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MOFFETT FIELD
SSIC NO. 5090.3

To: Su Don Tu@Code 18
From: Hubert H S Chan@Code 18
Originated by: Sandy Olliges <solliges@mail.arc.nasa.gov>
Cc:
Bcc:
Subject: fwd: nasa swea comments
Attachment: %SWEA_Questions1.doc,SWEA_Questions1.doc,Headers.822
Date: 5/19/98 4:08 PM

Su Don,

The attached document is for your file. Thanks.

Hubert

Original text
From: Sandy Olliges <solliges@mail.arc.nasa.gov>, on 5/7/98 4:46 PM:
To: <hhschan@efawest.navfac.navy.mil>, <sgchao@efawest.navfac.navy.mil>
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I have attached NASA's comments on the SWEA. In response to EPA's request for Tom Engel's opinion, he has reviewed the SWEA, and these are our comments. Please let me know if you would like to meet to discuss these before we submit them in writing. Thanks, Sandy

I have also copied them below in case you can't open the enclosure.

ld><fontfamily><param>Palatino</param>SWEA/FS COMMENTS & QUESTIONS

1. BENTHIC COMMUNITY STRUCTURE =20

</fontfamily></bold><fontfamily><param>Palatino</param><underline>General Issues:

</underline>The benthic invertebrate community within the Moffett wetlands has not been characterized adequately. Based on the findings of a very limited field study in 1993, the SWEA/FS assumes that no such community exists. If no community does exist, the question remains whether the cause is related to the contaminants or to the soils/surface water conditions of the wetlands. This question has not been sufficiently addressed in the SWEA or FS.

<underline>SWEA/FS Information</underline>:

Section 1.3.2.2 (p. 31) of the FS states that "the benthic community ttom-dwelling) in the aquatic habitat was qualitatively racterized." The characterization, however, is never described.

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SWEA/FS COMMENTS & QUESTIONS

1. BENTHIC COMMUNITY STRUCTURE

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SWEA/FS Information:

Section 1.3.2.2 (p. 31) of the FS states that "the benthic community (bottom-dwelling) in the aquatic habitat was qualitatively characterized." The characterization, however, is never described.

Based on the data presented in the SWEA, a single, non-random benthic invertebrate sampling event occurred in July 1993 at Moffett Federal Airfield. Sampling occurred at 6 points along the shoreline in the stormwater retention ponds and at 1 point in the eastern diked marsh (along the roadside). No sampling occurred away from the shoreline. No benthic invertebrates were detected during this sampling event, and the only mid-water taxa found were water boatmen (at all 7 points) and water scavenger beetles (at 1 point only).

The inherent weakness in the biological survey data is recognized on page 38 of the FS: "...a major uncertainty is whether the characterization of adverse effects of sediments to fauna is based on the correct fauna. This uncertainty also may be due to a major gap in information about resident fauna."

Questions:

- Is the FS based on the assumption that a benthic invertebrate community does not and cannot exist in the Moffett wetlands?
- If, in fact, there is no benthic invertebrate community in the Moffett wetlands, is it possible that this is due to the contamination?
- What is the rationale for characterizing the biotic community of a wetland ecosystem via a single, non-random sampling event during the dry season?

2. INTERPRETING THE HAZARD QUOTIENT (HQ)/HAZARD INDEX (HI)

General Issues:

Bioassays are the most appropriate means for quantifying risk. Without bioassay data, the HQ/HI approach is unreliable for quantifying risk. HQs/HIs based on literature values (instead of bioassay data) is useful solely as a means of *screening* and *ranking* potential sources of risk.

Since so little bioassay data was collected for the SWEA, much of it cannot be analyzed statistically. Consequently, a qualitative HQ/HI approach (based on literature values) is used in the SWEA to rank *and quantify* ecological risk. The scientific basis for using this approach to quantify ecological risk is unsubstantiated.

To quantify risk to avian and mammalian receptors, four different HQs (HQ_1, HQ_2, HQ_3, and HQ_4) are developed for each contaminant of concern (COC). HQ_1 assumes an average COC dose and a high COC toxicity reference value (TRV). HQ_4 assumes a high COC dose and a low COC TRV. Therefore, HQ_4 assumes greater risk than HQ_1. The SWEA/FS assumes that the true point at which the receptor is at risk lies between these two extremes. The basis for this assumption, however, is not provided. **This is a major concern regarding the HQ/HI method.**

It is important to emphasize that the SWEA's HQ matrix approach does not convey any information concerning the *magnitude* of risk for COC. For example, if COC_A has a HQ = 50 and COC_B has a HQ = 100, COC_A would be ranked as a lower risk than a COC_B. However, it would be inappropriate to conclude that COC_B's risk was twice that of COC_A. In addition, the conclusion that COC_A presents an acceptable risk, whereas COC_B does not, seems arbitrary. All that may be said is that COC_B is estimated to present a greater risk than COC_A. Therefore, **it seems inappropriate to use a qualitative HQ approach as a "yardstick" for either assessing risk or establishing clean-up levels.**

SWEA/FS Information:

The limitations of the SWEA's HQ/HI approach are noted in both the SWEA and FS:

> "It should be noted that an HQ is not a quantified measure of the probability of predicted effects." (SWEA, Section 8.1.1, p. 8-3)

> "[The HI approach] is a valuable screening technique because environmental concentrations that are *several orders of magnitude* below concentrations that affect laboratory test organisms are not likely to have any significant ecological consequences" (emphasis added). (SWEA, Section 8.1.1, p. 8-3)
>
> "The magnitude and ecological significance of the risks [estimated by HQs] are subject to interpretation." (FS, Section 1.3.2.2, p. 32)
>
> "...HIs are not a good predictor of biological responses for the bioassays." (SWEA, Section 9.1.4, p. 9-7)

Despite this recognition, however, this approach is *substituted* for the bioassay method as a tool for quantifying risk. The reason for this substitution: insufficient bioassay data.

Section 1.3.2.2 (p. 33) of the FS contends that the HQ "matrix approach" (i.e., HQ_1 through HQ_4) "was designed to provide more information, and less uncertainty, for the risk characterization than does a single HQ value, and thereby facilitate risk management decisions." This statement is unsubstantiated.

Section 3.3.2 (p. 3-18) of the SWEA states that the HQ approach was used "to understand the nature and magnitude of the potential ecological risk sediment COCs to benthic receptors." As previously stated, the SWEA's HQ approach does not reliably estimate the magnitude of risk.

<u>Questions</u>:

- What are the different ways in which the magnitude and ecological significance of the SWEA's HQ data may be interpreted?
- According to the FS, "it was assumed that the true point at which the receptor is at risk lies between the most extreme HQ values." Given the relatively small amount of biological data available (from both bioassays and field surveys), how can HQ_4 be ruled out? Which HQ_4 assumptions are met (and not met) by common underwater benthic invertebrates of the south San Francisco Bay?
- Is the level of precision of the SWEA's HQ/HI approach assumed to be plus/minus several orders of magnitude?
- What is the scientific rationale for selecting the following categories for evaluating risk at Moffett Field: $HQ \leq 10$, $10 < HQ \leq 100$, and $HQ>100$? Are these arbitrary thresholds, or do they implicitly identify meaningful levels of risk?
- What are the differences, for example, among the following levels of risk: $HQ_1 = 50$, $HQ_2 = 95$, $HQ_3 = 150$, and $HQ_4 = 200$?

- How does the hazard matrix provide less uncertainty than a single HQ value?
- If the SWEA's HIs are not a good predictor of biological responses for the bioassays, what are they predicting?
- The fact that the SWEA's HIs are very imprecise appears to be used as a *justification* for their use in the risk assessment process. This reasoning is not intuitive, regardless of whether HIs at times overstate risks compared to the bioassay data. A better explanation is needed regarding the usefulness of this very small data set in the risk assessment. In addition, this weakness in the bioassay data should not be used to justify the use of the HQ/HI method.

3. IDENTIFYING COCs RESPONSIBLE FOR ECOLOGICAL RISKS

General Issues:

Because the bioassay data set is so small, the risks associated with individual COCs cannot be quantified. This problem should have been resolved via conducting additional bioassay tests. Instead, a qualitative approach is taken. The conclusions from this approach are difficult to validate, especially given the likely bias generated by such a small sample size.

SWEA/FS Information:

According to the Section 9.1.3 (pp. 9-6 and 9-7) of the SWEA, the bioassay data set is so small that risks associated with COCs cannot be quantified:

> In the previous section, the results of the bioassays identified toxicity responses to surface water collected from two of the habitat areas at MFA. It is the objective of this section to determine if any specific COC or COCs are primarily responsible for the toxicity response that was observed. In order to evaluate the bioassay responses with the COC concentrations, the Navy compared the COC concentrations in the two samples that exhibit biological responses (SWNC-18 and SWRP-32) to those that did not. Due to the limited number of bioassays performed, it was not possible to perform a rigorous statistical analysis of the data to determine if differences existed. Instead, a qualitative comparison of the COC concentrations detected in the test solutions was performed. [....] The qualitative comparison evaluation consisted of simply noting those COC concentrations found in samples associated with a biological response that exceeded COC concentrations in samples not associated with a biological response. The assumption is if a COC concentration is higher in the samples associated with a biological response, it may be responsible for the toxic response and may be considered a risk driver.

Questions:

- What is the rationale for using the analytic approach described above?
- Given the problems that arose from insufficient data, why wasn't additional bioassay testing performed?

4. FROG EMBRYO BIOASSAY RESULTS

General Issues:

The early developmental stage of most organisms is characterized by rapid cellular growth. The deleterious effects of contaminants are often magnified during this stage. The frog embryo is commonly used in ecotoxicological studies as a model for organisms in their early developmental stages. This type of bioassay is referred to as a "frog embryo teratogenesis assay", or FETAX.

The SWEA presents FETAX results from a single sample point in the Eastern Diked Marsh. The results show a statistically significant increase in deaths among the frog embryos exposed to the marsh sediment. Despite this finding, no further FETAX testing was conducted and the issue was essentially dropped from discussion in the SWEA and FS. The decision to dismiss these FETAX results is not intuitively obvious.

SWEA/FS Information:

In Appendix K of the SWEA, the results of a frog embryo teratogenesis assay (FETAX) on sediment sample SSWL-22 are presented. (SSWL-22 is located in the eastern diked marsh.) According to these results, *Xenopus* laval mortality was more than 4 times higher in SSWL-22 than in the control sediment. According to Section 3.1 (p. 14) of Appendix K, "this represents a statistically significant increase in mortality in sample SSWL-22."

These bioassay results are discussed in Section 9.2.2.4 of the SWEA, and the following conclusion is made: "The combined FETAX bioassay and elutriate chemical data suggest that toxicants that may release from the sediments may pose a *low* risk to populations of early life stages that inhabit the sediment-surface water interface" (emphasis added). This conclusion is not intuitive from the data analysis presented.

Questions:

- What is the rationale for limiting the FETAX to a single sediment sample, especially considering the findings from that sample?
- Is SSWL-22 assumed to be the only point within the Moffett wetlands that is toxic to organisms in their early development stages?

5. WORKING HYPOTHESIS

General Issues:

The SWEA and FS lack a biologically meaningful performance standard (i.e., there is no yardstick for assessing the performance of the remedial action).

SWEA/FS Information:

In Section 9.2 (p. 9-12) of the SWEA, the overall working hypothesis is stated as being the "protection of benthic infauna and epifauna due to exposure to COCs". As stated, this is not a testable (i.e., falsifiable) hypothesis. This is a critical issue because it relates to performance evaluation.

Questions:

- What is meant by the term "protection" in the SWEA's working hypothesis?
- How will we know when the wetlands are, in fact, protected? What is the yardstick for evaluating performance?

6. ECOLOGICAL MONITORING PLAN

General Issues:

The proposed approach for ecological monitoring is flawed because it lacks an initial "baseline" reference point. In addition, it involves sampling at only three points in time. It is very difficult, if not impossible, to extrapolate a meaningful trend from only three data points.

SWEA/FS Information:

According to the Proposed Approach for Ecological Monitoring in Appendix C (p. C-4) of the FS, "the only biological survey completed as part of the SWEA was a habitat evaluation during Phase I. The FS describes this survey as being "limited in scope".

Page C-5 of the proposed monitoring plan states that "the first biological survey will be conducted immediately following the remedial action. The subsequent surveys will be conducted 2 years and 5 years following the remedial action." These surveys "would not be a detailed cataloging of the entire biological community at MFA, but rather a focused survey on specific populations of concern. Since sediments are the main medium of concern, the

biological survey should focus on benthic populations, especially in the Eastern Diked Marsh and Northern Channel."

Questions:

- What is the reference point for the proposed biological monitoring? If surveys would begin after remediation, how would remediation performance be evaluated?
- What is the likelihood of discovering a meaningful trend with only 3 sampling points through time?

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COMMENTS

1. What are the current investigation/remediation status of the active petroleum sites?

2. What will be TPH source removal cleanup levels? Soil: 1994 cleanup levels? groundwater: remove free product, then ....

3. Please note the MTBE concentration limit may be changed to 14 ppb soon.

4. Do we have at least 4 continuous quarters monitoring data of all leaked petroleum sites? We need to incorporate MTBE information in all sites closure documents.

5. An USTs inventory list shall be provided with this report.

6. Detailed geological and hydrogeological information should be included in future fuel contaminated soil/groundwater sites evaluation report.

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