



EA Engineering, Science, and Technology, Inc.

## **FINAL OPERATIONAL RANGE ASSESSMENT PROGRAM REPORT UNITED STATES ARMY GARRISON FORT HUNTER LIGGETT, CALIFORNIA**

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To meet Department of Defense (DOD) requirements and support the United States (U.S.) Army's Sustainable Range Program, the Army is conducting assessments to determine whether a release or substantial threat of release of munitions constituents of concern (MCOC) from an operational range to an off-range area creates a potentially unacceptable risk to human health of the environment. The initial assessment – Phase I – was a qualitative evaluation of whether (a) a MCOC source existed on the operational range footprint, (b) there is a potential migration mechanism, and (c) human or sensitive ecological receptors are present. For the operational range footprints having a potentially complete source-receptor pathway, the Army conducted a Phase II, a quantitative assessment of potentially complete pathways of MCOC. This ORAP Phase II Report presents evaluation of source-receptor pathways at United States Army Garrison Fort Hunter Liggett, California. EA Engineering, Science, and Technology, Inc. (EA) conducted this evaluation under contract W912DR-07-D-0042 to the U.S. Army Corps of Engineers (USACE)-Baltimore District.

Initially, the ORAP Phase II establishes whether the source-receptor pathway identified during Phase I is complete or new information has been identified that would impact the Phase I's conclusions. To determine whether MCOC are potentially leaving an operational range footprint by an identified pathway (e.g., groundwater or surface water) and pose a potential risk to off-site receptors, the Phase II considers existing and any new sampling data. The ORAP team may accomplish Phase II through reevaluating existing literature (e.g., prior sampling and/or reports), modeling, and/or collecting additional samples. In Fort Hunter Liggett's Phase II report, available information was used to establish a weight-of-evidence case that determines whether there has likely been release from the operational range footprint that may pose a potentially unacceptable risk to an off-range receptor.

Fort Hunter Liggett occupies approximately 164,637 acres in the central coastal region of California. The installation is situated three miles from the Pacific Ocean, and 150 miles south of San Francisco and is bound on the north by the Ventana Wilderness Area, and on the east by the Salinas River Valley, on the south by the Monterey-San Luis Obispo county line, and on the west by approximately 55 miles of the Los Padres National Forest. The installation currently utilizes 72 operational ranges, totaling approximately 154,849 acres. These ranges include a multi-purpose range complex; six observation points; six live-fire small arms ranges; three practice and high explosive grenade ranges; three runways and heliports; 30 training areas (including light, heavy, and amphibious maneuver areas); a tank range; and a single heavy demolition range. Fort Hunter Liggett also utilizes 95,000 acres in the adjoining Los Padres National Forest for special operations training. The remaining 9,305 acres consist of non-operational area (i.e., the cantonment area, Ammunition Supply Point, and off limits protected areas).

The Phase I was completed for Fort Hunter Liggett in 2008. All 72 operational ranges were evaluated under the Phase I Assessment. The ranges were categorized as either "Unlikely" (MCOC are unlikely to migrate to off-range receptors at concentrations that pose an unacceptable risk), or "Inconclusive" (a determination could not be made based on readily available information).

The Phase I concluded that current and/or historical sources of potential MCOC from 18 operational ranges have the potential to migrate off-range at levels that pose an unacceptable risk to off-range human and/or ecological receptors. These ranges were, therefore, categorized as Inconclusive for evaluation under the Phase II.

The Phase II multi-season field sampling was conducted in October 2010 and from February to May 2011. Surface water and sediment samples were collected from two off-range discharge locations, two upstream reference locations, and two comparison locations upstream and downstream of the cantonment area. Groundwater samples were collected from five existing production wells on Fort Hunter Liggett: four locations downgradient of potential MCOC source areas, and one reference location up gradient of potential source areas.

Due to the intermittent nature of streams at Fort Hunter Liggett, surface water and sediment sampling occurred during the wet season. Benthic macroinvertebrate samples were not collected. Diurnal variations in water quality were accounted for by collecting 24-hour composite samples. The effects of precipitation and runoff on water quality were considered by sampling after a storm event, which was defined as rainfall/runoff resulting in a rise in stream water level. Groundwater samples were collected in the dry season directly from the raw water tap or from a garden hose connected to the raw water tap following purging.

Surface water samples were analyzed for explosives, perchlorate, and metals (i.e., antimony, copper, lead, and zinc), and water quality parameters. Sediment samples were analyzed for explosives, metals, and total organic carbon. Groundwater samples were analyzed for explosives, perchlorate, and total metals (antimony, copper, lead, and zinc).

Results of the Phase II sampling and data analysis show that potential MCOC associated with the Inconclusive ranges at Fort Hunter Liggett are not migrating at levels that pose an unacceptable risk to off-range human and or ecological receptors. Although the average downstream concentrations of antimony and copper in surface water were higher than the average reference concentrations in the San Antonio River Watershed and the average downstream concentrations of antimony, copper, and zinc in surface water were higher than the average reference concentrations in the Nacimiento River Watershed, there were no detections above screening levels (individual samples or 95 percent UCLM). Additionally, no explosives (surface water or sediment) or perchlorate (surface water) were detected in any sample. All metals detected in groundwater and the two detected concentrations of perchlorate in groundwater were below the screening levels. There were no detections of explosives in groundwater.

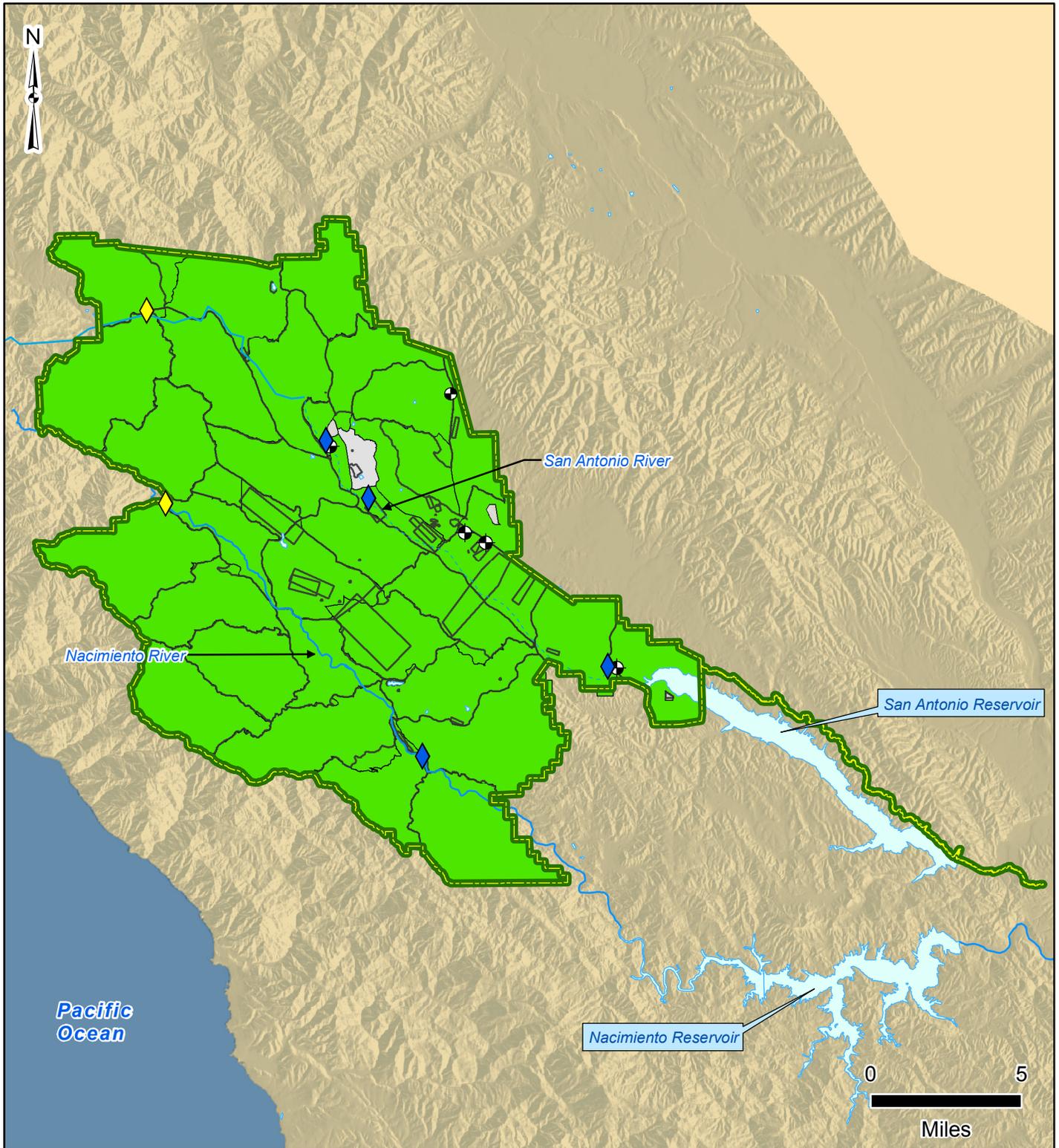
The 18 operational ranges at Fort Hunter Liggett that were categorized as Inconclusive in the Phase I were re-categorized as Unlikely following the completion of Phase II and were placed into a periodic review program under the ORAP (**Figure 1**).



Operational Range Assessment Program  
Phase II Quantitative Assessment  
Fort Hunter Liggett, California



Figure 1  
Phase II Summary



**Installation Data**

- Installation Boundary
- Operational Range
- Non Operational Area

**Range Category**

- Inconclusive
- Unlikely

**Hydrology**

- River
- Lake/Reservoir
- Wetland

**Sample Locations**

- Background Sample
- Downstream Sample
- Monitoring Wells

Data Sources: ITAM Geodatabase 2010  
ESRI Streetmap 2006

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