

Downstream from Los Alamos: A Workshop and Hearing Report

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Years ago people began coming together to confront threats from an unprecedented mixture of hazardous chemicals and radionuclides released into the environment during decades of nuclear weapons development at the Los Alamos National Laboratory (LANL) in northern New Mexico. Using various strategies to protect their water, land, air and communities, diverse coalitions achieved a number of remarkable successes, despite often facing long odds.

This past summer [Tewa Women United](#), a multicultural and multiracial organization founded and led by Native women, in collaboration with [Communities for Clean Water](#), invited us at the Science and Environmental Health Network to join them in planning a workshop on the precautionary principle as one of their series of events called “Protecting the Most Vulnerable”. The purpose was to help people from local communities prepare to participate in a public hearing addressing New Mexico Environment Department’s (NMED) response to toxic chromium, perchlorate and high explosive RDX plumes contaminating regional drinking water aquifers.

We dove into the lengthy history of contamination, who is responsible, what is being done, and uncertainties about cleanup efforts. Carolyn Raffensperger traveled to Los Alamos in August to tour the area where aquifers are contaminated and meet with community groups. We supplied fact sheets on specific contaminants. Then we participated in the workshop at the Northern Rio Grande National Heritage Center, in Alcalde on October 21. The public hearing on the permit was in Los Alamos on November 7 and 8. Beyond important technical details, the workshop and hearing raised larger questions about how best to protect land, water, communities and cultures from harm and who should decide.

Background:



Photo: Carolyn Raffensperger

In late October, even from a distance, you can follow the course of the Rio Grande through muted tones of the New Mexico landscape by looking for gold yellow leaves of cottonwoods lighting up river banks along the way. Flowing south more than 1800 miles from high in the San Juan Mountains of southern Colorado through New Mexico to El Paso, along the Texas-Mexico border into the Gulf of Mexico, the Rio Grande is among the longest river systems in North America.

For centuries, using a system of communal irrigation *acequias* and other water-conserving techniques Pueblo peoples from the mountains of the north to southern New Mexico have grown corn, beans, squash and other crops with this life-giving river water. But this is a region where rainfall averages only about ten inches a year. Stretches of

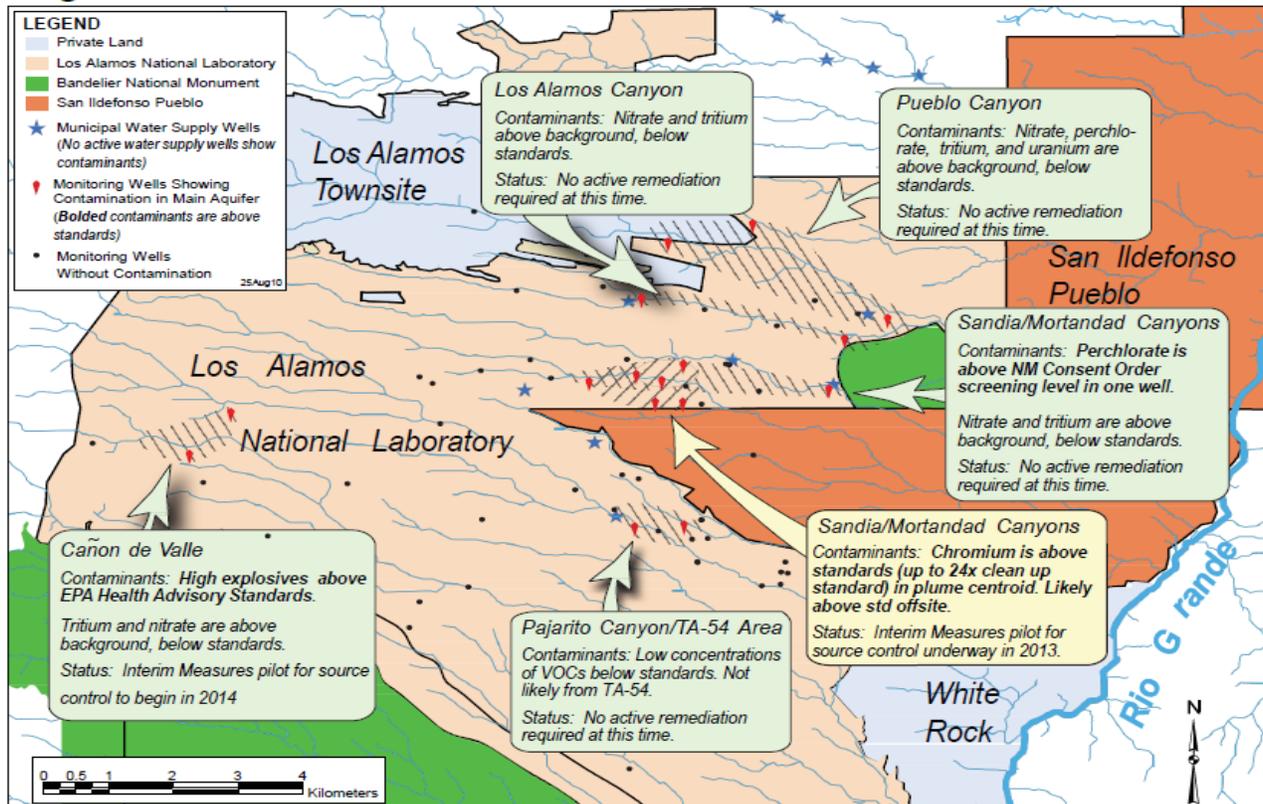
the Rio Grande sometimes run dry—more often now with a growing population, increasing water demands, and changing climate.

Water scarcity is not the only concern. In northern New Mexico surface and groundwater contamination with an array of hazardous chemicals and radionuclides from the LANL threaten the health of downstream users and confidence in traditional cultural practices. It's led to a struggle that's both scientific and ethical, shaped by values, history, politics and money.

The LANL was established in 1942 as a top secret location to coordinate the Manhattan Project for nuclear weapons design in the US. Military officials wanted a facility distant from international boundaries, isolated for safety and security. They selected the site of the [Los Alamos Ranch School](#) high on a mesa in northern New Mexico, largely at the urging of Robert Oppenheimer, an acclaimed scientist who spent time in the area as a school boy, leased a nearby ranch, and became the laboratory's first director. The government took over the school and surrounding land by eminent domain.

Administered by the US Department of Energy, LANL lies on mesas and canyons of the Pajarito Plateau 7000-8000 feet above sea level, sacred land to Pueblo peoples who once lived there. Canyons forested with juniper, piñon and ponderosa pine, spruce, fir, and oak running generally west to east southeast drain the plateau toward the Rio Grande 1500-2000 feet below. Pueblos along the river including the Pueblo de San Ildefonso adjacent to LANL and many others farther downstream lie in the drainage.

Regional Groundwater



Source: NMED

From its [beginning](#) LANL released a complex assortment of radionuclides and hazardous chemicals into the surrounding environment—sometimes intentionally, sometimes accidentally. As an example, from 1956 to 1972, LANL routinely dumped water from cooling towers into the headwaters of Sandia Canyon flowing to the Rio Grande. Because the water was first pumped through the pipes of an old power plant it was contaminated by hexavalent chromium (Cr6), a highly toxic metal component of anti-corrosion steel. It's unclear where LANL operators thought the contaminants would go or even who knew they were there. But though the geology of northern New Mexico is complex and water from rain and snowmelt can move through it in surprising ways, it still runs downhill. Here, toward the Rio Grande.

In the 1990s and early 2000s analyses of downstream storm-water runoff and deep groundwater disclosed plutonium and tritium, plumes of high levels of Cr6, perchlorate—a rocket propellant—high-explosive RDX, and nitrates, all traceable to LANL sources. The chromium plume, 900-1000 ft. deep is estimated at over a mile long, 100 feet thick and more than a half-mile wide. It is approaching a drinking water well for Los Alamos County and is somewhere near or beyond the border of the Pueblo de San Ildefonso abutting LANL, although details of its nature and extent are [unclear](#). People living in this Pueblo are understandably disturbed that their drinking and irrigation water could be contaminated, despite ongoing cleanup efforts.

New Mexico Environment Department Response:

Surface and groundwater access and quality are regulated by the New Mexico Environment Department (NMED). Valuable rights to surface water must be used or lost. Groundwater for drinking and irrigation from deeper and deeper wells is depleted far more rapidly than replenished. Existing wells have priority.

Since the plumes were discovered, many monitoring wells up to 1400 feet deep, some costing \$2-3 million, have been drilled in an attempt to determine the borders of the plumes, how they are moving, and levels of contamination. Cleanup efforts so far have largely involved extracting contaminated groundwater, treating it with activated charcoal or ion exchange to remove contaminants to no more than 90 percent of NMED's allowable drinking water levels and then applying the treated water to land or reinjecting it into the aquifer.

Without holding a public hearing, in 2015 NMED issued discharge permit DP-1793 for the land application of groundwater associated with remediation activities. Under the terms of the permit, up to 350,000 gallons of treated water could be applied to the land daily.

NMED initially denied Communities for Clean Water an opportunity for a public hearing on DP-1793, but the group took the matter to court. In December of 2017, the state Court of Appeals sided with Communities for Clean Water, finding that the NMED should not have denied requests for a hearing and ordered one to be scheduled.

The precautionary principle workshop and November hearing primarily addressed cleanup of the chromium, perchlorate, and RDX plumes contaminating the aquifer. At one level this is about the impacts of land application of water with residual contamination, risks to surface and groundwater, and alternative approaches to remediation. More broadly it's a referendum on community involvement in cleanup decisions.

The Workshop:

The workshop began with prayers and recognitions.

Three women from Tewa Women United and Communities for Clean Water (CCW) talked about the ways this particular permit fits within a much longer history of land, water, air, people and LANL.

Carolyn began by reminding us that people who have lived on this land for centuries have valuable expertise that must be considered, not ignored. They must be included in decision making in order to give consent to laws—the rules we all agree to be bound by.

The current legal system favors cost-benefit, cost-efficiency analyses and risk assessments that are poorly suited to evaluating the complexities of contamination at LANL, including cumulative impacts.

Using the Wingspread Statement of the Precautionary Principle, 1998,

“When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically”,

Carolyn pointed out that all versions of the precautionary principle address threats of harm, scientific uncertainty, and precautionary action to prevent harm. It incorporates ethics and values—do no harm, a duty to protect; as well as science—what we know, how we know, and what we don’t know.

Implementing the precautionary principle requires:

- 1) Heeding early warnings: If we wait for proof of harm before acting, we will take action too late
- 2) Setting goals: What do we want as the outcome of this permit? What do we want as the ultimate outcome for the water and the land?
- 3) Identifying and choosing the best alternatives to meet the goal(s)
- 4) Reversing the burden of proof: This means the polluter, in this case the US Department of Energy and its limited liability corporate contractors, have to demonstrate that their proposed action is the safest and that it doesn’t add to the cumulative impacts on a community
- 5) Engaging all stakeholders. It relies on free, prior and informed consent of all potentially affected people. And adding to an exclusively individual perspective, the U.N. Declaration on the Rights of Indigenous Peoples recognizes the right of communities of Indigenous peoples to free prior and informed consent to activities that may affect them. This is the first time a community right has been established, and its importance should not be overlooked.

Justice, rights of future generations to a clean and healthy environment, rights of Indigenous peoples, rights of nature, and respect are concepts deeply imbedded in precautionary action.

Following Carolyn, I discussed various kinds of scientific uncertainty inherent in addressing a contaminated site as complex as LANL, the kinds of mistakes we can make when assessing safety, and how we might address them.

With respect to specific contaminants:

Chromium:

Chromium largely exists in one of two forms: chromium6 and chromium3. (Cr6, Cr3). Most chromium that naturally exists in the environment and is mined for industrial purposes is Cr3. Most Cr6 is produced for industrial applications and was in the anti-corrosion coatings of the cooling towers, the source of contamination in the plume.

Cr6 is much more hazardous than Cr3. Cr6 is a carcinogen and reproductive/developmental toxicant. Exposures are associated with higher risk of lung and gastrointestinal cancer, testicular toxicity, birth defects, and miscarriages. Cr6 is also much more toxic to plants than Cr3, causing damage to roots that can impair water and nutrient uptake.

Efforts at LANL to remediate the groundwater plume and protect drinking water are, of course, exceedingly important. But inhalation exposures to chromium are also hazardous as shown by an increased risk of lung cancer. Since the permit currently allows land-application of large amounts of chromium-containing water after partial remediation, inhalation of contaminated mists and dust should be avoided.

Cr6 is much more water soluble and mobile in the environment than Cr3 so that conversion of Cr6 to Cr3 is one way to reduce the threats. Two pilot projects are underway at LANL to try to accomplish this through injecting iron-containing compounds or molasses into the aquifer—the first meant to reduce Cr6 to Cr3 and the latter supporting specific bacterial growth in the groundwater that will biologically favor the conversion. Some members of CCW are encouraging attempts to bio-remediate the extracted groundwater using mycelia that have successfully removed metal contaminants from water at other contaminated sites.

New Mexico has a drinking water standard of 100 parts per billion (ppb) for total chromium and does not distinguish between the two forms for regulatory purposes. But it's clear that New Mexico's groundwater standard of 50 ppb total chromium would not be health protective if nearly all of it were in the form of Cr6, which is the major contaminant in the groundwater plume at levels 24 times the cleanup standard in its center and likely to be higher than the standard offsite.

Perchlorate:

Perchlorate is primarily a concern because it interferes with iodine uptake into the thyroid gland, which can result in lower levels of thyroid hormone. Adequate levels of maternal, fetal, infant, and childhood thyroid hormone are essential for normal brain development and function. Careful monitoring of drinking water for perchlorate and potentially exposed people for iodine and thyroid hormone status can provide early warnings without having to wait for evidence of harm to brain development before taking action.

RDX:

RDX, an explosive, is listed by the US EPA as a possible human carcinogen. It is also a neurotoxicant and can cause seizures when high amounts are inhaled or ingested.

Applying the precautionary principle to contamination at LANL means:

- taking action based on early warnings to prevent potentially harmful exposures from occurring as a primary goal.
- identifying and urgently reducing or eliminating hazardous exposures that are already occurring without waiting for proof of harm.
- establishing baseline conditions in water, soil, air and community health.
- involving potentially affected people routinely in establishing cleanup and monitoring programs.
- adhering strictly to agreed-upon soil, air and water monitoring programs.
- sharing monitoring results with potentially affected people as soon as available.

Throughout the rest of the workshop, we discussed our own perspectives and potential talking points for those who would be attending the public hearing.

The Hearing:

The two-day hearing had witnesses called by N3B, the cleanup contractor for LANL, the NMED Pollution Prevention Program manager, and the New Mexico Environmental Law Center, representing Communities for Clean Water and its member groups. For nearly six and a half hours over the two days, more than 100 members of the public gave comments. Attorneys for N3B said the environmental safety requirements outlined in the permit have already been met and that spraying will protect the groundwater. Members of citizen groups called for more complete baseline screening of soil concentrations of contaminants before partially-decontaminated water is sprayed and for more rigorous monitoring of soil, air and water levels, with full transparency and sharing of data.

One member of Tewa Women United [called on](#) “the New Mexico Environment Department to require the Department of Energy, LANL, Triad (LANL management and operations contractor) and N3B (contractor for the waste remediation) to fully demonstrate that their proposed action is safe and that it does not contribute to harmful, cumulative impacts on any form of life,”

Attorneys will file written rebuttals in response to witness testimony by Dec. 7. Once the transcript is filed, the parties will have 30 days to file findings of fact, conclusions of law, and closing arguments. The hearing officer will have 30 days to make a recommendation to the environmental secretary on whether to grant stricter standards to the permit, uphold the permit as it is, or reject it altogether. A final ruling is expected after the first of the year.

Meanwhile water continues to flow downhill off the Pajarito Plateau toward communities along the Rio Grande. With its mission expanding far beyond nuclear weapons development into a complex portfolio of emerging national [security concerns](#), threats to communities in the drainage of LANL are not going away anytime soon. Neither are the growing number of people downstream who insist on legal and public health protection with full involvement in decision-making. Their voices will not be silent.