

# FY 2011 Secretary of Defense ENVIRONMENTAL AWARDS

75 CEG/CEVR, Environmental Restoration Branch / Secretary of Defense Environmental Restoration Award—Installation

## **INTRODUCTION**

Located approximately 30 miles north of Salt Lake City, Utah, Hill Air Force Base is a major Air Force aircraft and missile maintenance depot and weapon systems program office. The installation provides worldwide logistics management and engineering for the F-16 Fighting Falcon and A-10 Thunderbolt II aircraft and for 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 and C-130 aircraft. The installation is the Air Force Center of Industrial and Technical Excellence for “stealth” aircraft structural composite materials and provides support for the B-2 Spirit multi-role bomber. Supporting 6,698 acres and 50 tenant units on the installation and nearly 1 million acres of the Utah Test and Training Range (UTTR), Hill’s Restoration Team is responsible for all base and range environmental restoration activities.



Crews perform a surface sweep of an area suspected to have munitions. This area is being investigated as part of the Military Munitions Response Program. Nearly 120,000 acres of land adjacent to the Utah Test and Training Range are currently being investigated for munitions.

## **BACKGROUND**

Military operations at Hill AFB began in the 1920s when the Army established the Ogden Arsenal. The Army expanded operations and in 1940 created Hill Field as an aircraft maintenance depot. At the onset of World War II, the mission dramatically expanded, establishing Hill as one of the largest aircraft maintenance depots in the country. Industrial operations, unregulated chemical use, and improper disposal resulted in numerous releases of chemicals into the environment that ultimately contaminated soil and groundwater both on- and off-base.

The contaminants consist mainly of chlorinated solvents, fuels, and metals. In addition, more than 1,200 acres of densely populated off-base residential, commercial, and agricultural property sits atop contaminated groundwater. While drinking water supplies have not been affected by the contamination, vapor intrusion into as many as 3,000 homes poses a real threat of exposure to people living over the plumes.

In addition to contamination at Hill AFB, Hill’s Restoration Team is responsible for managing cleanup at the non-contiguous 1 million-acre UTTR in Utah’s West Desert. The vast open spaces on the range and sparse population make it an ideal location for aerial bombing and gunnery training, which the military has been conducting there since the 1940s. As a result, tons of metal, explosives and other materials have been left behind, posing both environmental and safety hazards. In addition, not all munitions used during training have landed within the UTTR boundaries. Some were dropped on non-military property adjacent to the range, posing a hazard to recreationalists, who frequent the areas near the range in ever increasing numbers.

## **PROGRAM SUMMARY**

Hill AFB Restoration Team consistently leads the path forward in identifying, developing, and implementing innovative techniques and technologies that improve the efficiency and effectiveness of remediation efforts while leaving behind the smallest possible environmental footprint. Hill’s Environmental Management Team operates under the philosophy of promoting cost-efficient environmental stewardship while meeting Air Force mission objectives.

The Restoration Team has embraced several projects that have led to innovative cost- and time-saving measures for restoration projects. Hill AFB implemented 29 energy-saving measures: cutting energy consumption by 35 percent, reducing its carbon footprint by 30 percent, and saving the Air Force more than \$250,000 per year in energy costs. Hill’s investment in sustainability will be repaid in less than three years. Hill AFB saved time and money on the timely restoration of a contaminated area to satisfy enhanced use lease requirements using performance-based contracting. The Restoration Team pioneered a method of accurately distinguishing between vapors from the

groundwater and vapors emitted from items in the home which eliminated unnecessary remediation, saving the Air Force millions of dollars in monitoring costs. Hill AFB's extensive communication efforts with the public has allowed for mission-critical work to proceed with community support.

## **ACCOMPLISHMENTS**

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. Key environmental restoration accomplishments include protecting human health and the environment; implementing early cleanup actions, when appropriate; optimizing the performance of remedial systems; and closing sites as soon as practicable. Hill also facilitates partnerships with researchers and technology vendors to demonstrate technologies that will improve cleanup efficiency and reduce costs;

The following projects demonstrate Hill's Restoration Team demonstrates outstanding leadership in finding new and innovative ways to clean up contamination while protecting human health and the environment.

### **VAPOR INTRUSION: IDENTIFYING THE SOURCE**

Because of the shallow nature of the groundwater contamination at Hill AFB and the surrounding communities, the primary exposure pathway has proven to be from vapor intrusion (vapor intrusion). Much of Hill's off-base groundwater contamination lies under residential communities, threatening thousands of homes. As a result, Hill operates a comprehensive vapor intrusion investigation, monitoring and mitigation program for the local communities.

This program had a challenge in accurately identifying vapor intrusion in local homes, even though detecting vapors is relatively straightforward. Many household products contain the same chemicals found in the contaminated groundwater, detections of vapors from household products were often misidentified as coming from the groundwater. As a result of the misidentifications, the Air Force frequently installed vapor mitigation systems in homes where vapor intrusion from the groundwater was not the problem. In an effort to reduce the number of unnecessary systems installed, Hill AFB developed a new analytical method for use with a portable chemical identification tool, called a HAPSITE®, to identify all the possible sources of chemical vapors in homes and determine human health risks from vapor intrusion.

Today, when a suspect chemical is detected in a home, the HAPSITE® is dispatched to investigate and determine the source of the chemical vapor. Often, the offending source is a tube of glue or can of solvent hiding in the back of a cupboard. Sometimes, however, the source is surprising, including items such as holiday ornaments, a wedding dress, lawn gnomes and taxidermy items. Once the Restoration Team identifies the source, the resident is asked to remove the item and another test is ordered. If the chemical is still detected and no further inside source is found, vapor intrusion from the groundwater is confirmed and the Air Force offers to install a vapor mitigation system.

This innovative approach has been very successful at reducing the number of unnecessary mitigation systems installed and has saved the Air Force \$220,000 annually in monitoring and analytical costs, along with an additional \$3.6 million in lifetime program costs.

Hill has proven to be a hotbed of vapor intrusion research. Scientists have been eager to learn the mechanisms by which vapors move from the groundwater into homes. Because of the volume of work done at Hill AFB, Arizona State University (ASU) purchased a home near the base known to be impacted by vapor intrusion. Working closely with Hill's vapor intrusion Restoration team, ASU researchers are studying what makes a house susceptible to vapor



Hill AFB believes that an informed RAB provides better advice. Hill provides its RAB multiple opportunities for training throughout the year. RAB members are often invited on site to witness work crews in action. In this case, they are observing the installation of a monitoring well.



Using a device known as a HAPSITE, Hill workers identify this stuffed deer head as the source of VOC vapors in a home. If VOC vapors can be traced to an inside source, it saves the Air Force thousands of dollars that would have otherwise been spent installing and maintaining a vapor mitigation system.

intrusion and what combination of conditions must exist for vapor intrusion to occur. Researchers placed data collection instruments throughout the house, beneath the foundation and outside the home to collect the information needed for the study. Scientists now better understand vapor intrusion and are applying these lessons learned at other locations where vapor intrusion poses a risk to residents. This study was recently named the Strategic Environmental Research and Development Program/Environmental Security Technology Certification Program Project of the Year.

### **MAKING REMEDIATION SUSTAINABLE**

Hill AFB is a leader in green remediation. Over the last couple of years the restoration program has looked for ways to improve energy efficiency and find solutions that are environmentally sustainable and economical. Operating and maintaining remediation systems, especially those installed more than 10 years ago, typically requires large amounts of energy. In 2009, the annual operating system used more than 1.2 million kilowatt hours at a cost of more than \$1.6 million and left a carbon footprint of more than 1.2 million pounds of carbon dioxide.

The significant energy requirements prompted Hill to conduct a study of each of the 12 operating remedial systems being used to clean up groundwater contamination. These systems, constructed between 1994 and 2007, have an operational life that goes to 2035 and beyond. The study analyzed available energy consumption data, conducted energy audits at individual facilities and performed field assessments of operations.

Based on the recommendations from the study, Hill evaluated and implemented 29 energy-saving initiatives, which have cut energy consumption by 35 percent, saved more than \$250,000 in energy costs per year and reduced the carbon footprint by 30 percent (approximately 360,000 lbs of CO<sub>2</sub>!). The payback period for the investment is estimated to be about 2.4 years.

In some cases, recommendations realized immediate savings. For example, by working with regulators and the local sewer district, the team was able to eliminate an existing air stripper and discharge groundwater with very low contaminant concentrations to the sewer for treatment. Another immediate energy-saving initiative resulted from changing the way a large air sparging treatment system operated. Engineers replaced two large inefficient blowers with one smaller, more energy-efficient unit. Instead of blowing air through the entire system at once, the new blower alternates air flow through three sparge zones. This not only allows the blower to operate more efficiently, but also aids the treatment efficiency of the system by reducing the preferential air pathways that developed under the previous operating conditions. This single initiative reduced energy consumption by 58,000 kilowatt hours annually, extending the operational life of the system by 10 years and saving \$1.5 million in replacement costs.

At other sites, Hill worked with regulators to shut down unnecessary and costly remedial system components. Through a series of tests, Hill demonstrated to regulators and stakeholders that the modified systems would continue to meet cleanup goals and maintain cleanup efficiency. At one of these locations the team reduced annual energy consumption by 60,000 kilowatt hours by shutting down two of five groundwater collection trenches. At another site, three unnecessary groundwater extraction wells were eliminated, saving 14,000 kilowatt hours per year.

Hill has implemented other measures to reduce costs by finding innovative solutions to solve problems. For example, Hill scientists and the regulators came to an agreement for no further action at a chemical disposal pit on the UTTR when it was shown that the site would never have any adverse impact to the environment. This decision closed the site 20 years ahead of schedule and reduced the cost-to-complete by more than \$2.5 million. At another site, Hill negotiated less stringent cleanup levels for an MTBE plume that would neither reach off base nor affect drinking water supplies. The resulting decision reduced projected cleanup time by 10 years.

### **SUPPORTING THE AIR FORCE MISSION**

In 2007, the Air Force announced its intentions to develop more than 500 acres on the west side of Hill AFB under an Enhanced Use Lease (EUL) to a private developer. This planned privatization presents a number of challenges, including making this undeveloped area suitable for commercial use.

A current phase of development involves relocating Hill's North Gate to a 12.5 acre parcel that straddles an environmental restoration site. The site contained construction debris, asbestos containing materials, heavy metals, and solvents - all sources of a groundwater plume that extends nearly a mile and a half into a nearby community.

Because of a strict timeline imposed by the impending gate construction, it was imperative that the Restoration Team characterize the site and remediate it sufficiently and quickly enough to allow construction to begin on schedule. Working with the Air Force Center for Engineering and the Environment (AFCEE), Hill awarded a \$12.5 million Performance Based Remediation contract with specific remediation objectives. Instead of prescribing a method and specific tasks, the contractor was given the flexibility to meet the objectives using whatever innovative and creative means necessary to accomplish the objectives within the prescribed schedule.

The contractor employed a special technique to characterize both the soil and groundwater. Using a membrane interface probe (MIP), geologists were able to simultaneously characterize the soil type and screen for the presence of Volatile Organic Compounds (VOCs). If VOCs were not present, no further characterization work was needed, freeing both time and resources for use in areas known to have VOCs. A statistical analysis of the results provided geologists reasonable certainty as to the location of the VOC-contaminated soils needing removal. This innovative approach allowed the entire site to be characterized in less than 24 field days and minimized the amount of soil needing removal, saving \$400K in disposal cost. In total, 58 tons of VOC-contaminated concrete, 55 tons of asbestos containing materials and 1,900 cubic yards of VOC-contaminated soil were removed from the site. In addition, 61 tons of scrap metal were recycled, further offsetting project costs.

Enhanced Use Leasing is just one of the Air Force/Private Developer cooperative ventures underway at Hill. As in much of the Department of Defense, the base housing function has been turned over to a private developer for management. In one privatized housing area, the Restoration Team has worked closely with the privatization contractor to identify and remove areas of PCB-contaminated soils in areas where old homes were demolished. As the developer continues to replace obsolete housing units with more modern homes, the Restoration Team works closely with the developer to ensure the new home sites meet all residential environmental standards. So far, the Restoration Team has removed 2,500 cubic yards of contaminated soil - making 13 acres safe for Hill AFB residents.

In addition, Hill is working to make almost 18,000 acres of bombing range suitable for other Air Force missions. Hill AFB contractors have completed surface clearance on 17,840 acres and have segregated and disposed of over 25 tons of munitions fragments and recycled more than one ton of scrap metal.

### SHARING WHAT WE LEARN

At Hill, we don't believe in keeping good ideas a secret. If something works, we want to tell the world about it. Over the last two years, Hill's Restoration Team members have published more than 30 papers and presented their findings at AFCEE training workshops, and symposiums and conferences all over the country on topics ranging from vapor intrusion to streamlining environmental investigations to green remediation. Of particular note, EPA Region 8 officials invited Hill's vapor intrusion team to present newly developed methods to a national EPA Vapor Intrusion Roundtable. Hill's findings were well received and will result in changes to future vapor intrusion studies. The result: liabilities could be reduced by more than \$10 million, and if applied DoD-wide, much more.

Hill has also spearheaded the exchange of information by hosting six tours and site visits highlighting the technology advances it has deployed. Tours were attended by research groups, government officials, Restoration Advisory Board members, and university students.



Using a Performance Based Contract (PBC), Hill's restoration team was able to quickly remediate a 12.5-acre area required to relocate one of Hill's main gates. The PBC contract vehicle allowed the contractor the flexibility to react quickly to changing conditions and meet the time restraints of the project.



Using the membrane interface probe (MIP) on a direct push rig. This device is able to characterize soil type and screen for the presence of Volatile Organic Compounds in real time. This approach allowed a 12.5 acre site to be characterized in little time and minimized the amount of soil needing removal.

## STAKEHOLDER INVOLVEMENT

Hill's Restoration Program emphasizes meaningful public involvement in the cleanup process and is based on three guiding principles: provide multiple ways to receive public input, communicate honestly and directly, and respond quickly and completely.

The following example illustrates these principles in action. One of Hill's remediation systems created a vapor intrusion issue via the sewer for 12 homes in a local community. As soon as the issue was identified, meetings were held with city officials, residents received personal visits, a newsletter article was published and distributed to residents and made available on the internet, and residents were given contact information so they could voice their concerns. As a result of these actions, the problem was satisfactorily resolved within two months. Due to Hill's quick response and open and honest communication, the vapor intrusion issue never became a problem in the community or the media. Instead, Hill's responsive actions solidified the trust that city leaders and the local community have in the Restoration Team.

Hill's Restoration Advisory Board (RAB) is a model for the Department of Defense. The RAB consists of 26 active members. Quarterly meetings are productive and include reports from RAB working groups and breakout sessions to allow members to fully discuss cleanup issues with Restoration Team members. Additionally, Hill offers technical training sessions prior to each RAB meeting, as well as other tours and training opportunities throughout the year. These sessions are well attended and provide interested RAB members an opportunity to become more technically savvy, thereby providing better advice to the Air Force.

With work associated with the Military Munitions Response Program increasing in the West Desert, the Restoration Team conducted community interviews and discovered significant community concern surrounding the cleanup of munitions on public and private property. In response, Hill AFB formed a second RAB to specifically address cleanup issues on and around the UTTR. This board consists of 19 members from local communities, recreation interests and American Indian tribes. The board has efficiently identified and is working to resolve diverse concerns ranging from economic development to recreational safety.

Opportunities for citizen involvement extend beyond the RABs. Over the last two years, Hill hosted five public information fairs, briefed at 14 city council meetings, met twice with county health officials, and met with school leaders and the Parent Teacher Association, with the sole purpose of providing the public an opportunity to discuss and keep up-to-date on Hill's cleanup issues. In addition, the team distributed nearly 7,000 newsletters covering site-specific information and hand-delivered hundreds of flyers to provide surrounding neighborhoods with information on upcoming field activities.

The Indoor Air Sampling Program is a significant part of the public involvement effort. Each year more than 3,000 information 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 homes, and instructions for enrolling in the program. Once sampling is completed, each resident gets a personal phone call reporting their results. Individuals of homes where a vapor intrusion level has been detected are personally called by the air sampling program manager, who typically handles more than 500 of these calls per year, so residents can get answers to any questions they may have.



Much of the fieldwork and sampling that is done at Hill AFB occurs in the streets of neighboring communities. Hill works very hard to ensure people are notified as to the type of work being done and are sensitive to ensure that those living in these areas are not adversely affected.