

**STATE OF CALIFORNIA  
REGIONAL WATER QUALITY CONTROL BOARD  
CENTRAL COAST REGION**

**Staff Report for Regular Meeting of March 5-6, 2020**

Prepared on January 14, 2020

**ITEM NUMBER:** 11

**SUBJECT:** Department of Defense Program - Update

**STAFF CONTACTS:** Sheila Soderberg, (805) 549-3592,  
[Sheila.Soderberg@waterboards.ca.gov](mailto:Sheila.Soderberg@waterboards.ca.gov)  
Amber Sellinger, (805) 549-3866,  
[Amber.Sellinger@waterboards.ca.gov](mailto:Amber.Sellinger@waterboards.ca.gov)  
Bryan Little, (805) 549-3887,  
[Bryan.Little@waterboards.ca.gov](mailto:Bryan.Little@waterboards.ca.gov)  
Don Eley, (805) 542-4626, [Don.Eley@waterboards.ca.gov](mailto:Don.Eley@waterboards.ca.gov)

**KEY INFORMATION**

**Key Function:** Clean up chemical releases polluting and/or threatening water resources at active and former military bases.

**Key Roles:** Require site investigation and cleanup associated with chemical releases. Provide technical review and quality assurance to ensure that proposed plans for investigation and remediation are protective of human health and the environment.

**Military Facilities:** Former Fort Ord Army Base, Army Garrison Fort Hunter Liggett, California Army National Guard Camp Roberts, Vandenberg Air Force Base, and Former Lompoc Army US Disciplinary Barracks

**Program Staff:** Three Engineering Geologists and one Senior Engineering Geologist (supervisor)

**ACTION:** Information/Discussion

**SUMMARY**

This staff report provides an overview of the Central Coast Water Board's Department of Defense (DoD) Program and describes the DoD facilities in our region with active, ongoing cleanup activities as well as the status of PFAS investigations and site closures at these facilities. A map showing these DoD facilities is included as Attachment 1.

This information item will include a presentation with a general overview of the DoD Program by Senior Engineering Geologist Sheila Soderberg and presentations about ongoing groundwater cleanup activities at former Fort Ord Army Base and Vandenberg

Air Force Base (Vandenberg AFB) by Engineering Geologists Amber Sellinger and Don Eley.

## **PROGRAM OVERVIEW**

### **Background**

Congress established the Environmental Restoration Program by the Superfund Amendments and Reauthorization Act of 1986 to address historical activities at federal facilities that could pose threats to human health or the environment. The states and the Department of Defense (DoD) operate under the *DoD and State Memorandum of Agreement*, which includes two-year cooperative agreement cycles to reimburse states for eligible base regulatory oversight while the DoD conducts environmental restoration activities. The Central Coast Water Board's DoD Program follows the investigation, cleanup, and closure process laid out by the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The U.S. Environmental Protection Agency (USEPA) is the lead regulatory agency at all California DoD facilities on the National Priorities List (i.e., Superfund sites), with support from the regional water boards statewide and the Department of Toxic Substances Control (DTSC). The former Fort Ord Army base is the only DoD Superfund site in the Central Coast region.

A 1990 agreement between the State Water Resources Control Board (State Water Board) and DTSC designated the respective roles of the two agencies at DoD facilities. At DoD facilities in our region, the Central Coast Water Board either shares the lead regulatory role with DTSC or can be the sole lead.

Many elements of the DoD Program are similar to the Site Cleanup Program (see Item 8 on the July 18-19, 2019, Central Coast Water Board agenda). The DoD Program is responsible for overseeing the investigation and cleanup of DoD sites where historical releases of pollutants to the environment (including soil, groundwater, surface water, soil gas, indoor air, and sediment) have occurred. Pollutants encountered at DoD facilities include petroleum hydrocarbons (gasoline, diesel, aviation gas, motor oil), various solvents (trichloroethene [TCE], tetrachloroethene [PCE], carbon tetrachloride), heavy metals, polychlorinated biphenyls (PCBs), pesticides, perchlorate, unexploded ordinance, and per- and polyfluoroalkyl substances (PFAS).

The DoD Program is funded by federal Defense Environmental Restoration Program and Base Realignment and Closure funds that the military set aside in the late 1980s for environmental restoration and cleanup. The states recover their regulatory agency staff costs directly from the military.

The DoD Program's primary oversight responsibilities include (1) reviewing and commenting on technical reports and studies designed to characterize releases to the environment and used develop remedial alternatives; (2) reviewing and commenting on records of decision, remedial design/remedial action plans, remedial action status reports, and closure reports; (3) participating in public outreach and education via

community meetings; and (4) providing oversight of leaking underground storage tank (UST) cases, which is not within DTSC's regulatory authority.

### **Priorities**

The DoD Program is focused on mitigating soil vapors potentially impacting human health via indoor air, removing contaminated soil to prevent impacts to human health or aquatic or terrestrial habitat, and cleaning up groundwater contamination problems that in some cases will take decades or centuries to reach water quality objectives.

Since 2008, the DoD Program has implemented a case prioritization strategy to 1) distribute work assignments among DoD Program staff, 2) establish milestones and goals for each cleanup site, and 3) ensure we focus our resources on our highest threats to water quality and human health priorities. Three primary site ranking elements are considered: 1) risk to human health and the environment, 2) site and waste complexity, and 3) federal contract means. Risk to human health and the environment relates to real or threatened impacts to human health and ecological receptors, including surface water and groundwater beneficial uses. Site and waste complexity relate to site and waste conditions, including (but not limited to) beneficial water uses, geology, hydrogeology, topography, soil type, waste types, plume characteristics, land use, and community involvement. Acknowledging the current economic realities in California, federal contract means considers the availability of cost recovery funds and DoD contracting/funding cycles. Contracting means can have a significant impact on which cleanup cases are ranked highest in the short-term, since available funding is necessary to support investigation and cleanup, and funding timeframes can drive efforts during funding "windows."

### **Performance Measures**

The DoD Program's most significant performance measure is the number of cases closed, which is aligned with the military's own performance expectations. However, most cases in the program are large, long-term projects that progress slowly toward closure. The Central Coast Water Board has closed 336 cases over the past ten years. Additional staff oversight work not included in the "closed case" list are the more than 300 locations ("areas of interest" and "areas of concern") that the Air Force has evaluated to determine if wastes have been discharged to the environment.

The DoD Program currently has 91 open cases: four cases at former Fort Ord Army Base, one case at Army Garrison Fort Hunter Liggett, three cases at Former Lompoc Army US Disciplinary Barracks, and 83 cases at Vandenberg Air Force Base.

### **Program Staff**

The DoD Program includes four staff: Engineering Geologist Bryan Little, Engineering Geologist Don Eley, Engineering Geologist Amber Sellinger and part-time Senior Engineering Geologist Sheila Soderberg.

As part of the case prioritization strategy, Bryan and Don work full-time on Vandenberg Air Force Base cases. Amber works part-time on former Fort Ord and Fort Hunter Liggett projects. For PFAS substances, Don is the PFAS contact for the Air Force and Amber is the PFAS contact for the Army.

Bryan, Don, and Sheila participate at Remedial Project Management and Community Advisory Board meetings at Vandenberg Air Force Base. Amber and Sheila participate at Base Closure Team and Technical Review committee meetings at former Fort Ord. Amber participates in the former Fort Ord's Community Involvement Mobile Workshop (Open House/Bus Tour).

## **PFAS BACKGROUND**

As detailed in Item 6 on the December 12, 2019 Central Coast Water Board agenda, PFAS substances are emerging contaminants and do not currently have established water quality standards.

In May 2016, the USEPA issued a lifetime health advisory for two PFAS analytes, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), in drinking water of 70 nanograms per liter (ng/L) individually or combined. The lifetime health advisory is non-enforceable but provides guidance to states to protect the public from adverse health effects from PFAS exposure in drinking water. The USEPA recommended that notifications include information on the increased risk to health, especially for susceptible populations.

Additionally, at the State level, notification levels and response levels are non-regulatory health-based advisory levels established by the State Water Board Division of Drinking Water for chemicals in public water systems that lack a drinking water standard or maximum contaminant level.

### **Notification Levels**

If a public water system detects a contaminant at a concentration exceeding its notification level, the public water system is required to report exceedances to its local governing board (e.g., county) and is urged by the State Water Board Division of Drinking Water to inform its customers.

Notification levels exist for two distinct classes of PFAS chemicals, PFOA and PFOS. They were revised on August 22, 2019, to:

PFOA: 5.1 ng/L

PFOS: 6.5 ng/L

These values are based upon an Office of Environmental Health Hazard Assessment (OEHHA) recommendation to set the notification levels at the lowest levels at which they can be reliably detected in drinking water. There is no requirement that a public water system stop serving water to its customers if a notification level is exceeded.

## Response Levels

The State response level previously matched the USEPA's lifetime health advisory level of 70 mg/L for combined PFOA and PFOS that was established in May 2016. However, on February 6, 2020, the State Water Resources Control Board announced new response levels for PFOA and PFOS:

PFOA: 10 ng/L

PFOS: 40 ng/L

Under a new California law (Assembly Bill 756), if a water system receives a State Water Board order for testing and finds that the PFOA or PFOS concentration exceeds the response level, the system is required to take the water source out of service, provide treatment, or notify their customers in writing. Water systems are also required to take several other measures to communicate the test results to the public.

The State Water Board is also seeking to establish its first enforceable regulatory standards for PFOA and PFOS. In August 2019, the State Water Board requested that OEHHA develop public health goals for PFOA and PFOS as the next step in developing regulatory standards, known as maximum contaminant levels. In the future other PFAS chemicals may be considered for enforceable regulatory standards.

In November 2019, December 2019, and January 2020, the State Water Board, regional water quality control boards, USEPA, and DTSC met with the Army, Air Force, and Navy to discuss the status of PFAS investigations at their respective military installations. It is expected that Central Coast Water Board staff will become involved with the Army's PFAS investigations at Army Garrison Fort Hunter Liggett and California Army National Guard Camp Roberts during the summer of 2020.

## FORMER FORT ORD ARMY BASE, MONTEREY COUNTY

Former Fort Ord encompasses 28,000 acres between the cities of Seaside and Marina. Between 1917 and its closure in 1943, Fort Ord served primarily as a maneuver and training ground for Army troops. In the late 1930s to 1940s, the Army constructed the Main Garrison, which consisted of administrative buildings, barracks, mess halls, tent pads, a sewage treatment plant, and a small airfield. In the 1950s, the Main Garrison airfield was decommissioned, and its facilities were redeveloped as motor pools and other facilities. In the early 1960s, Fritzsche Army Airfield was completed, which is now the Marina Municipal Airport. After 1975, the 7th Infantry Division occupied the installation and light infantry troops operated without heavy tanks, armor, or artillery.

The USEPA declared Fort Ord a federal Superfund site in February 1990 after facility-related chlorinated solvent wastes were detected in Fort Ord water supply wells, which are now part of the City of Marina's municipal water supply. The Army officially closed the base in September 1994 and most of the facility has since been transferred to civilian use. Since the facility's closure, the Army's base realignment and closure team has identified over 40 environmental waste sites, most of which have been remediated.

The Army identified four areas with wastes in groundwater. One groundwater treatment area has been cleaned up and closed with regulatory approval. The remaining three groundwater treatment areas have active groundwater extraction wells connected to granular activated carbon groundwater treatment systems and are in the maintenance stage with quarterly groundwater monitoring to evaluate remedial progress. Treated groundwater is then conveyed to injection/filtration points. Munitions cleanup of historical impact areas is expected to be completed in the next 10 years.

The USEPA recently indicated that they would like to nominate Fort Ord for the 2020 National Federal Facility Excellence in Site Reuse Awards. These awards recognize innovative thinking and cooperation that have led to noteworthy restoration and reuse of federal facility sites under the Superfund program.

The four groundwater treatment areas as well as basewide PFAS assessment activities are described in more detail below.

### **Operable Unit 1 (OU1), Former Fire Drill Area**

At Operable Unit 1 or OU1, the former fire drill area adjacent to the airport, the Army successfully removed approximately 4,000 cubic yards of contaminated soil and operated a groundwater pump and treat system to contain chlorinated solvents that had impacted Marina's municipal wells. The OU1 groundwater treatment facility began operation in 1989, and in 2014, the Army proposed operational and decision-making parameters to be used in proceeding towards site closure at OU1. The long-term monitoring results showed that the aquifer cleanup levels specified in the record of decision were met at all wells in September 2014, and the remediation system was shut off. Attainment monitoring to confirm the cleanup requirements have been met and will be maintained in the future was performed during 2015. The USEPA, DTSC, and Central Coast Water Board concluded that the cleanup objectives specified in the OU1 record of decision were met and would continue to be met in the future, and the site was closed in 2017.

### **Operable Unit 2 (OU2), Fort Ord Landfill**

Residential and on-base waste disposal in the former Fort Ord OU2 landfill resulted in TCE contamination of groundwater in the A-Aquifer, the Upper 180-Foot Aquifer, and the Lower 180-Foot Aquifer. The remedial action for the debris and soil includes placing an engineered cover system over the buried refuse, collection and removal of landfill gases, and institutional controls. The engineered cover system and the operation of a groundwater treatment facility addresses the OU2 groundwater plume. The original Fort Ord landfill groundwater treatment facility at OU2 began operation in 1995. A new treatment facility began operation in 2019.

### **Sites 2 and 12 (Sites 2/12), Vehicle Maintenance Area**

Vehicle maintenance activities in the Main Garrison area near 1st Avenue and 12th Street resulted in PCE and TCE contamination of soil in the vadose zone and groundwater in the Upper 180-Foot Aquifer. A soil vapor extraction and treatment

system operated continuously from September 2015 to February 2019 when, based on the results of soil gas monitoring, it was turned off for a soil gas rebound study and remains offline. A remedial action completion report for the soil gas program at Sites 2/12 is currently under agency review. A separate remedial action completion report for soil gas will be submitted in late 2020. The groundwater treatment facility addressing the Sites 2/12 groundwater contamination plume began operation in 1999 and continues to operate.

### **Operable Unit Carbon Tetrachloride Plume (OUCTP)**

Training and equipment maintenance activities in the northern portion of the former Fort Ord (now the Abrams Park housing area) resulted in carbon tetrachloride contamination of groundwater in the A-Aquifer, the Upper 180-Foot Aquifer, and the Lower 180-Foot Aquifer. For the main portion of the OUCTP in the A-Aquifer, the Army is using a cleanup method called in-situ biodegradation. The groundwater cleanup remedies for the Upper 180-Foot Aquifer and the Lower 180-Foot Aquifer are groundwater extraction and monitored natural attenuation, respectively.

### **PFAS Source Investigations**

As reported in the PFAS Board item at the December 12, 2019 meeting, the Army has performed groundwater investigations at the OU1 and OU2 areas for PFOS and PFOA.

For four quarters in 2015, the Army sampled groundwater monitoring wells for PFOA and PFOS at OU1, the former fire drill area adjacent to the airport, where firefighting foam was historically used. PFOA concentrations in groundwater ranged from 2 ng/L to 270 ng/L and PFOS concentrations in groundwater ranged from below laboratory detection limits to 72 ng/L. PFAS compounds were not considered during the development of the OU1 record of decision or included in the cleanup levels specified in the record of decision as these were not known contaminants at that time. In 2017, the USEPA, DTSC, and the Central Coast Water Board concurred with the Army's recommendation that the OU1 record of decision cleanup objectives had been met and the site was closed. The agencies also agreed that PFOA/PFOS investigations would continue independently of the completed OU1 remediation effort and that any additional work on PFOA/PFOS at any part of the former Fort Ord would not be associated with the OU1 record of decision.

In March 2019, the Army sampled groundwater monitoring wells for PFOA and PFOS at OU2, the former landfill. PFOA and PFOS were detected in A-Aquifer and Upper 180-Foot Aquifer groundwater monitoring wells. PFOA and PFOS were also detected in influent to the groundwater treatment plant. The PFOA and PFOS detected in the influent water were removed during groundwater treatment using granular activated carbon and therefore not detected in the groundwater treatment plant effluent. PFOA concentrations in groundwater ranged from below the laboratory detection limit of 2 ng/L to 113 ng/L and PFOS concentrations in groundwater ranged from below the laboratory detection limit of 2 ng/L to 447 ng/L. The Army has provided recommendations for further PFAS investigation based on a basewide review of historical activities with the

potential to cause PFAS contamination. The USEPA, DTSC, and Central Coast Water Board submitted comments to the Army on the draft report in December 2019.

Most of the groundwater contamination at the former Fort Ord is present in the A-Aquifer and the Upper and Lower 180-Foot aquifers. The water supply for the former Fort Ord community comes from the Marina Coast Water District, which includes the former Fort Ord water supply wells located in the northeastern part of former Fort Ord. TCE has been found at detectable concentrations but is well below standards in the three supply wells. Water pumped from these wells is combined with water from other water supply wells within the district's system. One water supply recently indicated a concentration of the PFAS analyte perfluorohexanoic acid (PFHxA) at 4.9 ng/L.

Local drinking water supplied to communities on and around the former Fort Ord meets all drinking water standards. Marina Coast Water District supply wells and the water served to the community are tested frequently to ensure water quality is maintained. The installation of new supply wells is restricted by Monterey County Health Department in areas that may influence the Fort Ord groundwater contamination plumes as well as in areas with seawater-intruded aquifers.

### **ARMY GARRISON FORT HUNTER LIGGETT, MONTEREY COUNTY**

Fort Hunter Liggett is in southern Monterey County, between the Salinas Valley and the Los Padres National Forest. It is the largest reserve command post in the country, with over 165,000 acres of land. Fifty-two acres of land was donated by the army base to Mission San Antonio de Padua, a Christian religious institution.

Since 1941, Fort Hunter Liggett has been used as a training facility, where activities such as field maneuvers and live-fire exercises are performed. Fort Hunter Liggett was under the authority of Camp Roberts until 1952, when it became a sub-installation of Fort Ord. From the 1970s through the early 1990s, the base served as a training area for the 7th Light Infantry Division based at Fort Ord and as the home for the Training and Experimentation Command. In 2007, the Army created the Combat Support Training Center and ramped up training to year-round. While training was centered around Army Reserve units preparing for deployment, such was provided to all Army components (active, reserve, and Guard), and to Air Force, Navy, Marines, and even foreign commands (the Japanese Ground Defense Force trained there in late 2007).

Significant training infrastructure improvements were made including a wired "shoot-house," improvements to the hardened landing strip capable of handling larger Air Force transport planes, and a 7-mile live-fire convoy course. A new US Army Reserve Center was constructed and the 91st Division moved into a new headquarters building in May 2009.

Over the years, Fort Hunter Liggett's environmental division successfully implemented its restoration program, and DTSC or the Central Coast Water Board closed twelve cleanup cases, including significant petroleum hydrocarbon releases from USTs at Building 194 and Building 258. Currently, the former landfill is the only active cleanup



case at the base. Groundwater monitoring for volatile organic compounds, total dissolved solids, barium, and general water quality parameters and landfill gas monitoring for methane is performed semiannually. In 2018, detectable concentrations of TCE, cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride in groundwater samples were all below the MCLs.

### **PFAS Source Investigations**

The Army's PFOA/PFOS testing of the Fort Hunter Liggett water supply wells indicated the presence of PFOS above the USEPA Health Advisory Level of 70 ng/L in the sample collected from well 236; therefore, this well was subsequently taken offline. Central Coast Water Board staff met with the Army on November 21, 2019, to discuss the Army's ongoing PFAS investigation and results at Fort Hunter Liggett. The Army has identified 13 areas of potential interest where site investigation activities will be performed. The Army indicated that site investigation activities will be completed and a draft PFAS site investigation report will be submitted in fall 2020.

### **CALIFORNIA ARMY NATIONAL GUARD CAMP ROBERTS, SAN LUIS OBISPO COUNTY AND MONTEREY COUNTY**

The Army built Camp Roberts in 1940 as a WWII training center; 45,000 troops were housed in 1945. Field and infantry artillery troops were trained at the camp, which also included an Army hospital. After WWII, the camp became inactive except for intermittent Army Reserve and California Army National Guard training. The camp was active again during the Korean War. In April 1970, the Army closed the camp and turned it over to the California Army National Guard in 1971 for a training center.

Five closed waste-disposal trench areas, collectively known as the Closed Landfill and South Landfill, are inactive waste-disposal units at Camp Roberts. The landfills were in operation in the 1940s and intermediate covers were constructed in the 1970s. To reduce impacts to groundwater and to address long-term maintenance issues, the landfills were formally closed with a final cover and a network of groundwater monitoring wells in 2006. Semiannual groundwater monitoring is performed at wells located at the landfills. Carbon tetrachloride has been detected in groundwater samples from South Landfill monitoring wells at concentrations exceeding the MCL of 0.5 micrograms per liter.

The Army National Guard initiated a remedial investigation in 2017 to determine the extent of carbon tetrachloride north of the South Landfill, and three new monitoring wells were constructed in May 2018. In May 2019, the Central Coast Water Board reviewed and provided comments on a draft remedial investigation/feasibility study (RI/FS) that included an evaluation of remedial alternatives for potential munitions and explosives of concern in soil and the carbon tetrachloride groundwater plume at the South Landfill. The RI/FS was finalized in July 2019. In November 2019, the Army issued a proposed plan for public comment, which identified the preferred remedial alternatives for the South Landfill area. The preferred alternative is monitored natural attenuation for the carbon tetrachloride groundwater plume and land use controls for the munitions and

explosives of concern in soil. Following the Central Coast Water Board's review and the public comment period, the preferred alternatives will be presented in a record of decision.

Over the years, the California Army National Guard Environmental Directorate has successfully implemented its restoration program, and DTSC or the Central Coast Water Board closed twelve cleanup cases. A number of cleanup sites at Camp Roberts have been closed including industrial area shops, a former pesticide storage and mixing area, Main and East Garrisons (including propane mixing plants, former laundry building, sewage treatment plant, gas station, and hobby shop), former dry cleaning facility, vehicle maintenance shops, and an underground storage tank.

### **PFAS Source Investigations**

Central Coast Water Board staff met with the Army on November 21, 2019, to discuss the Army's status of PFAS investigation activities at Army installations including Camp Roberts. The Army National Guard has been reviewing potential PFAS sites at Camp Roberts as part of a preliminary assessment leading up to site investigation activities in 2020. The Army anticipates that a PFAS Site Investigation Report will be submitted in fall 2020.

### **VANDENBERG AIR FORCE BASE (AFB), SANTA BARBARA COUNTY**

Vandenberg AFB, located on the north coast of Santa Barbara County, is the third-largest Air Force installation in the nation, occupying almost 100,000 acres and 35 miles of California coastline. Vandenberg AFB encompasses some of the highest quality coastal habitat in central California with a wealth of invaluable cultural and ecological sites. The 30th Space Wing, Vandenberg AFB's host unit, supports west coast launch activities for the Air Force, DoD, National Aeronautics and Space Administration, national programs, and various private industry contractors. The space and missile launch mission makes Vandenberg AFB unique to most other defense installations. Vandenberg AFB was the historic WWII-era Camp Cooke Army military-training facility that helped prepare soldiers for the conflict on the Korean peninsula.

Vandenberg AFB's launch operations left behind a legacy of soil and groundwater contamination that is the environmental restoration program focus. Initial environmental investigation at the base began in the mid-1980s, and over 1,800 sites were identified, including active and former launch complexes, missile silos, exploded rocket locations, landfills, drainage areas, fire training areas, radioactive waste sites, equipment assembly and maintenance facilities, dry cleaners, petroleum fueling stations, and waste disposal pits. Camp Cooke military-training areas left behind unexploded ordinance at the currently inactive bombing ranges and inactive artillery and armor training areas.

Typical pollutants at Vandenberg AFB include petroleum compounds such as gasoline, diesel, motor oil, jet fuel, and rocket fuel; volatile organic compounds; chlorinated

solvents; PCBs; pesticides; perchlorate; heavy metals; unexploded ordnance; and PFAS.

Since the 1980s, DTSC and the Central Coast Water Board have closed more than 90 percent of Vandenberg AFB's 1,800 sites. For the environmental work performed from 2016-2017, Vandenberg AFB received the 2018 Secretary of Defense Environmental Awards, Environmental Restoration, Installation Award. Vandenberg AFB oversees and actively manages the Air Force's largest performance-based remediation contract, valued at \$125 million over a 10-year span to address 107 cleanup sites. Through collaborative efforts with the Central Coast Water Board, DTSC, and Department of Fish and Wildlife, the Vandenberg AFB restoration program team accelerated various aspects of the program, resulting in cost savings and complete or partial site closure ahead of schedule at 44 performance-based remediation sites. Additionally, 55 sites have already been closed or are on schedule for on-time closure per the base's remediation schedule.

Some of the larger cleanup projects at Vandenberg AFB are discussed in more detail below.

#### **Site SD015, Former ABRES-B Missile Launch Complex**

Site SD015, located in north base, includes three decommissioned launch pads and their associated launch water discharge channels. The launch pad to the west, Pad 1, has significant amounts of solvent-impacted groundwater associated with its launch water Channel A. The launch pad in the middle, Pad 2, has some TCE-impacted groundwater associated with its Channel B. The launch pad to the east, Pad 3, has little known contamination associated with its Channel C. The primary chemicals in groundwater associated with Channels A and B are TCE and its breakdown products cis-1,2-dichloroethene and vinyl chloride. TCE solvent was historically used to degrease rocket engines and flush the fueling system components at the launch pads and apparently was released to the launch water discharge channels. The contaminant plume associated with Channel A infrastructure is the largest plume, about 90 acres in size (about 1/3-mile long and 1/4-mile wide) and extends into San Antonio Creek. TCE, cis-1,2-dichloroethene, and vinyl chloride are detected in San Antonio Creek surface water, with the latter two chemicals occasionally detected at concentrations exceeding their respective water quality standards. While this clearly is a water quality issue, performing remedial actions over tens of years is considered appropriate because the potential for human ingestion is negligible, due to the remote location on a military base not open to the public, and because the detected concentrations do not exceed ecological threshold risk values. Since 2009, pilot studies and interim remedial actions have been performed, including use of granular activated carbon with zero-valent iron and the use of carbon substrate injection with recirculation and the addition of specialty microbes for enhanced in-situ bioremediation. Currently, groundwater treatment is being conducted on a large scale in the 30-acre Channel A source area via a bioremediation system consisting of 11 extraction wells, carbon filtering treatment, and 24 substrate injection wells. Treatment in the Channel A distal plume area is being conducted over approximately 60 acres via 15 groundwater extraction wells, carbon filtering treatment,

and 17 groundwater injection wells. As of November 2019, approximately 85 pounds of TCE have been removed from the Channel A distal plume area via the carbon filtering treatment. Treatment is also underway at the 2-acre Channel B plume via bioremediation injections into dedicated wells. Central Coast Water Board staff anticipates that cleanup of groundwater and surface water will take dozens of years at SD015, due to the size of the plumes and the hydrogeologic complexity of the area.

### **Site SD024, Former Army Tank Maintenance, Fueling Station, Entomology Wash Rack and Dry Cleaner**

Site SD024, located in the cantonment area of north base, includes the following historical infrastructure with associated contaminant releases: the Camp Cooke Army tank maintenance area, a vehicle fueling station, a wash rack where pesticide mixing was performed and pesticide application equipment was washed, and a dry cleaner (Building 11193). The tank maintenance bay and its sump were removed in 2001, along with solvent-impacted soils that were accessible. The fueling station and underground storage tanks were removed by 2008, and accessible hydrocarbon-impacted soils were removed or remediated in place. Phased excavation of pesticide-impacted soils was completed in 2019. Building 11193 was removed in early 2019, and dry-cleaning-associated solvent (PCE) impacted soils were excavated to the extent practicable, leaving the residual for subsequent treatment in groundwater. Beginning in 2003, solvent-impacted groundwater associated with the former tank maintenance area, the former wash rack, and the former dry cleaner has been subjected to multiple treatment pilot studies and interim remedial actions, including chemical oxidation and bioremediation. Currently, a pilot study for TCE and PCE treatment via bioremediation in groundwater is underway within almost 45 acres of the solvent-impacted groundwater plumes, with the exception of a co-mingled solvent plume with 1,4-dioxane (about 1 acre) that is being treated in situ by injecting air and propane into the groundwater, enabling microbes to co-metabolize the 1,4-dioxane. Central Coast Water Board staff anticipates that water quality standard achievement will take dozens of years, due to the site's hydrogeologic complexity and the challenges associated with treating contaminants like 1,4-dioxane.

### **Site SD032, Two Former Atlas Missile Silos**

Site SD032, located on north base, includes former atlas missile silos 576-D (Site 32) and 576-G (Site 35) and their associated infrastructure. TCE is the primary contaminant at both sites. The Site 35 TCE plume is about a half mile long and is about 15 acres in size, while the Site 32 TCE plume is about 500 feet long and about two acres in size. The TCE at Site 35 may have been released from a historical wastewater leach field, but little is known about Site 32's historical release mechanism. Other more-localized contaminants of concern included PCBs in shallow soil. Pilot studies and interim removal actions began in 2001 with PCB-impacted surface soil removal and an injection pilot study. Groundwater treatment is underway at Sites 32 and 35 with bioremediation injections via 61 permanent injection wells and 73 temporary injection points associated with both sites and groundwater extraction at the Site 35 plume area followed by carbon filtering treatment and groundwater injection. The Site 35 distal groundwater treatment

system was turned on in October 2018 and has removed approximately 6 pounds of TCE through October 2019 via carbon filtering. Central Coast Water Board staff anticipates that water quality standard achievement may take a dozen or more years, due to the site's hydrogeologic complexity.

**Site WP005, Historic Operations Space Launch Complex 3 West and East (SLC-3W and SLC-3E)**

TCE was historically released from SLC-3W and SLC-3E, located on south base, reportedly due to rocket motor flushing prior to launches. SLC-3W began with a bioremediation pilot study conducted in 2016, designed to cut off TCE-impacted groundwater from entering Bear Creek. This near-creek treatment system was expanded in 2019. Additionally, remediation at SLC-3W includes a soil vapor extraction system extending down to about 200 feet below ground surface. After operating for four months in 2019, approximately 7,000 pounds of TCE was removed from the vadose zone by the soil vapor extraction system. TCE in groundwater under the SLC-3W and SLC-3E launch areas is being remediated with a pump and treatment system combined with bioremediation. Due to terrain access issues and size of site WP005 (approximately 115 acres), attaining water quality standards is anticipated to take about 200 years. Sandblast grit in shallow soils at both SLC-3W and SLC-3E, with associated lead and PCB contaminants, has been excavated.

**Site WP008, Current and Historic Space Launch Complex 4 West and East (SLC-4W and SLC-4E)**

WP008, located on Vandenberg AFB's south base, includes SLC-4W and SLC-4E, which were historically used for missile launches by the Air Force, but are now leased by a private contractor, Space Exploration Technologies (SpaceX). The primary chemicals impacting groundwater at WP008 are TCE and perchlorate. TCE was historically used during pre-launch operations before being discharged to the ground surface at both complexes, and perchlorate was released in 1986 when a rocket was detonated shortly after liftoff. Impacted groundwater extends from SLC-4E, located approximately 4,500 feet east of the Pacific Ocean, downslope to the cliff/beach interface at the ocean, and in some locations is detected in the water seeping from the cliff face. Bioremediation has been the primary treatment technology used to treat groundwater impacted by both TCE and perchlorate, beginning with pilot tests conducted in 2006. Bioremediation technology is still being used and is delivered to groundwater via well clusters spaced throughout the length of the plume. It is anticipated that it will take up to 80 years to achieve water quality standards at WP008.

**Site SD025, Current and Historic Space Launch Complexes 1 and 2 (SLC-1, SLC-2)**

SD025 is located at Purisima Point on Vandenberg AFB's north base, approximately 3,000 feet east of the Pacific Ocean and includes SLC-1, a decommissioned missile launch structure, and SLC-2, an active missile launch facility. TCE was historically used during pre-launch operations and is the primary chemical impacting groundwater. Since

2012, multiple remedial technologies have been used to treat the impacted groundwater including bioremediation, chemical oxidation, and pump and treat. A pump, treat, and reinjection system was expanded in 2018, and is currently the primary technology remediating groundwater. Since the startup of the system in 2018, approximately 2,000,000 gallons of groundwater have been circulated through the treatment system, with data trends beginning to indicate successful treatment.

### **PL351 Former Fuel Distribution Pipeline**

Site PL351 is a former 2.5-mile pipeline network in the cantonment area of north base, consisting of five historical pumphouses and associated underground storage tanks used to distribute fuel during the Army's use of the base as Camp Cooke training facility during WWII. Several phases of investigation were recently completed, and a work plan to address data gaps and present a proposed remedial action is forthcoming. Initial investigation activities show fuel-related hydrocarbon impacts occur within the unsaturated soil that could present a potential health risk to hypothetical future residents or workers through inhalation of vapors at four out of five of the historical pumphouses. Groundwater was only encountered at two of the pumphouses that are proximal to two known chlorinated solvent releases; therefore, groundwater remediation in these two areas will be addressed by activities conducted at those respective solvent cleanup sites.

### **Sites ST001 and ST060, Former Fueling Stations**

Sites ST001 and ST060 are located on Vandenberg AFB's north and south base, respectively. Both sites were former gas stations that were in operation until 1994 (ST060) and 2007 (ST001). Leaking underground storage tanks at the two sites have impacted groundwater with petroleum hydrocarbons including methyl-tert-butyl ether (MTBE) and tert-butyl alcohol. Remedial actions at both sites included removal of the storage tanks and associated piping, removal of petroleum contaminated soil, and groundwater bioremediation treatment via oxygenation supplied by an oxygen emitter and/or oxygen releasing compound. In 2014, Central Coast Water Board staff determined that the sites qualified for closure under the State Water Board's Low-Threat UST Case Closure Policy, which allows closure of these sites with a land use covenant prior to restoring groundwater to background levels. However, in 2016, the Air Force decided it would not pursue low threat closure and instead pursued unrestricted use of soil and groundwater at the site. Recently, the Air Force has asked the Central Coast Water Board to close the sites under the Low-Threat UST Case Closure Policy. Both sites are completing final activities necessary for closure in 2020.

### **Vandenberg AFB PFAS Source Investigations**

In 2015, the Air Force performed a base-wide preliminary assessment (existing information compilation and screening study) at Vandenberg AFB to identify areas of potential PFOS and PFOA releases, specifically from firefighting foam use and storage. The preliminary assessment report differentiated locations that pose little or no threat to human health and the environment from locations that warranted further investigation.

Five release locations were identified in the preliminary assessment report for further investigation. These areas include (1) former fire training area Site 21, near the Vandenberg AFB airfield; (2) 1992 fuel spill area, at the corner of Highway 1 and California Boulevard; (3) 2006 fuel spill area, at Highway 1 and Santa Lucia Canyon Road; 4) 2009 firefighting foam release near the Vandenberg AFB airfield; and (5) spray nozzle test area near the Vandenberg AFB airfield.

From 2018 to 2019 the Air Force performed a site assessment to sample and test for PFOS and PFOA at the five Vandenberg AFB release locations identified in the preliminary assessment report for further investigation. PFOS and/or PFOA compounds were found at all five locations at levels exceeding screening criteria. PFOS detected in soil ranged from 0.00049 to 2.3 milligrams per kilogram (mg/kg or parts per million), and PFOA detected in soil ranged from 0.0029 to 0.25 mg/kg. Groundwater was only encountered at two of the five release locations, and the amount of groundwater identified was limited. PFOS was detected in groundwater at concentrations of 13 nanograms per liter (ng/L or parts per trillion) at the 2006 fuel spill area and 150,000 ng/L at Site 21. PFOA was not detected above laboratory reporting limits in groundwater at the 2006 fuel spill area but was detected at a concentration of 8,200 ng/L at Site 21. Although PFOS and/or PFOA compounds were found at all five locations, the PFOS and PFOA at these locations do not pose a probable risk to the public due to current land uses at these locations, the distances to potential receptors, and the release locations relative to groundwater occurrence and groundwater flow direction.

In July 2019, the contractor that operates and maintains Vandenberg AFB's drinking water system sampled the water system's current source water and water supply wells that are used during prolonged drought conditions. The sampling and testing did not detect PFOS, PFOA, or related compounds in the water samples, with a laboratory detection limit below screening levels at 5.0 ng/L.

#### **FORMER LOMPOC US DISCIPLINARY BARRACKS, SANTA BARBARA COUNTY**

The former Lompoc US Disciplinary Barracks is located in the city of Lompoc near Vandenberg AFB. The barracks were part of the Army's Camp Cooke in the WWII era, and are now operated by US Bureau of Prisons as part of the Lompoc federal correctional complex.

From the late 1980s to late 1990s, the Army performed a base-wide assessment and further investigation and/or remediation at the former trap skeet range, former borrow/disposal pit/metal cage area, former incinerator, former Army landfill, former farm-fuel underground storage tanks, wood dump, and wash rack areas. By the late 1990s, USEPA, DTSC, and Central Coast Water Board staff agreed that no further action was appropriate for these areas, with the exception of the former wood dump, former Army landfill, and former wash rack. It was determined that these three areas would require further remediation and/or monitoring. Since then, the Central Coast Water Board has become the lead agency for oversight at these three sites.

### **Former Wood Dump**

The wood dump site is a former landfill located approximately one mile east of the Lompoc federal correctional complex and covers an area of approximately 3.5 acres. It was primarily used by the Unicom federal prison industries to dispose of wood products and lumber from a furniture manufacturer at the penitentiary. Municipal refuse, construction debris, and industrial waste may have also been disposed at the site. Site investigations determined that no significant impact to human health or the environment exists at the site; however, further action was needed to ensure long-term protection. Mitigation actions were agreed upon by stakeholders and completed in 2004. The mitigation efforts focused on improving the soil cover, controlling surface water flow, and improving the drainage system, all in order to maintain integrity of the landfill cap into the future. Ongoing post mitigation measures include semiannual site inspections of the vegetative cover for evidence of erosion or exposed waste, exclusion fencing, methane monitoring, and necessary maintenance. The Army is currently preparing a record of decision that will formally document the selected remedy and long-term monitoring requirements.

### **Former Army Landfill**

The former Army landfill is located approximately a half mile from the Lompoc federal correctional complex and was in use from the 1940s until 1959. Records regarding the disposed material are unavailable; however, during preliminary site inspections, metallics, glass, ceramic, and partially incinerated wood materials were observed. Soil and groundwater sampling at the landfill have indicated there is no substantial risk posed to human health or the environment, and, therefore, no significant remediation has been necessary. Currently the landfill follows semiannual inspections similar to the requirements at wood dump described above.

### **Former Wash Rack**

The wash rack site is located at the Lompoc federal correctional complex and is an approximately 950-square foot, 4-inch-thick concrete wash rack pad that was used for cleaning Army and Bureau of Prisons vehicles from the 1940s to the 1950s. Early site investigations identified chlorinated solvents in groundwater beneath the site. In-situ bioremediation injections were performed from 2002 to 2008 in to treat the approximately 250-foot-long groundwater plume exceeding water quality standards. In 2009, Central Coast Water Board staff agreed to implement long-term groundwater monitoring until chemical concentrations were reduced to at or below water quality standards. The 2018 groundwater monitoring results indicate that chlorinated solvent concentrations slightly exceed water quality standards. Central Coast Water Board staff is currently working with the Army to finalize a record of decision that will formally document the selected remedy for groundwater at the site, with the goal of reaching site closure in the near term.



## **CLIMATE CHANGE**

The DoD considers carbon impacts from proposed investigation and remediation projects against the benefits that those proposed projects will provide relative to the carbon impacts. For example, if an excavation project will have a substantial number of trucks transporting soil from the site, the emissions from the trucks would be considered as one of the many factors as part of the project's feasibility study cost-benefit analysis when the remedy is selected. Sites that are in areas susceptible to flooding or sea level rise effects from climate change are also evaluated to determine if changes in investigation or remediation approaches are warranted, including whether to speed up the remediation timeline. Some of the ways climate change is being addressed at DoD sites includes the following: treated groundwater infiltration galleries to reduce seawater intrusion, solar-powered treatment systems, reducing waste disposal through clean versus impacted soil segregation and no-purge water sampling, travel reduction with video conferencing, and providing electronic deliverables.

## **HUMAN RIGHT TO WATER**

California Water Code section 106.3, subdivision (a) states: It is a policy of the State of California "that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitation purposes." A release of solvents from the former Fort Ord landfill historically impacted the base's municipal supply wells. The DoD program is inherently aligned with the Water Board's Human Right to Water Policy because it is focused on restoring the beneficial uses of groundwater with an emphasis on drinking water and the protection of public health.

## **DISADVANTAGED COMMUNITIES**

DoD cases are data driven and the military gives priority to projects that have the highest risk to human health and the environment. If there are impacts to drinking water wells or unsafe vapor intrusion conditions from a DoD case, the DoD gives priority to the project whether it is a disadvantaged community or not.

In Central Coast Region, former Fort Ord is the only active, military facility adjacent to a SB535-listed disadvantaged community (City of Marina).

## **CONCLUSION**

The Army and Air Force have made significant environmental restoration progress at the former Fort Ord Army Base, Army Garrison Fort Hunter Liggett, California Army National Guard Camp Roberts, Vandenberg AFB, former Lompoc Army US Disciplinary Barracks, and other formerly used defense sites. Both the Army and the Air Force have conducted or will conduct PFAS preliminary assessments and site investigations at these military facilities in the Central Coast Region.

The goal of the DoD Program is to protect human health and the environment by reducing risk through the assessment and cleanup of cases in a collaborative, financially responsible, and expedited manner. DoD Program staff continued to prioritize

work on the highest priority cases with the objective of achieving cleanup goals and closure, even though complete environmental restoration may take many years. For the 2019-2020 fiscal year, the DoD Program is expected to close at least three cases at Vandenberg AFB.

**ATTACHMENT**

Attachment 1: Map Showing DoD Facilities in the Central Coast Region

r:\rb3\shared\dod\dod program\board status reports\2020\2020\_dod\_stfrpt\_final.docx

Attachment 1: Map Showing DoD Facilities in the Central Coast Region

