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MARE ISLAND
SSIC NO. 5090.3.A

C A

Department of Toxic Substances Control

700 Heinz Avenue
Suite 200
Berkeley, CA
94710-2737

July 13, 1998

Pete Wilson
Governor

James M. Strock
Secretary for Environmental Protection

Environmental Restoration Branch
Western Division
Naval Facilities Engineering Command
Attn: Mr. Bob Pender
900 Commodore Drive
San Bruno, California 94066-0720

Dear Mr. Pender:

MARE ISLAND DRAFT OFFSHORE AREAS ECOLOGICAL RISK ASSESSMENT, DATED 4/16/98.

The Department of Toxic Substances Control, the Regional Water Quality Control Board, and the Department of Fish and Game have reviewed the subject document. The attached comments are forwarded to you for your consideration.

Should you have any questions regarding this letter, please call me at (510) 540-3816.

Sincerely,

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

CC: Next page

Attachments

Printed on Recycled Paper

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Pete Wilson
Governor

James M. Strock
Secretary for Environmental Protection

MEMORANDUM

TO: Chip Gribble, Project Manager
Office of Military Facilities – Berkeley
700 Heinz Street, Building F, Second Floor
Berkeley, CA 94704

FROM: James M. Polisini, Ph.D.
Staff Toxicologist
Human and Ecological Risk Division (HERD)

DATE: June 23, 1998

SUBJECT: MARE ISLAND DRAFT OFFSHORE REMEDIAL INVESTIGATION REPORT
[PCA 14740, SITE 200063-47 H:80]

Background

We have reviewed the document titled *Draft Offshore Areas Ecological Risk Assessment, Mare Island Vallejo, California,* dated April 16, 1998 and prepared by Tetra Tech EM Inc. of San Francisco, California. This review is in response to your written work request dated May 13, 1998.

General Comments

Sediment at the Carquinez Strait disposal area was sampled and tested as part of the dredge permit evaluation for treatment of unexploded ordnance in the Dike 12/14 area. The Carquinez Strait disposal area is not an appropriate reference or comparison for evaluating the potential ecological hazard posed by Mare Island sediments. The appropriate reference or comparison is the San Francisco Regional Water Quality Control Board (SFRWQCB) Island #1 station and SFRWQCB sediment 'ambient' concentrations for fine sediments (SFRWQCB, May, 1998). The fact that all Mare Island sediments exhibited less toxicity than the sediments from the Carquinez Strait disposal area (Section 15.4.1, page 15-7) is encouraging. This means that Mare Island sediments are not as contaminated as sediments for which in bay disposal was deemed appropriate as opposed to ocean or upland disposal. The fact that the Dike 12/14 Area sediments ranged from less

toxic to more toxic than SFRWQCB Island #1 sediments indicates there are potential adverse effects associated with some Mare Island sediments. Please see the conclusions section for our recommendation for additional analysis.

The evaluation methodology applied to the sediment toxicity testing data has identified the sampling locations which pose the greatest ecological hazard. However other sampling locations pose a lesser but still significant degree of threat; and these require additional evaluation beyond that supplied. The criteria for identifying these additional sampling locations are provided in Specific Comment number 24.

Specific Comments

1. Please state the basis for the statement that most of the waste sandblast material deposited offshore of Installation Restoration (IR) Site 04 has been covered with silt and sediment (Section 2.2.8, page 2-7).

2. Diatoms are included in the text as one of the dominant vegetation groups offshore of MINSY (Section 3.2, page 3-3). They are not included in the referenced table (Table 3-2). Please correct the text and table so they are correct and agree.

3. Why was total organic carbon (TOC) not available for the Dike 12/14 sediment samples (Table 3-1, page 3-11)? The assumption that the TOC for these samples were within the range of TOC for other offshore areas at MINSY cannot be used because one TOC measurement (BS22) was excluded as the TOC was more than three standard deviations above the mean.

4. For completeness please indicate how often during the sediment sampling, a magnetometer screening caused a new sample location to be selected (Section 4.2.1, page 4-9).

5. Please explain, beyond the statement that non-contaminant stressors were observed, the reason for rejection of approximately 25 percent of the biological data (Section 4.5.2, page 4-19).

6. The San Francisco Regional Water Quality Control Board (SFRWQCB) recently released the listing of sediment concentrations considered 'ambient' in San Francisco Bay. These 'ambient' concentrations should be included in the assessment of Mare Island sediments and the reference stations (Section 5.1.1, page 5-3 and page 5-9).

7. The federal Ambient Water Quality Criteria (AWQC) do not include protection of shorelines, beaches, aesthetics and recreation as stated in the text (5.1.2.1, page 5-4). Please amend the text.

8. A notation of 'LPEST' follows the entry for hexachlorobenzene in the table of toxicity guidance values (TGVs) (Table 5-1, page 5-7). Please define this notation.

9. Please explain why selenium was only analyzed in one reference location grab sample (Table 5-2, page 5-9).

10. Barium was identified as a COPEC for Offshore Area 2 (Section 6.3.1, page 6-27) based on a statistically significant difference from the reference location. The reference location table (Table 5-2) indicates that no analyses were performed for barium at the reference location. Please explain this apparent discrepancy.

11. Most of the summary statements regarding COPEC frequency of detection and maximum concentration (Sections 6.2 through 6.4) agree with those presented in later tables (Tables 6-1 through 6-18). However, the text states that hexachlorobenzene was detected in 3 of 6 elutriate samples from Area 2 (Section 6.3.4.2, page 6-47), while the elutriate summary table (Table 6-11, page 6-97) indicates that hexachlorobenzene was detected in 3 of 29 samples. Please correct either the table or the text so they are correct and agree.

12. Although it follows the methodology for elimination of COCs, individual polychlorinated biphenyl (PCB) congeners (Section 6.3.4.3, page 6-48) should not be eliminated, unless the PCB congeners will be considered separately with their own toxicity values in the risk characterization. If the sum of the PCB congener concentration will be compared with an Aroclor TGV all the individual congeners detected should be retained.

13. The evaluation of COPECs to determine which will be carried forward in the analysis does not provide the rationale for some COPECs. For example, cobalt in Area 3 sediments and pore water (Section 6.4.2, page 6-57) and vanadium in elutriate and pore water (Section 6.4.2, page 6-59) are not carried forward but no rationale is provided. Please state the basis for exclusion or inclusion for all COPECs.

14. The text states that beryllium was detected in 4 of 8 shallow core samples in Area 3 (Section 6.4.1, page 6-51), while the table (Table 6-14, page 6-104) indicates that beryllium was detected in 4 of 18 shallow cores. Please correct the text.

15. The fact that the detection limit for mercury in water is higher than the AWQC for mercury (Section 6.4.2, page 6-58) means that the potential adverse effects associated with dissolved mercury are not evaluated and remain a data gap. The results of the effort to set soil 'ambient' concentrations for Mare Island soils indicate that mercury may be elevated in the fill used to construct a portion of Mare Island Naval Shipyard. Additional sediment samples should be taken during the IR04 investigation for mercury analysis with sufficiently low detection limits to fill this data gap.

16. The presentation of the sediment concentrations around Mare Island (Figures 6-1 through 6-11) is most useful. However, please provide some discussion in the text for portraying the semivolatile organic compound (SVOC) (Figure 6-9) and pesticide concentrations (Figure 6-10) based on a range of zero to three SVOCs or pesticide samples within a cell greater than the Effects Range-Low (ER-L) or Effects Range-Median (ER-M). Did any individual SVOCs or pesticides which were greater than the ER-M present a different pattern than the summed SVOCs or pesticides?

17. The units for polychlorinated biphenyls (PCBs) ER-L and ER-M (Figure 6-11) are incorrectly listed as mg/kg instead of µg/kg. Please correct this typographic error.

18. The summary tables listing the minimum and maximum sediment concentrations (Tables 6-1 through 6-3, Tables 6-7 through 6-9, and 6-13 through 6-15) incorrectly state the units as µg/kg rather than mg/kg. Please correct this typographic error.

19. The typographic error in units, in the previous comment, makes comparison of the sediment concentrations in the grab samples and surface cores to the sediment 'ambient' concentrations recently set by the SFRWQCB (SFRWQCB, May, 1998) difficult. However, it appears that nearly all the Mare Island maxima exceed the SFRWQCB sediment 'ambient' concentrations for extremely fine sediments. Please include some comparison to the SFRWQCB sediment 'ambient' concentrations in the text and provide a table presenting this comparison.

20. It appears that bioaccumulation was not considered when selecting COPECs. There are no entries in the bioaccumulation column in all three tables identifying the COPECs for the three areas (Table 6-6, Table 6-12 and Table 6-18). Please indicate in these tables the COPECs which are carried forward based on bioaccumulation potential. Also, the footnotes for these tables indicate that bioaccumulation was considered significant for those COPECs with a log octanol-water partition factor (log K_{ow}) greater than 1.7. The text (Section 5.1, page 5-2) indicates a Bioaccumulation Factor (BAF) greater than 2.5 indicates the potential

for bioaccumulation. Please correct the text and the tables so that the correct BAF, Biota Sediment Accumulation Factor (BSAF) or log K_{ow} is indicated in both.

21. The table identifying COPECs for Area 2 (Table 6-12, page 6-99) contains an entry of 'check' in the Ambient Water Quality Criteria (AWQC) column. All other entries in the table are an 'X'. Please explain the meaning of this entry.

22. Please explain how 2 grab samples were taken in Area 3 for cadmium, chromium, copper, lead, mercury, nickel and zinc, but only one grab sample for all other analytes (Table 6-13, page 6-103).

23. It is difficult to understand why there appears to be such a great concern that the offshore sediment samples are not from the same population due to 'widely varying sediment characteristics (Section 7.1.1, page 7-3). One page later the bioassay data from the SFRWQCB Island #1 station and two other studies of San Francisco Bay are assumed to be from the same population (Section 7.1.1, page 7-4). The bioassay data should be analyzed with effort equal to that applied to the sediment data to justify this assumption.

24. We would interpret amphipod survival below 50 percent as definitely toxic not 'potentially toxic' (Section 7.1.1, page 7-4). This criterion for toxicity certainly identifies those areas that present the greatest hazard as measured by the bioassay results. We are not convinced that amphipod survival between 50 percent and 74 percent represents no significant biological hazard. A working standard for amphipod survival that has been used at other sites is that survival rates of less than 76 percent are considered significant. HERD's interpretation of the DeWitt, et al., 1988 publication is that *Eohaustorius estuarius* in 100 percent fine sediment <u>may</u> exhibit a 10 percent decrease in survival not related to chemical stressors. Applying this 10 percent decrease in survival to the 76 percent survival working standard yields a survival criterion of 66 percent. A survival criterion of 66 percent in 100 percent fines could significantly alter the offshore areas considered potentially toxic as compared to the 50 percent survival criterion applied. A 66 percent survival rate criterion would add 16 more sample locations as Areas of Concern (AOCs) for Area 1, 14 more sample locations as AOCs for Area 2, 4 more sample locations as AOCs for Area 3 excluding Dike 12/14 and 6 more sample locations as AOCs for the Dike 12/14 Area. These are the sampling cells HERD considers to pose some toxic effect on amphipods, and therefore require additional evaluation, separate from the cells identified as toxic for amphipods at greater than a 50 percent rate. Please see the conclusions for our recommendation on additional analysis.

25. The discussion of the probability of Type I error in the statistical comparison (pages 7-5 through 7-6) must be augmented so that all the risk managers realize that this is the probability that a true null hypothesis will be rejected. The null hypothesis is that test areas are different from the reference areas. This means that the probability that the areas differ from the reference areas is 0.061 for Area 1, 0.108 for Area 2 and 0.58 for Area 3 and 0.46 for Dikes 12/14 Area. There is approximately 1 chance in 2 that Area 3 and the Dike 12/14 Area are actually statistically different from the reference area. This is an extremely high error rate. We recommend different statistical tests should be evaluated to determine if they are applicable.

26. Please explain why there were only two amphipod bioassays were performed in the Dike 12/14 area (Section 7.1.1.3, page 7-6) when there are 10 cells in this area and surface grab samples were taken in all cells (Figure 4-4). The associated table (Table 7-5, page 7-35) gives amphipod survival results for all 10 sampling cells in the Dike 12/14 Area. If this is a reference to two Dike 12/14 reference stations please insert the word 'reference' at the appropriate place(s).

27. The text states that Dike 12/14 samples with survival less than the lowest SFRWQCB Island #1 reference station were considered toxic. The SFRWQCB Island #1 reference station percent survival rates were 87, 80, 75, 65, and 49 (Table 7-3, page 7-33). Dike 12/14 amphipod percent survival rates of 28 (Cell A1), 41 (Cell A2), 24 (Cell A6), 26 (Cell B1), 25 (Cell B2) and 33 (Cell B4) are not asterisked as toxic in the Area 3 amphipod table (Table 7-5, page 7-35). Please amend the table to include the asterisk in the appropriate places.

28. Please state the basis for considering the acceptability of the sand dollar bioassay results based on the mean survival plus or minus one standard deviation (Section 7.1.2.1, page 7-8). The amphipod toxicity criterion previously applied was the mean survival plus or minus two standard deviations and the following sea urchin and mussel larva acceptability criterion (Section 7.1.2.1, page 7-8) is the mean plus or minus two standard deviations. Deviations from the ASTM, EPA or agreed-upon protocols are not acceptable.

29. The citation provided for the 0.03 mg/l un-ionized ammonia Effect Concentration for 50 percent of the tested organisms (EC_{50}) for the sand dollar (Section 7.1.2.2, page 7-9 and page 7-10) is the Wildlife Exposure Factors Handbook (U.S. EPA, 1993 a,b) for terrestrial organisms. Please correct the citation.

30. The citation provided for the 0.071 mg/l un-ionized ammonia EC50 for blue mussels (Section 7.1.2.2, page 7-9) is listed in the text as published in 1997 and listed in the

reference section as published in 1996. In addition, the reference indicates that the value was presented in a Society of Environmental Toxicology and Chemistry (SETAC) short course at the 17th annual meeting. The class notes for this course are not available in the public literature. Please provide the supporting documentation so HERD can review the EC_{50} for un-ionized ammonia..

31. In the sentence describing the size of the 95 percent prediction interval around the plots of un-ionized ammonia against normal development rates (Section 7.1.2.2, page 7-10), the word 'not' appears to contradict the meaning of the sentence. As the sentence refers to high variability in the un-ionized ammonia values, it would appear that the word 'not' should be removed.

32. We agree with the argument presented (Section 7.1.2.2, page 7-10) that un-ionized ammonia concentrations appear to have caused toxic effects in the larval bioassay in addition to any toxic effects caused by other contaminants. One presentation method, which would support this argument, would be to plot the percent dilution versus percent normal development rather than presenting separate plots of each dilution versus percent normal development.

33. We would agree that COPCs with BAFs greater than 1.0 or biota-sediment accumulation factors (BSAFs) greater than 1.7 pose the greatest ecological hazard (Section 7.2, page 7-12). These criteria identify those COPCs which will accumulate to equal or higher concentrations in biota than in sediment. However, COPCs with BAFs less than 1.0 or BSAFs less than 1.7 can still pose a threat to ecological receptors depending on the toxicity reference value and intake used for representative species. Inorganic COPCs rarely have BAFs greater than 1.0 or BSAFs greater than 1.7, yet inorganic COPCs frequently are risk drivers in ecological risk assessments. The BAF/BSAF criterion may be applied to identify organic COPCs which may pose a bioaccumulation threat but should not be applied to inorganic COPCs. Inorganic COPCs, which are not screened out by other criteria, should be carried through the food web analysis.

34. A PCB congener from Offshore Area 3 is indicated as 'BZ-8' (Table 7-14, page 7-49). Please identify this PCB congener with the standard PCB congener numbering system used for the other PCB congeners.

35. Percent survival is misspelled as 'Percent Surviva' (Figure 7-2, page 7-17). Please correct this typographic error.

36. The listing of the Offshore Area 1 COPCs carried forward in the analysis (Table 7-15, page 7-51) based on amphipod toxicity, echinoderm toxicity or bioaccumulation

potential. Entries in the bioaccumulation column are confusing. In some cases identical analytes are listed for adjacent sediment samples, but bioaccumulation is indicated as a potential factor for only one of the sediment samples. For example, on the second page of the table at sample location NM23, the sediment grab sample and the outfall sediment grab sample have identical analytes, but bioaccumulation potential is indicated only for the outfall grab sample. Similar differences occur in the tables for Offshore Area 2 (Table 7-16, page 7-55) and Offshore Area 3 (Table 7-17, page 7-60). Please explain the rationale for the distinction.

37. We agree that the sediment locations identified as toxic (Section 7.3.4, page 7-15), Berths 1 and 2 and sediment under Piers 21 and 23, are the sediment areas sampled which pose the greatest threat due to the 50 percent amphipod bioassay mortality criterion applied. We do not necessarily agree that the other sediment locations with amphipod bioassay mortality between 50 percent and 66 percent mortality do not pose a threat.

38. Please more clearly present the rationale for the conclusion that bioaccumulation potential for most anthropogenic chemicals in sediments appears low (Section 7.3.4, page 7-15). Presently there are four citations presented without explanation of the basis for this statement. There appear to be numerous COPCs with BAFs greater than 1.0 and BSAFs greater than 1.7 (Table 7-14) in Offshore Area 1 and Offshore Area 2.

39. The harbor seal is referred to as a subspecies when only the genus and species are supplied in the discussion (Section 8.3.2.1, page 8-11). Please supply the subspecies designation or refer to the harbor seal as a species.

40. The table of risk characterization methodology (Table 8-3, page 8-17) refers to Acid Volatile Sulfide/Simultaneously Extracted Metals (AVS/SEM) analysis. The text discusses SEM/AVS analysis (Section 9.4.1, page 9-14). SEM/AVS is the usual abbreviation for this methodology and should be applied consistently in text and tables.

41. We do not agree with the interpretation proposed for the numerically high toxicity reference value (TRV) when used to calculate the low dose hazard quotient (HQ_1) (Section 9.2.2.2, page 9-9). The HQ_1 is calculated as the Low Dose divided by the numerically high TRV. We do not agree that an HQ_1 of less than one indicates no immediate risk. The numerically high TRV represents a dose at which the regulatory agencies would <u>expect</u> there to be adverse ecological effects. Whether daily doses between the numerically high TRV and the numerically low TRV are

likely to produce adverse effects is uncertain. However, the probability of adverse effects increases as the daily dose approaches the numerically high TRV. Please amend the phrase indicate that an HQ_1 less than 1.0 represents some unquantifiable risk.

42. Several of the intake calculations and the HQ_1 and HQ_2 calculations (Section 9.2.2 and Appendix F) for vertebrate receptors were checked at random and found to be correct.

43. The discussion of SEM/AVS results Section 9.4.1, page 9-14 and 9-15) must discuss the impact of the important item contained in a later footnote (Table 9-4, page 9-42 and Table 9-5, page 9-43 and 9-44). The first footnote in this table indicates that 'Sulfide chemistry value was rejected during data validation, so both the sulfide and SEM/AVS values are suspected to be inaccurate'. First, our understanding was that sulfide was being measured using a sulfide electrode, while SEM/AVS was measured by simultaneous extraction in cold acid. Please explain why data validation problems for sulfide, measured by electrode, invalidate SEM/AVS measurements which used a different technique. Second, relying on a notation having potential impact on the assessment of metal bioavailability without discussion in the text must be corrected. Any potential analytical problem with the SEM/AVS results must be included in the summary discussing bioavailability (Section 9.5, page 9-19).

44. When identifying sediment locations which pose potential risk to benthic receptors (Section 10.1, page 10-2 and 10-3), the discussion of sediment reference area locations should be restricted to SFRWQCB Island #1 reference location. Please see the General Comments.

45. The discussion of bioaccumulation (Section 10.2, page 10-3) should be augmented to more fully explain the conclusion that bioaccumulation potential is low even though some contaminants in some sample locations displayed BSAFs above the equilibrium driven 1.7 value (Table 7-14). If this conclusion in based on the fact that only a few contaminants showed extremely high BSAFs at a relatively small number of sample locations, provide the range of BSAFs and species tested from the literature as well as the fraction of sample locations with BSAFs above the literature values. If adequate supporting rationale cannot be presented the conclusions regarding bioaccumulation (Section 13.2.1, page 13-3, fourth bulleted item) will need to be amended.

46. The vertebrate representative species are the harbor seal, the short-billed dowitcher, the double-crested cormorant and the osprey (Section 11, page 11-1

and 11-2). It would seem that the sediments accessible to these species would be markedly different. For example, the harbor seal makes significant use of muddy beaches such as those in dikes 12 and 14 (Section 3.2.5, page 3-5). The short-billed dowitcher might also use these areas, but it is doubtful the cormorant or osprey would. Please explain how the maximum Mare Island Offshore sediment concentrations (Table 11-1) were derived for comparison with the SFRWQCB Island #1 sediment concentrations.

47. The reference to evaluating bioaccumulation potential with *M. edulis* (Section 15.2.1, page 15-4) appears to be in error. The following paragraph refers to bioaccumulation testing using *M. nasuta*, a completely different genus.

48. The fact that all Mare Island sediments exhibited less toxicity than the sediments from the Carquinez Strait disposal area (Section 15.4.1, page 15-7) is encouraging. This means that Mare Island sediments are not as contaminated as sediments for which in bay disposal was deemed appropriate as opposed to ocean or upland disposal. The fact that the Dike 12/14 Area sediments ranged from less toxic to more toxic than SFRWQCB Island #1 sediments indicates there are potential adverse effects associated with <u>some</u> Mare Island sediments.

49. The discussion of bioaccumulation potential for Dike 12/14 Area sediments (Section 15.4.1, page 15-7) must be augmented in line with Specific Comment number 45. Please more carefully word the phrase '...but the extent of their bioaccumulation is reduced relative to other kinds of sediments'. Does this mean the geographic extent? Does this mean relative to other sediments physically? Does this mean relative to other kinds of sediments on a concentration continuum? Please be more specific.

50. The decision on whether upland disposal is not required (Section 15.4.2, page 15-9) is not a decision for the DTSC project manager, but for the U.S. EPA Region IX and U.S. Army Corps of Engineers dredge program coordinators. It seems premature for the Navy to make this conclusion without their input.

<u>Conclusions</u>

We agree that the sediment locations identified as toxic (Section 7.3.4, page 7-15), Berths 1 and 2 and sediment under Piers 21 and 23, are the sediment areas sampled which pose the greatest threat due to the 50 percent amphipod bioassay mortality criterion applied. We do not necessarily agree that the other sediment locations with amphipod bioassay mortality between 50 percent and 66 percent mortality do not pose a threat.

There is uncertainty regarding the areas identified as toxic to benthic invertebrates due to the potentially confounding effects of un-ionized ammonia and sediment grain size. Many sample locations displayed adverse sediment bioassay effects in the range of 50 to 60 percent, which would normally indicate locations to be evaluated for remediation. A map identifying the location of grab samples and upper core samples exceeding the SFRWQCB sediment 'ambient' concentrations for fine grain sediment should be prepared to assess how these areas coincide with the locations identified in this report as the greatest threat to benthic invertebrates.

References

Gandesbery, Tom and Fred Hetzel. 1998. Ambient Concentrations of Toxic Chemicals in Sediment. Staff Report. Regional Water Quality Control Board San Francisco Region. May, 1998.

Reviewed by: John P. Christopher, Ph.D., DABT
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cc: Michael J. Wade, Ph.D., DABT
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Internal Memorandum
Regional Water Quality Control Board
San Francisco Bay Region

Date: July 13, 1998

To: Michael Rochette, RPM
RWQCB

Chip Gribble, RPM
DTSC

From: Susan Gladstone Susan Gladstone
File No.

Re: Draft Offshore Areas Ecological Risk Assessment
Mare Island, dated April 16, 1998

General Comments:

1. Two types of investigations were conducted on the offshore sediments at Mare Island. The objectives of these investigations were to determine dredge disposal options for UXO-related sediments, and an "insitu" evaluation was required to determine ecological risk of the non-UXO sediments. The potential exposure associated with sediments in each of these areas is different, however, it appears that the Navy evaluated the UXO-related sediments in the context of a CERCLA ecological risk assessment, as well as for determining dredge disposal options. This is inappropriate, as the sampling design for the dredge material generally does not meet the design requirements for an "insitu" evaluation. The major difference is that at the UXO sites, five sediment samples from each cell of approximately 55,000 cu yds were composited into one for chemical analysis. Another difference is that sediment elutriate bioassays were performed on the composited samples, which is appropriate dredging protocol. However, it is not representative of an "insitu" scenario, since five vertical feet of sediment will not likely be disturbed in one event. For these reasons, the Navy should clearly separate these two evaluations and not combine the data sets from the discrete and the composited sediment samples to interpret results.

2. The large intervals in sediment core samples (0 - 5' and 5' -10') taken in the non-UXO areas for chemical analysis limit the usefulness of the results with respect to delineating contaminant concentrations in the vertical dimension. Additionally, only four sediment cores were taken in this extensive offshore area to evaluate vertical nature and extent. Given the large intervals and the limited number of locations, RWQCB staff have concerns with respect to sufficient delineation of chemical concentrations. The RWQCB and other agencies' concerns regarding compositing sediment samples and large intervals was expressed to the Navy and their contractors during the scoping phase of the Field Sampling and Analysis Plan. We request that the Navy provide a more detailed analysis of the chemical results with respect to depth for each sample near the ERM, and the implications for potential exposure to ecological receptors.

3. During the scoping phase of the Field Sampling and Analysis Plan, RWQCB staff proposed the use of the Island #1 station as a reference site for solid phase and porewater toxicity tests based on our previous testing using a variety of invertebrate test species. However, the Navy has also used this station as a reference site for sediment elutriate bioassays on their shallow (0 - 5') and subsurface (5' -

10') cores. The RWQCB has not evaluated subsurface (deeper than 5cm) for sediment chemistry, nor performed elutriate bioassays at this location. Therefore, data from those sampling efforts may not necessarily be appropriate as a reference site. The Navy should re-evaluate their results in light of this information to determine whether their use of the RWQCB Island #1 can be considered a reference location.

4. With regard to the bioassay results and due to the effects attributed to confounding factors (i.e., grain size and unionized ammonia concentrations), we request that the Navy provide copies of the laboratory data sheets indicating water and sediment quality measurements for all replicates for each treatment and statistical comparisons to controls and reference toxicants.

5. As the Navy moves toward risk management decisions for this site, it would be useful to compare the sediment chemistry data to the ambient sediment data for San Francisco Bay[1].

Specific Comments:

1. **Section 1.2, Technical Approach, page 1-3:** The last sentence of this section indicates that decisions on potential remedial actions will be based on conclusions of the offshore and onshore ERAs, land use, and "feasibility studies of sites where risk is deemed unacceptably high." The Navy should modify this sentence to: " . . . feasibility studies of sites where risk is deemed unacceptable."

2. **Section 1.2.3, Evaluation of Ecological Risk in Onshore, Wetland, and Offshore Areas, page 1-6:** The last sentence indicates that the effect of groundwater contamination on the offshore sediments will be evaluated in a later report. The Navy should provide more specifics on the timing, coordination with the ERAs, and the documentation of the evaluation of groundwater.

3. **Figure 5-1, Overview of Risk Assessment Process For Mare Island Offshore Areas, page 5-10:** With respect to COEC determination, this decision matrix does not take into account the scenario where there is no numerical exceedance of a reference or guidance value, but toxicity is observed in the sample (not attributed to confounding factors). Eliminating COPECs before the evaluation of the bioassay data may potentially eliminate chemicals which could be causing toxicity. This is particularly relevant for the sediment values, which are only benchmarks. The Navy should take all chemicals detected in the samples into consideration when attempting a correlation to toxicity test results, not just those exceeding reference or guidance values.

4. **Chapter 6, Identification of Chemicals of Potential Ecological Concern:** In this section, specific chemical results are discussed and those that were identified as COPECs for each of the three Offshore Areas. The Navy has not provided the rationale or the basis for identifying each chemical as a COPEC in all cases. Although the criteria are discussed conceptually in the previous chapter, the Navy must state the basis for selecting or rejecting each chemical.

   Additionally, the Navy has proposed a criteria for eliminating a chemical as a COPECs if it exceeds the criteria in less the 10% of the samples. During the scoping meetings, the agencies discussed this point with the Navy and stated that if a chemical is to be eliminated for this reason, that individual samples should be evaluated for magnitude of exceedances, so as not to eliminate potential hot spots. This is especially relevant, given the limited number of sampling locations per cell. It is not clear from this document that this evaluation has been performed.

5. **Section 5.1.1, Development of Reference Chemical Concentrations, page 5-3 and Table 5-2, RWQCB Data Used for the Determination of Reference Location Concentrations:** This section states that there was variability in the reference site chemistry data. To facilitate easier review of this variability, the Navy should provide a table identifying chemical results from the RWQCB studies and those performed by the Navy. As noted in General Comment #3, the difference in depth of RWQCB

and Navy samples may be relevant to the evaluation of Island#1 as an appropriate reference site for Mare Island.

6. **Section 6.2.1, Inorganic Constituents in Sediment Samples for Offshore Area 1, pages 6-10 and 6-11:** There appears to be a typographical error in reporting the acute and chronic marine AWQC values for chromium. The Navy should verify these values and assure that appropriate comparisons to site samples were performed.

7. **Section 7.1.1, Toxicity Evaluation - Amphipod Bioassays and Appendix D - Biological Data Quality Worksheets:** This section discusses the results of the amphipod bioassays and the potential for influence on toxicity from confounding factors, specifically grain size. The Navy concluded that the results of the *Eohaustorius estuarius* bioassay were strongly affected by grain size. It is difficult to evaluate this conclusion based on the information provided in this report, as there appears to be a discrepancy with the sample identification numbers for the two reference sites in Tables 7-3, 7-4, and 7-5 displaying the bioassay results and in Table 9-2 displaying grain size (see comment #9 below).

   Additionally, the methodology used to evaluate the relationship between grain size and toxicity using the Island #1 reference site data and that of sites in San Francisco Bay obtained from the literature was not previously agreed to by the agencies. These data were combined using the assumption that they are from a single population. It is unclear from this report as to whether those data obtained from the literature are similar to Island #1 and should be combined. If the reference site results raise questions about the effect of confounding factors, the investigator typically relies on the results of the controls to tease out those relationships.

   Another confusing aspect of the interpretation of the amphipod results is the description of the test conditions provided in Appendix D. Virtually all of the treatments for the amphipod showed deviation from the guidelines for water quality parameters, yet the only rejected data were those which had elevated ammonia concentrations. It is unclear as to the Navy's criteria for their evaluation of acceptable data. The information regarding the controls and the reference toxicants does not appear to be included in this report, so I am unable to evaluate the potential impact to the site sample treatments. As noted elsewhere in this memo, the Navy should provide the agencies with the laboratory data sheets for each treatment so that we may have the opportunity to further evaluate their conclusions.

   Figures 7-1, 7-2, and 7-3 display the percent amphipod survival for Offshore Areas 1, 2, and 3. It would be useful to display the results of the reference site bioassays in the same figure for comparison.

   Table 7-5, Amphipod Survival Results for Offshore Area 3, displays percent survival values from literature. However, these values differ somewhat from those shown on Table 7-2. This column needs to be checked and a reference provided as a footnote on this table.

   Finally, although **Table 7-1** shows a side-by-side comparison of the two amphipod species bioassay results, Section 7.1.1 does not discuss the use of the amphipod *Leptocheirus plumulosus* bioassays at three sampling stations. Navy should include some discussion on the relevance of these results.

8. **Sections 7.1.2 and 7.1.2.1, Toxicity Evaluation of Echinoderm Bioassays and Results of Embryo Development Bioassays:** In reading these sections and reviewing Tables 7-7 and 7-8 (results of 100% porewater tests and sediment elutriate tests, and 50% porewater and sediment elutriate for the sand dollar), it is unclear if in the interpretation, the bioassay data for both porewater and elutriate bioassays were combined or were kept separate. Although the same species was used for both test methods, the data should be evaluated separately, as manipulation of the sediment to obtain the water fraction is different. The Navy should clarify this point.

A similar comparison is made to evaluate ammonia sensitivity of the various test species. However, **Figures 7-3 through 7-13** have combined the porewater and elutriate bioassays ammonia data for each species. It is unclear if this is an appropriate comparison, since the test methods, and perhaps the physical-chemical reactions which release ammonia, are different. The Navy should provide some discussion on this lumping of the toxicity test results.

Another aspect of this evaluation is also confusing. At the Fleet Reserve Piers and the South Mare Island Strait locations, sediment elutriate tests were performed on surface grab samples (0 - 6") and on shallow cores (0-5'). While the manipulation of the sediments to obtain elutriate would be the same, the Navy has tested two different vertical strata of different sizes and depths. It is unclear if the Navy combined this data in their evaluation of the bioassays, and if so, whether it is appropriate to combine these two data sets. Additionally, it is unclear as to what reference site data (with respect to the depth question) the Navy compared the Mare Island data. The Navy needs to clarify this point.

On page 7-9, first paragraph, there appears to be a typo: "The results for *Mytilus* indicated toxicity in all samples tested in both the 100% and 50% porewater dilutions, toxicity . . . " should be 100% and 50% sediment elutriate dilutions. Also, **Figures 7-14 and 7-15** indicate that the *Mytilus* had both porewater and elutriate treatments, but the text and Table 7-6 indicates that only elutriate was performed on the mussel.

9. **Table 9-2 page 9-23, Grain Size Distribution and Total Organic Carbon:** Station identification numbers are noted as RF2, Carquinez Strait, and RF1 is noted as RWQCB Island #1. Corresponding grain sizes indicate that RF1 is much more coarse grained that RF2. However, this seems illogical for two reasons. First, the sampling previously performed by the RWQCB at Island #1 for our Reference Sites Study has shown greater than 90% fines. Secondly, it seems more likely that because of its location near the confluence of the Sacramento River and Mare Island Strait, the Carquinez Strait disposal site would have a greater percentage of coarse-grained material. I have noted that in other tables, RF1 represented Carquinez Strait and RF2 represented Island #1. The Navy must clarify this point. If the labeling is correct, then Island #1 should not be used as a reference site, as it does not have a similar grain size to that of the Mare Island samples.

10. **Section 12.1.1.1, Sources of Uncertainty - Sampling and Data Analysis:** As noted in the General Comments, RWQCB staff are not convinced that the "sample size was more than adequate for characterization of nature and extent of contamination" as is stated in the second paragraph. In some areas, the limited number of deep cores and the 5' vertical intervals may not be sufficient coverage for the large volumes of sediment which may have been impacted by Navy activities.

11. **Section 12.1.1.2, Sources of Uncertainty - Toxicity Guidance Values [TGVs]:** This section should be modified to reflect the following comments.

    In the second sentence, add the bolded word: "Although the TGVs were based on numerous studies, they ***may*** include taxa not relevant to site receptors, and only represent an estimate of real effects." It is inappropriate to say that the taxa are not relevant to site receptors, unless the Navy can demonstrate otherwise.

    The AWQC, in particular, were promulgated after a series of tests were run using different species and taxonomic groups and different endpoints to, in fact, represent a range of possible effects to sensitive species. While the TGVs are results from laboratory tests, as are the results from the Navy's effort, the investigators select species and test methods that attempt to reasonably represent insitu conditions.

12. **Section 12.2, Potential Confounding Noncontaminant Stressors - Grain Size:** In this section, as well as elsewhere in the document, the Navy provides citations from the literature as to the potential

grain size effects on the amphipod *Eohaustorius estuarus* bioassays in this study. One might ask whether grain size was considered in the selection of the test species during the development of the Field Sampling and Analysis Plan.

Concur: Dennis Mishek

Dennis Mishek, Section Leader

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[i] RWQCB, San Francisco Bay Region. 1998. "Ambient Concentration of Toxic Chemicals in Sediment: Staff Report."

PETE WILSON, Governor

TATE OF CALIFORNIA—THE RESOURCES AGENCY

DEPARTMENT OF FISH AND GAME

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July 13, 1998

Mr. Chip Gribble, Project Manager
Office of Military Facilities
700 Heinz Street, Building F, Second Floor
Berkeley, CA 94704

Subject: **Mare Island Draft Offshore Ecological Risk Assessment (PCA 60130 Index NTX503 00)**

Dear Mr. Gribble:

The California Department of Fish and Game (DFG) Office of Spill Prevention and Response (OSPR) has completed our biological review of the April 16, 1998 "Draft Offshore Areas Ecological Assessment, Mare Island", prepared by Tetra Tech EM Inc. (TTEMI) for the Department of the Navy. These comments are provided as part of our role as natural resource trustee for the State's fish and wildlife and their habitats. Due to scheduling conflicts, they do not include review by our Staff Toxicologist. It is our understanding that Dr. Jim Polisini of the Human and Ecological Risk Division (HERD) of DTSC has provided toxicological review.

Background

Mare Island is located in the southern portion of Solano County across Mare Island Strait from Vallejo, California. The offshore area includes the shoreline along Mare Island Strait and Carquinez Strait. Mare Island was operated as a naval shipyard from 1896 to 1995, with a primary mission of fleet maintenance, overhaul, construction and refueling. It contained a variety of shipbuilding, ship repair, and ammunitions manufacturing facilities.

The offshore area includes piers and berths that have been used for mooring and light repair of various types of ships. Possible industrial wastes associated with the mooring and repairing of these vessels are welding debris, paint chips, cleaning solvents, sandblasting residue, and petroleum products. Unwanted ordnance was disposed of in some of the offshore areas and onshore activities may have resulted in release or disposal

of ordnance-related material. The areas investigated also include numerous storm water outfalls from Mare Island.

The Ecological Risk Assessment (ERA) presents the results of the Navy's offshore sampling and analysis procedures, evaluates the chemical and biological data collected and characterizes the risk associated with the site. It also evaluates the possibility of performing a dredging operation in selected offshore areas.

General Comments

1. The Navy should have one consistent approach for Ecological Risk Assessment at the Offshore Area at Mare Island that includes the entire Mare Island shoreline. The suspected UXO areas, as well as the other contaminated areas must be sampled using the same criteria. The mudflat area on the west side of Mare Island should also be sampled, or a rationale for not including this area in the sampling program should be provided.

2. Consultation with the Department and the National Marine Fisheries Service is required if activities, including dredging, have the potential to disrupt the migration of sensitive species such as steelhead; winter-run, fall-run or late fall- run chinook salmon.

Specific Comments

1. Section 1.2.2, Dredge Material Evaluation Approach, Page 1-5: Define the criteria used for the selection of the proposed reference sites. We do not think that the Carquinez Strait disposal site is an appropriate site.

2. Figure 1-2, Offshore Study Area: UXO and nonUXO areas should be differentiated on this figure. The extent of mudflat or wetland on the eastern shore of Mare Island should be shown on this figure.

3. Section 2.1, Location, page 2-1: The six offshore areas only encompass the eastern and southern shores of Mare Island. Please provide the rationale for not including the western shore in this ERA.

4. Section 2.2.2, Dredging and Fill Activities, page 2-3: Please include "A" Street on Figure 1-2.

5. Section 2.2.4, Fleet Reserve Piers, page 2-5: Dredging is not a substitute for an Ecological Risk Assessment. Sampling of the sediment that remains after the removal of the UXOs is needed. Dredging of mudflat areas will destroy valuable

habitat for shorebirds and invertebrates. Compensation for lost use of those areas must be discussed.

6. Section 2.3, Current and Proposed Operations, page 2-9: Provide a more detailed description of the current operations at Dikes 12 and 14, or provide a reference.

7. Table 3-4, Potential Fish Species at Mare Island Offshore Areas, page 3-15:

   a. The Central Valley evolutionary significant unit (ESU) of Steelhead is listed as threatened by the federal government. Mare Island is part of the migratory pathway of these fish stocks that spawn in the Sacramento and San Joaquin rivers and tributaries. They should be included on Table 3-4.

   b. The Central California Coast ESU of steelhead is listed as threatened by the federal government. The adults migrate through the Mare Island area, up the Napa River from December to April. The juvenile outmigration is from March to June. They should be included on Table 3-4. Consultation is required when planning activities that could disrupt migration.

   c. The fall run and late fall run stocks of Chinook salmon were both proposed for federal listing as threatened in February 1998. This should be noted in the "Regulatory Status" column and defined in the status notes.

   d. The notation FPE is in the "Regulatory Status " column, but is not defined in the Status notes.

   e. Footnotes 1, 2 and 3 are used in the "Scientific Name" column, but not defined in the notes or references.

8. Table 3-5, List of Potential Bird Species at Mare Island Offshore Area, pages 3-18 to 3-31: For several species, "not available" is used in the residency and behavior columns. This type of information is available in the literature. Please explain the reasons for not including residency and behavior information for these species, particularly the Least tern. If literature information is not available, seasonal surveys must be conducted to determine the residency status of these species at Mare Island.

9. Table 3-7, Special Status Species at Mare Island Offshore Areas, page 3-33: See comment #7.

10. Section 4.1, Sampling Strategy, page 4-1: Sediment will be disrupted during the removal of UXOs. Further sampling will be needed after removal is complete.

11. Section 4.1.1, Dredging Investigation (Study Areas with Unexploded Ordnance), page 4-3: Provide a more detailed rationale for the selection of the reference sites.

12. Section 4.1.1, Dredging Investigation page 4-4: The use of a composite sample of the 0-5 foot sediment core will not accurately depict toxicity of bioavailable contaminants and will not identify potential hotspots.

13. Figure 8-2, Chemical Exposure and Flow Diagram for Assessment and Measurement Endpoints: There are inadequate measurement endpoints in this diagram. The only biological measurement endpoint for piscivorous birds and carnivorous mammals is benthic invertebrates. Fish tissue sampling and analysis will allow for a more direct measurement for bioaccumulation and biomagnification of chemicals.

14. Table 8-2, Rationale for Selection of Assessment Endpoints at Mare Island Offshore Areas, page 8-16: This table indicates that there is toxicological literature available for some species but not others. Please indicate what literature was considered for each species.

15. Table 8-3, Risk Characterization Methodology for Mare Island Offshore Areas, page 8-17: The linkage for the assessment endpoint for piscivorous birds and carnivorous mammals is too remote. The invertebrates used should be identified in this table, and fish tissue should be included for this model.

16. Table 8-4, Natural History of Selected Receptors for Mare Island Offshore Areas, page 8-19: The California Gull, a terrestrial receptor is shown on this table. Its feeding guild is not included in the assessment endpoints.

17. Chapter 14, Dredge Material Evaluation, page 14-1: Dredge projects in the San Francisco Bay must be coordinated with the Dredge Materials Monitoring Office. The Department of Fish and Game contact is Ms. Becky Ota, (650) 688-6361.

18. Section 14.3, Tier III Evaluation of Dredge Material: The dredge material will only be subjected to acute toxicity tests and bioaccumulation tests. Testing of the chronic affects of COCs in needed.

Conclusions

As noted in the Comments above, there are several issues that must be resolved before this document can be considered final by DFG. The Navy need to address these in the response to agency comments.

DFG appreciates the opportunity to review the Draft Ecological Risk Assessment for the Offshore Areas at Mare Island. If you have any questions regarding this review, or require further details, please contact me at (916) 327-3196, or e-mail address: selllis@ospr.dfg.ca.gov.

Sincerely,

Susan R. Ellis, Senior Biologist
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Office of Spill Prevention and Response
California Department of Fish and Game

Reviewer: Scott Flint, Senior Biologist

cc: Ned Black, Ph.D.
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