and suspended sediment, and measure bank erosion rates. This will enable us to quantify the sediment being discharged by these canyons, and evaluate whether areas with known contamination are threatened.

We will be sharing our findings with the Pajarito Watershed Management team, which includes representatives of the Laboratory, the State, Los Alamos County, the U.S. Forest Service, and the Pueblos. The team's primary focus is to monitor the condition of Los Alamos watersheds and evaluate the need for possible future restoration activities.

Activities at Sandia's Chemical Waste Landfill Excavation Project

by Rich Kilbury

Sandia National Laboratories began excavating and removing wastes from the Chemical Waste Landfill (CWL) on September 30, 1998. Waste materials were disposed of in the landfill from 1962 until 1985. The excavation is one of the most complex environmental remediation projects undertaken at Sandia. We've worked with Sandia to ensure the project is protective of the public health and environment and that changes occur in accordance with regulatory requirements.

Oversight of Sandia's largest Environmental Restoration project includes participation in frequent update and planning meetings. This year, Bureau staff worked on several issues that involved developing treatment pathways for various waste types, including debris shredding and gas cylinder processing. We also helped develop changes to sampling, analysis, and waste management protocols that have resulted in significant improvements to sampling and analysis plans and modifications to the CWL Closure Plan.

As reported in the Spring/Summer 2000 edition of the Environmental Reporter, Bureau staff played a key technical role in the development of an approved risk-based approach that will allow soils that pass the Environment Department's residential risk levels to be returned as backfill to the CWL. Currently, there are approximately 5,000 cubic yards of soil that require no treatment that may be returned as backfill. We noted that concentrations of organic contaminants in excavated soils were lower than expected, and were below or very near Environment Department soil cleanup guidelines. We suggested that the original plan to treat these soils by Low Temperature Thermal Desorption might not therefore be necessary, thus eliminating unnecessary costs and potential air emissions.

The landfill excavation is permitted under an interim status Closure Plan approved by the New Mexico Environment Department in March 1997. By August 1, 2001, approximately 43,000 cubic yards of waste had been removed and characterized. The excavation project involves high-hazard operations that are anticipated to continue through the fall of 2001. Four primary areas of contamination have generated wastes contaminated with various organic compounds (solvent wastes), polychlorinated biphenyls (PCBs), chromium, tritium, radioactive materials, assorted debris, and gas cylinders.

Excavation to the 12-foot depth in all four areas was completed in July 2001. During 2000 and 2001, the Bureau took soil samples within the excavation using a 25-foot sampling grid. We also collected off-grid samples in areas where there was visible staining. Later this year, the Bureau will participate in additional sampling activities within the excavation. When verification sampling is completed, our results will be used to verify Sandia's results and to help confirm that remaining contamination does not pose unacceptable risks to the environment.

Sandia is currently excavating hotspots discovered during verification sampling in the Southwest Area. This area has been excavated to a depth of 20 feet due to the presence of PCBs that range up to 1,500 parts-per-million in concentration. PCB contamination and resulting remediation waste must be managed in accordance with the Toxic Substances Control Act. Two Bureau members entered the excavation to visually examine the PCB contamination and discuss potential methods for further investigation and remediation. Sandia is planning to investigate this area beneath the 20-foot limit of excavation using a hydraulic probe.

The Bureau will continue to oversee aspects of the closure of the CWL and provide recommendations to help assure that the project is completed in a manner that is protective of the environment.

Lance Voss examines PCB soil contamination at the 20 foot level in the Southwest Area of the Chemical Waste Landfill.

DOE Cleanup

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The strategy identified a clean-up goal consistent with the concept of ALARA, implying an overall reduction of radiation dose to levels that are "As Low As Reasonably Achievable" at the site. A team composed of representatives of DOE, LANL, and NMED developed a human health risk assessment together with target clean-up levels for the site (see the article on clean-up levels on p. 2). Because of the overall difficulty of using heavy equipment in the narrow canyon bottom and its close proximity to noise-sensitive residential areas, picks and shovels coupled with a powerful semi-truck-sized vacuum were used to vacuum the contaminated dirt into large steel roll-off bins for transport to LANL's low-level radioactive waste storage facility at TA-54.

Once the cleanup began, our oversight role focused on monitoring for radionuclide particulates in air, radiation screening of soils during cleanup, and sampling to verify that clean-up goals were met. We installed two high-volume air monitors on a prominent bluff overlooking Acid Canyon to monitor fugitive dust coming from the work site. Samples were analyzed for radioactive contaminants known to be present at the site: plutonium, uranium, americium, cesium, and strontium. We operated the air monitors during work hours and collected the first two samples during the period in which the most contaminated dirt was being removed. We later collected a sample when less-contaminated dirt was being removed. This strategy provided us with data from periods representing normal and worst-case exposure scenarios for mesa top residents or the occasional jogger or biker passing by the area. Preliminary analysis of our data showed that there was no unacceptable radiation exposure to residents or passers-by during the cleanup.

One of the most crucial elements of the clean-up operation was ensuring a reliable means of performing radiation screening of the dirt samples. From the outset, field screening coupled with timely laboratory results determined what soil would stay or be removed. For the clean-up goal of 280-piC/g plutonium-239, LANL developed a fairly precise correlation between a field screening result of 49-cpm and a laboratory result of 350-piC/g gross alpha activity. By taking independent side-by-side field screening measurements, our involvement gave greater confidence to decisions concerning soil removal and selection of samples to verify that clean-up goals were met.

By November 9th, final verification sampling and site restoration were underway, and the interim action was complete with over 450 cubic yards of contaminated soil removed, almost two times the original estimate. This higher level of removal was brought about in part by U.S. Department of Transportation limits on the amount of radioactivity allowed to be transported on public roads (additional soil was removed to dilute the material taken from the hot spots), as well as the fact that the actionable contamination was more extensive than originally estimated. The Oversight Bureau is pleased to have worked with DOE, LANL, EPA, Los Alamos County, and citizen advocacy groups in achieving this important cleanup. The cleanup demonstrates the Laboratory's ability to remove contamination in a manner that is environmentally sensitive and protective of the public health and safety.

Trailer-mounted vacuum rig and truck at the Acid Canyon clean-up site.

Staff Biography

Kim Granzow — Environmental Specialist

Kim Granzow has been an Environmental Specialist with the New Mexico Environment Department's DOE Oversight Bureau at Los Alamos since September 2000. She is the Project Manager of the Environmental Surveillance Water Program and provides GIS support to allow the evaluation of all activities and programs at Los Alamos National Laboratory. Ms. Granzow previously worked for ARCO Oil and Gas Company and Placid Oil Company as an Exploration Geologist. She is a graduate of the University of New Mexico with a BA degree in Anthropology (1978) and a BS degree in Geology (1979).

Public Meetings and Contacts

Cerro Grande Fire Risk Assessment Progress Meeting
December 12, 1 – 4 PM, NMED Offices
2905 Rodeo Park Drive East
Contact Barbara Hoditschek
428-2547,
barbara_hoditschek@nmenv.state.nm.us

Community Radiation Monitoring Group (CRMG)
Usual meeting time is 2:00 PM on the fourth Wednesday of each month.
Contact Bob Weeks, NMED
428-2558,
robert_weeks@nmenv.state.nm.us

Radiation Education and Awareness Program (REAP)
Contact Dr. Debra Thrall
277-0718, dthrall@unm.edu

Los Alamos National Laboratory Environmental Restoration Public meetings
Contact Carmen Rodriguez
665-6770

DOE/DOD Quarterly Public Meetings
Environmental Restoration and Waste Management Activities for KAFB and SNL
Contact John Gould 845-6089

Northern New Mexico Citizens Advisory Board
Contact Menice Manzanares
989-1662, www.nnmcab/org

Sandia National Laboratories Permit Public meetings
Contact Will Moats, NMED
284-5086

Los Alamos National Laboratory Permit Public meetings
Contact Carl Will, NMED
28-2542

Waste Isolation Pilot Plant Permit Public meetings
Contact Steve Zappe
428-2517

PCB and Mercury Contamination in Fish

by Ralph Ford-Schmid

The Oversight Bureau monitors contaminants that are associated with releases from Los Alamos and Sandia National Laboratories. Some of these contaminants also occur at low concentrations in the environment throughout the world. Mercury and a group of chlorine-containing organic compounds that include polychlorinated biphenyls (PCBs), dioxins, and furans are well known examples.

These contaminants are ubiquitous and persistent in the environment, hazardous at low concentrations, and have an affinity for living tissues. Also, in a process known as biomagnification, their concentration increases as they move up the food chain. This process has obvious negative implications for human health, given our position at the top of the food chain. The process can also be used to our advantage by making it easier to monitor levels of contaminants that are virtually undetectable in water.

Fish, often near the top of the aquatic food chain, are particularly useful in measuring low levels of these contaminants. Low levels of mercury can be measured using standard analytical methods. However, low levels of PCB and dioxin congeners, which are different forms of these compounds, must be measured using special high-resolution methods. Predictably, these methods are considerably more costly than standard methods.

We are currently evaluating analytical results from fish samples collected last year from Cochiti (9 samples) and Abiquiu (5 samples) Reservoirs, and a control site, McAllister Lake (1 sample). Abiquiu Reservoir is part of the San Juan-Chama River system, which joins the Rio Grande upstream from Los Alamos National Laboratory. Cochiti Reservoir is on the Rio Grande downstream from the Laboratory. McAllister Lake, near Las Vegas, New Mexico, is a playa lake supplemented with diversions from the Gallinas River via Storrie Lake. We compared our results to species-specific national average concentrations from a U.S. Geological Survey database and to averages found in a National Bioaccumulation Study by the U.S. Environmental Protection Agency. We also compared our results to EPA Screening Values (see table below) and to 2001 NMED Fish Consumption Guidance, although our samples consisted of both whole fish and edible portions (fillets).

Concentrations of mercury in fish from both Abiquiu and Cochiti Reservoirs were greater than the national averages. The mercury concentration in the one fish from McAllister Lake was less than the USGS average, although it was greater than the EPA average. The concentrations from northern pike and white bass from Cochiti and a smallmouth bass from Abiquiu may indicate a need for additional fish consumption advisories. Current fish consumption advisories for New Mexico can be found at www/swqb/ Fish_Consumption_Guidelines_for_Mercury_08-2000.pdf.

Total mercury, total PCBs, PCB TEQ*, and dioxin/furan TEQ*

	Total Mercury mg/kg (ppm)	U.S. EPA SV Total Mercury mg/kg (ppm)	Total PCBs (sum of all congeners) ng/g (ppb)	U.S. EPA SV Total PCBs ng/g (ppb)	Sum of 12 dioxin-like PCB congeners (TEQ) pg/g (ppt)	Dioxins & Furans (TEQ) pg/g (ppt)	U.S. EPA SV Dioxin (TEQ) pg/g (ppt)
Cochiti Reservoir (9 samples)	0.2 to 2.2 Average 0.8	0.6	5.0 to 89.0 Average 22.7	10	0.2 to 2.1 Average 0.9	Non-Detect to 0.182	0.7
Abiquiu Reservoir (5 samples)	0.4 to 0.7 Average 0.5	0.6	1.1 to 27.5 Average 10.7	10	0.1 to 1.9 Average 0.7	Non-Detect to 0.005	0.7
McAllister Lake (1 sample)	0.1	0.6	6.6	10	0.1	Non-Detect	0.7

*TEQ = toxic equivalency quotients

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PCB and Mercury Contamination in Fish

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The concentrations of dioxins and furans in all fish sampled were lower than the national averages. The concentrations of PCBs in all fish were higher than the EPA averages, and lower than the USGS averages. Eight of the fifteen samples from Cochiti and Abiquiu Reservoirs exceeded the EPA screening value of 10 parts-per-billion total PCBs. The sum of the twelve dioxin-like PCB congeners exceeded the EPA screening value for dioxins in six of the fifteen fish sampled from Cochiti and Abiquiu Reservoirs. Currently there are no fish consumption advisories for PCBs or dioxins in New Mexico.

Los Alamos National Laboratory helped us collect our samples. We support continued monitoring of PCBs, dioxins, and furans using high-resolution methods, which the Laboratory is also now using. While more costly, high-resolution methods provide the measurements needed to assure that levels of these contaminants continue to decline in New Mexico. We will continue to share our findings with those individuals within the Environment and Health Departments who are responsible for issuing fish advisories.

Information on mercury in New Mexico can be found at
http://www/swqb/hg_white.html

Information on PCBs, dioxins, and furans can be found at
http://www.epa.gov/opptintr/pcb/effects.htm and
http://cfpub.epa.gov/ncea/cfm/dioxin.cfm

Polychlorinated biphenyls (PCBs) are a class of highly stable, non-corrosive and relatively non-flammable chemicals, which were first manufactured on a commercial scale in 1929. For several decades they were used extensively in a wide range of industrial applications, including cutting oils, sealants, caulking compounds, inks, carbonless copy paper, paint additives, and, in particular, as coolants and lubricants in closed electrical applications, such as transformers and capacitors.

Studies have identified trace levels of PCBs everywhere in the environment. This is thought to be due to improper disposal practices, accidental releases from the 1930s to the 1970s, and subsequent long-range transport by global air currents. Once in the environment, PCBs are extremely persistent, have a tendency to biomagnify as they move up the food chain, and generally accumulate in fatty tissues of animals and humans. Filleting, skinning, and trimming off the belly meat and dark meat along the lateral line before cooking can reduce PCBs in fish you eat.

Twelve of the PCB congeners cause physiological responses similar to dioxins and the World Health Organization recommends using Toxic Equivalency Factors (TEFs) to convert concentrations of those 12 PCB congeners to dioxin Toxic Equivalency Quotients (TEQs).

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