Department of Toxic Substances Control

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700 Heinz Avenue, Bldg. F, Suite 200
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Winston H. Hickox
Secretary for
Environmental
Protection

Gray Davis
Governor

N00221_003633
MARE ISLAND
SSIC NO. 5090.3.A

July 22, 2003

Southwest Division
Naval Facilities Engineering Command
Attn: Mr. Jerry Dunaway
1220 Pacific Highway
San Diego, California 92132-5190

Dear Mr. Dunaway:

NAVY MARE ISLAND FINAL COMPILATION OF TECHNICAL MEMORANDA ON AMBIENT ANALYSES OF METALS IN SOILS AND GROUNDWATER, DATED 4/19/2002

The Department of Toxic Substances Control has reviewed the subject document. As we have no further comments, the subject document is considered a final document. The attached memorandum from Dr. John Christopher is provided for your information.

Should you have any questions regarding this letter, please call me at (510) 540-3773.

Sincerely,

Chip Gribble
Remedial Project Manager
Base Closure Unit
Office of Military Facilities

Attachment

cc: Ms. Brenda McConathy
Mr. Henry Chui
Mr. Mr. Gary Riley
Ms. Emily Roth
Ms. Carolyn d'Almeida

Department of Toxic Substances Control

Edwin F. Lowry, Director
1001 I Street, 25th Floor
P. O. Box 806
Sacramento, California 95812-0806

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MEMORANDUM

TO: Charles Gribble
Office of Military Facilities (OMF) Region 2 Office
700 Heinz Avenue
Berkeley, CA 94710-2721

FROM: John P. Christopher, Ph.D., D.A.B.T.
Staff Toxicologist
Human and Ecological Risk Division (HERD)
8800 Cal Center Drive
Sacramento, CA 95826
916.255.6630 JChristo@dtsc.ca.gov

DATE: 9 April 2003

SUBJECT: Mare Island Naval Shipyard: Ambient Metals in Soils and Groundwater
PCA: 201208-00 Site: 18040

Background

The former Mare Island Naval Shipyard is a closed military facility in Contra Costa County. Cleanup operations are being managed by Naval Facilities Engineering Command, Southwest Division, Engineering Facility West. The current document summarizes the Navy's investigations into ambient concentrations of metals in soils and shallow groundwater at the facility.

Document Reviewed

We reviewed "Final Compilation of Technical Memoranda on Ambient Analyses of Metals in Soils and Groundwater, Mare Island, California.". This document is dated .19 April 2002. It was prepared by TetraTech Environmental Management, Inc., contractors to the Navy. This technical memorandum presents the several investigations into ambient concentrations of metals in soils and groundwater at Mare Island. The document has four parts, all prepared by TetraTech EMI:

1. "Final Technical Memorandum, Ambient Concentrations of Metals in Fill Materials", dated 2 February 1999.

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2. "Final Technical Memorandum, Estimation of Ambient Metal Concentrations in Soils (1995) Amended to Include Iron", dated 19 April 2002.

3. "Technical Memorandum, Estimation of Ambient Metal Concentrations in Shallow Groundwater, Mare Island, California", dated 15 November 1996.

4. "Response to Regulatory Agency Comments on the Technical Memorandum, Estimation of Ambient Metal Concentrations in Shallow Groundwater, Mare Island, California", dated 2 February 1998.

Comments and Recommendations

HERD approves this compilation of information on ambient concentrations on metals in soils and shallow groundwater. We accept the following summaries as definitive:

- For Native Soils: Table 1 of Reference 1.
- For Fill Soils: Table 2 of Reference 1.
- For Shallow Groundwater Beneath the Fill: Tables 1 and 2 of Reference 3.

DTSC worked closely with the Navy and its contractors over a period of several years to gain an understanding of ambient concentrations of metals in the soils and shallow groundwater at this facility. Estimating these ambient concentrations had two principal complicating factors. First, about two-thirds of the current land area of Mare Island is man-made fill; the remainder is the original island. The original island and fill material differ markedly in soil chemistry. Second, the chemistry of the fill material has been heavily impacted by historic mining activities. Several current and former mercury mines are located in the Napa Valley, and Mare Island is situated immediately opposite the opening of the Napa River into Carquinez Strait and San Pablo Bay. Mining activities on the western slope of the Sierra Nevada from the 1850's until the present, including hydraulic and hard rock mining for gold, created an enormous load of metal-laden silt. Some of this silt accumulated around Mare Island, ultimately to be deposited as dredge spoil in the man-made portions of the island. Thus, the concentrations of many metals are greatly different in soils at Mare Island compared to other parts of California. As the fill was infiltrated with rainwater and contaminated with industrial waste, these differences in soil chemistry eventually produced characteristic patterns in the shallow groundwater beneath the fill material.

In the first document listed above, analytical data on metals in soil from several remedial investigations were divided into two portions, the fill material and the original island. Ambient data sets were developed for each region. Over 3,000 analyses of fill material were available, while about 300 were available for the original island. The exercise was fairly straightforward for the original island, but it was quite complicated for the fill material. After assembling descriptive statistics, probability plots, and other information, obvious high values representing contamination were eliminated. From the remaining analyses, the project team reached a con-

sensus, one metal at a time, for a data set which represented an acceptable ambient range. The memorandum contains a table with estimated 95th percentiles of the ambient range for each metal, if such a calculation could be made. For metals with very low frequencies of detection (*e.g.* Ag, Th), the highest value thought not to be contamination was selected by agreement.

The second document contains two modifications from the first. First, the Navy presents an ambient data set for iron as a supplement to the first reference. This was added at the request of the ecological risk assessors. Second, the Navy presents convincing evidence that the relatively high levels of arsenic are not apparently due to Navy activities. The main sources are historic mining activities, siltation, and dredging. Percolation of rainwater through these fill materials has mobilized arsenic and caused relatively high levels in shallow groundwater beneath the fill. Tables 1 and 2 in this technical memorandum present summaries of ambient metals in soils and sediments for San Francisco Bay and for nine Navy installations in the Bay Area.

The third document presents the Navy's estimates of the upper ranges of ambient concentrations for metals in the shallow groundwater beneath the fill material. A careful selection process located 27 wells in the fill material which were outside any known plumes of organic contamination and for which four consecutive quarters of monitoring data were available. Once, again, descriptive statistics were assembled for each metal. Frequencies of detection were much lower than in soil for nearly all metals. However, parametric estimates of 95th percentiles were possible in most cases. The Navy's statistician used the "dummy substitution" method described in DTSC's 1997 guidance on identifying ambient metals in soils as chemicals of potential concern in risk assessments (http://www.dtsc.ca.gov/ScienceTechnology/ftp/backgrnd.pdf). This permitted regression of the detected values and graphical estimation of the mean and standard deviation. Once these two descriptors were identified, any quantile could be estimated parametrically. Parametric determination were possible even when frequencies of detection were as low as 6-10%, provided the regression line was not scattered.

The fourth document contains resolutions of various agency comments on the groundwater memorandum. The values for the upper percentiles of ambient ranges are those shown in the second and fourth documents.

The contents of these technical memoranda represent the culmination of a learning process on the part of the Navy and the regulatory agencies. Producing these technical memoranda required the technical skills of geologists, analytical chemists, statisticians, toxicologists, and risk assessors. The project team brought these skills together and cooperated well to produce these memoranda.

Reviewed by: Michael J. Wade, Ph.D., D.A.B.T.
Senior Toxicologist, HERD

cc: G. Hiatt, USEPA Region 9