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Environmental Cleanup Program

Beale Air Force Base Wins Prestigious Environmental Award

Beale Air Force Base (AFB) has been awarded the 2018 General Thomas D. White Award for Environmental Restoration. The award competition was established to promote excellence in every aspect of U.S. Air Force (Air Force) environmental programs. The competition recognizes the efforts of installations and individuals for environmental quality, restoration, pollution prevention, recycling, and conservation of natural and cultural resources.

The General Thomas D. White Environmental Award is the largest category of Air Force environmental awards and recognizes outstanding performance in environmental restoration and cleanup. Installation-level organizations submit nominees to the Air Force Civil Engineer Center (AFCEC) and a panel of experts for each award category. These Air Force winners then compete at the U.S. Department of Defense (DoD) level against environmental award winners from other military departments. Beale AFB was the recipient of the General Thomas D. White Award in 2013 and 2015.

Plume CG041-018 Biosparge System

Plume CG041-018 is a benzene plume emanating from the bulk fuel tank farm located at the intersection of 9th and H Streets. The tank farm historically stored jet petroleum (JP-4 and JP-7). A failed threaded connection in a pipeline was the source of a release in the 1990s. The released fuel migrated vertically to the groundwater table roughly 100 feet below ground surface (bgs). Since the release, groundwater has risen in the area to approximately 52 feet bgs and trapped the light nonaqueous phase liquid (LNAPL) fuel below the current groundwater table. The chemical of concern in groundwater in this area is benzene. LNAPL is fuel that is not dissolved into the groundwater and remains a continuing source of benzene.

In 2017, a Record of Decision was issued that specified the remedy for the benzene plume as a combination of biosparge, LNAPL skimming, enhanced attenuation, and land use controls. The enhanced attenuation includes monitoring of the groundwater plume, and land use controls restrict exposure to the benzene until concentrations reach the cleanup level of 1 microgram per liter (µg/L), which is the California maximum contaminant level (MCL). LNAPL is monitored and occasionally recovered using passive skimmers from two monitoring wells screened below the groundwater table.

To expedite cleanup of the benzene, biosparge was selected for the area of the release where LNAPL remains. The biosparge works by introducing air into the groundwater. Oxygen within the air dissolves into the groundwater, which stimulates naturally occurring aerobic bacteria to consume the benzene. Aerobic bacteria degrade the benzene (and other petroleum hydrocarbons) to create energy and carbon for cell growth.

The target treatment volume for the biosparge system consists of a 2,600-square-foot area and extends vertically from the groundwater table (about 52 feet bgs) to a depth of 100 feet bgs. The biosparge system was designed with four sparge locations and two wells per location (shallow and deep). The deep sparge wells are screened at 115 feet bgs, which allows the air introduced to migrate radially away from the well as it moves vertically up through the soil. The maximum anticipated radius of influence from the well is 15 feet. Shallow sparge wells were installed at 75 feet bgs to allow the system to target contamination near the water table.

Pipe installation at a sparge well with the biosparge system in the background.

The primary component of the biosparge system is an air compressor. The compressor supplies air to a single well at a time, and automated controls rotate through four wells every hour (15 minutes per well). This allows for a smaller air compressor, which is more energy efficient.

The biosparge system is anticipated to operate for several years until LNAPL no longer accumulates in monitoring wells and benzene concentrations in groundwater reach the established MCL.

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Plume CG041-039 Vapor Intrusion Sampling

The Air Force has partnered with Arizona State University to develop and test an innovative method for conducting vapor intrusion (VI) sampling in buildings to determine if there is a risk of exposure to building occupants from volatile organic compound (VOC) contamination in groundwater. The sampling approach utilizes a portable gas chromatograph (GC) to detect specific VOCs, based on the chemicals of concern. The GC is capable of analyzing compounds that vaporize without decomposing or changing the chemical makeup.

The currently accepted method for VI sampling requires several sampling events to occur over two temporal seasons (summer and winter or fall and spring) and sub-slab samples from multiple locations inside the building. The analytical process being tested reduces the sampling to a 2-day sampling event, with real-time results.

Once the buildings to be sampled are identified, a quick survey is conducted to determine size, heating/air conditioning vents, and possible air flow pathways. After the survey is conducted, the building's doors and windows are sealed to prevent ambient air from entering the building. Large reversible fans are used to depressurize the building. Once the building reaches a predetermined negative pressure, air samples are taken at the fan location using the GC. The data collected will indicate if there are vapors from under the building intruding into the building through cracks in the foundation, sewer drains, or plumbing locations.

After the depressurization sampling is complete, the building is repressurized to a pre-determined pressure. Samples are again taken at venting locations using the GC. Both sets of samples are then compared to determine if any detected concentrations originated from outside or inside the building.

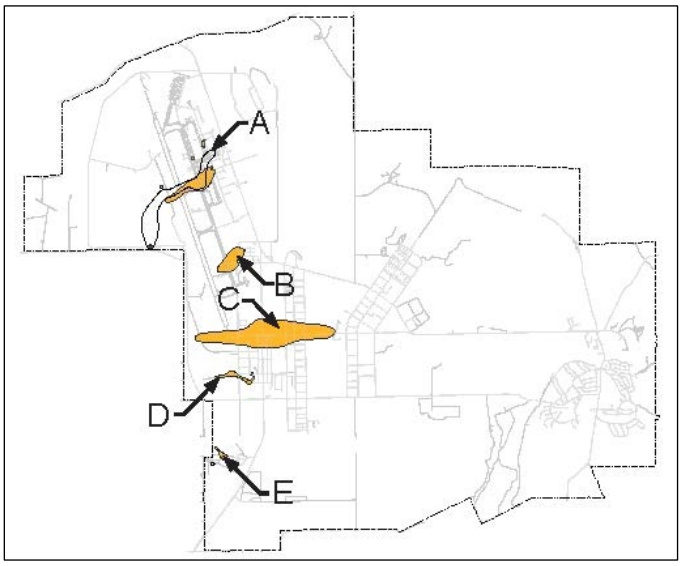
Three buildings within the Cantonment Area at Beale AFB were sampled using this method, and initial results suggest that there is no risk to human health from VI. The Air Force's goal is to publish the results and obtain concurrence from regulatory agencies on both the findings and the new methodology. Once the final report is received from Arizona State University, it will be provided to the regulatory agencies for review and comments. The data look promising, and approval is anticipated.

Preliminary Findings: Data Gap Investigations at Site CG044, the "Western Plumes"

Data gap investigations were conducted at the five western plumes (CG044-003, CG044-013, CG044-031, CG044-032, and CG044-040) during the 2018 field season to provide additional data to select appropriate remedies. Beale AFB is looking to answer three questions regarding the western plumes:

1. How far from the source has the contamination migrated?
2. Which direction is the plume moving?
3. Is there a vapor intrusion risk from groundwater downgradient from the source?

Twenty-seven new groundwater monitoring wells and seven new soil vapor monitoring points were installed at the five western plumes to answer these questions. New groundwater monitoring wells were installed using a method that minimizes the amount of soil and water waste material generated during drilling. The groundwater monitoring wells were then sampled for VOCs. Soil vapor samples were also collected from the soil vapor monitoring points and analyzed for VOCs.



The five plumes of Site CG044: (A) CG044-032, (B) CG044-003, (C) CG044-040, (D) CG044-031, and (E) CG044-013.

The discussion presented in this newsletter summarizes preliminary information that will be included in the Site CG044 Data Gap Investigation Summary Report. The report is still in preparation, and the regulatory authorities (Central Valley Regional Water Quality Control Board [Central Valley Water Board], and Department of Toxic Substances Control [DTSC]) have not yet had the opportunity to review and comment on the findings. After the Site CG044 Data Gap Investigation Summary Report is completed, the Air Force will prepare a focused feasibility study to evaluate remedial alternatives for the western plumes.

Plume CG044-003

Plume CG044-003 is a tricholoroethene (TCE) plume east of the runway and north of the fire training area. Four groundwater monitoring wells and one vapor monitoring point were installed between the taxiway and runway.

The Plume CG044-003 data gap investigation has delineated the downgradient VOC plume at CG044-003. The results from the data gap investigation indicate that the plume has migrated beneath the taxiway but does not extend further west beneath the runway.

Plume CG044-013

Plume CG044-013 is a TCE plume west of the wastewater treatment plant. TCE concentrations detected during the data gap investigation indicate that TCE in shallow groundwater is being captured by the Plume CG044-013 groundwater treatment system and has not migrated offbase.

In deep groundwater, low concentrations of TCE detected in a previously existing offbase monitoring well have been bounded by a new well installed further west during the data gap investigation. The low levels of TCE contamination detected offbase are limited in extent and did not exceed MCLs in 2018.

Plume CG044-031

Plume CG044-031 is a TCE plume south of the runway and west of J Street. TCE concentrations greater than 1,000 µg/L in two of the data gap investigation wells indicate that a TCE source is still present near the original suspected release location (former Building 896). The highest TCE concentrations within the source area occur between 85 and 105 feet bgs, and are migrating to the southwest, away from the source area. The plume is currently bound to the west.

Plume CG044-032

Plume CG044-032 is a TCE plume that originates from the flightline and extends to the Beale AFB boundary along North Beale Road.

TCE concentrations in previously existing and newly installed monitoring wells indicate that the TCE plume is not following the prevailing groundwater flow direction to the southwest, but instead extends to the south, to the Base boundary along North Beale Road. Currently, there are no wells located south of the Base boundary to evaluate TCE concentrations, but there are no receptor agricultural or domestic wells located directly south of the toe of the TCE plume. Data from offbase domestic and agricultural wells southwest of the toe of the TCE plume indicate the plume has not migrated toward the offbase wells.

Plume CG044-040

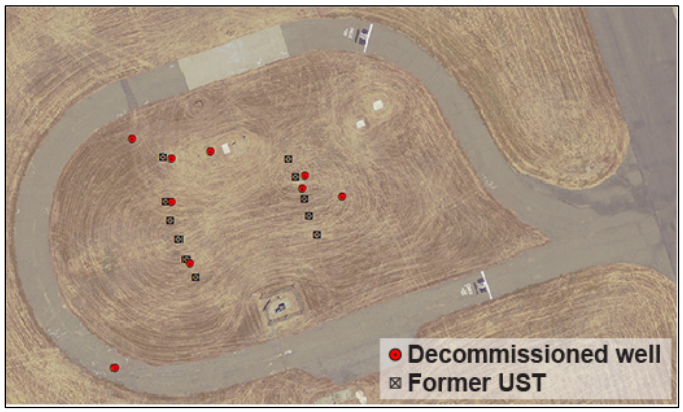
Plume CG044-040 is a TCE plume that originates from a parking lot along Warren Shingle Road. Results of the data gap investigation indicate that TCE concentrations continue to decrease westward and are not migrating horizontally to the west, or vertically. TCE concentrations in data gap investigation results indicate that TCE concentrations also decrease to the southwest.

Additional analyses were conducted to determine where TCE plume CG044-040 and the plume from new Site SS043 begin to commingle. Results of this analysis will be presented in the Site CG044 Data Gap Investigation Summary Report.

Site ST022 Well Decommissioning

Ten monitoring and remediation wells at former underground storage tanks (USTs) associated with Site ST022 were decommissioned on October 27, 2018. These wells were located at 11 former USTs associated with the hydrant refueling system for Beale AFB's SR-71 mission. The 11 USTs associated with the SR-71 hydrant fueling system, along with 13 other USTs that had no monitoring or remediation wells installed, were granted conditional no further action (NFA) status by the Central Valley Water Board in 2015 and 2017. Well decommissioning was performed as part of an effort to achieve unconditional NFA and case closure at these 24 former USTs.

After well decommissioning was completed, a concurrence request seeking unconditional NFA and case closure at all 24 of these former USTs was submitted to the Central Valley Water Board in January 2019.



The former USTs and associated monitoring and remediation wells from Site ST022 that were decommissioned in 2018.

Remedial Actions and Interim Remedial Actions Completed

The Air Force has implemented remedies at groundwater plumes associated with Site CG041 to treat TCE contamination. Emulsified vegetable oil (EVO) injections have been completed at Plumes CG041-010, CG041-018, and CG041-035. A biosparge groundwater remediation system is currently being constructed at CG041-018. EVO is currently being injected at Plume CG041-039.

Interim remedial actions have been implemented to treat TCE at three of the five plumes associated with Site CG044. EVO injections have been completed at Plumes CG044-031 and CG044-040. Sodium permanganate has been injected at Plume CG044-003.

From the RPM's Desk: Tulelake Air Force Station Cleanup Progress

By Darren Rector, Beale AFB Remedial Project Manager

Tule Lake Air Force Station (AFS) is located in Modoc County, on approximately 927 acres in the Modoc National Forest. The site was the receiving station for the West Coast Air Force Over the Horizon Backscatter radar system, and consists of three sectors, each with an antenna array. Each sector is roughly 154 acres. An 8-foot treated wood security fence surrounds each sector, totaling 57,480 linear feet. Construction of the site began in 1986 under a Memorandum of Agreement between the Air Force and the United States Forest Service (USFS), and construction was completed in December 1990. In January 2007, Congress declared the site as excess, authorizing the Air Force to negotiate the disposition of the site with USFS.

In 2014, a Resource Conservation and Recovery Act Facility Investigation (RFI) determined that the treated wood fencing was leaching copper, zinc, and arsenic into the soil from the chromated copper arsenate (CCA) wood treatment. Based on information from the RFI and a Corrective Measures Study, a Statement of Basis was finalized in May 2017. The Statement of Basis identified removal of the treated wood fencing, treated fence posts, and fencing-associated concrete, and excavation and soil washing of impacted soil along the fence line, as the cleanup remedy.

The project started as a way for the Air Force to implement an innovative method to remove heavy metal contamination from the soil. While there were skeptics, the scientific data looked good, and the contractors were excited to follow through with the project. As the project kicked off, challenges started to pop up. The first came after the first 300 feet of fencing were removed. The roll-off bins started arriving with a crossbar at the back of the bin, preventing disposal. The fencing panels were too long to load straight into the bin. URS and Brice Environmental were quick to make adjustments and developed a jig, allowing fencing panels to be quickly cut to dimensions that would facilitate the loading of the bins.

The fence and fence post removal went fairly smoothly until it was time to remove the lower portion of the fence posts. It appeared that the fence builders loved their job. They didn't simply use an auger to set wooden fence posts, the holes for the fence posts were drilled using a sonic drilling rig, allowing the posts to be set in large boulders and bedrock. This left us scratching our heads and heading back to the table to come up with a plan on how to remove the treated wooden posts and the contaminated concrete. But the problem at hand was no match for URS's and Brice Environmental's expertise and ingenuity. Plans were well thought out and set into motion. They procured a vertical "grinder" from a German company and hired two sonic drilling rigs and a hollow-stem auger drilling rig to grind out the fence posts. Once the posts and concrete were removed, the wood and concrete debris left over was cleaned using portable vacuum trailers. All the waste was disposed of as treated wood waste.

Below-ground fence post removal using a track-mounted Geoprobe sonic drill rig.

A vertical grinder was used to grind out the fence posts.

Next, it was on to the soil excavation and washing equipment delivery and assembly. The soil excavation went as smooth as could have been expected, considering the amount of boulders and bedrock that had been found. The crews excavated approximately 10,000 cubic yards of soil from all three sectors and stockpiled it at Sector 4 as planned.

The soil washing was a completely different story. Equipment started arriving on site that was contaminated with petroleum products, forcing the equipment to be returned to the Port of Oakland for decontamination. To make a long story short, the subcontractor who was to conduct the soil washing was terminated by URS due to safety concerns, forcing the project to change directions again.

A section of Tulelake AFS after fence post removal and backfilling.

We put our heads together one more time and decided the best way forward for the project was to change the remedy from soil washing to excavate and haul. Through the excellent working relationship we have developed with the regulatory agencies and the quick actions of the project contractors, we were able to produce an approved Statement of Basis Addendum, changing our remedy and we gained approval from all involved regulatory agencies, USFS, and the Air Force. Now we are waiting for the weather to cooperate so we can haul the soil offsite to Anderson Landfill. After the soil is removed and confirmation sampling shows the site is clean, we'll be able to turn the site back over to USFS. We are currently looking at 1 April to get back to work. I know, and I hope it's not an April Fool's trick on Mother Nature's part.

Restoration Advisory Board Tours and Meetings

You are cordially invited to attend the public RAB tours and meetings. RAB meetings are held at the One Stop Center for Business and Workforce Development, Second Floor, 1114 Yuba Street, Marysville, CA. The next RAB meeting will be held on May 16, 2019, from 6:00 to 7:00 p.m.

For more information on the RAB at Beale AFB, to be placed on the mailing list, or to inquire about becoming a RAB member, please contact any of the following individuals:

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