

**Memorandum**

To : Mr. Charles Gribble  
Office of Military Facilities  
Department of Toxic Substances Control  
700 Heinz Avenue, Suite 200  
Berkeley, California 94710

Date : January 24, 1996

From : Department of Fish and Game

Subject : Review of Technical Memorandum Estimation of Ambient Metal Concentrations in Soils  
(12/14/95) for Mare Island Naval Shipyard, Vallejo (5920/60130/NTX 503 00: 25)

This memorandum is in response to your work request dated January 12, 1996, requesting review of the subject document. The document describes the approach used for estimating ambient metal concentration limits in Soils at Mare Island Naval Shipyard (MINS) in Vallejo, California. Ambient concentration limits estimated through this approach will be used in the baseline human health risk assessment, ecological risk assessment, and remedial investigation of MINS. The Department of Fish and Game (DFG) was not asked to provide comments on the two previous drafts (in January and April, 1995). DFG recommends that the following specific comments and issues be addressed in this document to ensure that State trust natural resources, including fish, wildlife species, biota, and their habitats, are protected:

**Section 1.0 Introduction (pages 2-3)**

DFG does not agree with the exclusion of the following metals from further consideration: cobalt, molybdenum, selenium, silver, and tin (organic and inorganic). Metals with an ambient concentration less than 0.1 times the Environmental Protection Agency (EPA's) preliminary remedial goals (PRG) for residential use were excluded from the process. The criteria used to exclude these metals focuses primarily on utilizing this data set for estimating human health effects and risk assessment not for ecological effects and risk assessment. DFG has developed recommended soil PRGs for initial risk assessment screening for plants, birds, mammals, and invertebrates (enclosed Table 1). The table lists PRGs for the metals mentioned above. DFG recommends that these metals be included, utilizing DFG's PRGs (enclosed Table 2). These metals, at the levels listed, have been shown to adversely affect the fish and wildlife.

**Section 1.0 Introduction (page 3)**

The data set used was limited to soil samples collected from depths of 10 feet or less. The reason for this was to be consistent with risk assessment procedures. It is unclear whether these were human or ecological risk assessment procedures. Intuitively, it would seem more likely that soils from deeper depths would have less anthropogenic contact. Surficial samples may skew the ambient data set, because of possible contamination from human activities.

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### **Section 2.0 Approach (page 3)**

If the intent of this approach is to also calculate risk to fish and wildlife resources, DFG disagrees with the approach presented. For reference, Step Number 2, DFG recommends the database be queried to identify specific metals in soils approaching or exceeding PRGs set for plants, birds, mammals, and invertebrates, not just for residential use PRGs. DFG will assist in providing this review.

### **Section 3.0 Conceptual Model (page 4)**

Were soil analyses conducted in undisturbed sediment and depositional areas to determine the origins of copper, iron, and lead? The report suggests these metals originated from offsite mining activities.

DFG would not object to using artificial fill material to obtain ambient concentrations of metals if the fill were clean and not hazardous to fish and wildlife. A description, text, and explanation should be provided to support this.

### **Section 3.0 Conceptual Model (page 5)**

There seems to be an inconsistency in the text. Why were these five metals (barium, calcium, cobalt, iron, and magnesium) used for soil comparisons after they were previously excluded from further consideration (see page 3)?

### **Section 4.1.1 Treatment of Nondetectable Results (page 6)**

The detection limits for the excluded metals (page 3) need to be reported. Some of these detection limits may be above DFG's PRGs. If Quality Assurance/Quality Control (QA/QC) storage requirements can be met, we recommend that an evaluation of the samples be done with detection limits below DFG's PRGs.

### **Section 4.2.2 Identification of a Threshold Concentration (pages 7-8)**

There is only one set of probability plots included. We would like to have the plots shown for the two types of data distributions listed [the normal distribution (that appeared as a bell-shaped histograms) and the polymodal distribution (that appeared as two bells on a histogram)], prior to the final adjustments having been made.

We would also like to have "threshold concentration" and the statistical procedure used to trim the "site-related values" explained.

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**Section 5.0 Summary of Findings (page 9).**

In the two tables, EPA's Residential PRGs and the Regional Water Quality Control Board's Sediment Screening Criteria are included for comparison. For further comparison, DFG recommends that their PRGs also be included in these tables. In the enclosed Table 3, we have listed all the various metal concentrations.

In summary, DFG feels that if this approach will not fully protect the natural resources, including fish, wildlife species, biota, and their habitats.

**DFG recommends:**

- 1) The metals that were excluded from further consideration (listed in Table 2) be included in any further sampling.
- 2) DFG be allowed to do a complete review of the recommended approach, especially if this approach is to be utilized at other military facilities.

Staff from the DFG's BRAC/IR Team should be included in any further discussions pertaining to the development of these ambient limits and should review any further revisions of this report. If you have any questions, need additional information, or wish to discuss our comments, please contact Dr. Michael Martin, Staff Toxicologist, at 20 Lower Ragsdale Drive, Monterey, California, 93940 at (408) 649-7178 or me at (916) 653-7560.



John L. Turner, Chief  
Environmental Services Division

**Attachments**

cc: California Department of Fish and Game

Dr. Michael Martin  
Monterey

Captain Ken Boettcher  
Santa Rosa

TABLE 1  
DEPARTMENT OF FISH AND GAME'S RECOMMENDED SOIL PRGs FOR  
INITIAL RISK ASSESSMENT SCREENING (ng/kg)

Analyte	PRG plants	PRG birds	PRG mammals	PRG invertebrates
Aluminum	10	N/A	7,690	2,800
Antimony	5	N/A	192	N/A
Arsenic	3 <sup>a</sup>	256	200 <sup>a</sup>	N/A
Barium	500	18,300	6,850	N/A
Beryllium	10	N/A	104	N/A
Cadmium	2	4 <sup>b</sup>	1 <sup>b</sup>	1.0 <sup>c</sup>
Chromium	5	N/A	38,500	1.0 <sup>c</sup>
Cobalt	25	183	1,920	N/A
Copper	40	531	12,700	15 <sup>c</sup>
Cyanide	N/A	100 <sup>d</sup>	100 <sup>c</sup>	N/A
Iron	N/A	7,140	19,200	1,000
Lead	200 <sup>e</sup>	458	125 <sup>e</sup>	100 <sup>c</sup>
Manganese	500	750	44,200	N/A
Mercury	0.3	45.8	25 <sup>f</sup>	0.12 <sup>c</sup>
Nickel	20	N/A	4,640	50 <sup>c</sup>
Selenium	1	12.1	11.0	N/A
Silver	2	N/A	13,100	N/A
Thallium	N/A	4.34	30.4	N/A
Vanadium	2.5	N/A	N/A	N/A
Zinc	93	421	6,540	75 <sup>c</sup>

<sup>a</sup> Eisler, R. 1988. Arsenic hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish Wildl. Serv. Biol. Rept. 85(1.12). 92 pp.

<sup>b</sup> Eisler, R. 1985. Cadmium hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish Wildl. Serv. Biol. Rept. 85(1.2). 46 pp.

<sup>c</sup> van Straalen, N.M. et al. 1993. In Ecotoxicology of Metals in Invertebrates. Dallinger, R. and Rainbow, P.S., eds., pgs 383-399. Lewis Publishers.

<sup>d</sup> Eisler, R. 1991. Cyanide hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish Wildl. Serv. Biol. Rept. 85(1.23). 55 pp.

<sup>e</sup> Eisler, R. 1988. Lead hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish Wildl. Serv. Biol. Rept. 85(1.14). 134 pp.

<sup>f</sup> Eisler, R. 1987. Mercury hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish Wildl. Serv. Biol. Rept. 85(1.10). 90 pp.

N/A Not Available.

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cc: John Turner  
Sacramento

Ann Malcolm  
Sacramento

TABLE 2  
METALS OF CONCERN WITH NO RECOMMENDED ESTIMATION OF AMBIENT LIMITS

Metal	U.S. EPA Residential PRG 0.1 (mg/kg)	DFG-BRS (mg/kg)
Cobalt	460	25
Molybdenum	38	12 <sup>a</sup>
Selenium	38	1
Silver	38	2
Tin (organic)	0.2	.001 <sup>b</sup>
Tin (inorganic)	4,600	4 <sup>c</sup>

<sup>a</sup> US EPA. 1995. Draft "Exit Criteria." Protective exposure concentrations for ecological receptors in the terrestrial ecosystem. pgs. 5-196.

<sup>b</sup> Bisler, R. 1989. Tin hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish Wildl. Serv. Biol. Rept. 85(1.15). 83 pp.

<sup>c</sup> NOAA. 1994. Screening criteria for inorganics. Publication 94-8.

TABLE 3  
 AMBIENT METAL CONCENTRATIONS - MARE ISLAND NAVAL SHIPYARD

Metal	Soil Metal Concentration Statistics for Ambient Data Sets (ug/kg)		U.S. EPA PMS (ug/kg)	RNOGS Sediment Screening Criteria	DFG PPG (ug/kg)
	80% LEL on 95th Percentile (Ambient Limit in Original Island Soils)	95th Percentile (Ambient Limit in Artificial Fill Soils)			
Aluminum	26,000	35,000	77,000	N/A	10
Antimony	1.3	8.5	31	N/A	5
Arsenic	16	36	0.38	33	3 <sup>a</sup>
Beryllium	1.8	0.90	0.14	N/A	10
Cadmium	3.5	5.2	9	5	1.0 <sup>b</sup>
Chromium	56	140	210	220	1.0 <sup>c</sup>
Copper	210	120	2,800	90	15 <sup>c</sup>
Lead	33	59	130	50	100 <sup>c</sup>
Manganese	560	1,600	380	N/A	500
Mercury	DL	2.0	23	0.35	0.3 <sup>c</sup>
Nickel	70	130	150	140	20
Thallium	DL	DL	5.4	N/A	4.3
Vanadium	130	190	540	N/A	2.5
Zinc	100	230	23,000	160	75 <sup>c</sup>

<sup>a</sup> Eisler, R. 1988. Arsenic hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish Wildl. Serv. Biol. Rept. 85(1.12). 92 pp.

<sup>b</sup> Eisler, R. 1985. Cadmium hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish Wildl. Serv. Biol. Rept. 85(1.2). 46 pp.

<sup>c</sup> van Straalen, N.M. et al. 1993. In Ecotoxicology of Metals in Invertebrates. Dallinger, R. and Rainbow, P.S., eds., pgs 383-399. Lewis Publishers.

N/A Not Available.

DL Detection Limit.