

Secretary of Defense Environmental Award Environmental Restoration – Installation

Hill Air Force Base, Utah FY 2009



Nominee:

75 CEG/CEVR

Environmental Restoration Branch

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Integrity, Service and Excellence

Hill AFB, Utah

Location: Ogden, Utah

Primary Missions: Air Logistics Center, Fighter Wing Headquarters, Management of Utah Test and Training Range (UTTR)

Area: Approx. 6,700 acres (UTTR: 1 million acres)

Area of groundwater contamination: 1,700 acres (1,200 acres off base)

Population living near areas of groundwater contamination: Approximately 20,000



Introduction

Located approximately 30 miles north of Salt Lake City, Utah, Hill Air Force Base (AFB) is a major Air Force aircraft and missile maintenance depot and weapon systems program office with over 28,000 civilian and military employees. The installation provides worldwide engineering and logistics management for the F-16 Fighting Falcon, A-10 Thunderbolt II Aircraft and the Minuteman III and Peacekeeper intercontinental ballistic missiles. Activities at Hill include depot maintenance, repair and overhaul of the F-16, A-10, F-22 Raptor and C-130 Hercules aircraft. The installation is the Air Force Center of Industrial and

Technical Excellence for the low-observable, “stealth,” aircraft structural composite materials and provides support for the B-2 Spirit multi-role bomber. Supporting more than 40 tenant units and nearly a million acres of the Utah Test and Training Range, the Hill AFB Restoration Team is responsible for oversight of all base and range environmental restoration activities.

Background

Hill AFB has been an active military base and maintenance depot since the early 1940s. For several decades since that time historical waste handling and disposal practices,



Environmental Restoration Staff, Hill AFB, Utah



With more than 2,500 homes over areas of groundwater contamination, much of the field work Hill does is literally right in front of people's homes.

along with other industrial processes have resulted in numerous contaminant releases. The base was placed on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), National Priorities List (NPL) in July 1987. In 1989 a Federal Facility Agreement (FFA) was signed by Hill AFB, the U.S. Environmental Protection Agency (EPA) Region VIII, and the Utah Department of Environmental Quality (UDEQ). The majority of the releases consist of chlorinated solvents and metals. These plumes extend into seven communities surrounding the base. Approximately 1,200 acres of off-base commercial and residential property have been affected by the contamination, with most of this acreage in densely populated areas.

Program Summary

The Hill AFB Environmental Team manages its program with the philosophy of cost-efficiency, while at the same time meeting Air Force mission objectives and promoting environmental stewardship.

Key environmental restoration objectives include protecting human health and the environment; conducting all Restoration activities in compliance with the law; facilitating partnerships with researchers and technology vendors to demonstrate technologies that will improve cleanup efficiency and reduce costs; implementing early cleanup actions when appropriate; optimizing the performance of remedial systems and close sites as soon as practicable. The success of the Hill AFB Restoration Program can be directly attributed to innovative program management, an extremely high level of technical expertise, regulatory partnerships and stakeholder involvement.

Accomplishments

Hill AFB's Restoration philosophy is to manage to the

most cost-effective outcome and reduce time to Response Complete where possible; thereby, returning resources to the mission. Where practicable, Hill AFB incorporates green remediation principles.

Hill's outstanding Restoration program is continuously incorporating strategies to accomplish its mission in the most cost-effective and environmentally responsible way possible. Over the last two years, the Restoration program has reduced annual operating costs by more than \$435,000. These reductions have been achieved through innovative contracting, improving process efficiency and incorporating a continuous remedial optimization approach.

For example, Hill recently decommissioned a complex steam stripper treatment system, which had been in operation since 1993. Hill demonstrated to regulatory officials that the system was no longer needed, as contaminant concentrations had reduced significantly. Hill requested and received the regulators' approval to bypass the steam stripper and divert all groundwater treatment to an on-site air stripper. This change has saved \$75,000 annually, or \$1.5 million over the expected life of the project.

Hill AFB has implemented TRIAD principles to all its investigations to rapidly characterize the nature and extent of contamination at sites using the latest in technology advances, and reducing costs

One way Hill engineers have achieved this goal is to install high-tech nested monitoring well systems in place of traditional wells. With this new system, up to four small-diameter wells screened at different depths can be installed within the same six-inch standard borehole. This system has cut well installation time by four months, saving \$810,000 at one operable unit alone.

Hill has used tree core samples to speed investigations



Using tree cores to determine the presence of TCE in the groundwater yielded quick results and saved tens of thousands of dollars over conventional investigations.



Hill AFB's unique conditions attracts attention of technical researchers throughout the world. And sometimes it attracts not-so-technical researchers, like the George Lucas Educational Foundation, which followed Clearfield High School science students on base as they learned about Hill's Restoration program.

and reduce cost. In some areas around the base, groundwater contamination is less than 10 feet from the surface and is thus within the root zone of mature trees. Working with researchers from Utah State University, Hill sampled the tree cores of dozens of trees in a 100-acre area suspected to contain contamination. In less than a week, the team had determined the extent of the contamination, saving tens of thousands of dollars compared to direct push sampling and unnecessary monitoring well installations that would have come with a conventional investigation.

Improving performance

Hill engineers know that to understand the effectiveness of a treatment system, one must ask the right questions. By carefully analyzing each treatment system, defining what successful treatment means and designing a set of standards to measure success, Hill's Restoration Team developed Performance Standard Verification Plans (PSVPs) for each of the base's Operable Units. Once the PSVPs were developed, monitoring was modified to gather only the necessary data spelled out in the plans. As a result, only those monitoring points that provide useful information are used, and the monitoring frequency has been optimized to ensure that no unnecessary samples are taken. The result is an improved understanding of treatment system effectiveness and an annual cost savings of more than \$250,000. The data gathered are currently being used to optimize treatment system performance, shortening, where possible, the cleanup time frames, also resulting in future savings to the Air Force.

Bombs to barriers

Hill AFB has implemented an innovative cost-reducing solution by converting waste into material that assists in other cleanup processes. Permeable Reactive Barriers (PRBs) have proven to be an effective way of treating TCE-contaminated groundwater. PRBs offer the advantage of effective treatment, low operation and maintenance costs and, once installed, virtually no adverse impact to nearby residents. The primary disadvantage is installation costs, with the reactive material (iron filings) being a significant portion of that cost. Hill engineers have been looking for ways to deploy this technology at other locations, but at a reduced cost.

Hill engineers found the solution literally lying on the desert floor. Tens of thousands of cast-iron dummy bombs are located throughout the Utah Test and Training Range's nearly one million acres. Bombs on the surface are collected, demilitarized and sent off for recycling, often at a cost to the Air Force. Hill engineers saw an opportunity. Instead of shipping the demilitarized bombs away, the bombs were seen as an inexpensive source of iron. The bombs needed to be crushed into a medium suitable for PRB use, but at significantly lower cost than commercially available iron. After consulting with mining engineers, a large two-stage hammer mill was designed and built that pulverized the iron into sand-sized granules. The result is an installation cost savings of more than 20 percent, which translates into a savings of hundreds of thousands of dollars for a typical PRB installation.

The BDU-33, as it is known, is the standard aerial practice bomb used throughout the Department of Defense at ranges all over the country. Collecting and recycling these bombs to treat groundwater contamination could save millions of dollars at DoD installations.



This hammermill crushed cast-iron dummy bombs collected from the Utah Test and Training Range for use as reactive agent for Permeable Reactive Barriers.

"DEQ is appreciative and supportive of the environmental work Hill Air Force Base conducts to protect Utah's environment and the public health of the citizens of the this state. Efforts by the base to prevent and cleanup environmental concerns have been vital to ensuring the quality of life we hold dear in this state. As a stakeholder in the process, DEQ is pleased with and supports the work Hill Air Force Base is engaged in to make our state a better place to live."

Amanda Smith
Executive Director
Utah Department of Environmental Quality

Performance-based contracts

The Restoration office is working hard to return property for mission use. Through the use of innovative performance-based contracts (PBCs), we have done just that at Operable Unit 12. Through DoD's Enhanced Use Leasing program, Hill will be leasing more than 500 acres on the base's west side to developers to build the Falcon Hill National Aerospace

Research Park. In return, the Air Force receives much-needed office space and significant reductions in maintenance costs. In preparation for this development, a number of infrastructure improvements were required, including constructing a new access gate to the base. However, the location of the gate happens to be atop a 12.5-acre parcel beset with volatile organic compounds, construction debris, drums and asbestos-containing materials. The VOC-contaminated soil, is the source area for a groundwater contamination plume that extends for nearly two miles into the neighboring community.

The strategic goals for this PBC were to clean up the VOCs in the soil, eliminate any risk to construction workers and leave the site in a geotechnically sound condition for future construction—all while reutilizing all materials possible (for example, crushing concrete for use as backfill) and minimizing the excavation and disposal requirements. In addition, the project had to be completed in 18 months. Hill's Restoration Team worked closely with the developer, the regulators and the contractor to develop an innovative approach to meet all project goals. Because of the complexities of the site and the time constraints, work plans were developed and implemented as the project proceeded, allowing for real-time decisions as data became available. This approach allows the contractor to adjust its approach more quickly if it encounters unexpected conditions.

By implementing PBC principles through this approach, this project has saved more than \$350,000 in comparison to the government cost estimates.

Offending ornaments

Hill AFB's Restoration program is DoD's leader in

seeking out and remediating vapor intrusion into homes. There are more than 2,500 homes over the areas of off-base groundwater contamination, any of which could be impacted by vapor intrusion issues. However, our technically savvy and professional staff has successfully dealt with these issues so that there are no significant community concerns. The program engineers are continually forward-thinking and developing new ways of meeting the complexities associated with characterizing vapor intrusion, identifying when groundwater is the source of the problem and ensuring appropriate vapor mitigation measures are taken.

One of the challenges of characterizing vapor intrusion in homes is differentiating between vapors coming from groundwater and vapors from sources inside the home.

To adequately combat this challenge, Hill engineers worked with vapor intrusion experts and companies that design monitoring and analytical equipment and together developed new analytical methods for an existing tool known as the HAPSITE (Hazardous Air Pollutants on SITE). This portable analytical devices uses off-the-shelf components and specially developed analytical procedures to give Hill the ability to locate and measure increased concentrations of specific chemical vapors at low part-per-billion levels in a matter of minutes.

The HAPSITE was first successfully deployed in a home where 1,2-dichloroethane (DCA) vapors were detected. This was one of many homes in an area where DCA detections inexplicably increased 400 percent between 2004 and 2008. Mitigation systems installed to prevent vapors from entering the home had not been effective, which indicated the source was not the groundwater and was most likely coming from inside the home. The HAPSITE identified a plastic Christmas ornament as the source of the DCA vapors. Further testing found several other items emitting DCA

Hill AFB is indeed an outstanding leader in the Federal Facility environmental cleanup arena. Their program management excels in coordinating numerous, complex technical projects and in resolution of stakeholder issues. Their response to potential human health and environmental emergencies is prompt and thorough, and quickly integrated into the overall program, such as with the discovered PCBs and vapor intrusion issues. Technical documents are produced with consistently high quality. Hill AFB's Restoration Advisory Board (RAB) and interactions with the community and local governments are superior in developing teams and partnerships. Their RAB would serve well as a model for any site with complex issues and multiple stakeholders.

Robert L. Stites
Federal Facilities Team Leader
U.S. EPA Region 8



The Hazardous Air Pollutants on Site, or HAPSITE, is a portable vapor analyzer capable of finding individual objects

vapors, all made out of the same plastic resin material. Testing similar items in other homes produced the same results. The use of the HAPSITE is now routine when an inside source is suspected. This device has already saved the Air Force an estimated \$3.6 million by not having to install and maintain unnecessary mitigation systems. It has also developed an increased level of trust and understanding in the communities as we can show residents the actual item or items that are causing the indoor air contamination.

Public involvement

Hill's Restoration Program emphasizes meaningful public involvement in the cleanup process. Hill's Public Involvement program is based on three principals:

1. Provide multiple ways to receive public input
2. Communicate honestly and directly
3. Respond quickly and completely

Hill's Restoration Advisory board is a model for the Department of Defense. Established in 1995, the RAB consists of 26 members. Quarterly meetings are productive and include reports from RAB working groups and breakout sessions that allow members to have detailed discussions regarding cleanup issues with Restoration engineers. In addition, RAB members may attend technical training sessions held prior to each meeting. These sessions provide interested RAB members an opportunity to become more

technically savvy. RAB members are also offered special training sessions and tours throughout the year. These sessions have included tours of the base's industrial area and maintenance facilities, a tour of the Operable Units, toxicology training, risk communication training and other pertinent topics. Annual training is provided for new RAB members to help them understand their role and how they can best serve their communities.

But the RAB is not the only place for citizens to be involved. Hill regularly hosts meetings in each of the surrounding communities to discuss issues pertaining to the cleanup. Called InfoFairs, these meetings are "Open House" style meetings that allow attendees to freely mingle and talk with staff members. Hill also provides an independent toxicology expert (Scott Phillips, M.D., University of Colorado Medical School) at each meeting to discuss health-related concerns people may have.

The Indoor Air Sampling Program is a significant part of the public involvement effort. Every year more than 3,000 packets are sent to residents living in areas of potential vapor intrusion. These packets include information about the sampling program, a map showing the area of groundwater contamination near their home and instructions on enrolling in the program. Once the sampling is complete, each resident gets a personal phone call reporting their results. Because of this extraordinary communications effort, Hill has been able to keep community concerns very low.

The Hill AFB Restoration Program's goal for community involvement is "No missed commitments." Tracking communications is an important part of ensuring timely follow-up is made and questions and concerns are not lost. Each communication, be it phone call, letter, newsletter or email, is recorded in a contacts database. To date, more than 20,000 entries have been recorded in the database, allowing the Restoration Team to know what was sent to whom and

InfoFairs in the local communities are a regular occurrence, allowing residents to talk face-to-face with Hill's Restoration staff.



Hill's Restoration Advisory Board is recognized across the country as a model of government/ citizen cooperation.

“Based on my 30-plus years of experience in group mediation and facilitation, Hill AFB has developed an extremely successful approach to engaging the public in its environmental restoration activities. This is not a coincidence — it is the result of strategic steps taken by the base to ensure that it reaches out to the public “early and often” and incorporates public input into its decision-making. The interaction between the base and the RAB is constructive, without posturing or high emotion on either side. This is unfortunately not the case with many of the collaborative groups that I work with—it is a group dynamic that reflects trust and respect going in both directions.”

Michele Straube
Mediator/Facilitator
CommUnity Resolution, Inc.

when. The database is also set up to track questions and follow-ups.

Hill has also established a Web site designed to act as an information portal for both RAB members and the public (www.hillrab.org). The site contains fact sheets, newsletters, maps, RAB meeting agendas and minutes, a calendar of public involvement opportunities and staff contact

information. In addition, the site acts as a management tool for the RAB. Members can access documents for review, draft minutes and agendas and other RAB-specific information.

Because of open, honest and frequent communication, Hill's public involvement program has been successful in keeping trust levels high and community concerns low. People know that if there were a problem, Hill's Restoration Team would tell them, because we always do.

PCB cleanup

In 2007, a routine pesticide soil sample taken after the demolition of an obsolete privatized base-housing unit revealed a surprise—PCBs. Follow-up sampling revealed more PCBs in the soil just a few feet from several base housing units. The Restoration Team took immediate action, beginning a fast-paced, comprehensive soil-sampling effort. Very detailed strategic planning, quick-turn analysis and other time-saving techniques were used to quickly characterize the area for PCBs. Restoration personnel worked closely with the military housing contractor, the Base Hospital staff and a medical toxicologist and immediately notified the residents of the PCB discovery and held an Information Fair with the residents to explain the findings, discuss health concerns and lay out future plans for investigation and cleanup. More than 100 residents attended the meeting, which was covered extensively by the local print and broadcast news media. Within five months, an investigation comprising 13 acres and more than 800 samples was complete.

As the investigation unfolded, residents received

personal notification of the sampling results. In addition, a weekly update was distributed to residents keeping them apprised of the investigation's progress and a Web site was developed and updated weekly so residents could see the results of all the samples. At the conclusion of the investigation, another meeting was held to report the results. Predictably, because residents were kept informed throughout the process, trust was high, concern was low.

The investigation identified nine areas where PCB levels exceeded residential standards. Hill also involved residents in the development of the cleanup strategies. Those living in the affected units were interviewed to determine what their concerns and requirements would be if they were to be displaced. These requirements were incorporated into the cleanup contract.

Only 22 months after the initial discovery of PCBs, the cleanup was complete, removing approximately 63,000 cubic feet of contaminated soil and making the housing areas safe for residents once again.

Asbestos removal

In addition to the Utah Test and Training Range, Hill AFB also has management responsibility for the Wendover Air Force Auxiliary Field Range at Wendover, Utah. From the 1940s through the 1960s, Wendover was used as an Air



During the PCB investigation, more than 800 soil samples were taken in the base housing area, some chosen by the residents themselves. This built trust with the residents by allowing them to pick the area of greatest concern to them.



A large-scale PCB cleanup in a base housing area was completed in just 22 months and hauled away 63,000 cubic feet of contaminated soil.

Force training facility. While most of those operations have ceased and much of the land ceded to the local city government, Restoration issues still remained on property still owned by the Air Force. Recently, a 165-acre parcel of land was found to harbor a large amount of asbestos-containing materials, such as roofing materials, siding and other construction debris. These materials, most of which were on the surface, were beginning to weather and becoming friable, making them a potential hazard to nearby residents and businesses.

In very rapid succession, Hill's Restoration team secured adequate funding, investigated the site, determined the areas requiring removal and began cleanup operations under a Time Critical Removal Action. Instead of excavating and hauling the materials away, it was decided to create an on-site landfill to minimize disposal costs and, more importantly, reduce the risk to the public and reduce the project's overall carbon footprint. By landfilling the asbestos on-site, Hill saved the Air Force nearly \$1 million over the total project costs of other disposal options.

In all, more than 4,200 cubic yards of contaminated soil and materials were excavated from the site and buried in the on-site landfill. The landfill was covered with a soil and gravel cap to prevent erosion. By cleaning up the site, Hill restored this previously unusable acreage, returning it to mission-ready status.

Getting the word out

At Hill, we don't believe in keeping good ideas a secret. If something works, we want to tell the world about it—and we have.

Hill project managers are frequently invited to share their successes at symposiums and conferences. In 2008 and

2009, Hill personnel presented 10 technical presentations in both military and civilian settings and published 10 articles in peer-reviewed publications; and these numbers do not include the countless presentations and articles produced by contractors and researchers who have worked on Hill projects.

Hill is also renowned as a fertile test-bed for cutting-edge remediation technologies. Research performed at Hill has made great advancements in the areas of phytoremediation, vapor intrusion, and biological-enhanced treatment of groundwater. In the last two years, more than \$2 million in research has been brought to Hill, with potential applications across DoD and throughout the world.

Conclusion

Hill's Restoration Program has demonstrated time and again that it leads DoD in innovative program management, cost efficiency, leading-edge transferrable technologies, sustainability and community involvement. Its commitment to excellence and to mission is second to none. Evidence can be found in its results, with millions of dollars saved through a conscientious application of a strong management philosophy of cost efficiency, mission support and environmental stewardship.



Construction contractors excavate an on-site landfill at Wendover Air Force Auxiliary Field, into which 4,200 cubic yards of asbestos-containing materials and contaminated soil would be placed. Landfilling the material on-site saved the Air Force nearly \$1 million in transportation and disposal costs.

