

1.0 INTRODUCTION

1.1 BACKGROUND

Tetra Tech EM Inc. (TtEMI) received contract task order (CTO) 112 from the U.S. Department of the Navy, Naval Facilities Engineering Command, Engineering Field Activity West (EFA West) under Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62474-94-D-7609. Under CTO 112, TtEMI has implemented an ecological risk assessment (ERA) at Naval Fuel Depot Point Molate (NFD Point Molate) to evaluate risk to ecological receptors from chemicals released at the site. ENTRIX, Inc. (ENTRIX) was subcontracted by TtEMI to conduct the offshore portion of the ERA at NFD Point Molate.

NFD Point Molate is a former bulk storage and transfer facility capable of storing more than 40 million gallons of fuel. The facility is no longer operational, and the Navy and City of Richmond have entered into a cooperative agreement for caretaker services. This ERA at NFD Point Molate is being conducted under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). A base closure team (BCT) exists for NFD Point Molate. The BCT is the decision-making body for cleanup activities and consists of the Navy, U.S. Environmental Protection Agency (EPA), and the California Regional Water Quality Control Board - San Francisco Bay Region (RWQCB). The Navy is the lead agency for the CERCLA cleanup process. The RWQCB is the lead regulatory agency for oversight of cleanup activities. The BCT management support team includes the City of Richmond, community restoration advisory board (RAB), other regulatory agencies, other Navy support staff, and the Navy's consultants. Potential human health risks and terrestrial ecological risks will be evaluated in separate reports. The focus of this report is the assessment of risk to ecological receptors associated with the offshore environment at NFD Point Molate.

1.2 OBJECTIVES OF THE OFFSHORE ECOLOGICAL RISK ASSESSMENT (ERA)

The objectives of the offshore ERA are to:

- Evaluate the exposure and effects of prior chemical (i.e., petroleum-related constituents) releases from NFD Point Molate on aquatic receptors (i.e., shorebirds, fish, and invertebrates).
- Characterize risk to representative aquatic receptors. As described in the "Ecological Risk Assessment Addendum to the Phase II Remedial Investigation Field Work Plan

NFD Point Molate” (Offshore ERA Work Plan) (TtEMI, 1998), risk will be characterized at each sampling location separately.

- Develop a transparent, well-documented process that will allow for the evaluation of uncertainty at different stages of the ERA process.
- Document consensus on the approach as developed between the Navy and all involved agencies at a number of meetings over the past year.

This document describes the results of the work performed for the offshore ERA at NFD Point Molate.

1.3 NFD POINT MOLATE ERA APPROACH

The EPA has developed a framework for an ERA that consists of four phases: (1) problem formulation, (2) exposure assessment, (3) effects assessment, and (4) risk characterization (EPA, 1992; EPA, 1996; EPA, 1997). Each of these phases will be considered to evaluate ecological risk at NFD Point Molate as described by EPA guidance. In addition to the EPA framework, the State of California’s protocol (California Department of Toxic Substances Control [DTSC] 1996), and the Tri-Service guidelines (Wentsel et al., 1996) were considered prior to conducting the offshore ERA at NFD Point Molate.

As outlined in the Offshore ERA Work Plan (TtEMI, 1998), data were collected and analyzed for four separate lines of evidence: (1) bulk sediment chemistry, (2) sediment toxicity, (3) bioaccumulation potential, and (4) benthic community analysis. These data were used to characterize potential risk to ecological resources exposed to NFD Point Molate offshore sediments. The sampling design targeted locations where the highest levels of contamination in the near-shore sediments were expected based on site history and past sampling data. Thus, the samples collected for this ERA are expected to represent a “worst-case” scenario for risk characterization.

The use of multiple lines of evidence to evaluate ecological risk requires an approach to integrate potentially inconsistent findings in order to draw conclusions about risk. The need for a weight-of-evidence (WOE) approach to integrate various types of data was expressed in the Offshore ERA Work Plan (TtEMI, 1998). At the time the Offshore ERA Work Plan was prepared, a WOE approach had not been identified or developed. The WOE approach has since been developed specifically to integrate and evaluate the four lines of evidence collected at NFD Point Molate. The WOE approach developed for the offshore ERA integrates environmental data (i.e., lines of evidence) to assess risk based on the association of assessment endpoints (i.e., those ecological resources selected for protection) and measurement endpoints (i.e., environmental measurements collected to evaluate risk to an assessment endpoint).

The WOE approach presented in this report has been developed by modifying a WOE approach developed by the Massachusetts Weight-of-Evidence Workgroup (Menzie et al., 1996). Section 2.8 describes the WOE approach and its development, and Section 6.0 presents the results of its application. The developed WOE approach does not deviate from the ERA process described by the EPA (EPA, 1992; EPA, 1996; EPA, 1997), rather it parallels the process and adds structure by defining and documenting the process. Figure 1-1 illustrates the association between the standard ERA process and steps associated with the WOE approach.

The ERA process at NFD Point Molate has been implemented in a “partnering” environment with the Navy and involved agencies. Beginning with problem formulation through the use of a WOE approach to summarize and evaluate ERA findings, all parties have provided input and worked towards consensus on the technical and strategic aspects of the ERA. These technical issues include, but are not limited to:

- Selection of assessment endpoints (AEs) and measurement endpoints (MEs)
- Representative avian receptors
- Bioassay test species
- Exposure parameters for the selected avian receptors
- Sampling approach
- Sediment chemistry screening criteria
- Development and use of a WOE approach
- Development of avian toxicity reference values

The components of the offshore ERA process, and their specific objectives, are listed and described below.

Problem Formulation: The problem formulation step for the offshore ERA presents the goals and focus of the ERA. It is a formal process to develop and evaluate a preliminary hypothesis concerning the likelihood and causes of ecological effects that may have occurred, or may occur, from human activities (EPA, 1996). This step addresses the following:

- Overview of site history, and site characterization.
- Preliminary description of the ecosystem potentially at risk.
- Summarization of the ecological conceptual site model (CSM).
- Selection of assessment and measurement endpoints.

- Determination of evaluation criteria for measurement endpoints for WOE evaluation.
- Calculation of numerical weight and measurement endpoints for WOE approach.

Exposure and Effects Assessment: In the exposure assessment, the potential adverse effects to ecological receptors caused by exposure to chemical stressors is assessed by evaluating the co-occurrence of the stressors and the ecological receptors considered (EPA, 1996). The effects assessment evaluates effects data to assess: (1) the link between elicited effects and stressor levels, (2) the relationship between the elicited effects and the associated assessment endpoint, and (3) the validity of the exposure model (i.e., are conditions under which the effects occur consistent with the CSM) (EPA, 1996).

Risk Characterization: In the risk characterization phase, the results of the exposure and effects assessment are used to estimate risk to the assessment endpoints identified in problem formulation, and the risk is interpreted and conclusions are reported (EPA, 1996). Specifically, information obtained during the exposure and the ecological effects assessment are combined to evaluate the relationship between environmental concentrations of chemical stressors and observed adverse biological effects. The WOE evaluation integrates different types of environmental data (e.g., different measurement endpoint results) to characterize risk at a sampling location or site considering all assessment endpoints.

1.4 ERA ORGANIZATION

This ERA report is organized as follows:

- Executive Summary
- Section 1.0 - Introduction
- Section 2.0 - Problem Formulation
- Section 3.0 - Summary of 1998 Offshore ERA Data Collection
- Section 4.0 - Exposure and Effects Assessment.
- Section 5.0 - Risk Characterization
- Section 6.0 - Weight-of-Evidence Evaluation, Uncertainty Evaluation, and Conclusions
- Section 7.0 - References

