ENVIRONMENTAL RESTORATION – INDIVIDUAL:
FAIRCHILD AIR FORCE BASE

INTRODUCTION

Fairchild Air Force Base (AFB) is home to the 92d Air Refueling Wing and multiple associate units including the 141st Air Refueling Wing of the Washington Air National Guard, the 336th Training Group (Air Force Survival, Evasion, Resistance and Escape (SERE) School), and numerous Army National Guard and Army Reserve units. The largest employer in Eastern Washington State, Team Fairchild encompasses more than 5,100 active-duty, Air National Guard, tenant unit members, and civilian employees. Air refueling is the principle mission of the 92d and 141st, which operate and maintain thirty-five KC-135 Stratotanker aircraft. The installation is also responsible for providing rapid and reliable passenger and cargo airlift and aero-medical evacuations.

Fairchild AFB is comprised of over 4,500 acres in Spokane County, Washington, in a rural, flat, semi-arid prairie setting. The installation is located approximately 12 miles west of the City of Spokane, in the northeastern portion of Washington State. Groundwater at Fairchild AFB is encountered at depths ranging from three to 50 feet below ground surface. The highly heterogeneous nature of the geology and hydrogeology at Fairchild AFB significantly impacts the environmental cleanup process and makes groundwater contaminant plumes especially difficult to characterize and remediate.

BACKGROUND

As a member of the 92d Civil Engineer Squadron, Mr. Connally serves as the Environmental Restoration Program lead for Fairchild AFB. Mr. Connally has been a member of Team Fairchild since 1996. His dedicated efforts to the ERP have resulted in strong partnerships with regulators and other program stakeholders, accelerated environmental cleanup, and a high-level of credibility in the program he leads.

Mr. Marc Connally is the Restoration Program Manager for Fairchild AFB within the 92d Civil Engineer Squadron. He has been in this position since 1996 and continues to lead a strong, leadership-recognized, Environmental Restoration Program (ERP) that is dedicated to excellence in planning and executing the remedial process. Mr. Connally's tenure at Fairchild AFB provides him with an abundance of historical knowledge about the cleanup programs at Fairchild AFB which he shares with and educates other base personnel. His continued efforts to meet Air Force-directed cleanup goals has resulted in accelerated cleanup of Fairchild AFB ERP sites, established program credibility, and fostered valuable working relationships with regulators and other stakeholders.

POSITION DESCRIPTION

Mr. Connally is responsible for planning, programming, executing, and managing projects for Fairchild AFB's 80 plus ERP sites. An important aspect of this responsibility is collaborating with regulatory bodies and other stakeholders to communicate Air Force policy and negotiate cleanup requirements. His efforts have resulted in significant continuity and consistency within the ERP at Fairchild AFB. These important communications and relationships led to successful completion of a benchmark Record of Decision (ROD) for the installation's most complex site and three Five Year Reviews as well as many other project related decisions and documents. Most recently, Mr. Connally worked extensively with local agencies to facilitate participation in the Restoration Advisory Board (RAB), partnered with the City of Airway Heights to complete quarterly groundwater sampling, performed negotiations with a local landowner to secure access agreements to private wells for monitoring, and provided invaluable feedback to contractor personnel to ensure compliance with ROD requirements.

Additionally Mr. Connally is the focal point for all questions relative to the ERP and reviews all proposed actions that may interact or have impact to remedial operations at ERP sites. He also conducts multiple programmatic reviews of the Air Force's restoration database to develop accurate and auditable cost-to-complete data annually for over 80 sites. This 200 plus man-hour effort conducted each year has led to the reduction of over $27 million in requirements. His outstanding attention to detail continues to promote a more productive and accurate path forward laying the groundwork for ERP success!

AWARDS AND SERVICES

Mr. Connally works alongside the Fairchild AFB environmental quality program managers to promote a long-standing tradition of environmental excellence in all four pillars of environmental stewardship: Compliance, Pollution Prevention, Protecting Natural Resources and Cultural Resources, and Restoration. Team Fairchild strives to go beyond mere compliance with federal, state, and local laws, insisting on maximum protection of human health, natural resources, and the environment. Team Fairchild's environmental program has been recognized as a leader at the local, state, and national levels. Mr. Connally was a contributing party to Fairchild AFB's recent receipt of the 2012 Air Force General Thomas D. White Environmental Restoration Award, the 2012 Air Mobility Command General Thomas D. White Sustainability Awards, and 2013 Air Mobility Command Major General Del R. Eulberg Award for the best Installation Management Flight.

SUMMARY OF ACCOMPLISHMENTS

Accelerated Environmental Cleanup

Implementation of new technologies and optimization of existing remedies and monitoring are major components in the effective management of the Fairchild AFB ERP. Many preemptive efforts have been initiated to aid in the acceleration site closure, optimization of site cleanup schedules, and reduction in lifecycle costs.

The Fairchild AFB ERP continuously works to design contracts and projects that promote optimization, sustainable design, and accelerated cleanup. Mr. Connally assisted in the development of the Statement of Objective for the award and execution of a fence-to-fence 10 year, $15.6 million performance based remediation contract slated to cover the breadth of Team Fairchild's ERP sites. Objectives for each site were developed to maximize the forward progress towards site closure while allowing for use of innovation and "green" technologies by the contractors to accomplish the desired milestones. Mr. Connally's extensive knowledge and experience was instrumental in providing input to determine appropriate targets, goals, and objectives for this effort. His contribution will lend for a successful contract award and future execution of project requirements towards accelerated cleanup.

Craig Road Landfill is a closed landfill on Fairchild AFB. Groundwater contamination associated with this unlined landfill was discovered in the early 1990s in residential wells adjacent to the site. As a result, Fairchild AFB was added as a fence-to-fence site on the National Priority List and subsequent cleanup efforts, including the operation of a groundwater extraction and treatment system that was installed in 1995, were initiated. Over time, contamination removal plateaued and optimization endeavors were initiated to maximize contaminant removal at the site. In 2012, Fairchild AFB implemented in-situ chemical oxidation (ISCO) injections into groundwater at Craig Road Landfill; this technology breaks down trichloroethylene (TCE) using natural chemical processes, resulting in greater efficiency than the groundwater extraction and treatment system without the operational costs. This was done in conjunction with operation of the traditional groundwater extraction and treatment system (GETS) and soil vapor extraction (SVE) systems.

Fairchild AFB operates a groundwater extraction and treatment system (GETS) in parallel with two soil vapor extraction systems while also performing in-site chemical oxidation injections at a former base landfill, Craig Road Landfill. Use of multiple remedial technologies at this site has increased groundwater contaminant removal and degradation six fold. The objective for this site is to eliminate the need to operate the GETS which would result in a significant reduction in the future cleanup and operational costs.

The use of multiple remediation systems in parallel has increased TCE removal from groundwater by an astounding 600%. The SVE system implemented alone captured over 70 pounds of TCE in less than three months; more than the groundwater extraction and treatment system captured previously in a year! This has resulted in over $250,000 per year lifecycle cost savings and has accelerated site closure. Mr. Connally's restoration team is developing an amendment to the ROD for Craig Road Landfill to eliminate the requirement to permanently operate the GETS. This will allow for the utilization of more effective and efficient technologies to achieve the cleanup objectives at this site. The implementation of SVE and ISCO injections has remediated previously unreachable contamination in the vadose zone and in fractured basalt as the radius of influence of the GETS is limited. In FY 2012 and 2013, the SVE system removed over 200 pounds of chlorinated solvents compared to 10 pounds that were removed through the groundwater extraction and treatment system. ISCO injections reduced TCE concentrations in monitoring wells from as much as 16,000 micrograms/liter to non-detect.

In 2012, Mr. Connally was instrumental in starting a removal action project for a mercury spill site that involved removing all contaminated materials from the site. This effort was conducted for under $220,000 with over $100,000 in cost savings from the awarded contract amount. Additionally, the Restoration Team prepared a removal action memorandum for EPA Regional 10 to elicit a "No Further Action" determination. EPA reviewed and approved this memorandum; thus the site was not required to be placed on the National Priorities List and no further Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) action is required at the site.

Innovations Technology Demonstration/ Validation and Implementation

As described below, Mr. Connally has utilized innovative techniques which have led to more efficient program management, resulting in multi-million dollar cost avoidances, reduction of future environmental liabilities, and enhanced remediation of contamination in both soil and groundwater.

Remediation of contaminated groundwater plumes at Fairchild AFB present unique difficulties because of the heterogeneity of the installation's hydrogeology and geology which have resulted in uncertainties and significant data gaps at the various ERP sites. To fill these data gaps and minimize much uncertainty, he partnered with Air Force Civil Engineer Center (AFCEC) subject matter experts (SMEs) to utilize existing Air Force contracting resources to develop a base-wide conceptual site model to guide future restoration efforts. This site model aimed to provide a holistic vision of Fairchild AFB's hydrogeology, geochemistry, and geology, supporting future cleanup activities, as well as assess groundwater in the area of the new Wing Headquarters building slated for an energy efficient ground source heat pump (GSHP).

The installation of a GSHP requires the installation of more than 70 vertical well-like borings stretching hundreds of feet below ground and penetrating alluvial and basaltic layers and aquifers. This was problematic due to an unknown extent of groundwater contamination from an undefined chlorinated solvent plume in the area. The installation of this GSHP could potentially pose a significant risk to human health and the environment by creating preferential vapor intrusion pathways and by penetrating multiple contaminated and uncontaminated aquifers further expanding the extent of contamination in the area. Mr. Connally's proactive management, foresight of potential issues, and ingenuity allowed two wells planned for the base-wide conceptual site model to be strategically placed to serve a dual purpose by evaluating groundwater within the footprint of the proposed GSHP system.

Additionally, Mr. Connally partnered with other base personnel and AFCEC SMEs to utilize an in-house gas chromatography/mass spectrometry (GC/MS) unit to provide real-time analyses of groundwater samples which facilitated critical and timely decision making relative to the Wing Headquarters design. Groundwater samples were collected as water-bearing units were identified throughout drilling to determine the depth and extent of chlorinated solvent contamination in the area (extending to approximately 200 feet below ground surface). Findings were validated by an off-base laboratory and were analyzed with respect to regulatory chemical toxicity levels, stratigraphic lithology, and other water quality results acquired as part of the base-wide conceptual site model. The GC/MS identified groundwater contamination over three times the cleanup level which quickly led to the decision not to pursue the installation of a GSHP system at the project site. This initiative prevented the installation of a GSHP system that would have increased future environmental liabilities and risks to human health, and allowed for the quick re-design of water source heat pump system to be utilized at the new building. This re-designed system uses above-ground water towers and piping to recirculate water for more efficient heating and cooling compared to conventional heating, ventilation, and air conditioning systems.

Specialized drilling techniques were also employed to prevent any cross contamination of aquifers and gain valuable information on the various alluvial and basaltic layers in the formation. As part of the conceptual site model a synoptic groundwater elevation survey of 336 wells was performed and water quality samples collected from 50 wells for geochemical analysis, age dating, and stable isotope identification. This assisted with tracing groundwater flow paths and interconnections between shallow and deeper aquifers and characterized the origin and compositional history of groundwater in the hydrogeological system. Developing and creating a more holistic picture of the Fairchild AFB hydrogeology through the base-wide conceptual site model transforms the conventional site-specific investigations and identifies efficiencies gained from a larger perspective.

In 2012, to investigate whether vapors were present in Airmen's breathing space as a result of past subsurface environmental releases, Mr. Connally collaborated with AFCEC to establish a vapor intrusion (VI) assessment team. The VI team used a unique combination of in-house experts, contract resources, and more technical advances to efficiently respond to regulatory requests and address ROD requirements which resulted in costs savings of over $110,000. The techniques utilized also avoided adverse operational impacts associated with conventional practices that require invasive sub-slab coring to perform sampling. Drilling of over 58 holes in six buildings was avoided. Rather, a portable GC/MS was used to identify and remove indoor vapor sources and perform real-time indoor sampling. Additionally, differential pressure monitors, in conjunction with heavy duty fans, were deployed to simulate the "worst case scenario" and negating the need to sample under differing seasonal conditions.

In addition to the cost savings, the traditional project execution timeframe was greatly reduced using in-house work plans, expedited base-moderated regulatory approval, and internal expertise. From requirements development to field mobilization, a truly cross-functional team completed the effort in one week compared to the one month effort previously planned. Additionally, EPA Region 10 hailed this effort as the benchmark for VI studies, suggesting these efforts be utilized as a nationwide model. The VI team's innovative approach provided a superior solution expected to save over $1 million in the next two years alone while being able to showcase the "worst case scenario", thus eliminating future efforts to address the vapor intrusion concern at this site. The distinctive accomplishments of these scientists and engineers reflect great credit upon the Restoration Team and the United States Air Force.

Stakeholder Involvement

The Fairchild AFB Restoration Program emphasizes the importance of: stakeholder interaction through our RAB which is co-chaired by a community leader; extensive interface with local, state, and federal regulatory agencies; support of educational outreach opportunities; education of base leadership of environmental programs; and through promoting mutual and honest communication with stakeholders.

Comprehensive RAB meetings are held at least annually and are led by the Vice Wing Commander and community co-chair. Mr. Connally is responsible for organizing and scheduling the details for the meetings and participates in many of the presentations. Comprehensive RAB minutes are compiled by Restoration Team members and provided to RAB and community members to serve as a permanent record of discussions. Prior to and following each meeting Mr. Connally personally contacts the community RAB members to solicit any additional input and affirm membership.

Mr. Connally fosters Fairchild AFB's strength and commitment to stakeholder interaction is illustrated by the following example. In light of identifying groundwater contamination at the base boundary, he immediately worked to notify the necessary regulatory agencies, RAB members, base Public Affairs and Legal Office, and Bioenvironmental Engineering, and briefed base leadership. An exhaustive record search of state and local databases was performed to determine the nearby residents potentially impacted and to gather information on the residential wells in the affected area. He proactively contacted nearby residents through letters and phone calls to notify them of the identified contamination and facilitate an urgent, high priority sampling event to ensure the residents drinking water had not been impacted by the plume leaving the base. He led a team to accompany the sampling team during the residential sampling event of 19 residential wells to address any questions or concerns of the residents.

Mr. Connally performs water level measurements at a monitoring well associated with ERP site SS039. Site SS-39 is defined by a 12,000 foot long contaminant plume in shallow groundwater that varies in width up to about 1,500 feet. Most recently at this site, a benchmark vapor intrusion assessment was performed by AF personnel using an innovative approach saving $1 million plus over the next two years alone and hailed as the future nationwide model by EPA Region 10.

Impacted residents were individually invited to the upcoming RAB meeting and were provided base point of contact information to address any additional questions or concerns. Also, multiple base agencies worked cooperatively on short notice, over a two-week period, to develop a leadership-backed communication plan and public notice to effectively communicate risks with adjacent residents and the surrounding community leaders and members.

Mr. Connally's other stakeholder interaction highlights include:

- Providing local landowners quarterly sampling results and trends from residential well sampling events
- Conducting weekly conference calls with regulators, AFCEC, contractors, and the Restoration Team to facilitate decision making, program transparency, and to maintain good working relationships
- Teaming with a local municipality to allow for Fairchild AFB monitoring wells to be utilized to ensure a newly installed water reclamation facility does not affect the regional aquifer
- Partnering with Spokane County to remediate an abandoned railroad line on the base, saving the Air Force $100,000 and transferring land back to the Air Force which meets clean-up standards for the base populace to enjoy
- Promoting environmental awareness through hundreds of hours spent mentoring local boy scout troops
- Participating in his local National Society of Professional Engineer charter and their associated outreach opportunities including MATH COUNTS

The mature, credible, aggressive ERP at Fairchild AFB under Mr. Connally's stellar leadership garners minimal public concern, unquestionable integrity, and much appreciation by Air Force leadership and the surrounding communities.

Reducing Risk to Human Health and the Environment

Mr. Connally is always striving to maximize potential land use while protecting the integrity of legal agreements with regulators. Every year the restoration team participates in the review of over 400 work clearances and over 500 work requests to ensure compliance with required land use controls, identify any potential impacts to any ERP sites and/or monitoring wells, and support other base infrastructure projects and potential future mission bed-down in areas of restoration sites.

Mr. Connally is responsible for the review of hundreds of work requests and clearances, project and construction documents, and ERP-related documents each year. His dedication to excellence helps to ensure institutional controls are maintained and to preserve the integrity of the environmental remediation efforts at Fairchild AFB. This attention to detail has served as a critical component of success in sustaining a credible and effective ERP.

All project design packages are thoroughly reviewed against detailed base design standards and environmental specifications, and project sites are routinely visited to ensure necessary project work can be completed in and around restoration sites without incident. Each year he leads a team to respond to multiple project sites with potential finds of historical contamination. Mr. Connally's historic knowledge of the base is highly valuable in these situations so that a response is quick and consistent to protect human health and the environment. The Restoration Team's response provides direction to the contracting officer and project managers on the path forward to properly characterize and manage the contamination, helps limit future cleanup liabilities, and ensures materials are properly disposed of.

As part of a conceptual site model update for a large groundwater plume at Fairchild AFB, additional monitoring wells and geophysical analyses were performed to further delineate the lateral and vertical extent of a chlorinated solvent plume in groundwater. He led a team to determine which buildings could be potentially impacted by vapor intrusion and to determine the most efficient and effective areas to implement the remedy, minimize potential health risks, reduce mission impacts, and alleviate land use concerns. A groundwater monitoring well was subsequently installed at the northern base boundary to assess the deeper aquifer in the area, and TCE contaminated groundwater above the EPA cleanup level was detected in the deeper aquifer. Residential wells were sampled within 60 days of discovering off-base contamination. All wells except an unused agricultural well were found to be below the cleanup level. Additional wells were also installed at the base boundary, in addition to other areas throughout the chlorinated solvent plume, to determine the lateral extent of the contamination. This enabled the development of updated plume maps and further identified potential contamination source areas for future remediation. Mr. Connally initiated negotiations to obtain an access agreement with the private property owner of the contaminated agricultural well that will allow for the installation of monitoring wells and quarterly monitoring of the existing residential well where contamination was identified. These efforts will continue to ensure residents are not impacted by contamination and will allow further delineation of the extent of contamination leaving the base. Fairchild AFB is working alongside the EPA to determine the best placement of monitoring wells and is continuing to develop real estate agreements and associated environmental baseline studies.

In 2013, Mr. Connally led the extensive effort to complete the third Fairchild AFB Five Year Review to determine compliance with applicable CERCLA requirements and determine whether ERP goals and objectives are being achieved in protection of human health and the environment. The review was completed within the statutory timeframe through proactive teaming with EPA Region 10 with limited comments and all EPA concerns addressed, confirming that Fairchild AFB's ERP is currently protective of human health and the environment.

Green Remediation

The use of "green" technologies and products is emphasized throughout all Fairchild AFB environmental programs. Within the ERP, this has been accomplished though implementation of two demonstration projects and the use of in-situ remedies to promote use of natural processes to degrade contamination.

Mr. Connally visits Team Fairchild's phytoremediation demonstration project site. This stand of poplar trees was planted in 2001 to demonstrate the potential effectiveness of utilizing natural processes to remediate shallow groundwater in a localized area. Although, this project has long since ended, these trees still appear to have a remedial effect on the shallow chlorinated solvent contamination in groundwater in the area; on his free time Mr. Connally visits this site on occasion to perform routine maintenance and pick up any garbage.

Fairchild AFB has supported technology demonstration projects to promote early cleanup actions and contribute to the development of sustainable environmental remedies. In mid-2011, Fairchild AFB demonstrated an in-situ bioreactor at the site of a chlorinated solvent groundwater plume. The bioreactor uses solar energy to pump groundwater through a mulch bed with an added carbon source (recycled cheese whey) thus utilizing natural processes to degrade TCE in groundwater. This sustainable, low cost, energy efficient technology reduced contamination by upwards of 90%. The initial installation of the bioreactor also enabled the removal of contaminated soil within the area excavated for the mulch bed contributing to the cleanup of groundwater in the area. Mr. Connally has taken the initiative to actively monitor the system weekly. These continued efforts are extremely valuable and continue to have a positive effect on contamination levels at the site and ensure continued operation until a future contract is awarded to implement a full-scale remedial design at the site.

Mr. Connally performs a weekly inspection of an in-situ bioreactor that uses solar power to recirculate and treat chlorinated solvent contaminated groundwater. As part of the effort to install this green remediation technology, Fairchild AFB worked cooperatively with a local creamery to enable the reuse of cheese whey, a bi-product from creamery processes. The cheese whey served as a necessary carbon source within the construction of the solar-operated bioreactor and promotes the breakdown of contaminants in groundwater using natural processes.

Fairchild AFB has also implemented ISCO injections and enhanced bioremediation injections at the base's three largest ERP sites. These injections have utilized natural biological and chemical processes to degrade contamination in the aquifer, and reduce potential operating and capital costs when compared to conventional pump and treat technologies. To date, these efforts have been primarily used on smaller scales to initially demonstrate the performance and applicability of the sustainable technology. Emulsified vegetable oil, recycled cheese whey, and sodium permanganate have all been used as substrates for the injections to promoted decreasing chlorinated solvent contaminant concentrations in groundwater. Concentrations have decreased in some wells from as much as 21,000 micrograms per liter to non-detect. These in-situ efforts are likely the future for many groundwater cleanup efforts and are a sustainable solution with low lifecycle costs. Small scale efforts currently being conducted will help to fine-tune the application and viability of this technology in the future for not only at Fairchild AFB but for the Air Force as a whole.