

# ARC ECOLOGY

## ARMS CONTROL RESEARCH CENTER

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February 27, 1995

Mr. Ernesto M. Galang  
Remedial Project Manager, NSTI  
Engineering Field Activity, West  
900 Commodore Drive  
Code 09ER2EG  
San Bruno, CA 94066-5006

Dear Mr. Galang,

Please find enclosed ARC's comments on the Phase II Ecological Risk Assessment Draft Work Plan for Naval Station Treasure Island San Francisco, California.

Should you have any further questions regarding this matter, please contact me at the above telephone number.

Sincerely,



Donald Meyers, Ph.D.

Encl. 1

Distribution:

NS Treasure Island, BRAC Environmental Coordinator (Attn. James B. Sullivan)

cc:

U.S. Environmental Protection Agency (Attn. Rachel D. Simons)

California Regional Water Quality Control Board, San Francisco Bay Region

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**Comments on Phase II Ecological Risk Assessment  
Draft Work Plan  
for  
Naval Station Treasure Island  
San Francisco, California**

### **General Comments**

Risk assessment is the process used to predict the likelihood that adverse health effects will appear in a specific population that has been, is being or may become exposed to toxic contamination. In the case of an ecological risk assessment, such as the one planned for Naval Station Treasure Island (NSTI), the appearance of these effects will be predicted for a small number of species with the belief that the protection of their health will translate to protection for the ecosystem of which NSTI is a part. Like all health risk assessments, the predictions are the end result of the application of one or more extrapolative techniques (often referred to as models) to physical and chemical data drawn from the area of concern. These predictions are then compared to regulatory or "developed" standards and weighed along with other factors for the purpose of deciding whether environmental remediation of the ecosystem is warranted.

An ecological risk assessment work plan should therefore explain how the site physical and chemical data are to be acquired, the extrapolative techniques to be applied to that data to generate estimates of risk, the standards against which those estimates will be compared for the purpose of triggering any remedial action, the origin of those standards and the uncertainty associated with each process. With the partial exception of physical and chemical data collection, the phase II ecological risk assessment work plan falls far short of providing such an explanation. At practically every point where an extrapolation or comparison is to be made, the text lacks the detail required to assess the process.

For example, the method to be used for estimating bioavailability of contaminants for benthic invertebrates is not explained, although it is the central component of the model which is claimed to provide the "realistic estimation of risk." The manner in which the estimate of bioavailability is to be "compared" and "correlated" with liquid-phase benchmarks and bioassay results is not undocumented, as is the method which will employ these comparisons and correlations to produce risk estimates and cleanup criteria. Clearly, the validity of this process cannot be assessed.

The necessity for remediation hinges on comparisons of site data to standards that, in most cases, have yet to be determined. While it would be preferable to see the final values for these standards written in the work plan, at a minimum the plan should provide a defensible framework for the development of standards. In the absence of such information, the logical assumption is that the

standards will be developed to suit the data rather than to insure the health of the ecosystem. In addition, the quality of the reference data will be seriously compromised, as it is to be drawn from three closely spaced reference stations in areas which are almost certainly contaminated. Benthic community analysis derived from sediment samples taken from "at least one" of these stations will be virtually useless. If insight is to be gained into the natural state of benthic communities, the analysis must be performed on sediment samples that are uncontaminated and drawn from reference stations that are separated by a significant distance.

The work plan also suffers from the use of ambiguous and in places contradictory language. The section that attempts to define assessment and measurement endpoints in section 7.0 is a case in point. The work plan is also unnecessarily repetitive. If explanations and descriptions are made clearly where they first become relevant, the reader can be referred back to these points when necessary, rather than reading another version of the original text. An example of this type of repetition is the description of the proposed sediment analysis found in sections 8.2 and 13.10. Considerable effort should be applied to the purging of unnecessary text and improving the clarity and logical flow of the work plan.

The material included in Appendix B is greatly appreciated.

### **Specific Points**

Section 3.0 As "prioritization" of contaminants is not dealt with in this section, it should be removed from the heading. Please explain how contaminants will be prioritized.

Section 3.2 Please elaborate on the use of the equilibrium partitioning approach for sediment screening, particularly the origin of the partitioning coefficients used.

Is the list of screening comparisons complete?

Section 5.0 Considering that this is the second phase of ecological assessment (EA), the objectives of the EA should be more refined than "further develop the problem formulation" and "further characterize offshore contamination". Please provide a clear statement of the objectives.

The objectives of the EA should also be stated in section 1.0.

Section 7.0 The description of assessment endpoints is virtually uninterpretable. It is first stated that they are "formal expressions of the actual values that are to be protected in the course of an EA". It is then stated that they are "characteristics of biological and social significance" which may include organisms and that the risk to assessment endpoints must be measurable. Interpretation is confounded further by reference to Table 2 in section 7.2 which lists protection of habitat for a variety of species as assessment endpoints. Similar problems pertain to the definition of measurement endpoints. For example, how can "food chain modeling" and "literature study" be measurement endpoints? Important terms and

concepts that are fundamental to the work plan need to be clearly defined and should include relevant examples.

Please revise the explanation of assessment and measurement endpoints so that they are understandable and internally consistent.

**Section 7.2** It is not clear whether the last sentences in the third and fourth paragraphs are alternative descriptions of the same process for estimating risk to raptors. Clarification is required.

Table 2, which purports to be a summary of proposed assessment and measurement endpoints, appears more like a summary of management strategies and general methodologies. Please revise the content of the table so that it reflects the definitions of the stated subject matter.

**Section 7.3** The two stated measurement endpoints are in fact the methods that will be used to assess the measurement endpoints. While this section deals at some length with the basis for selection of the species for bioassay, at no stage is the end point of the bioassay stated. Section 13.7.4 provides some additional information on the objectives of the two bioassays but does not provide toxicity criteria. Please add this information to this section.

**Section 8.2** The terms bioaccumulation and bioavailability are used throughout the text without being defined. Unlike bioconcentration and biomagnification which have strict definitions, bioaccumulation and bioavailability can be more freely interpreted.

Please define all of these terms where they first appear in the text.

**Section 10.0** This section should be titled "Ecological Risk Assessment" as the ensuing sub sections deal with exposure and ecological effects assessments in addition to risk characterization.

**Section 10.1** This section should be titled "Ecological Risk Assessment of Benthic Receptors".

If this component of the risk assessment addresses only benthic invertebrates, please change "benthic receptors" to "benthic invertebrates" where appropriate.

The weight-of-evidence approach and the manner in which it will be applied to the EA needs to be explained (more fully than the sentence provided on page 36) at this point. The text on page 36 states that this approach requires the use of more than one model to estimate risk. The text in section 10.1, however, implies that only one model is being used and provides the assumptions for that model. Clarification is required.

Please provide a thorough and clear description for each model being used to estimate risk to benthic receptors and include a discussion of the assumptions on which each model is based.

The stated assumptions underlying the proposed model are for the most part not assumptions but rather a justification for the use of estimates of contaminant bioavailability in assessing risk to benthic receptors. The only assumption that can be gleaned from the text is that contaminant bioavailability can be predicted from measurements of “bond strength to the controlling solid phase”. Please include a thorough description of the bioavailability estimation method and the associated uncertainties in the section that deals with exposure assessment (section 10.1.1).

As the Navy is convinced that bioavailability of contaminants provides the best foundation on which to assess risk, please explain why sediment pore-water samples will not be analyzed directly for the full suite of contaminants. This would avoid the uncertainties associated with extrapolating bioavailable concentrations from sediment chemical data.

The last sentence in this section outlines the objectives of the benthic EA. This sentence should be moved to the beginning of the section.

Section 10.1.1 Please explain the Monte Carlo method of estimating the probability of exposure, including the origin of the data that will be used for the estimate.

Section 10.1.2.1 Please state the bioassay toxicity criteria explicitly either here or in section 7.3. Presenting this information in tabular form would be useful.

Please state and discuss the relationship between the EPA’s bioassay toxicity criteria and “literature values”.

10.1.2.2 Although the title of this section suggests that it deals with risk characterization, the text appears to be a very simplistic description of the benthic risk assessment model that will be used.

If it is intended that this section deal with risk characterization in a manner similar to that of section 10.2.5 for avian assessment endpoints, the description of exposure and ecological effects assessment should be removed and incorporated into the relevant sections.

Step 1 is already explained in section 10.1 although it would be more logical to incorporate it into the exposure assessment section (10.1.1)

Steps 2 deals with the identification of chemicals of concern. Please state the origin of all the solid and liquid-phase benchmarks which will be used for comparison and explain the process by which the evaluation will be performed.

Section 3 deals with the development of site-specific toxicity values. As there is no indication that the proposed bioassays will identify individual chemicals responsible for

producing toxic responses, please explain how the site-specific toxicity values will be derived from a correlation of station-specific chemicals of concern with bioassay results.

Steps 2 and 3 should be incorporated into the ecological effects assessment (section 10.1.2.1).

Step 4 is the risk characterization component of the risk assessment. The process outlined here is too vague to be useful. Please explain how “The results of these comparisons will be used to develop estimates of risk” and how these estimates will be used to develop the cleanup criteria.

Please remove the statement in Step 4 suggesting that the “bioavailable comparison will provide a realistic estimate of risk.” If one method must be considered more realistic than another, it is more likely that the solid-phase comparisons will be more realistic as less extrapolation is used in that process.

Please explain how the risk to benthic invertebrates from exposure to multiple chemicals will be assessed.

Section 10.2 The text implies that a number of models will be used to estimate the dose of contaminants to which avian assessment endpoints are exposed. It appears, however, that only one model is being used. Clarification is required.

Is the weight-of-evidence approach being applied to avian assessment endpoints? If so, please explain its role in the risk assessment.

10.2.1.1 The right hand side of the equation has been incorrectly normalized twice for body weight, yielding units of  $\text{mg}/\text{Kg}^2$  -day for  $\text{Dose}_{\text{total}}$ . Ingestion rates for soil/sediment and prey should appear in units of  $\text{mg}/\text{day}$  if  $\text{Dose}_{\text{total}}$  is to appear in units of  $\text{mg}/\text{Kg}\text{-day}$ .

The generic exposure model does not include a sediment ingestion rate. Will estimates of such rates be used in the exposure assessment for avian assessment endpoints?

10.2.1.3 Please define “body size”.

Please explain the allometric regression models that will be used and the assumptions upon which they are based.

The section following 10.2.1.3 should explain the food chain exposure calculations as this is the stated third component of the exposure assessment (see section 10.2.1, point 3, second paragraph). If section 10.2.2.3 “Bioaccumulation and Effects on Higher Trophic Levels” is the section that deals with this topic, it should follow section 10.2.1.3. If not, the relevant material is required at this point.

10.2.1.4 This section is out of context at this point in the text. If it is to be retained, it should precede or commence section 10.2.1.

10.2.2.1 In the previous section (10.2.2) it is stated that the characterization of ecological effects requires the examination of effects that occur at the individual, population and community levels and that the methodology for the assessment will follow. The ensuing sections, however, describe only the hazard quotient calculation procedure for single chemicals at the individual level. Please provide the additional information dealing with ecological effects at the population and community levels. The last paragraph in section 10.2.2.4, which states that effects at the population and community levels will be evaluated by “developing exposure pathway and effects scenarios predictive of these higher-level effects” and provides a vague description of how the evaluation might be performed, is inadequate.

In this section, toxicological reference values (TRVs) appear to be values that will be developed on the basis of a variety of data. The text in section 10.2.1, however, states that TRVs are published values. Clarification is required.

Please explain the differences between TRVs, “published toxicity effects values” (section 10.2) and the reference values used in the Phase I EA. If these all refer to the same value, please explain the origin of these values and use consistent language throughout the text.

Section 10.2.2.2 This section refers to the use of bioassay results and tissue residue data in “the exposure models as described previously”. Only one exposure model is described for avian assessment endpoints. Please include a description of the additional models to be used for the estimation of dose or state explicitly in sections 10.2 and 10.2.1 that only one exposure model will be used.

Section 10.2.2.3 This section appears to deal with food chain modeling. Please describe the model and the assumptions on which it is based.

This section should follow section 10.2.1.3 to be consistent with point 3 in the second paragraph of section 10.2.1.

Section 10.2.3 Apart from stating that predicting the effects of multiple stressors is difficult, this section provides no insight into how the problem will be handled. If it is the intention of the Navy to make no attempt at assessing the effect of exposure to multiple contaminants, this should be stated explicitly in section 10.2.

The hazard index approach was used to assess exposure to multiple contaminants in the phase I EA. Please explain why this method will not be used in the phase II study.

Section 10.2.4 Uncertainty is associated with all extrapolative procedures and should be discussed at each relevant point in the text.

As pointed out in this section, application of uncertainty analysis seldom leads to more definitive answers. In addition to using a weight-of-evidence approach to arrive at risk estimates, the final report should include upper and lower ranges for the "developed" values in addition to the final values adopted and a discussion of the uncertainty associated with those values.

Section 10.3 Please delete the reference from the EPA/COE manual as it bears no relevance to the problem being addressed.

In the paragraph dealing with the rationale for selecting the sediment reference stations, please delete points 1 and 2 as they are misleading. For example, Figure 2 shows that there was no phase I sampling performed in this area. Thus, it would have been impossible for phase I sampling results to demonstrate elevated levels of contaminants. With respect to point 2, contaminated surface runoff from NSTI and Yerba Buena Island is ubiquitous, as is contamination from the Bay Bridge. In addition, sample station 13-SS-10, which is approximately 650 yards to the North of reference station R-1 is known to contain substantially elevated levels of metals and pesticides. It is therefore inaccurate to state that there are no known sources of contamination to these areas.

The text states that community structure (presumably benthic community structure) analysis will be performed on "at least one of the three reference sites." As the spatial variation in benthic community structure in similar sediment types can be considerable, community structure analysis should be performed on sediment samples from at least three reference sites to provide an indication of the range of this variability.

If the Navy wishes to perform a valid analysis of benthic community structure, three new reference stations will have to be found. The current stations are inadequate because they are too close together and unless it can be shown otherwise, it is reasonable to assume that these sites contain significant levels of contamination.

Section 13.6 Why are water samples being collected only in the vicinity of the Clipper Cove skeet range? Water should be sampled from each sample station.

Section 13.7.5 Will the bioassay results from control and reference sediments be compared? If not, what is the purpose of gathering the control data?

Unless the proposed reference areas are demonstrated to be contaminant free, they cannot be used for the comparison of bioassay results.

Section 13.10 The contract-required detection limits for many compounds, especially chlorinated organics are unacceptably high. Quantitation limits set this high will make it difficult to identify chemicals of concern.

Figure 5 Please indicate the measurement units for the soundings.

Figures 7 and 8 Please include measurement units on these figures.

Figures 9 and 10 Please include pesticide/herbicide usage, fuel usage/disposal and solvent storage/disposal as primary sources. Please explain why storm water is not included as a secondary release mechanism.