
APPENDIX G

FIELD INVESTIGATIONS

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APPENDIX G-1

HYDROGEOLOGIC INVESTIGATION REPORT

HYDROGEOLOGIC INVESTIGATION REPORT FOR MAKUA MILITARY RESERVATION

By

Geotechnical and Structures Laboratory
Waterways Experiment Station
and Environet, Inc.



**US Army Corps
of Engineers®**

Engineer Research and
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For

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SECTION 1: TASK SUMMARIES

1.1 Purpose and Scope

This hydrogeologic investigation report presents information on soil, surface water, and groundwater studies performed as part of the Environmental Impact Statement (EIS) for resumption of live-fire training at Makua Military Reservation (MMR). The workplan prepared for this hydrogeologic investigation was finalized in October 2002 and is available for public viewing on the world wide web site: www.MakuaEIS.com. The Final Sampling and Analysis Plan incorporated changes to the original scope of work based on recommendations and comments received from the public and consultants hired by Malama Makua, made from June to August 2002. Changes to the Sampling and Analysis Plan were added if they were evaluated to be reasonable based on the recommendations of experts, as well as considering the standards of the industry at this time.

The MMR hydrogeologic investigation incorporated soil, sediment, surface water, groundwater, and environmental sampling. The sampling program, summarized in this report, evaluated the potential for compounds associated with present and historic training to be transported beyond the boundaries of Makua Valley. Compounds potentially introduced by Army training operations might be discharged from Makua Military Reservation, and could potentially impact the Muliwai Ponds, or marine resources or wildlife on or near Makua Beach. The work included obtaining samples of surface soils, streambed materials, subsurface soils, water from intermittent stream flows, suspended sediment from intermittent stream flows, and groundwater and comparing these compound levels to current environmental standards and background levels. The work also included collection of additional parameters to refine the general hydrologic site conceptual model of the Makua Valley.

This Appendix outlining the results of the MMR investigation is included as part of the Makua EIS document. It is not intended to be a stand-alone document, so further background on the Makua site will be found in the main body of this EIS document.

This report was prepared by the Engineer Research and Development Center, its contractor DIMCO, Inc., and Environet, Inc., at the direction of the Schofield Barracks DPW Environmental Office and the U.S. Army Corps of Engineers Honolulu District for the use of the U.S. Department of the Army (Army). No other party should rely on the information contained in this report, except for the intended purpose of evaluating the impacts of Army training on soil, groundwater, and surface water within the Makua Valley. This report and the interpretations, conclusions, and recommendations within are based on information in other cited and referenced documents. Therefore, this report is subject to the limitations and qualifications presented in the referenced documents.

1.2 Data Objectives

Figure 1.1 shows the location of the Makua Military Reservation on O`ahu, Hawai`i. Figure 1.2 shows the boundaries of the site, and the location of the former Open Burning/Open Detonation Area.

Specific objectives that will be met by the data reported in this document are summarized below:

- a.* Assess potential sources, types, and the overall degree of potential contamination (defined as compounds associated with military training) within the Open Burn/Open Detonation (OB/OD) area and other areas of MMR, including the PFC Pililaau Range Complex.
- b.* Evaluate whether contamination from the OB/OD area or the Range Complex has migrated, is currently migrating, or has the potential to migrate off the Makua Military Reservation.
- c.* Acquire data to be used by the EIS contractor (TetraTech, Inc) in evaluating potential pathways of exposure to off-site receptors.
- d.* Refine the hydrogeologic site conceptual model for the Makua Military Reservation.
- e.* Evaluate the potential for erosion of soils, and subsequent discharge of soil particles off-site during large rainfall events in the Makua Valley.

Figure 1.1 Makua Military Reservation Location

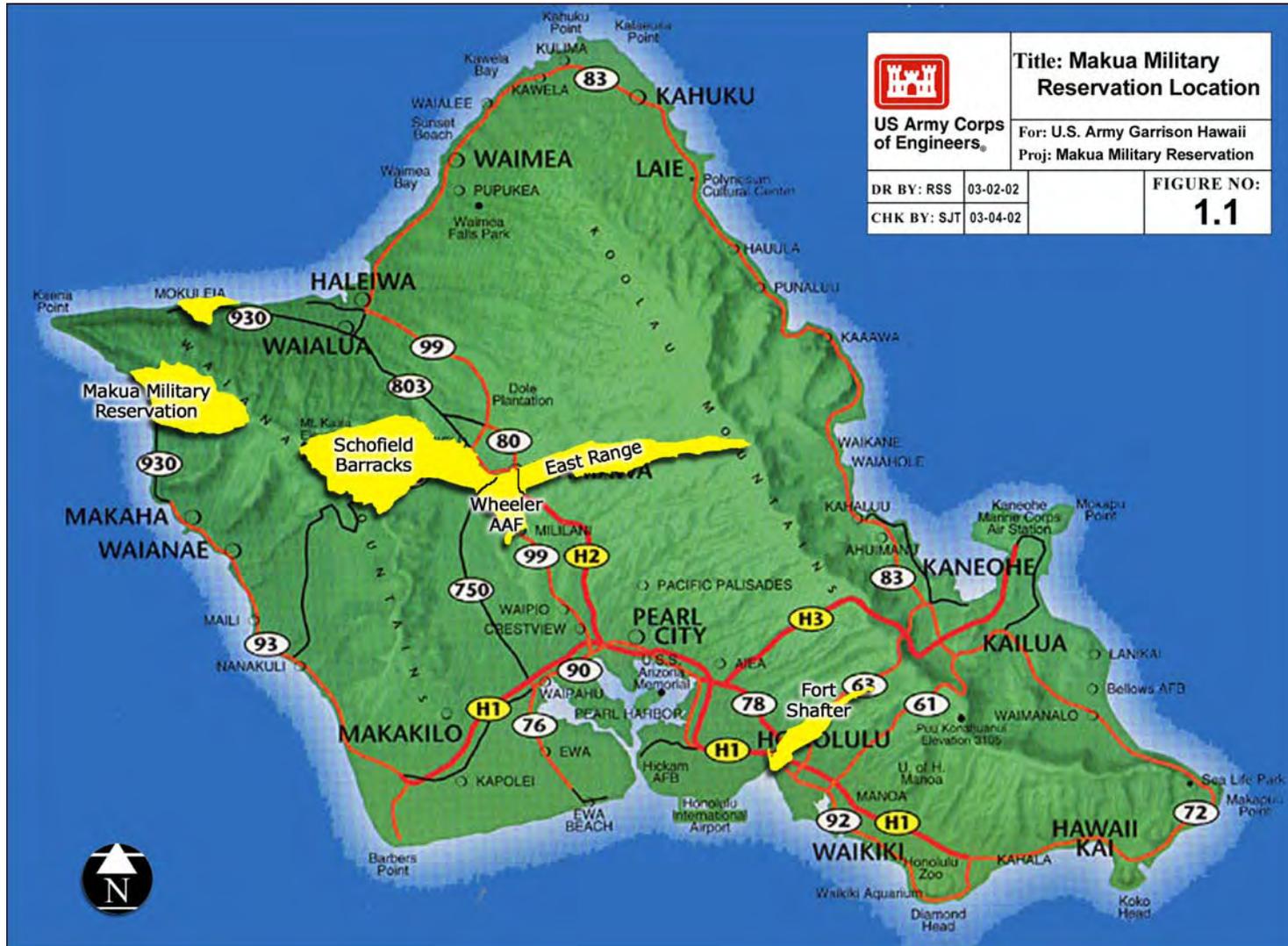
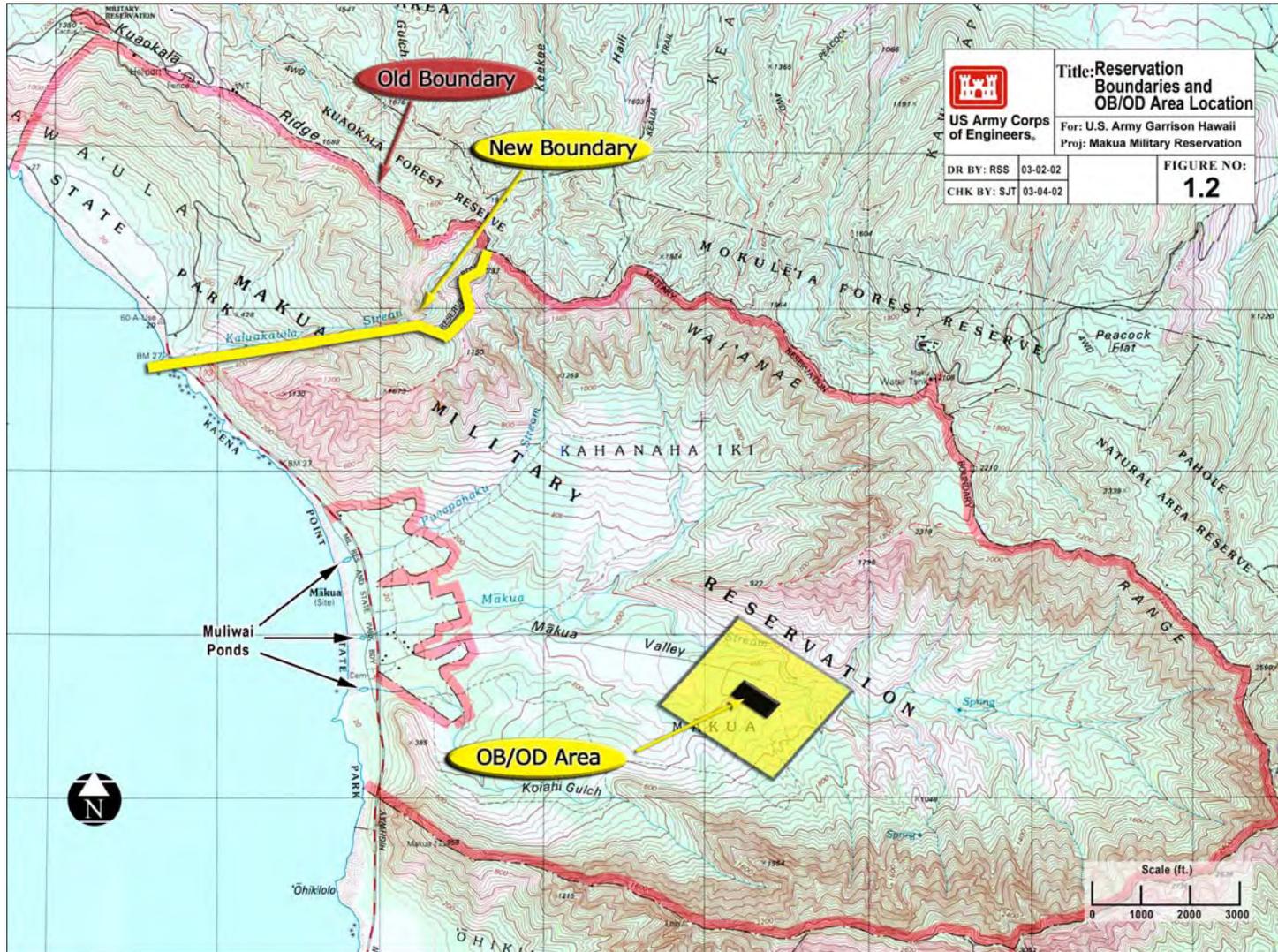


Figure 1.2 Reservation Boundaries and OB/OD Area Location



1.3 Tasks Completed

Listed below is a summary of the scope-of-work. The general time period when these tasks were completed is shown in parentheses ():

- a.* Drill two (2) boreholes and collect soil samples from the OB/OD area to depths of approximately 50 feet, and one borehole at the junk car pit to approximately 20 feet, and collect soil samples at 5-foot intervals. Install vadose zone sampling equipment in boreholes at the OB/OD area and the junk car pit (February 2003).
- b.* Collect four (4) sets of soil samples from streambeds at varying depths of 6, 12, and 18 inches (March 2003).
- c.* Collect up to three (3) rounds of stream water samples from Makua Streams if the streams flow (February 14, 2003; January 23, 2004; February 27, 2004).
- d.* Rehabilitate the existing well (SP-7)(September 2002).
- e.* Install two additional wells (35 feet deep) adjacent to intermittent streams (September to October 2002).
- f.* Install four deeper monitoring wells (approximately 60-100 feet deep) to sample groundwater chemistry along groundwater flow paths. (October to December 2002)
- g.* Collect background soil samples for dioxin/furans and metal compounds (February and September 2003).
- h.* Perform fate and transport calculations using both surface water and groundwater computer models (May to September 2003).
- i.* Collect 102 soil samples from 18 areas of concern, 19 additional surface soil samples, and 10 background samples from outlying areas of Makua Military Reservation (September 2002 to February 2003).
- j.* Drill one deep monitoring well between the OB/OD areas and the ocean (December 2002).
- k.* Install and monitor rainfall measurement equipment in Makua Valley (September 2002 to September 2003).
- l.* Collect six (6) quarterly rounds of groundwater samples from the monitoring wells (December 2002 to December 2003).