

SET NEAR THE NEAT DOUBLE-DECKER HOUSES OF East Watertown and the verdant shores of the meandering Charles River, the army's Materials Technology Laboratory—known locally as the Watertown Arsenal—presents a grim face to shoppers on their way to the adjacent Arsenal Mall. For more than a century the arsenal has been a familiar landmark in the area, but few local residents have ever been allowed inside.

A tall iron fence topped with strands of barbed wire runs the vast length of the complex of aging brick buildings, punctuated only by signs reading "Restricted Area" and "Warning." Row after row of towering windows seem

The army is slowly and quietly closing down the 47-acre Watertown Arsenal, for decades the site of chemical- and nuclear-weapons experiments.

to belie those security precautions, but the panes reveal little but the ominously distorted silhouettes of massive machines.

Now, however, the army facility is scheduled to shut down—one of more than 80 military bases nationwide, including New Hampshire's

Pease Air Force Base, that will be closed by a Defense Department commission at an annual savings of nearly \$700 million. In the process, the facility behind the iron gates will finally be subjected to a type of scrutiny that it has successfully evaded for generations.

Founded in 1816 for the manufacture, storage, and repair of arms, ammunition, and other military supplies, the Watertown Arsenal has had an illustrious history, having made contributions to nearly every military venture this country has known. But this work has created an urgent problem almost as old as the facility itself—a toxic legacy left by many decades of weapons research, evaluation, and production that employed some of the world's most potent and dangerous chemicals.

Protected from public scrutiny by barbed

TOXIC CHEMICALS REVEALS

wire, armed guards, and secrecy laws, the Watertown Arsenal has been the site of numerous environmentally destructive practices, often in flagrant violation of state and federal laws. Today the Defense Department's Environmental Restoration Program reports that the 47-acre facility may be home to as many as 19 separate toxic-waste sites—one-seventh of all such military toxic sites in the commonwealth.

Laboratory director Edward Wright admits that some of the arsenal buildings are so contaminated that they may have to be demolished "brick by brick" and each piece may have to be individually "wrapped" before the site can be put to new uses. He estimates that the cleanup

will cost \$100 million but cautions that the army has yet to complete its long-overdue survey of contamination at the site. But even that study, now under review by the army's Toxic and Hazardous Materials Agency, will likely fail to reveal the full extent of the contamination

on the grounds. Some of the facility's work, which may have left radioactive contamination, remains secret to this day—more than 30 years after it was completed.

The army's own documents acknowledge that many toxic spills, leaks, and waste piles at the arsenal have long since been forgotten. "Toxic, radioactive, and/or explosive materials may have been used as backfill around construction areas," according to the most recently available army environmental report, from March 1988. Operations at the facility, the report continued, "have almost certainly . . . resulted in hazardous materials being deposited in the soil and groundwater." But, the report admitted, "the details of those releases and the exact amount of material that still exists in the environment is unknown."

The land, next to the Arsenal Mall, is extremely valuable. Only it's poisoned. How badly? Not even the army knows. A Boston Magazine investigation.

BY SETH SHULMAN AND DAN GROSSMAN



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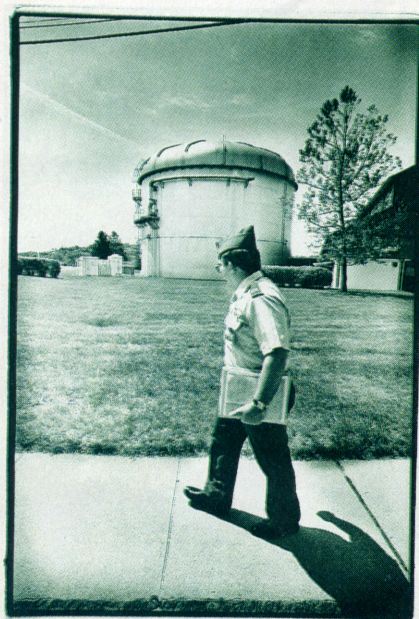


MATERIALS TECHNOLOGY LABORATORY

PHOTOGRAPHS BY FLINT DUNN MOUNTPRINTING BY JEAN BAILEY

The Watertown Arsenal.

Army officials are loath to discuss contamination at the base. But with the help of increased public oversight in the base-closing procedure, the facility's toxic secrets will not remain hidden much longer. The complete details might not yet be available, but a tour of the facility, a review of thousands of pages of government documents, including some obtained through a Freedom of Information Act request, and interviews with past and present employees at the base reveal a disturbing picture of the environmental problems that will soon confront the entire community.



Residual radioactivity remains in the arsenal reactor's walls, in the foundation of the building, and in the soil outside. Some of that radioactivity came from routine operation of the facility, some from a variety of nuclear "events."

THE ARMED GUARD AT THE FRONT GATE OF THE arsenal motions to a parking space alongside the visitors' entrance. Inside, Chuck Paone, the base's chipper spokesman, hands out clip-on ID badges. A glass case features samples of the lab's work: a deadly-looking array of shiny shells and mortars arranged in ascending order by height. A black iron sphere about the size of a bowling ball hangs suspended in another display. Uncovered on the grounds by accident, explains a small card, the cannonball was made for the innovative Civil War-era Rodman cannon—invented and produced at the arsenal.

Paone leads the way to a large briefing room ringed with tables displaying more army hardware developed at the base: tall, slender warheads; lightweight plastic helmets. Major Melvin Adams, acting commander of the facility, is waiting with a slide presentation detailing the aims and accomplishments of the facility.

The Watertown Arsenal selects and tests materials for "every single thing the army makes," he explains, "from the bottom of the boot to the top of the tank." Set to rhythmic music, a montage of soldiers in action and the latest weaponry in use illuminates the laboratory's motto: Better Materials for Tomorrow's Army. The facility's goal, reports the slide show's narrator, is "to make modern weapon systems

lighter, faster, better protected, more fuel efficient, and more lethal to the enemy."

Adams reels off an impressive list of laboratory achievements. The base recently completed a prototype shell for a plastic-armored fighting vehicle that is lighter than conventional metal models yet just as tough. The arsenal's researchers even developed the bulletproof materials for President Bush's new limousine. A major project under Adams's command, for which the laboratory already received an army R & D Achievement Award, is the improvement of armor-piercing shells, or penetrators, fabricated from uranium and complete with "rotating copper bands" affixed to titanium shells with "niobium foil."

While Adams's display of high-tech wizardry is indeed impressive, it leaves one with the same uneasy feeling one gets from an army-recruitment ad: there must be something they're not telling you. Even laboratory director Wright admits that the base conducts classified research, although he hastens to add that it is just "a small amount." Nevertheless, that secrecy has allowed the army's technicians to engage in practices that would have been impossible had the complex been subject to public scrutiny.

As recently as last spring, for example, the base conducted research analyzing the corrosive effects of a compound used in the army's binary chemical weapons. Unlike the army's earlier and more primitive poison-gas technology, the new generation of binary chemical weapons employs two separate compounds that mix to form dead-

ly nerve gas after being fired by troops in combat.

The army claims that the research involved methyl phosphoric difluoride (DF)—only one of the toxic elements necessary to produce the deadly nerve gas GB. Just four years ago, anxious Cambridge residents prevented nearby Arthur D. Little from conducting research with the same deadly gas. The other element, "a combination of isopropyl amine and isopropyl alcohol," says the army, "was never stored at the [Watertown] Materials Technology Laboratory." But according to Harvard biochemist and chemical-warfare expert Matthew Meselson, the nerve gas can be formed when DF mixes with ordinary rubbing alcohol.

The army concedes that the research involved more than a half-gallon of DF—about as much, says Meselson, as is contained in one of the army's new 155-millimeter binary artillery shells. The research involved enough DF, by comparison, to make more than 20 times the amount of nerve gas than that which moved the residents of Cambridge to ban Arthur D. Little's work.

This binary-weapons project was not the first to involve poison-gas research at the facility. The army recently acknowledged that in 1978 and 1979 the base accepted for analysis fragments of the leaking shells of "Weteye" chemical bombs, which had once contained GB. Army officials now assert that neither of those projects was ever classified.

Watertown officials, however, were never informed of their existence.

THE DAY HAS TURNED WARM, AND CHUCK Paone squints into the bright sun as we leave the darkened briefing room and walk onto the grounds. In the distance are the large parking lot and squat buildings of the Arsenal Mall.

The mall was built on land that was once part of the army facility after the army transferred more than half of the arsenal's property to the federal government's property manager, the General Services Administration (GSA), in 1966. Most of that land was later acquired by a consortium led by New England Development, which built the shopping area in the early eighties.

It was on property now occupied by the mall that many of the arsenal's extensive nuclear operations took place—far more vast in scale than the work on chemical weapons, and even more secret. There, between 1946 and 1967, the army and the Atomic Energy Commission, now called the Department of Energy, conducted an extensive nuclear-weapons research program, which began as part of the Manhattan Project and left a legacy of nuclear contamination throughout the property. Among other projects, that work included the development in the late forties of the world's first atomic cannon, stretching 85 feet long and weighing 85 tons. Because of the strict secrecy surrounding the research, however, even today it is difficult to find out exactly what went on and how much contamination remains. As Energy Department official David Jackson puts it, such information "never has been and probably never will be released."

Nevertheless, some information has been released about the contamination. Between 1980 and 1983, for example, an Energy Department team did a survey to determine if any contamination remained from nuclear-weapons activities. The study, conducted even as the mall was under construction, found that the area that is now the shopping center's front parking lot had "significant levels of contamination" in excess of Nuclear Regulatory Commission guidelines.

The radioactivity was found to emanate from the foundation of a building that had once housed a uranium metalworking shop. Soil surrounding the foundation of another building, a uranium foundry that stood on a site that is now a parking lot behind the mall, was found to contain "elevated levels of uranium." A report on the two foundations concluded that a clean-up effort could require the removal of more than 20 tons of concrete and nearly 100 tons of soil.

In all likelihood, neither of those contaminated foundations today presents a health threat to visitors to the Arsenal Mall. And yet the radioactive contamination could be harmful if, someday, the property is put to some other use with closer human contact or if future construction work should

expose the buried foundations.

However, there is little chance that the sites will ever be decontaminated, because both the Defense Department and the Energy Department have declined to perform a cleanup. And the sites' present manager and co-owner, Stephen Plumeri, president of New England Development, refuses even to admit that the contamination exists. Plumeri declined to be interviewed about the property, stating only that "the site was given a clean bill of health" by "professional consultants who have substantial experience in hazardous-waste analysis." In fact, a 1985 Energy Department document shows that New England Development may have been misled when it purchased the land. That government report indicates that the site contained radioactive contamination and further states that the developers were never informed by the army or the GSA that this was the case.

A small parcel of land on the far side of the mall that was also previously part of the arsenal gives added cause for concern. Unbeknownst to the GSA when it acquired the land from the army, in 1966, a concrete platform on the site was once used for storing radioactive waste and for burning scraps of uranium discarded from arsenal activities. The Energy Department team surveying the site found radioactive contamination on the concrete slab, in the surrounding soil,



Tests in 1985 disclosed the presence of "volatile organic compounds" in the soil. Further studies determined that the soil contained a toxic plume approximately 200 feet in diameter that was moving slowly toward the Charles River.

and in the groundwater. The site, it concluded, suffered "significant contamination," which would require as much as 20 tons of soil to be removed.

Because the parcel is currently undergoing a decontamination program, it provides the best idea to date of how difficult and expensive such clean-up efforts can be. GSA contractors began decontamination work on a small piece of the property last year at a cost of a million dollars, and had hoped to be finished by this past summer. But in addition to the radioactive contamination in the site's soil and ground-
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water, the clean-up team has now found toxic contamination, which will delay the project and promises considerable additional cost. Not only was more uranium discovered, but petroleum products were found as well, along with chunks of some metal—as if barrels or some other form of container had once been buried there. Until the GSA determines what further steps are necessary, says Frank Camacho, who is overseeing the project, the cleanup is on hold.

CHUCK PAONE IS UNDER STRICT ORDERS not to talk about the environmental state of the installation, but, as we cross a large parking lot in the middle of the facility, heading toward the army's nearby nuclear reactor, he does acknowledge the apparent gloom cast over the entire facility by the decision to close the base. "These are hard times for this installation," he says.

At the morning briefing, director Edward Wright emphatically stated that despite some areas of "mild contamination" in certain buildings, the facility presented no radiation hazard, "no environmental hazard at all." Curiously, though, he did acknowledge a disturbing fact. "Like most industrial sites dating back to the same period," he said, it used to be common practice at the arsenal to "dump solvents and other chemical materials in the ground."

As we later discover, the parking lot in front of the nuclear reactor may well have been just such a dumping area. When the army considered constructing a new research building in 1985, tests on routine geological borings into the soil under the lot disclosed the presence of "volatile organic compounds." Fuel oil, it was determined, was present in the soil and groundwater in concentrations as high as 70 parts per million—hundreds of times greater than the level considered acceptable by state and federal environmental standards.

In their report to the Watertown Arsenal, the geologists from a division of the Raytheon Corporation wrote that they had noticed "oil odors and soils having an oily appearance" during their drilling operations. The geologists warned that "additional studies may be required by regulatory authorities to evaluate the source and extent of the contamination." The army now concedes that the geologists' findings were not released to the state's environmental authorities until March 1988, more than two years later. By that time, further studies initiated by the army's Toxic and Hazardous Materials Agency had determined that the soil under the parking lot contained a toxic plume approximately 200 feet in diameter that was moving slowly toward the Charles River.

This case is only one of numerous examples of neglect of state environmental regulations at the arsenal. As Environmental Protection Agency scientist Rosina Toscano

puts it, "Because of the issue of national security, the Department of Defense can say, 'We're a federal facility; we don't have to comply with all of the federal and state regulations.' But," she adds, "that's not right." Toscano should know. Between 1982 and 1986 she served as the arsenal's environmental coordinator, before joining the EPA.

In another case of disregard for state environmental laws, the facility failed for a decade to renew its permit to discharge liquid waste into the local sewage system. "MTL is currently out of compliance with applicable state and local discharge regulations," stated a 1987 report by the Army Corps of Engineers. "Since 1977 . . ." the report added, "no measures have been taken to achieve compliance." The army now claims to have a conditional sewer-discharge permit from the state but also acknowledges that planned renovations to the system were never completed. Unfortunately, with the prospect of the base closure five years away, it is almost a certainty that these renovations will never take place.

Even the EPA is ignorant of army activities. The agency's 1983 "perimeter survey" of the arsenal consisted mainly of the observation that the site "appeared to encompass several blocks" and "appeared to be old." According to this sad excuse for an environmental report, nothing more could be determined about the facility, "since it was completely enclosed by gates and secured by Department of Defense security police." When it comes to environmental laws, says Toscano, "the Watertown Arsenal is and was and probably always will be a closed facility." But, she adds, problems at the facility have often become "too obvious to hide from the general public."

According to Stephanie Pollack, an attorney with the Boston-based Conservation Law Foundation, the problem is that the EPA and the state environmental agencies have little or no jurisdiction over military facilities. Instead, the military itself is vested with the responsibility for regulating its environmental practices and cleaning up its own contamination. As federal law now stands, though, this responsibility ends when the base is sold.

"Purchasers may find federal property a bad gamble," says Pollack, "if they find themselves saddled with the entire cost of cleaning up any hazardous wastes discovered after the land changes hands." Pollack and the foundation are filing suit this fall against the EPA for failing to promulgate regulations to remedy this situation.

ON THE EDGE OF THE PARKING LOT, CHUCK PAONE complains about the politics involved in the base-closure process. We ask to visit an adjacent building where dozens of black drums labeled "radioactive" can be seen through the large open warehouse doors, but Paone says no.

It is here, in Building 43, that the facility has routinely burned the scraps and tailings

of depleted uranium left from much of the laboratory's research. The radioactive chips and shavings of the metal are extremely flammable and, in such small pieces, can spontaneously ignite. In fact, before the adoption of the current incineration process, they did "periodically" catch fire in the arsenal's collection barrels, according to a recent army document. Now the material is kept in plastic bags immersed in water until it is removed, placed in an incinerator, and lit with newspaper. The radioactive smoke from the procedure is filtered and released into the open air through a tall smokestack.

Like so many aspects of the laboratory's work, the practice of burning depleted uranium—including the emission of low levels of radioactivity and the clear potential fire hazard involved—had been going on for decades before it came to light, in 1982, when a local environmental group curious about the facility uncovered the practice through a Freedom of Information Act request. The uranium incineration continues today, and the army estimates that in the past six years alone, the facility has burned more than 16,000 pounds of the radioactive metal scraps. And although the army had promised to provide regular reports on the incineration practices at the base in 1982, Watertown public health director Joseph DiVico says he never received them.

Paone and other army officials maintain that the procedure is safe, emitting radioactivity into the atmosphere at levels well below federal safety standards. Such an assessment may be technically accurate, but it is due in part to the fact that the safety standards are calculated by averaging the potent individual incineration releases over long periods of time. In fact, even with such "time weighted" average standards, the Nuclear Regulatory Commission has cited the Watertown Arsenal's uranium-burning practices for regulatory violations on numerous occasions. In 1977, for example, the NRC alleged that the laboratory had failed to measure radiation levels in the wastewater released from the incinerator filters. More recently, the agency charged that the facility had failed to monitor the release of radioactive smoke often enough to be sure that it fell within acceptable limits. And as the army's most recent environmental assessment itself recommends, "radiation monitoring" used in the incineration process "should be upgraded to minimize the potential spread of contamination."

With all the radioactive material being used and burned at the facility—some 50,000 pounds were stockpiled at the base as recently as 1987—it is not surprising that an army report also cites readings from some of the arsenal's buildings that show they are "highly contaminated" by radioactivity. In Building 43, for example, numerous locations were found to contain levels of radioactivity far in excess of those the NRC considers safe for converting the facility to other uses.

Not surprisingly, residual radioactive contamination exists in several locations inside the nuclear-reactor facility itself. And, unlike Building 45, the small nuclear plant is included on our tour. An odd silver building, the plant looks something like a giant upside-down milk pail.

In operation for more than a decade, the research reactor used neutrons to study the fundamental characteristics of various materials. The nuclear fuel and core, by far the most radioactive of the plant's elements, have been removed. Nonetheless, residual radioactivity remains in the concrete and metal walls, in the foundation of the building, and, to a lesser extent, in the soil outside. Some of that radioactivity came from routine operation of the facility over time. Some, however, came from a variety of unward nuclear "events."

In 1969, for example, 4,900 gallons of low-level radioactive water overflowed from a reactor cooling tank in a dramatic accident, according to NRC documents. The public was not notified of the incident at the time, and after some consideration, the NRC later allowed the overflow to be classified as "burial in the soil."

Inside the reactor containment building, flickering fluorescent lights shine on dark green cement walls. It is not surprising that everything looks old; after all, built in 1960, it is among the oldest reactors of its kind. By comparison, the very first commercial nuclear power plant in America was completed only three years earlier, in 1957. Now the lab's reactor will have to be a groundbreaker in another respect as well. Only a few nuclear reactors in the world have ever been dismantled. The army has never overseen such a project. Even its own optimistic estimates acknowledge that the process will take at least three years.

Before the site can be considered safe for other uses, all the thick cement, including a large underground storage tank for radioactive cooling water, will have to be dismantled by workers in protective suits. The radioactive material will have to be shipped off to a repository. These are difficult, costly, and relatively untried procedures.

At the morning briefing, Wright estimated that the dismantling of the facility's reactor would cost \$14 million, but the actual total may well be much higher. The levels of radioactivity present may not be particularly high, but the facility is densely constructed, with a foundation four and a half feet deep and a total of more than 600 tons of concrete. And radioactivity from the 1969 wastewater spill still remains, raising questions about whether the site will be safe for other uses after the base closes. As recently as 1987, an army contractor found "detectable radiation" on the ground near the reactor's underground wastewater tank.

LEAVING THE REACTOR, HEADING ACROSS the neatly cropped lawn at the southeast corner of the installation, we near the end

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of our tour. From here, overlooking the Charles, the army base has a certain pastoral charm. The elegant brick-and-wrought-iron Commander's House, built in 1865, suggests the facility's former glory and casts an intricate Victorian shadow across the grass; it is easy to see how the building earned its spot in the National Register of Historic Places. The peaceful setting and the stately lawn stretching down toward the river at this corner of the site make it difficult to imagine the contamination present in the facility's other buildings and below the ground.

Contaminated or not, the availability of this parcel of prime real estate overlooking the Charles just a few miles from downtown Boston has local officials excited.

"This land," says Congressman Joe Kennedy, whose district includes Watertown, "is critical and important to the future of Watertown and the people there." Town officials already have appointed a "re-use" committee for the site, which has so far heard proposals to convert the facility into a high-tech industrial park, an elderly-housing complex, and an addition to the mall.

And Kennedy and other government officials speak fondly of the idea of turning at least a part of the facility into a park. Paul Davis, formerly a legislative aide in Kennedy's office and still an active member of Watertown's re-use committee, says his personal vision for the site is to remove a piece of the parkway called Greenough Boulevard so that a town park could be created, stretching uninterrupted from what is now arsenal property to the river's edge. Alex Liazos, a candidate for Watertown city councillor, has even suggested turning the Commander's House into a cultural center.

Meanwhile, all the participants involved acknowledge that there is much costly work to be done before any such plan can be implemented. This was underscored by the army's recent admission that groundwater samples taken at the facility revealed levels exceeding EPA standards for 11 toxic chemicals. At public hearings in Watertown last spring, residents, local politicians, and workers at the facility all expressed concern about the army's ability to complete the environmental cleanup safely and thoroughly. As the town begins to come to grips with the problem of what to do with the land, everybody agrees that a far more immediate problem is making sure the army honors its stated aim of returning the site to the community clean.

Raymond Hinxman, a chemist at the army laboratory and the head of the local branch of the American Federation of Government Employees, has his doubts. "The army's record of dealing with environmental matters is horrible," he says bluntly. And Hinxman speaks for many in the community when he expresses his worst fear about the facility's current status. "Most of all," he says, "I don't want to see them locking the gate and leaving this mess behind." □



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