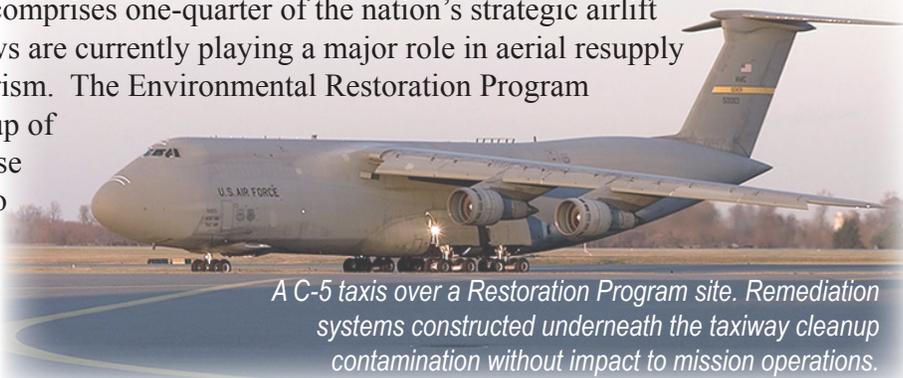




DOVER AIR FORCE BASE, DELAWARE

FY06 SECRETARY OF DEFENSE ENVIRONMENTAL AWARDS ENVIRONMENTAL RESTORATION - INSTALLATION

Situated on approximately 4,000 acres in central Delaware, Dover Air Force Base is home to the 436th Airlift Wing, whose aircrews fly a fleet of C-5 galaxy aircraft, the largest plane in the western world. The Dover fleet comprises one-quarter of the nation's strategic airlift capability, and Dover's aircrews are currently playing a major role in aerial resupply in support of the war on terrorism. The Environmental Restoration Program focuses on expeditious cleanup of areas impacted by past defense activities. The objective is to restore natural resources for use in supporting the base's warfighting mission.



A C-5 taxis over a Restoration Program site. Remediation systems constructed underneath the taxiway cleanup contamination without impact to mission operations.

Dover Air Force Base's Environmental Restoration Accomplishments During the Award Period:

- » Spearheaded an Acceleration Initiative to transform processes and reduce inefficiencies, accelerating achievement of Remedy in Place (RIP) by as much as 4 years at some sites
- » Fostered a spirit of commitment with environmental regulators, and developed mutual goals to assure active involvement by all parties
- » Obtained regulator signatures on 6 Records of Decision for 39 sites in 6 months – an Air Force record
- » Completed Remedial Designs and Work Plans for 17 sites in only 3 months
- » Accomplished simultaneous construction of innovative groundwater cleanup remedies at 17 sites – in only 7 months
- » Achieved RIP at all remaining sites, 8 years ahead of the DoD goal
- » Achieved Response Complete status at 27 of Dover's 59 sites
- » Opened up 54 acres of formerly restricted land for use in supporting the base's mission

Direct injection of organic carbon into a solvent source area. In 2006, the Dover Team injected 10 Million gallons of substrate into 620 acres of groundwater plumes, implementing anaerobic biodegradation remedies at all remaining sites.



Supporting the Mission Through Accelerated Cleanup



INTRODUCTION

Dover Air Force Base (Dover AFB) is home to the 436th Airlift Wing, known as the “Eagle Wing,” within Air Mobility Command (AMC).



It is the home base to a fleet of 22 C-5 Galaxy aircraft, the largest aircraft in the western world. The Eagle Wing is the only combat-ready C-5 Galaxy Wing capable of employing airdrop and special operations tactics in support of worldwide airlift. Co-located at Dover AFB is the 512th Airlift Wing, the “Liberty Wing,” an Air Force Reserve tenant organization. Eagle and Liberty Wing aircrews fly an air fleet that comprises one-quarter of the nation’s strategic airlift capability. The Eagle Wing operates the largest and busiest aerial port in the Department of Defense (DoD). Dover AFB is also home to the Charles C. Carson Center for Mortuary Affairs, the DoD’s only stateside joint services mortuary, whose mission is to return America’s fallen heroes with dignity, honor, and respect.

Located in central Delaware, Dover AFB covers approximately 4,000 acres, and is surrounded by cropland, wetlands, and commercial development. The Delaware Bay is several miles to the east. Two miles to the northwest is the city of Dover, the capital of Delaware. With a population of just over 34,000, the city of Dover is the largest population center in the southern two-thirds of the state. Dover AFB is the third largest employer in the state of Delaware. With a total force strength of 11,800 (including 3400 Active Duty, 1200 Civilians, and the remainder comprised of Reserve, National Guard, and Dependents) Dover AFB has an economic impact of more than \$375 million on the local community.

BACKGROUND

The Challenge: Dover AFB has been an active military airfield since 1941. As such, historical waste handling and disposal practices, industrial processes, and airfield activities caused

contaminant releases over several decades. The base was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) in March 1989. In August 1989, a Federal Facility Agreement (FFA) was signed by Dover AFB, the U.S. Environmental Protection Agency (USEPA) Region III, and the Delaware Department of Natural Resources and Environmental Control (DNREC). Environmental investigations subsequently identified 59 contaminant release sites. Common contaminants at these environmental restoration (ER) sites are chlorinated solvents, jet fuel, and to a lesser extent, pesticides and metals. Groundwater contaminant plumes, primarily consisting of chlorinated solvents, extend under a quarter of the base’s 4,000 acres.

Organization, Staffing, and Management

Approach: Dover’s top-notch team of environmental experts, and their innovative management approach, are the keys to the ER program’s phenomenal success. Dover’s current staff includes a Restoration Program Manager (RPM) and two environmental support specialists. Several years ago, Dover’s forward-thinking ER personnel recognized that conventional processes and contracting support services were not efficient in meeting their complex groundwater remediation challenges. Therefore, they forged a unique teaming arrangement with the Department of Energy’s (DOE) Oak Ridge National Laboratory (ORNL) through a performance-based acquisition strategy. The Dover staff maintains responsibility for program, schedule, and funds management, regulatory interactions, and overall decision making. The ORNL staff provides the Dover Team with process flexibility, timely



A C-5 in flight near one of Dover AFB's Environmental Restoration cleanup sites.



ORNL personnel perform injection activities for cleanup of groundwater.

project execution, and superlative technical expertise. With three full-time ORNL personnel working side-by-side with the Dover ER staff, the Team performs most of its field oversight, operations, monitoring, and administrative work in-house, and contracts for major construction activities.

USEPA Region III and DNREC also play key roles in the overall success of the Dover ER program. Through Tier I and Tier II partnering, the Dover Team is able to obtain rapid consensus decisions with regulators on complex cleanup actions. The dynamic teaming arrangement with ORNL, coupled with continuous regulatory engagement, facilitates efficient use of talent and resources, creativity in problem solving, stakeholder buy-in, flexibility to address unforeseen issues, and provides for incomparable budget and schedule control.

ER Initiatives: Beginning two years ago, the Dover Team boldly implemented an ER Acceleration Initiative that has dramatically improved processes and productivity. With strong support from higher level management within Air Force, USEPA, and DNREC agencies, the Dover Team developed a forward-thinking plan to transform and accelerate the program. The plan established a challenging goal, agreed to by all agencies, of achieving Remedy in Place (RIP) at all 59 sites by the end of fiscal year 2006 (FY06), several years ahead of original schedules. As discussed in the Accomplishments Section, the Dover Acceleration Initiative is a stellar success.

Community Involvement: Because of the base's reputation for outstanding environmental stewardship, and due to the ER Team's energetic outreach efforts, the community has expressed no interest in establishing a Restoration Advisory Board (RAB). Despite the absence of a RAB, the Dover Team manages a robust public



affairs program to ensure that the community is kept informed and afforded opportunities to participate. The Team publishes newspaper articles, hosts press events, and provides tours to interested groups, as well as holding public meetings and issuing press releases when ER milestones are achieved. In FY05 and FY06, the Team published periodic articles in the base newspaper to apprise the community of extensive field activities, had 6 articles and 4 notices published in local newspapers, hosted two tours for local schools, and held public meetings for 6 proposed remedial action plans. In May 2006, the ER Team hosted a Record of Decision (ROD) signing ceremony to commemorate the signing of the last of Dover AFB's RODs. In addition to Air Force, USEPA, and State officials, the event was attended by community members, including the Mayor of Dover, and local and regional press.



"It's a great pleasure for me to be here today to congratulate all of the Dover Restoration Team for their exceptional work and excellent progress," said keynote speaker Major General (sel) Del Eulberg, AMC Director of Installations and Mission Support, addressing the crowd at Dover's May 2006 ROD signing event.

PROGRAM SUMMARY

Mission focus is the driver behind the Dover ER Team’s success. The overall goal of the Dover ER program is to support Dover’s warfighting mission while protecting human health and the environment. Specifically, the objectives are to:

- Restore natural resources and land availability as quickly and cost effectively as possible to enhance mission capability
- Enhance combat support through ER program integration with Base Planning and Requirements Development functions
- Maintain compliance with environmental laws and regulations to ensure protection of human health and the environment
- Meet or exceed DoD and AF cleanup goals

“Today, as we sign this final ROD for Dover AFB, we have reached a significant milestone toward the completion of a major Superfund cleanup. What has been accomplished here is a true government partnership.”

William P. Wisniewski, Deputy Administrator
USEPA Region III

By transforming their processes through the Dover Acceleration Initiative, the ER Team is achieving all of their ambitious objectives, even surpassing their extremely compressed acceleration schedules at some sites, and most importantly, supporting Dover’s military mission.

ACCOMPLISHMENTS



Supporting the Mission through Accelerated Cleanup:

The ER Team’s ultimate goal is to make more land available for military operations while protecting human health and the environment. By expediting implementation of final cleanup decisions, in FY06 alone, the ER Team opened up 54 acres of formerly restricted land, which are now available for base industrial use. This success story is the direct result of the Dover ER Acceleration Initiative. During FY05 and FY06, the Dover ER Team:

- Obtained regulator approval of Feasibility Studies (FSs) evaluating complex cleanup options for 17 of Dover’s most contaminated sites and groundwater contaminant plumes
- Completed 6 Proposed Remedial Action Plans for 39 sites and obtained community and stakeholder buy-in
- Obtained signatures on 6 RODs for 39 sites in 6 months – an Air Force record!
- Completed Remedial Designs and Work Plans for 17 sites in only 3 months
- Accomplished simultaneous construction of remedies at 17 sites – in only 7 months
- Achieved RIP at all remaining sites, 8 years ahead of the DoD goal – from FS to RIP at 39 sites in just 18 months!

The ER Team shaved as many as 4 years off projected RIP schedules at numerous sites (Table 1). But that’s not all. As a true measure of tangible progress, the ER Team achieved Remedial Action Objectives (RAOs) at 27 of Dover’s 59 sites during FY05 and FY06, bringing the total number of ER sites in the Response Complete (RC) category to 35.

Site #	Original Projected RIP Date	Actual RIP Date
FT001	15 Sep 2006	30 Mar 2006
ST004	01 Oct 2006	02 Aug 2005
SS007	01 Oct 2006	30 Mar 2006
SD012	01 Jun 2006	30 Mar 2006
LF017	15 Sep 2006	30 Mar 2006
LF018	15 Sep 2006	30 Mar 2006
SS020	30 Nov 2010	30 Sep 2006
LF022	01 Jun 2006	30 Mar 2006
LF023	01 Jun 2006	30 Mar 2006
LF025	01 Oct 2010	30 Sep 2006
LF026	01 Jun 2006	30 Mar 2006
WP031	30 Sep 2007	30 Sep 2006
OT041	30 Sep 2007	30 Sep 2006
OT044	30 Sep 2007	30 Sep 2006
OT048	30 Sep 2007	30 Sep 2006
OT050	30 Jun 2007	30 Sep 2006
OT051	30 Jun 2007	30 Sep 2006

Dover is sharing these success stories to aid progress at other installations. Dover's RODs and other documents are posted as "how to" examples on Air Force websites, and AMC is adopting some of Dover's acceleration concepts into its corporate program strategies. The 54 acres freed up by the ER Team's efforts are now available to support development for base realignment and C-17 aircraft basing activities currently ongoing at Dover AFB. Mission focus is a reality, not a concept, for the Dover Team.



Team Building & Process Transformation – How Dover Accelerated its ER Program:

Dover's amazing accomplishments are the result of the Acceleration Initiative spearheaded by Air Force, EPA, and State RPMs. Representatives of these organizations formed a cooperative partnership, committed key resources, established an ambitious goal of achieving RIP by the end of fiscal year 2006, developed an acceleration plan, and executed that plan. With staunch dedication, innovative problem solving, and willingness to challenge process inefficiencies, the Dover Team shaved several years off their restoration schedules. They undertook specific transformation activities such as:

- Assembled a first-rate team of acquisition and technical experts who are dedicated full time to the Dover program
- Directly engaged high level AF, USEPA, and State managers to establish mutual goals, identify process inefficiencies and overcome program obstacles
- Developed detailed schedules with tasks and deadlines defined by site and by organization to assist each agency with resource allocation planning
- Slashed document review times to 2 weeks instead of the standard 4 weeks established in the Dover FFA
- Identified funding issues associated with accelerating projects; reallocated resources to accommodate

- Streamlined base-level activities by soliciting buy-in early in the planning process from base planners, property managers, funds managers, civil engineers, building managers, and flightline operations managers; enabled construction of cleanup remedies in critical areas with no negative impacts to mission operations
- Comprehensively integrated ER land use requirements and controls into the Base General Planning process, providing a direct and transparent link between the cleanup program and military operations
- Obtained cost and schedule efficiencies by competitively bidding multi-year performance-based basic ordering agreements for remedy construction, operations, and maintenance
- Assessed talent pool against requirements and effectively balanced work load among AF in-house, ORNL, and contractor personnel. Result: multiple critical path tasks were accomplished in parallel rather than in series, reducing project timelines
- Dover in-house staff performed tasks ordinarily contracted out, including writing RODs and Implementation Plans
- Fostered commitment from all team members - the linchpin to success



Innovative Bio-Remedies Cut Cleanup Duration and Cost:

Dover, a long-time pioneer of biotechnology development, has hosted many innovative biotechnology demonstrations and remedies since the mid-1990s. The valuable information gained from these projects has been published and distributed to government and private sector entities alike, and our success stories are used as examples at bioremediation training courses sponsored by the Interstate Technology and Regulatory Cooperation (ITRC) Group. Moreover, the information has been instrumental in persuading regulators and stakeholders to approve innovative biotechnology applications as final remedies for the base's major

groundwater plumes. FY05 and FY06 saw a massive surge in biotech implementation at Dover as the ER Team completed remedy construction at all sites. The following are highlights.

○ **Anaerobic Bioremediation (AB) to Address Huge Chlorinated Solvent Plumes:**

In FY06, the indomitable Dover Team implemented AB remedies over an area covering 620 acres of groundwater contaminant plumes at 17 ER sites. By simultaneous deployment of 7 separate field crews, the Team installed over 251 injection wells, direct-injected over 1000 boreholes, and pressure-injected over **10 Million gallons** of carbon substrate into groundwater plumes – **all in just 7 months!** The substrate is a mixture of potable water, sodium lactate to stimulate immediate bio-growth, emulsified soybean oil to provide a long-term food source, and di-basic ammonium phosphate, a fertilizer. The on-site Team designed an innovative push-pull delivery technique – alternately extracting and injecting on every other well along each installed transect – for optimum distribution of substrate into the aquifer (Figure 1). This innovative treatment program will cut Dover's overall cleanup time by 28 years, and cut total treatment train lifecycle costs by 26% over conventional treatments.

○ **Accelerated Anaerobic Biodegradation (AAB) Recirculation System at Building 719:**

In FY06, RAOs were met in most monitoring wells at site OT041, Dover's largest source of chlorinated solvent contamination. An AAB recirculation system was installed at this site in 2002 to treat a contaminant source area underneath a jet engine maintenance facility. The system creates a reactive zone below the building where conditions are ideal for anaerobic biodegradation (Figure 2). Contaminated groundwater is pulled from under the building into extraction wells, circulated into a process building where sodium lactate and di-basic ammonium phosphate are added, and then reinjected on the upgradient side of the building into the reactive zone. In just 4 short years, contaminant levels, which had been greater than 50,000 parts per billion (ppb), fell to the current

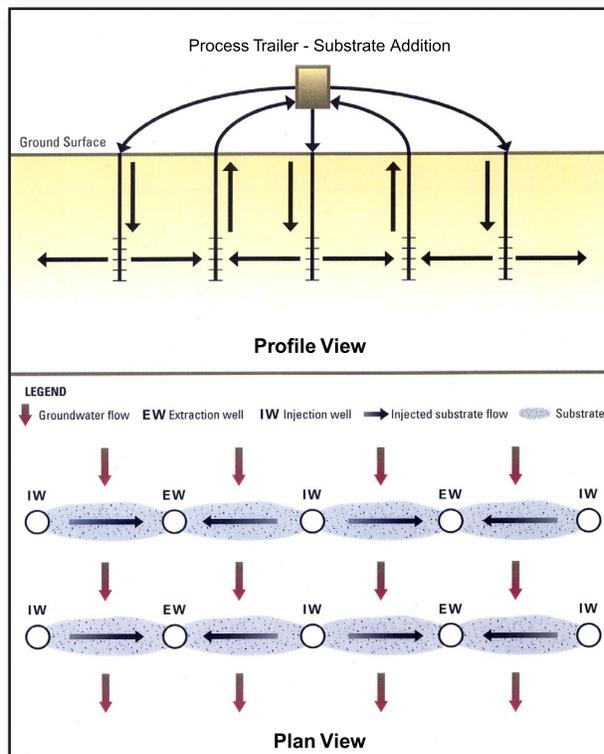


Figure 1. Innovative push-pull delivery technique uses a simple mobile process trailer and generator to inject substrate into the aquifer.

levels of less than 500 ppb in all key wells, and less than RAOs in all but three wells. The remedy is so successful that in FY06 regulators agreed to allow Dover AFB to terminate operation of the system, and passively monitor as biodegradation continues. By removing the source area from underneath the building, the AAB remedy reduced total plume cleanup time from an estimated 80 years with conventional remedies, to just 15 years with AAB, and cut lifecycle costs by 45%. Best of all, cleanup was managed without disruption to mission critical operations within the building.

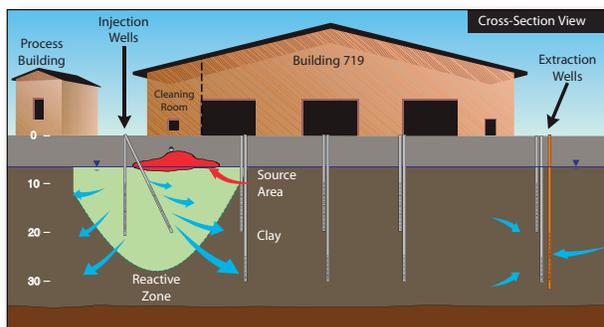


Figure 2: Conceptual Model for Accelerated Anaerobic Biodegradation Recirculation System

○ **Bio-geochemical Permeable Reactive Mulch Barrier:**

In FY05, the Dover Team collaborated with the Air Force Center for Environmental Excellence to install a new permutation of a permeable reactive barrier in a chlorinated solvent plume. Two trenches, both 556 feet long and 20 feet deep, were installed. Both trenches were filled with wood mulch. One trench was also treated with magnesium sulfate for a side-by-side comparison of anaerobic biodegradation



The barrier was installed using a one-pass trench excavator, which simultaneously excavates soil and emplaces the barrier's reactive material.

versus bio-geochemical breakdown. The ever resourceful ER staff used wood mulch from base tree removal activities – a bonus no-cost solution for reducing base solid waste. They strategically located the barrier upgradient of a surface water stream to prevent contaminant discharge to the stream. As an added bonus, the barrier stops contaminant bleed into a downgradient ER site; the resultant drop in contaminant concentrations at that site will allow site closure several years earlier than estimated.

"[Dover] ... is a success story of what can happen at a federal NPL site when good people develop chemistry, set a goal, and put their minds to it."

Hank Sokolowski, P.E.
Associate Division Director
Office of Federal Facility
Remediation & Site Assessment
USEPA, Region III



Regulatory Partnerships: To maintain the super-productivity necessary to achieve Dover's accelerated cleanup objectives, the Dover ER staff diligently fostered a spirit of committed cooperation with regulatory partners. The Team's modus operandi is to develop

"We are proud to have been part of the team of competent and committed staff, using ITRC technical support, who proved that long-term environmental stewardship and maintaining warfighting readiness can and must be managed together."

James D. Werner
Director, Division of Air & Waste Mgt.
Delaware Dept. of Natural Resources &
Environmental Control

objectives designed to help each agency attain its internal goals, thus benefiting all parties. For example, the Dover Team developed accelerated schedules that would meet both the Air Force RIP milestone and the USEPA's Construction Complete milestone. In another instance, they modified a Post-Closure Permit for a Resource Conservation and Recovery Act (RCRA) site to transfer cleanup activities to the CERCLA program, thereby expediting cleanup but still meeting State goals. Once mutual objectives are established, all agencies are invested in the outcome, and active involvement by all is assured. The ultimate proof of Team Dover's partnering success can be summed up in one astounding statistic: the Team achieved regulator buy-in on 36 intricate technical documents in the space of only 12 months! That's partnering at its best.



The enthusiastic Tier II partnering team proudly displays the first of 6 RODs to be signed under the Acceleration Initiative.