



Accomplish

ber 31, 2018

Marine Corps Air Station Yuma

ENVIRONMENTAL RESTORATION, INSTALLATION AWARD

INTRODUCTION

Marine Corps Air Station (MCAS) Yuma is one of the United States Marine Corps' (USMC) premier aviation training bases. The air station is an expansive aviation training base containing over 10,000 square miles of special-use airspace and 2.8 million acres of bombing and aviation training ranges. The mission of MCAS Yuma is to provide aviation ranges, support facilities and services that enable our tenants, other Marine Corps commands, visiting military and interagency forces to enhance their mission capabilities and combat readiness.

The installation supports 80% of the Marine Corps' air-to-ground aviation training. MCAS Yuma maintains 60% of all range space owned by the USMC and includes the geographically separated units of 16th Street Housing, the Cannon Air Defense Complex, and the Yuma Training Range Complex (YTRC). The YTRC encompasses the Chocolate Mountain Aerial Bombing and Gunnery Range, which includes approximately 5,000 square miles of airspace in the western segment of the Barry M. Goldwater Range (BMGR) designated for military use in Arizona. The YTRC is the only location available to, and operated by, the Marine Corps where the primary

mission is to provide full spectrum support for Marine Corps tactical aviation training.

The MCAS Yuma training ranges are located in southwest Arizona, near the border of Mexico and California. Sharing an international border with Mexico and being regulated by two different states (Arizona and California) are unique complicating factors that represent a special challenge in mission accomplishment and regulatory arenas complying with two different sets of environmental regulations. MCAS Yuma is located within the City of Yuma, Arizona and is comprised of approximately 23,000 Marines, Sailors, and civilians. The installation will be expanding in the coming months in terms of both personnel and aircraft. Rotary Squadron VMX-1 JSF is slated to move from Edwards Air Force Base to become permanent residents at MCAS Yuma. Additionally, four current permanent resident squadrons at MCAS Yuma will increase in size. These planned expansions require all base resources to be managed effectively to ensure the continued success of MCAS Yuma's mission.

BACKGROUND

The objective of the MCAS Yuma Environmental Restoration Program (ERP) is to mitigate, remediate, and control releases of hazardous substances from past Installation operations and spills that can impact both human health and the environment. The ERP comprises Installation Restoration Program (IRP) sites and Munitions Response Program (MRP) sites. Initial investigation began in the mid-1980s under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). These early studies found the presence of various contaminants in soil and chlorinated solvents in groundwater underlying MCAS Yuma, which led to its inclusion on U.S. Environmental Protection Agency's (USEPA) National Priorities List (NPL), or Superfund list, on February 21, 1990. Following the listing on the NPL, MCAS Yuma entered into a Federal Facility Agreement (FFA), signed on August 19, 1991, with the USEPA and the Arizona Department of Environmental Quality (ADEQ).



CH-53E Super Stallion aircraft during a live fire training exercise at MCAS Yuma training range. Munition training areas have the potential to contain munitions constituents and explosives of concern. Such sites are managed under the ERP as MRP Sites.

The FFA team agreed to subdivide MCAS Yuma into three operable units (OUs). Areas with potential groundwater and soil contamination deeper than 10 feet below ground surface (bgs) were designated as OU 1. OU 2 was designated as containing potential soil contamination shallower than 10 feet bgs. OU 3 was designated for sites that may be identified in the

future, designated FFA Assessment Program sites. In addition to the three OUs, there are also six MRP sites at MCAS Yuma.

OU 1 is contaminated groundwater underlying MCAS Yuma. Seven areas and one subarea of groundwater contamination have been identified. Remedies were selected for four of the areas (Areas 1, 2, 3, and 6) by the IR program through a Record of Decision (ROD) signed by the Installation, USEPA, and ADEQ in 2000. Areas 2, 3, and 6 received site closure prior to this awards period timeframe. The remaining areas of groundwater contamination (Areas 4, 5, Subarea 5a, and Area 7) were addressed under the State of Arizona's leaking underground storage tank program. Areas 4, 5, and Subarea 5a have previously received site closure. Area 7 (which is also known as Underground Storage Tank [UST] Site 6) received site closure during this awards period timeframe. Area 1, a large chlorinated hydrocarbon plume underlying an area of nearly 60 acres, has a remedy in place and continues to be remediated in accordance with the ROD. The emerging contaminant 1,4-dioxane was detected in the plume and represents a new clean up challenge. The emerging contaminants per- and polyfluoroalkyl substances (PFAS) were detected in Area 1 groundwater; however, concentrations are not migrating beyond the base boundary at levels of concern.

OU 2 is soil in the upper 10 feet bgs at 18 sites where releases occurred. Twelve of these sites required No Further Action (NFA) when the ROD was signed by the Installation, USEPA, and ADEQ in 1997. Since then, three additional sites have received site closure based upon clean up actions conducted in accordance with the ROD. The risk drivers for the three remaining sites include polycyclic aromatic hydrocarbons (PAHs) for Sites 1 and 10, and polychlorinated biphenyls (PCBs) for Site 8A. The remedy for Sites 1 and 10 consists of land use controls (LUCs) which allows for continued industrial uses. The remedy for Site 8A is a LUC restricting against further uses.

There are six MRP sites at MCAS Yuma. Sites 1 through 4 were formerly small arms ranges. The

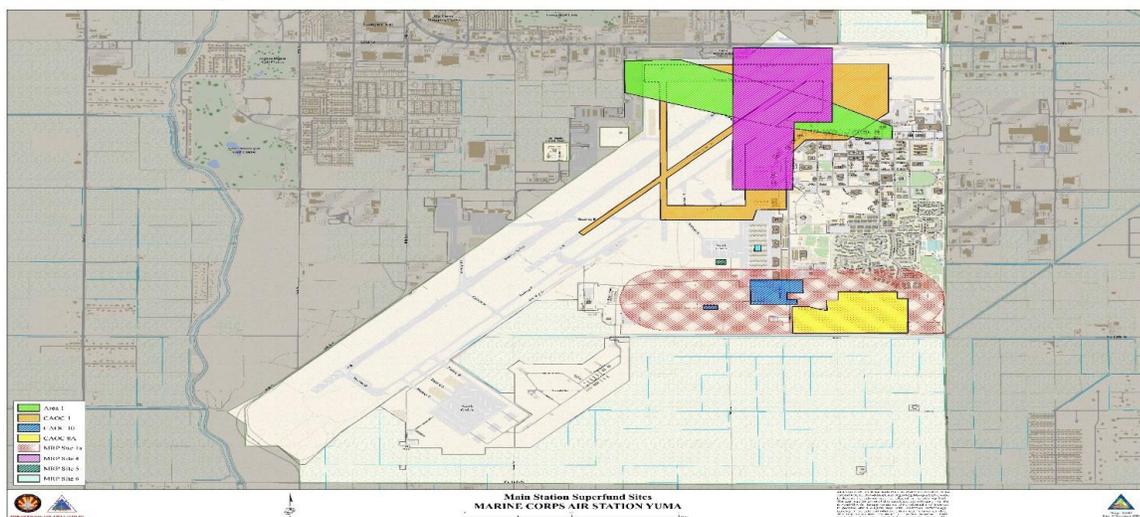
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primary hazard at these sites is the potential for munitions constituents (MC). MRP Sites 5 and 6 have the potential for munitions and explosives of concern (MEC) and MC because of the potential historical use of munitions with explosives at these sites. MRP Sites 2 and 3 have previously received site closure. MRP Sites 4 and 6 have a ROD in place, signed by the USEPA and ADEQ in 2017 during this awards period timeframe. The selected remedy for MRP Sites 4 and 6 was institutional controls (ICs) and LUCs. MRP Site 5 received ADEQ written concurrence and USEPA verbal concurrence with a NFA ROD in 2018 during this awards period timeframe, and the ROD will be signed in 2019. MRP Site 1 was divided into MRP Sites 1a and 1b in 2015. A time-critical removal action (TCRA) was conducted at MRP Site 1b in 2015 to remediate the soils at the 2.9-acre site. MCAS Yuma received concurrence from ADEQ and USEPA to close MRP Site 1b with NFA in 2015. The MRP has been quite successful at closing sites. Only MRP Site 1a remains open and continues to proceed through the CERCLA process.

The ERP is managed by two civilian employees who work in tandem with the rest of the MCAS Yuma Environmental Department. These dedicated professionals work closely with senior Installation leadership to ensure the ERP is

managed in the most effective and efficient manner possible to accomplish the Installation's mission. All activities performed under the ERP are conducted under the guidelines set forth in the FFA with the USEPA and the ADEQ. Due to portions of MCAS Yuma being located in California, the ERP often has to consider California regulations that can differ from ADEQ regulations. This presents a unique challenge to ensuring successful ERP projects and site closure. MCAS Yuma engages in continuous dialogue and cooperates with regulatory agencies, community advisory board, and the public to ensure all stakeholders understand the unique challenges at the Installation and the approach of the ERP.

The management approach of the ERP is to proactively conduct investigations in a cost-effective manner, using streamlined and innovative methods to expedite remedial actions to ensure the program is successful in mitigating site impacts. The objective of the management approach is to ensure all impacted areas at MCAS Yuma are available to support the Installation's mission while being protective of human health and the environment. Since signing the FFA in 1991, the ERP has successfully put a remedy in place or closed 94% of all ERP sites. MRP Sites 1 and 5 are the only sites without a remedy in place. However, a removal action is currently underway at MRP Site 1a and a NFA ROD for MRP Site 5 will be signed in 2019.



Superfund Sites (Area 1 from OU 1, CERCLA Areas of Concern [CAOC] from OU 2, and MRP Sites) at MCAS Yuma with remedies in place. During this accomplishment period, the ERP has significantly supported the mission by integrating potential future development plans into site clean-up (32 acres at MRP Site 1a) and providing for installation use of MRP Sites 4, 5, and 6 (242 acres) in accordance with airfield use requirements.

SUMMARY OF ACCOMPLISHMENTS

Accelerated Environmental Cleanup

Through proactive program management and collaborating with FFA signatories and consultants, MCAS Yuma has been successful at accelerating environmental cleanup at sites within the ERP.



Contractor performing excavation activities as part of the NTCRA at MRP Site 1a. As part of the Removal Action, approximately 26,000 cubic yards of impacted soil was excavated and removed from the site.

The clean-up at MRP Site 1a was accelerated to ensure that the area is available for installation uses such as a future renewable energy project (solar panels) and to protect human health and the environment. The soil at MRP Site 1a was impacted by PAHs from clay target debris associated with skeet shooting activities and metals (antimony, copper, and lead) from munitions. A non-time critical removal action (NTCRA) was performed to address impacted soils in the project area. An area of 32-acres was excavated to 0.5-ft bgs (~ 26,000 cubic yards), and impacted soils were disposed off- site.

Post excavation sampling confirmed that soil clean-up levels were achieved. By performing the NTCRA and accelerating clean-up, the ERP ensured that the project area would be available for installation needs. During the awards period timeframe, the ERP also requested and received approval to perform additional NTCRA over the remainder of MRP Site 1. This will shave as many as three years from the project schedule and reduce the cost to site closure by allowing for development of a NFA ROD.



Unexploded 20 mm rounds unearthed as part of the Non-Time Critical Removal Action at MRP Site 1a.

Innovative Technology Demonstration/Validation and Implementation

To address the commingled groundwater contaminant 1,4-dioxane at OU 1 Area 1, MCAS Yuma conducted pilot studies consisting of two separate remedial strategies to reduce 1,4-dioxane concentrations. 1,4-dioxane is an emerging contaminant that is toxic and difficult to treat because of its high solubility and mobility.

A groundwater treatment pilot study was conducted in 2016 and 2017 to evaluate the effectiveness of in situ chemical oxidation (ISCO) using sodium persulfate to reduce 1,4-dioxane concentrations in a “hot-spot” area. Two rounds of ISCO injections were conducted in the hot spot area using Direct Push Technology (DPT) injection process to deliver PersulOx™ as the oxidizing reagent. The results presented in the draft Pilot Study Report showed that the ISCO injections resulted in significant decreases in 1,4-dioxane concentrations, the radius of influence only achieved 20-30% of initial estimates.

During the same time period of the ISCO pilot study, an innovative pilot study to evaluate treatment of 1,4- dioxane at the base boundary using AMBERSORB 560™ was completed. The study consisted of retrofitting the existing vertical circulation treatment (VCT) system to process extracted groundwater through the synthetic adsorbent media unit, before

processing groundwater through the granular activated carbon (GAC) vessels, and then reinjecting the groundwater back into the aquifer.

Based on the assessment of the analytical results, the pilot study demonstrated successful removal of 1,4-dioxane and the OU 1 Area 1 contaminants of concern (tetrachloroethylene, trichloroethylene, and 1,1-dichloroethene). Effluent concentrations were below project action limits, thus meeting treatment performance objectives. Additionally, steam regeneration of AMBERSORB 560™ was successful using cooling and capture of condensate and steam venting to atmosphere to effectively regenerate the AMBERSORB 560™ treatment capacity after each contaminant loading cycle.

The successful regeneration of the synthetic media reduces the waste stream of this remediation technology by recycling the media as opposed to disposal.



A VCT Groundwater Treatment System has been in operation since 2011 to treat chlorinated hydrocarbons at the leading edge plume area of OU 1, Area 1. Based on stable groundwater and plume conditions, MCAS Yuma reached an agreement with FFA stakeholders to shut down the system in 2018 and to remediate the groundwater via MNA, a green technology.

By implementing and studying these remedial technologies, the ERP at MCAS Yuma has been successful in validating AMBERSORB 560™ performance in actual field conditions and communicating the results. These studies are an example of how the ERP leadership at MCAS Yuma proactively seek innovative solutions to protect human health and the environment.

Partnerships Addressing Environmental Issues Between DoD and Other Entities

By maintaining an open and cooperative working relationship with federal and state regulators and consultants, the ERP at MCAS Yuma has finalized RODs at two MRP sites (Sites 4 and 6), received concurrence with a NFA ROD for MRP Site 5, and obtained ADEQ concurrence for site closure for UST Site 6 during this award period. Through creating these partnerships, MCAS Yuma ensured that the sites would be addressed in the most efficient manner and that its decisions were supported by regulatory agencies.

This professional working relationship and ability to address environmental challenges has enabled the ERP to help maintain MCAS Yuma's aviation partnership with the Yuma County Airport Authority (YCAA) that also utilizes runways at MCAS Yuma. RODs were finalized for MRP Sites 4 and 6 with concurrence from regulators and stakeholders. These sites are located within the flight-line area at MCAS Yuma. By working with the regulatory agencies and the community, the ERP was able to remedy MRP Sites 4 and 6 with ICs and LUCs. By selecting these remedies, the ERP was able to provide 241 acres for uses required by the airfield with minimal intrusive sampling or airfield operation disruptions.

Reducing Risk to Human Health and the Environment

The ERP managers at MCAS Yuma work closely with state and federal regulators to quickly reduce risk to human health and the environment while working through the CERCLA process.

While completing the Remedial Investigation at MRP Site 5 to characterize MEC and MPPEH, MCAS Yuma performed several remedial activities on the one-acre site. These activities

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removed during screening and target investigations and approximately 83 tons of concrete were removed from the site.

Investigative sampling confirmed that explosives were not present in the soils at the site and that metals were not above background concentrations. A NFA ROD for MRP Site 5 has been developed to provide unrestricted use of this 1-acre site. The

regulatory agencies have concurred with the NFA ROD, which will be signed in 2019.

A base-wide Preliminary Assessment for PFAS was completed in August 2018 to ensure the protection of human health from these emerging contaminants.

Several areas were identified that require further investigation in the form of Site Inspections, which will be conducted in 2019.



Contractor screening excavated soil for munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH) as part of a remedial action at MRP Site 5. In total, 124 targets of interests were investigated and removed. Approximately 332 pounds of scrap metal were removed during screening and target investigations.

Green Remediation

The ERP at MCAS Yuma successfully implemented the green remediation technique of monitored natural attenuation (MNA) to address contaminant impacts in the groundwater at OU 1, Area 1. The selected remedy at the time of the ROD for Area 1 included utilizing an air sparge/soil vapor extraction (AS/SVE) system to treat the groundwater within the “hot spot” area and treating the groundwater at the leading edge of the plume by circulating groundwater through a VCT with GAC vessels. Through diligent monitoring of the treatment systems, MCAS Yuma was able to demonstrate to regulatory agencies the site groundwater conditions justify remediation via MNA. Use of the AS/SVE system was discontinued in 2014.

By communicating sample results and outputs from groundwater modeling to regulators, MCAS Yuma was able to show that concentrations of groundwater contaminants from the “hot spot” area would be below USEPA maximum contaminant levels (MCLs) by the time they reached the base boundary. Based on contaminant concentrations in groundwater samples collected from the leading edge of the plume being consistently below MCLs, MCAS Yuma was able to gain USEPA and ADEQ concurrence to temporarily shut down the VCT system in August 2018.

By opting to utilize MNA, MCAS Yuma is reducing capital cost for remediation while still being protective of human health and the environment. Additional benefits of this alternative include eliminating the need for electrical power for remediation and eliminating the release of vapors from the AS/SVE to the atmosphere.

Impacts/Outcomes

Site Closure and return of unrestricted land to support the Department of Defense (DoD) mission is the top priority and most notable success of the ERP at MCAS Yuma. The accomplishments of the ERP have significantly supported the mission by integrating potential future development plans into site clean-up (32 acres at MRP Site 1a) and providing for installation use of MRP Sites 4, 5, and 6 (242 acres) in accordance with airfield use requirements. Additionally, during this accomplishment period, cost reductions were achieved by obtaining agreements with the state and USEPA on site closure of MRP Site 5 and UST Site 6 and use of MNA to treat contaminants of concern at Area 1. Innovative techniques were evaluated via two successful pilot studies at Area 1 to reduce the human health risk associated with emerging contaminants.

In closing, MCAS Yuma’s outstanding management of the ERP to include well received environmental remediation designs, innovative approaches to solve impacted media, and proactive efforts to build working relationships with regulatory agencies and public stakeholders further ensures the mission at MCAS Yuma for today and into the future.