



2026 Department of War

Environmental Awards

Environmental Restoration – Installation
Beale Air Force Base, California

Introduction

Beale Air Force Base (AFB) is a 22,944-acre military installation located in Yuba County, California, approximately 40 miles north of Sacramento. The 9th Reconnaissance Wing's mission is to provide high altitude reconnaissance, mission ready Airmen, and combat ammunitions expertise to combatant commands, while integrating new capabilities. To accomplish this mission, the Wing is equipped with the nation's only fleet of U-2 Dragon Lady reconnaissance aircraft and associated support equipment. The Wing also maintains a high state of readiness in its expeditionary combat support forces for potential deployment in response to theater contingencies. The 9th Reconnaissance Wing is composed of more than 7,100 personnel, including 6,063 military and 1,090 civilians and contractors. These personnel serve in four groups at Beale AFB, multiple stateside and overseas locations, and various tenant units.

The total annual economic impact of Beale AFB on California is approximately \$614M. Over 17,000 acres of Beale AFB is undeveloped and consists of riparian areas and wetlands. Of the 17,000 undeveloped acres, approximately 13,000 acres are leased to cattle ranchers for grazing, accommodating over 2,000 cattle annually. The base sits between the Yuba and Bear Rivers in an area characterized by the transition from the western Sacramento Valley to the eastern Sierra Nevada foothills. Beale AFB also owns a 235-acre communication site, known as the Lincoln Receiver Site, located in Lincoln, California. Beale AFB is responsible for environmental restoration at two geographically separated locations. These are Point Arena Air Force Station (AFS), 190 miles west in Mendocino County, and Tulelake AFS, 290 miles northeast in Modoc County.

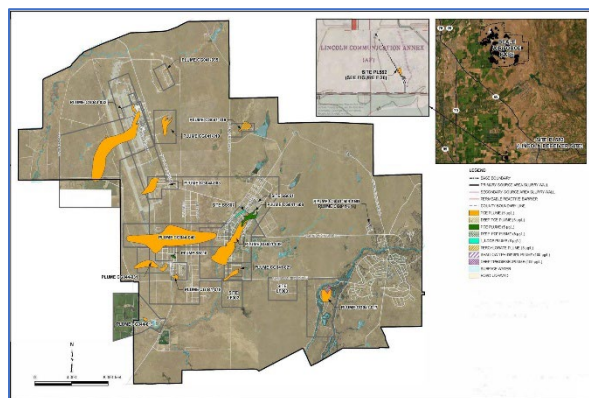
Background

The Beale AFB Environmental Restoration Program (ERP) encompasses 66 Installation Restoration Program (IRP) sites and the Military Munitions Response Program (MMRP), with 63 Munitions Response Areas (MRAs), consisting of 122 Munitions Response Sites (MRSs). IRP sites are addressed under one of the following: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA); the Resource Conservation and Recovery Act (RCRA) of 1976; or the Leaking Underground Fuel Tank (LUFT) program. MMRP sites are addressed under CERCLA.

Contaminants of concern (COCs) for the IRP sites include petroleum hydrocarbons, chlorinated hydrocarbons, including dense non-aqueous phase liquids (DNAPLs), and per- and polyfluoroalkyl substances (PFAS). The majority of the petroleum hydrocarbon contamination in the groundwater resulted from old single-walled underground storage tanks that leaked or from fuel spills on or near the flightline. The chlorinated hydrocarbon contamination resulted from improper disposal practices or solvent spills in various locations around the installation from legacy operations occurring from the 1950s to the 1970s. Of the 66 IRP sites, 29 remain open with active investigations or remedial actions being conducted.

The MMRP has several COCs based on the use of on-base ranges. Munitions contributing to COCs range from 105-millimeter rounds, white phosphorus mortars, and MK II hand grenades to small arms projectiles (.50 caliber and smaller). Of the 122 MRSs, 114 have been closed. These closures were achieved either administratively during site investigation or through concurrence with state regulatory agencies, the Air Force Safety Center, and the Department of War Explosives Safety Board. Beale AFB has eight MRSs requiring site closeout, seven of which have undergone

surface clearances and are awaiting final remedial action.



Beale AFB IRP Site/Plume Locations

Beale AFB has 37 ERP Sites (IRP and MMRP) located throughout the installation. Majority of the IRP Sites are clustered around areas where maintenance and material handling were conducted.

Current ERP staffing at Beale AFB consists of three permanent civilians and one full-time support contractor. IRP site remediation and monitoring is conducted under a Performance Based Contract. MMRP site cleanup projects and IRP geographically separated locations are awarded by project and not by contract.

A critical element of Beale AFB's ERP management approach is the communications plan that fosters established stakeholder relationships (regulatory and public). This communication plan enhances Beale's public outreach efficiency. The program includes a Restoration Advisory Board (RAB) meeting three times annually, a biannual RAB Newsletter, an annual mission-focused briefing, and a yearly tour of IRP sites.

Beale encountered challenges despite making outstanding progress in closing the ERP sites. The primary challenge was conducting remedial action in sensitive habitat areas. Approximately 75% of Beale AFB is undeveloped, consisting of wetlands and/or vernal pools that require habitat mitigation for projects posing a potential impact. Habitat mitigation can have a significant impact on project costs.

The presence of wetlands and/or vernal pools can also limit the locations allowed for

monitoring well installation. To alleviate mitigation costs, Beale AFB adopted a method of 'surgically' removing soil from contamination 'hot spots.' This approach involves several steps: using hand excavation near sensitive habitats, identifying duripan depths to maintain local hydrology, and harvesting topsoil from the excavation area to use as seed material for restoration. Within the framework of the MMRP, Beale AFB employs advanced geophysical classification (AGC) technology for site characterization in sensitive ecological areas, including wetlands and vernal pools. The application of this methodology curtails the necessity for intensive subsurface anomaly investigations during removal and remedial phases, thereby substantially mitigating or preventing adverse impacts on threatened and endangered species and their habitats.

Off-base agricultural groundwater pumping also has a significant impact on the groundwater plumes at Beale AFB. The pumping, which is part of a groundwater substitution transfer program, has caused groundwater levels to drop by as much as 50 feet. This drop in groundwater levels poses a risk of causing the contaminant plumes to migrate farther off-base.

The evolving legal and regulatory framework surrounding PFAS necessitates a proactive and adaptive approach by the Beale ERP Team. The continual introduction of new and updated health advisories, cleanup standards, and disposal guidance requires the team to remain agile in the formulation and modification of its investigation strategies and objectives for the installation and the installation's continued mission growth. This ensures that all environmental actions align with the most current federal and state requirements to protect human health and the environment.

An additional challenge is working within the California regulatory climate. California has stringent guidance addressing soil, soil vapor, surface water, and groundwater cleanup

actions. Some state maximum contaminant limits and public health goals for soil, soil vapor, and water are more stringent than federal levels, as are some toxicity criteria. This challenge is overcome by maintaining an excellent rapport with California Department of Toxic Substances Control (DTSC), the Regional Water Quality Control Board, and the California Department of Fish and Wildlife (CDFW). These strong relationships help achieve consensus on a path forward, particularly when chemical contaminant concentrations are above state regulatory levels, but still within acceptable risk levels. This includes working closely with regulatory stakeholders to develop language acceptable to all parties for inclusion in decision documents.

Accomplishments

Strategic Management Accelerates Mission-Critical Land Return

During the achievement period, Beale AFB has consistently demonstrated exceptional program management and military mission orientation by accelerating the restoration and return of mission-critical land. In Fiscal Year (FY) 2025, through strategic oversight of the base's Optimized Remediation Contract, the ERP team ensured six remedies, and two Response Complete milestones remained on or ahead of schedule, showcasing a commitment to efficient and effective task execution. The cornerstone of this accomplishment was the successful negotiation with regulatory agencies for the removal of industrial Land Use Controls (LUCs) across a significant portion of the installation. This strategic action directly returned approximately 700 acres of land for mission-critical expansion, a full two years ahead of the projected schedule. The early return of this land provides the 9th Reconnaissance Wing with vital operational flexibility and supports future mission growth, directly enhancing the installation's strategic value. Beyond the operational benefits, this achievement yielded significant financial savings, eliminating \$35,000

in annual costs associated with regulatory compliance from monitoring and reporting for the LUCs. Removal of the LUCs also eliminated the need for costly vapor intrusion mitigation measures for new operational facilities within Beale AFB's cantonment area. This landmark achievement provides a lasting enhancement to the installation's strategic capacity for approximately 700 acres, securing the critical flexibility required to meet the nation's future mission demands head-on.

Enhancing Remediation Management with In-House Expertise

Beale AFB has cultivated a culture of self-reliance and technical excellence within its ERP team, leading to significant cost savings and enhanced remediation management. A prime example of this is the team's work at the geographically separated unit, Point Arena AFS. By leveraging superior in-house expertise, the team personally conducted four site visits and developed the comprehensive Second Five-Year Review report and two annual LUC inspection reports. This insourcing of technical work, which would typically be contracted out, saved the Department of the Air Force (DAF) over \$390,000 in contract costs and 72 man-hours, demonstrating an outstanding commitment to efficient resource management. Additionally, the team took on the task of authoring an Explanation of Significant Differences to address recommendations identified in the Point Arena Second Five-Year Review, with an estimated DAF saving of \$45,000.

Furthermore, the ERP team provided invaluable strategic direction and technical expertise to solve a complex, multi-million-dollar cleanup challenge related to a hangar construction project. By delivering expert guidance on the efficient disposal of construction debris, the team reduced the overall project cost by \$1.4M. This proactive involvement not only saved taxpayer money but also prevented potential project delays, ensuring that installation development could proceed without interruption. This multi-faceted

success—blending accelerated restoration, direct mission support, and astute financial stewardship—serves as a model for how environmental programs can function as key enablers of military readiness and installation modernization. Key findings and procedural insights are disseminated throughout the Air Force Civil Engineer Center's Restoration Division and are further communicated to the U.S. Environmental Protection Agency and state regulatory agencies during Regulatory Tier 1 and Quarterly Tier II Regulatory Partnering Meetings.

Pioneering PFAS Remediation through Innovative Technology

Beale AFB has firmly established itself as a Department of War (DoW) leader in tackling one of the most pressing and complex environmental challenges: the remediation of PFAS. Demonstrating outstanding technical merit and forward-thinking program management, the installation was selected to conduct three pioneering and nationally significant studies aimed at developing effective PFAS treatment technologies. During the award period, the ERP team launched a critical treatability study to identify viable methods for removing and treating PFAS contamination within the installation's groundwater. This study is essential for developing a long-term, cost-effective strategy to protect vital water resources and mitigate potential risks to human health. In parallel, Beale AFB championed cutting-edge solutions by partnering with the Environmental Security Technology Certification Program (ESTCP) on two separate technology demonstrations. These innovative projects are evaluating both *ex situ* (extracted) groundwater and *in situ* (in-place) soil treatment methods, providing critical data on the efficacy and scalability of different PFAS removal and destruction technologies. The groundwater treatment technologies included Surface-Active Foam Fractionation (SAFF) to remove PFAS compound from groundwater, plasma vortex,

and Hydrothermal Alkaline Treatment (HALT) to break down PFAS compounds. The soil treatment technology used a thermal treatment to vaporize PFAS compounds and removal via a vapor extraction system. By actively validating these multiple, cutting-edge solutions, the Beale ERP team is not just addressing a local contamination issue, but is also paving the way for faster, more cost-effective PFAS remediation strategies that can be transferred and implemented across the DoW. The results of these studies provide a validated technical framework and scalable methodologies that will inform and standardize future PFAS remediation efforts, ensuring broader applicability and enhanced efficacy across the DoW.



Plasma Vortex Treatment System

A vortex is created with the PFAS concentrate to allow for a greater treatment surface area and a shorter treatment time.

The data generated from these studies will directly inform future policy and cleanup decisions, helping to reduce the DoW's multi-billion-dollar environmental liability associated with PFAS. This proactive and innovative approach underscores Beale AFB's commitment to leveraging science and technology to solve complex environmental problems, protecting the health of its personnel and the surrounding community while contributing invaluable knowledge to the national environmental security effort.



In Situ Thermal PFAS Soil Treatment

Heating the subsurface soils to reach temperatures where PFAS can desorb, volatilize, or boil for separation from soil and groundwater. Contaminants are then removed using conventional subsurface vacuum extraction equipment.

Advancing Resourceful Remediation for a Reduced Environmental Footprint

Beale AFB continues to be at the forefront of implementing and optimizing resource-efficient remediation practices, minimizing the program's environmental impact while effectively treating contamination. A key achievement during the award period was the execution of four emulsified vegetable oil (EVO) substrate treatments within a key trichloroethylene (TCE) groundwater plume source area. This innovative and resourceful approach involves injecting a food-grade, biodegradable substrate into the aquifer, which then harnesses and stimulates naturally occurring bacteria to break down harmful contaminants into benign substances. This passive, low-energy treatment serves as a model for long-term remediation, effectively destroying contaminants in place with minimal environmental disturbance and significantly lower long-term cost savings of an estimated \$12 million, compared to traditional pump-and-treat systems.

In addition to pioneering new cleanup applications, Beale's ERP expertly manages and maintains multiple existing low-impact remediation systems, ensuring their continued effectiveness and longevity. These systems include two large-scale bioreactors and a permeable reactive barrier (PRB) containing zero-valent iron, all of which are designed to treat contaminants passively with minimal energy inputs. By prioritizing these environmentally focused technologies, Beale

AFB reduces its reliance on energy-intensive systems. This approach minimizes long-term operational costs, saving approximately \$51 million and moves the installation closer to its overall environmental goals. This dedicated focus on long-lasting solutions demonstrates a clear commitment to cleaning up past contamination and in a way that is environmentally responsible and financially prudent.



Clay Cap on Plume CG041-017 PRB

The PRB was installed 25 feet below ground surface to intercept the flow of groundwater containing the chlorinated volatile organic compounds.

Achieving a New Standard in Program Transparency & Community Trust

Recognizing that stakeholder trust is paramount to program success, Beale's ERP team executed a comprehensive and multi-faceted community engagement strategy that sets a new standard for transparency and public involvement. Over the two-year award period, the team directed six highly collaborative Restoration Advisory Board meetings and authored and distributed four public newsletters, ensuring a consistent and open dialogue with regulators, community members, and other stakeholders. This sustained effort fostered remarkable program transparency and earned high praise from public agencies and board members alike for its commitment to open communication and collaborative problem-solving.

Going beyond traditional outreach, Beale's ERP managed a public information booth at the June 2025 Beale Air and Space Exposition, a major community event. This initiative allowed team members to interact

directly with over 400 visitors, educating them on the installation's extensive restoration efforts and answering their questions in a personal, accessible forum.

In addition to major public events, Beale's ERP is responsible for reviewing all the National Defense Authorization Act (NDAA) Section 335 notifications and outreach to 47 agricultural property owners and serves as a point of contact to address their concerns. This direct engagement significantly boosted community awareness and fosters a deep sense of trust with local residents.

To ensure total and enduring public transparency, the team also completed a massive overhaul of the Administrative Record website. This undertaking involved uploading 189 critical cleanup records, providing the public with unfettered, around-the-clock access to the documentation that guides the restoration program. The effort was capped by leading a comprehensive tour of a key ERP site for installation leadership, effectively presenting how the environmental plan directly connects to and supports the military mission.



Beale AFB Air and Space Exposition

Beale ERP Team directly answered questions, provided information on Beale AFB's ongoing ERP activities, and showed equipment used to collect data points.

These efforts bolstered both leadership and public support for the \$4M-plus restoration project to install a zero-valent iron permeable reactive barrier, two bioreactors, and 30 emulsified vegetable oil injection wells, ensuring its continued success and stability of Beale AFB's \$55.7M program.

Reducing Risk through Diligent Investigation & Fiscal Stewardship

Beale has demonstrated an unwavering commitment to protecting human health and the environment through a combination of aggressive risk-reduction actions and remarkable fiscal stewardship. The ERP team expertly managed and executed a massive \$8M-plus contracting effort over the two-year award period, awarding seven critical contract modifications and resolving a complex Request for Equitable Adjustment to mitigate environmental risks and propel cleanup objectives forward. A major highlight of this effort was the spearheading of a large-scale groundwater investigation to address potential impacts from PFAS and TCE contamination. This proactive investigation involved installing 55 new monitoring wells. These wells were meticulously planned to delineate the full extent of contaminant plumes both on and off the installation and included working with nine private properties and a Yuba County agency to secure access agreements to accomplish monitoring well installations and to conduct semiannual groundwater monitoring requirements. This technically rigorous effort was essential to gain a complete understanding of the subsurface impacts and to implement protective measures to safeguard human health and drinking water sources in the surrounding community. While aggressively pursuing risk reduction, the team also displayed superior program management and financial acumen. They proactively identified and de-obligated \$2.4M in funds from a MMRP site.

The team's vigilance is further demonstrated through the annual and semiannual monitoring of over 2,200 groundwater wells across the installation. This massive data collection effort provides critical information for multiple objectives. It helps ensure public safety, enables strategic planning, allows for the accurate mapping of 22 distinct groundwater plumes and is used to measure the progress of remediation systems. This

hands-on approach ensures data quality and provides an intimate understanding of site conditions. This deep program knowledge enabled the team to author four key cleanup completion documents during the award period, including a Site Closure Report, a Biosparge Decommissioning Technical Memorandum, and a Groundwater Extraction and Treatment System/Well Decommissioning Technical Memorandum. The successful completion and regulatory approval of these documents formally advanced multiple sites toward closure, directly reducing the DAF's long-term environmental liabilities and hundreds of thousands of dollars in associated costs. This blend of hands-on technical work, diligent monitoring, and strategic documentation showcases a highly effective and cost-conscious approach to long-term environmental stewardship.



Annual Base-wide Groundwater Monitoring

Sampling locations include area wells, background wells, surface water, and off-base residential wells.

This astute financial maneuver was accomplished while ensuring all program requirements were met and exceeded, providing a clear path forward for the site's eventual cleanup. This action optimized the use of taxpayer dollars, allowing funds to be reallocated to other critical priorities without compromising environmental protection. This dual achievement of expanding crucial health-protective investigations while simultaneously optimizing financial resources showcases a sophisticated and highly effective management approach that can be shared and implemented across the DAF and DOW.