



2019 Secretary of Defense

Environmental Awards

Environmental Restoration - Installation
Peterson Air Force Base

Introduction

The 21st Space Wing (SW) at Peterson Air Force Base (AFB), Colorado, is the most geographically-dispersed and the fifth largest wing by number of units in the Air Force. 21 SW operations span 22 locations across 13 time zones. The 21 SW provides missile warning, space situational awareness, and space control through a network of command and control units and ground-based sensors.

Peterson AFB hosts three major commands: United States Air Force Space Command, United States Northern Command/North American Defense Command, and Army Strategic Command. The Installation is home to 5,556 military personnel, 7,049 military dependents, 2,993 Department of Defense (DoD) civilians, 1,299 contractors, and 23,400 military retirees. Peterson AFB consists of

1,573 acres of improved and semi-improved land. The Installation resides within Colorado Springs and shares runways with the Colorado Springs Airport. Peterson AFB's geography includes mountains to the west and high plains to the east. The 21 SW Commander is a member of the Pikes Peak Area Council of Governments and 21 SW staff participate in several subcommittees including the Air Quality Technical Committee, Traffic Advisory Committee, and the Water Quality Management Committee.

The community surrounding Peterson AFB is diverse and consists of a large city and rural farmland. The most contentious regional environmental issue is the Widefield Aquifer, which is contaminated with perfluorooctane sulfonate and perfluorooctanoic acid (PFOS/PFOA), the two most widely recognized of the per- and poly-fluoroalkyl substance (PFAS) family of chemicals. The Aquifer supplies water to the municipalities of Fountain, Widefield, and Security, and the rural community via private wells.

Background

The Peterson AFB Environmental Restoration Program is comprised of Installation Restoration Program and Military Munitions Response Program (MMRP) sites. Initial site investigation began in the mid-1980s under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Over 30 sites were identified, including storage tanks, landfills, drainage areas, former fire training areas, spill areas, inactive small-arms ranges, inactive open burn/open detonation sites, and a leach field. Primary contaminants in soil and water include fuels, solvents, metals, polycyclic aromatic hydrocarbons, and PFAS. Potential unexploded ordnance concerns include four and six-pound incendiary bombs, 40-millimeter grenades, and small arms. Peterson AFB was not included in the United States Environmental Protection Agency (EPA)

National Priorities List; therefore, regulatory authority was delegated to the State of Colorado. The Colorado Department of Public Health and Environment (CDPHE) is the key regulatory stakeholder.

The Peterson AFB Restoration Program consists of two full-time civilian employees who work closely with Installation leadership and personnel, are mindful of community interests, and remain in contact with stakeholders. The Program's approach to environmental restoration is to conduct investigation and cleanup in a cost-effective manner using streamlined and innovative methods to expedite remedial actions and ensure far reaching impacts. The Restoration Program has matured with continued investigation and would have achieved site close-out for 100% of the sites, but one site was reopened in November 2017 due to identification of PFAS both on and off the Installation.



Peterson AFB Environmental Restoration Team

The Team works closely with Installation leadership, the community, and stakeholders. The Program employs streamlined and innovative methods to achieve restoration actions.

Summary of Accomplishments

Accelerated Environmental Cleanup

In February 2016, CDPHE requested that Peterson AFB conduct groundwater and soil sampling of old fire training areas as a potential source of PFAS, specifically PFOS/PFOA. Peterson AFB responded by conducting a CERCLA Preliminary Assessment in March

2016 which identified seven potential source areas: two closed and one active fire training area; two fire stations; one retention pond; and one former leach field.

In May 2016, EPA published a Lifetime Health Advisory (LHA) level of 70 parts per trillion (ppt) cumulative for PFOS/PFOA in drinking water. The water supply for over 80,000 residents was impacted, with 42 public drinking water wells and 39 private wells in the Widefield Aquifer above the LHA. The highest PFAS sample to date was 1,300 ppt in a drinking water well just down gradient of the Colorado Springs Airport.

Peterson AFB reacted expediently to the EPA publication of the LHA for PFOS/PFOA. The CERCLA Site Inspection (SI) process of the seven potential source areas was completed in July 2017, 12 months ahead of schedule. The Installation immediately petitioned for and executed an expanded SI to fill in data gaps. Fifty-seven direct push soil borings were utilized in 14 transects across the Installation to site the locations for new groundwater monitoring wells. During a face to face meeting between CDPHE, SI and hydrogeological contractors, and the Air Force, the monitoring well locations were selected, eliminating the need for negotiation during the typical document review and response to comment cycle. This resulted in CDPHE approval of the 21 new well locations six months ahead of schedule. Utilizing this efficient approach built CDPHE's confidence in Peterson AFB through information sharing. Results of the expanded SI will identify the source-to-aquifer travel paths and dilution patterns and ensure the accuracy of groundwater modeling.

Peterson AFB initiated expedited sampling of an on-base stormwater retention pond utilized for irrigation concurrently with the initial SI. Test results showed concentrations ten times the LHA for PFOS/PFOA in water and

sediment. This sampling paved the way for knowledge of PFOS/PFOA attributes and behavior in multi-media settings. Efforts ultimately barred the application of PFOS/PFOA contaminated stormwater on the Peterson AFB golf course. The irrigation system was locked out/tagged out, preventing the possible infiltration of 36.6 million gallons of PFOS/PFOA contaminated water to the Aquifer.



Monitoring Well Installation

Peterson AFB expanded groundwater sampling via installation of 21 new monitoring wells during the accomplishment period. This photo depicts drilling at one of the new well locations.

The Installation accelerated funding utilizing rapid response contracts to address drinking water impacts in the community. This work resulted in significant operations and maintenance savings of \$3.6 million. Peterson AFB received Gold status under the Colorado Environmental Leadership awards for calendar years 2017 and 2018.

Peterson AFB directed \$3 million to excavate four MMRP sites, achieving response complete and site closeout at six sites by CDPHE in May 2018. During the process, Peterson AFB developed a polycyclic aromatic hydrocarbons background study for four of the MMRP sites containing over 68 acres, and reduced excavation by 3,922 tons (54%), resulting in

acceleration of site closeout and \$1.1 million of avoided costs.

Innovative Technology Demonstration/ Validation and Implementation

Peterson AFB has received praise for its forward-reaching approach in building and installing the Air Force's first ion exchange (IX) treatment system. Current industry standard is Granulated Activated Carbon (GAC); however, IX resin life is three times longer using half the filter media. Accolades have come from CDPHE, Widefield Water and Sanitation District, City of Fountain, Security Water District, the Office of Secretary of Defense, Under Secretary of Air Force, and Air Force Installation and Mission Support Center. The Installation pioneered the usage of IX treatment for PFOS/PFOA in drinking water, which included installing and testing two IX systems. In 2019, there are plans to add four additional systems.



Ion Exchange Treatment System

Peterson AFB installed the Air Force's first ion exchange treatment system. The multi-step process treats PFOS/PFOA contaminated water to prevent migration off-site.

Peterson AFB co-authored with Colorado School of Mines a \$900,000 groundwater treatment pilot study to remove PFAS using nanofiltration, followed by an ultraviolet photochemical process to treat the nanofiltration rejected water. Initial results of lab scale treatability studies indicate a greater than 95% removal of most PFAS and a 90% reduction in PFOS/PFOA. The full-scale

system is currently being built, with plans to implement the pilot study at Peterson AFB in the summer of 2019. This study will be utilized by the Air Force Civil Engineer Center technical team to share lessons learned across the DoD.

Little information is available related to treatment of PFAS in environmental media other than drinking water. Thus, Peterson AFB championed for and received \$1.6 million to implement a stormwater treatability study. This study utilized filtration to remove solids, followed by liquid phase GAC for pretreatment of PFAS, then final treatment using IX. The study was implemented in June 2018 and initial results indicate that this treatment is viable for National Pollutant Discharge Elimination System permits.



Leveraging Technology

Peterson AFB championed a stormwater treatability study to learn more about PFAS treatment. As part of the effort, a GAC/IX Treatment System was installed on Peterson AFB.

Peterson AFB revolutionized groundwater conceptual modeling through a \$355,000 contract awarded to compile data from multiple sources across the affected watershed. Sources included United States Geological Survey (USGS) historical maps and sample results, El Paso County Health Department (EPCHD) records, State of Colorado well records, and numerous others. The model identified critical groundwater flow paths from Peterson AFB and within the affected communities. This allowed

for focused placement of sampling locations and will enhance the accuracy of investigation activities in the future.

Peterson AFB's forward thinking utilized technology to incorporate environmental sampling data collected by outside agencies and Environmental Resources Program Information Management System data into a Geospatial Information System allowing decades of data to be critically analyzed in real time. This allowed Peterson AFB to fill data gaps within the 15-mile-long impacted area, resulting in a comprehensive conceptual site model for the area.

Peterson AFB awarded a \$500,000 contract to USGS to conduct critical groundwater hydrology and water quality analysis of the Fountain Creek Alluvial Aquifer, which includes the Widefield Aquifer. The purpose of the study is to assess present day sources of recharge, groundwater flow directions, and areas of groundwater discharge. In addition, characterization of geochemical conditions will also be conducted, resulting in a forensic analysis of PFAS to differentiation between sources of contamination and attribute them to causes other than Air Force activities. Sampling is currently being conducted on Peterson AFB and the surrounding community, with a final report to be prepared in Fiscal Year 2019.

Partnerships Addressing Environmental Restoration Issues

Peterson AFB expertly negotiated environmental service agreements totaling \$9 million to sustain two local sanitation districts and the City of Fountain until adequate treatment for PFOS/PFOA could be installed. These agreements allowed the Air Force to pay for treatment system operation and maintenance and surface water to replace the impacted groundwater. Over \$4.5 million in costs were avoided by paying the water districts

directly, rather than incurring contractor overhead.

The Installation set the benchmark for the Air Force by partnering with EPA, CDPHE, EPCHD, Army Corps of Engineers, and the City of Fountain to develop the first ever Air Force Engineering Evaluation and Cost Analysis for PFOS/PFOA. Results identified and evaluated proposed alternatives for conducting a removal action.

The Peterson AFB Restoration Program collaborated with flight-line operations and Colorado Springs Utilities to isolate two oil water separators and aircraft hangar vaults from the sanitary sewer system. This prevented all potential discharge of PFOS/PFOA containing media to the sanitary sewer system, which would adversely impact operation of the publicly owned waste water treatment plant.

Peterson AFB's preparation and forward thinking positioned them to receive \$41 million in funding provided by Congress to the DoD for assistance with mitigation of PFOS/PFOA in affected communities. Peterson AFB partnered with local sanitation districts and the City of Fountain to develop mitigation plans for their drinking water. The partnership culminated in the IX systems currently under contract for each of the water districts.

Peterson AFB partners with EPA, CDPHE, EPCHD, local sanitation districts, and local communities on efforts related to PFOS/PFOA. Quarterly stakeholder meetings between these parties have been occurring since 2016 to discuss community impacts and a unified path forward. One key result of the stakeholder meetings is a State-promulgated site-specific standard for PFOS/PFOA in the Fountain Watershed.

Peterson AFB keeps 750,000 local citizens up-to-date on PFOS/PFOA mitigation efforts via

monthly briefings to the Pikes Peak Area Council of Governments. The Installation and partners also presented PFOS/PFOA sampling results in a local open house attended by 150 citizens during the accomplishment period. Peterson AFB tackled communication challenges by delivering mitigation talking points for Installation leadership and solidifying a clear message that the safety and health of Airmen, their families, and community partners is an Air Force priority. Over 230 public meetings on environmental exposure related to PFOS/PFOA have been facilitated. This herculean effort was praised by Congressman Doug Lamborn to SAF/IE at an EPA meeting in June 2018. A press release followed, citing the importance of the Air Force partnership ensuring clean drinking water for his constituents. The CDPHE Federal Facilities Remediation and Restoration Unit Leader stated, "...we truly appreciate all of their hard work and perseverance, as well as the Air Force's continued commitment to the surrounding community."



Community Relations

A cornerstone of PFOS/PFOA management at Peterson AFB is effective communication and public outreach. In this photo, the Honorable John Henderson, SAF/IEE, tours Peterson AFB to gain real-time project status updates.

The Restoration Program is routinely asked to brief senior Air Force leadership on the status of PFOS/PFOA actions at the Installation. Communications with senior leadership include

52 PFOS/PFOA bullet background papers and 104 subsequent updates.

The quick response and timely implementation of the SI provided the Air Force Legal Operations Agency (AFLOA) data to overcome over 4,000 potential litigation claims from the community, thus guarding greater than \$4 billion in Air Force funds. Peterson AFB also worked with AFLOA to coordinate a multi-agency potentially responsible parties search. Sixty-six potential contributors of PFOS/PFOA to the groundwater were identified, paving the way for legal recourse by the Air Force.

During SIs, Peterson AFB facilitated contractor access to Colorado Springs Airport airfield and obtained Transportation Security Administration waivers and clearances allowing the contractor to self-escort. Efforts enabled unhindered military and commercial operations and saved over 800 man-hours by military and airport personnel.

Reducing Risk to Human Health and the Environment

During Fiscal Year 2017, Peterson AFB efficiently executed a \$4.3 million Rapid Response Contract to provide alternate drinking water sources and in-line treatment for PFOS/PFOA impacted public water systems and private wells. Efforts help to safeguard the water supply for 80,000 residents.

Peterson AFB carefully evaluated the use of whole home GAC treatment versus point of use reverse osmosis units for the removal of PFOS/PFOA from drinking water. Based on the consistency of results and low maintenance costs, reverse osmosis units were installed in 26 affected homes with private drinking water wells. These units save the Air Force \$26,000 annually in maintenance and testing.

Peterson AFB commissioned two GAC systems for the City of Fountain, providing clean

drinking water to 80,000 residents. In close collaboration with CDPHE, the systems were approved and installed in under eight months, an unusually short time for a drinking water system. Due to the invaluable knowledge achieved by Peterson AFB related to the inefficiency of GAC, IX systems became the preferred technology utilized in the way forward for Peterson AFB.

Peterson AFB championed efforts to investigate 83 private wells in the impacted aquifer. Thirty-seven drinking water wells exceeded the LHA. This information redefined the contamination threat and informed treatment decisions. Treatments that were selected included one connection to city water, 26 point of use reverse osmosis filtration systems, and delivery of bottled water to the remaining 10 locations.



City of Fountain GAC Treatment System

Peterson AFB commissioned two water treatment systems for the City of Fountain, providing clean drinking water to 80,000 citizens. The systems were approved and installed in under eight months, an unusually short time for a drinking water system.

Green Remediation

The innovative use of IX technology over GAC is environmentally friendly. GAC replacement is required at least annually, where current projections indicate that IX resin will only require replacement every three years. In addition, less resin is required to treat the same

amount of water as GAC, significantly reducing the amount of waste generated.

Peterson AFB was able to renegotiate multi-contractor change order requests. This mastery of the design process saved \$1 million without reducing the effectiveness of the drinking water mitigation.

In coordination with EPCHD, Peterson AFB streamlined and organized bottled drinking water delivery to 90 private well owners by supplying 9,318 five-gallon bottles and water dispensers instead of 15,530 cases of 16-ounce bottles. This action enhanced sustainability by eliminating 372,840 bottles from potential landfill disposal.

Peterson AFB coordinated changes to the process for pre-construction approvals. By coordinating with 16 organizations to ensure 150 construction permits were issued on 12,000 acres with no Restoration Program site disturbances. This allows Restoration sites to be left undisturbed, thereby eliminating transport and disposal of contaminated media. The Installation also digitized and uploaded over 500 remediation files to a digital record system, contributing 20% greater reliability with a single point of reference. Records management supports Peterson AFB's overall audit readiness.