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Contract Task Order 0236

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MOFFETT FEDERAL AIRFIELD
CALIFORNIA

OPERABLE UNIT 6
RESPONSES TO COMMENTS ON
FINAL REMEDIAL INVESTIGATION REPORT

Prepared by

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March 1, 1995

Mr. Stephen Chao and Mr. Hubert Chan
Department of the Navy
Western Division
Naval Facilities Engineering Command
900 Commodore Way, Building 101
San Bruno, California 94066-2402

Subject: **Final Operable Unit 6 (OU6) Remedial Investigation (RI) Report and Responses to Comments, Moffett Federal Airfield CLEAN Contract Number N62474-88-D-5086, Contract Task Order 0236**

Dear Messrs. Chao and Chan:

Enclosed are three copies of the responses to regulatory agency comments on the above-referenced document prepared by PRC Environmental Management, Inc. (PRC). Copies have also been forwarded to regulatory agencies and project personnel.

If you have any questions or comments, please call us at (303) 295-1101.

Sincerely,

Richard L. DeGrandchamp, Ph.D.
Project Toxicologist

Michael N. Young
Project Manager

RLD/rkr

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1.0 INTRODUCTION

The U.S. Navy prepared these responses to comments received from regulatory agencies for the Final Operable Unit 6 Remedial Investigation Report (OU6 RI), Moffett Federal Airfield (MFA), dated October 31, 1994. Comments on the OU6 RI were received from Mr. Michael Gill of the U.S. Environmental Protection Agency (EPA) on November 23, 1994 and from Mr. Joseph Chou of the California Environmental Protection Agency (Cal EPA), Department of Toxic Substances Control (DTSC) on December 14, 1994.

This response to comments report has been divided into four sections. Section 1.0 presents the introduction. Section 2.0 addresses DTSC's comments on the Navy's responses to comments on the OU6 Draft Final RI Report. Section 3.0 presents responses to EPA and DTSC comments on the OU6 RI. Section 4.0 provides references.

2.0 RESPONSES TO DTSC'S COMMENTS ON NAVY'S RESPONSES TO COMMENTS ON OU6 DRAFT FINAL REMEDIAL INVESTIGATION REPORT

Comment 1: The Department is not aware of, nor is it part of our guidance, that a hot spot is defined as a small area of contamination that exceeds the site wide average concentration by greater than 100 fold. Strict application of this rule could, in some cases, lead to a serious health threat, if for example, a residence was cited (sic) over an undetected hot spot because adjacent samples failed to meet the 100 fold rule. A decision to proceed with additional sampling should be done based on site specific conditions and not on an arbitrary rule of thumb that we are not aware of.

Response: *There appear to be two components to this DTSC comment. The first component addresses the criteria the Navy used to carry out the hot spot analysis. DTSC correctly notes that one shortcoming of current EPA and DTSC risk assessment guidance is the absence of a clear definition of a hot spot. Moreover, regulatory agencies have not yet developed a sampling strategy or statistical approach to identify hot spots in remedial investigations. Lacking such guidance, professional judgment must be applied. For this reason, the Navy (in its response to comments dated October 31, 1994) stressed the term "by convention." This term was used intentionally to indicate that the Navy's definition of a hot spot was not a regulatory definition, but rather is commonly used in hot spot analyses.*

Although DTSC has suggested during teleconference conversations that it should be easy to identify a hot spot when one "sees" it, it is impractical to simply "look" at the data. Objective criteria defining a hot spot must first be established in order to conduct the initial screen in the hot spot analysis that involves data queries. Without specific benchmark criteria, the data base cannot be "looked" at in this context.

Contaminant concentration is only one factor that defines a hot spot. The areal extent of contamination is another. For example, an exceedingly high concentration of a toxic compound is ubiquitously distributed over much of an OU would not be defined as a hot spot. This type of contamination would instead be characterized as contaminant source. Risk associated with the site would accordingly be based on random contact with the entire source area. The upper 95 percent confidence limit on the mean concentration (95 UCL) would be calculated based on all the data collected across the entire OU. However, in the case where a small delineated "hot spot" was identified within the OU, the risk would not be underestimated as long as data collected from the hot spot were used to derive the 95 UCL. This is because random contact with the site is assumed when risk is calculated and more frequent contact with the "hot spot" is not made more likely simply because it is a hot spot. The probability of contact with the hot spot is no more nor no less than for any other region within the OU6 exposure areas. As long as samples were collected from the hot spot and was used to derive the 95 UCL exposure point concentration, risks would not be underestimated. In fact, according to EPA (1989) risk assessment guidance, hot spot data <u>should not</u> be weighted in the risk assessment except when the areal extent of the hot spot is large relative to the exposure area in the OU or when more frequent contact with the hot spot is anticipated. Otherwise, small delineated hot spots should not be invested with any more importance than other areas of the site.

Although neither EPA nor DTSC has defined a hot spot, it should be noted that the Department of Energy (DOE, Order 5400.5) has. DOE defines a hot spot in terms of the areal extent of contamination. According to DOE, the area of a hot spot cannot exceed 25 square meters. When the area exceeds this maximum value, the contamination is simply considered a source. DOE guidelines, however, do not specify the concentration that corresponds to a hot spot.

If hot spots do (unknowingly) exist within OU6, they likely have already been accounted for because purposive sampling was carried out rather than random sampling. With purposive sampling, samples are intentionally collected from those areas that (presumably) have the highest contaminant concentrations; this would likely capture all the hot spots in the OU. When purposive sampling data are used to calculate the 95 UCL, it is incorrectly assumed that the receptor does not randomly contact all areas of the site, but exclusively contacts only those areas that are contaminated. When randomly collected data are used to estimate risks, the 95 UCL and risk correctly represent random exposure conditions that reflect reality. However, when samples are collected randomly for the risk assessment, the likelihood that a hot spot will be undetected is significantly increased. To identify hot spots using a random sampling regimen, specific sampling protocols must be coupled with robust statistical methods. Gilbert (Gilbert 1987) describes several sampling techniques that if implemented correctly may allow investigators to uncover small areas of relatively high concentration. If DTSC's concerns about potential hot spots had been communicated earlier, a hot spot approach could have been used even though purposive sampling was carried out that minimizes the potential for a false negative hot spot finding.

The second component of this DTSC comment appears to address the issue of possible additional sampling for hot spots. Additional sampling should be considered only if hot spots were clearly identified in the OU6 RI or if DTSC has reason to believe that undetected hot spots exist. No hot spots were identified in the OU6 RI and no activities conducted in OU6 involved treatment, storage, or disposal of hazardous wastes. Unless DTSC has information that hot spots may still exist in OU6, the Navy has concluded that the site has been well characterized with regard to contamination involving hot spots and that no further sampling is required.

Consensus was reached among all parties that evaluation of residential exposure in OU6 was not necessary because it is precluded by the official designation of OU6 as a wetland. Accordingly, positioning "a residence over an undetected hot spot" is not applicable to OU6. Additionally, for the aforementioned reasons it is highly unlikely that there are any undetected hot spots in OU6.

Comment 2: Due to much cooperation and work between DTSC and U.S. EPA Region IX, differences between EPA and DTSC risk assessment guidance have been almost entirely eliminated. It has been long-time policy of DTSC and Region IX, that if a difference between DTSC and EPA Region IX guidance on risk assessment differs, then the most stringent guidance be followed, i.e. leading to the highest calculated risk or to the lowest remedial goals. It is our understanding that federal and state guidance will be followed regarding risk assessment issues at all closing military bases. The Navy should not create its own risk assessment policy(s) which would be in contradiction to U.S. EPA or DTSC guidance.

Response: *The Navy has consistently applied both EPA and DTSC risk assessment guidance. Although DTSC may suggest that the maximum upper-bound risk be calculated, the EPA specifically requires that an reasonable maximum exposure (RME) and average risk be calculated and that the upper-bound risk not be calculated. In fact, the EPA specifically requires that the DTSC approach not be followed because the approach DTSC is advocating calculates the upper-bound estimate.*

EPA defines the RME risk as the risk that can reasonably expected to occur at the site (EPA 1989). The final calculated RME risk is intended to represent the upper 95th percentile. When the risk estimate is based on all upper-bound and 95th percentile exposure parameters, the resulting risk estimate can exceed the required upper 95th percentile risk by one to two orders of magnitude. Whereas the RME risk is supposed to represent the reasonable maximum exposure, the upper-bound risk is considerably higher than the range of possible exposures.

Although the statement that the "most stringent guidance be followed, i.e. leading to the highest calculated risk" may be DTSC policy, it is diametrically opposed to EPA risk assessment guidelines and may be counterproductive to risk management goals. According to EPA, both average and upper-bound exposure assumptions should be used to calculate the RME. With regard to choosing exposure variables, EPA (1989) specifically states (emphasis in original):

> *Each intake variable in the equation has a range of values. <u>For Superfund exposure assessments, intake variable values for a given pathway should be selected so that the combination of all intake variables results in an estimate of the reasonable maximum exposure for that pathway.</u> As defined previously, the reasonable maximum exposure (RME) is the maximum exposure that is reasonably expected to occur at a site. Under this approach, some intake variables may not be at their individual maximum values but when in combination with other variables will result in estimates of the RME.*

Accordingly, maximum values should not be used to calculate the "highest risk," since the goal of the risk assessment is not to calculate the highest risk. Moreover, according to EPA, risk management decisions are based on RME risk.

For these reasons, the Navy has not "created its own risk assessment policy which would be in contradiction to U.S. EPA or DTSC guidance." On the contrary, if the Navy followed DTSC's recommendation to use maximum values, the Navy RME risks would not be calculated, which would contradict EPA risk assessment guidance.

It should also be emphasized that EPA (EPA 1989) believes that the RME risk already overestimates actual site related risks, stating:

> *"[A]s in all environmental risk assessments, it already is known that uncertainty about the numerical results is generally large (i.e. on the range of at least an order of magnitude or greater) (EPA 1989)."*

The Navy believes that calculating the "highest risk" by using the maximum value for each exposure value would compound the conservatism already incorporated in the RME risk estimate to the point that "highest risk estimate" would not be a meaningful value and would not reflect actual upper 95 percentile exposures.

However, the Navy believes that if it is DTSC's policy to calculate the "highest risk" based on the "maximum value" for each exposure assumption this information will be included in the risk assessment. However, if the "highest risk" differs significantly from the RME risk, both risk estimates will be presented separately and qualified with the appropriate narrative so that all stakeholders clearly understand the significance of the risk estimates.

Comment 3: An oral RfD for copper can be calculated based on the criteria of 1.3 mg/l in drinking water cited in the 1992, 1993 and 1994 Health Effects Summary Tables.

Response: *Although an oral reference dose (RfD) for copper can be calculated from drinking water criteria, the Navy believes that there are several reasons why it is scientifically untenable to do so.*

- *There is no derived RfD value in EPA's Integrated Risk Information System (IRIS) (EPA 1994a), which is EPA's up-to-date verified toxicity database.*
- *An RfD has not been derived in EPA's 1994 Health Effects Summary Tables (HEAST) (EPA 1994b), which is EPA's provisional source of toxicity values.*
- *EPA specifically states in HEAST (EPA 1994b) that for copper*

  "DWCD (drinking water criteria document) (1987) concluded toxicity data were inadequate for calculation of an RfD for copper."
- *It is inappropriate to directly calculate an RfD for soil intake from a drinking water criteria value. The acceptable drinking water concentration is based on soluble copper in drinking water. However, copper in soil is typically bound in the soil matrix, which largely prevents absorption from the gastrointestinal tract. Differences in bioavailability between soil and water must be accounted for when calculating an RfD.*

Based on these reasons, the Navy has concluded that if EPA believes that the data base is currently inadequate to calculate an RfD for copper, it is inappropriate for the Navy to independently derive a toxicity based on the same inadequate data base.

However, the Navy will make the calculations DTSC recommends and communicate the results to DTSC.

Comment 4: The DTSC has analyzed seven split soil and sediment samples which were taken on July 22, 1994. The results showed that benzo(a)pyrene was detected in all seven samples at a concentration range close to the DTSC suggested screening value of 20 micrograms per kilogram (μg/kg). In addition, benzo(a)pyrene was also detected at SSRP-023 of 140 μg/kg; therefore, it is appropriate for the Navy to include benzo(a)pyrene as a chemical of concern in the OU6 risk assessment. However, since most of the previous OU6 "non-detected" Polynuclear Aromatic Hydrocarbons

(PAHs) data are associated with higher detection limits, it may not be possible to find the realistic concentrations of PAHs for use in conducting quantitative risk assessment at this time. To resolve this problem, the Department has suggested that the navy may use motor oil, JP-5 or diesel concentrations to estimate the PAH concentrations and carry through other RI reports in Moffett Federal Airfield.

Response: *The Navy believes that the results from the split samples confirm that any potential PAH contamination in OU6 is insignificant. This comment indicates there may be a misinterpretation of the summary of the PAH analysis.*

As the summary indicates, benzo[a]pyrene (B[a]P) was detected above the quantitation limit in only four samples, not seven. Although sample quantitation levels were significantly reduced for this analysis, the increase in sensitivity was gained at the expense of accuracy and precision. Even known additions of B[a]P to the samples (sample spikes) could not be recovered in the quality control analysis.

According to the most recent preliminary remediation goals (PRGs) prepared by EPA Region 9, the appropriate screening value for B[a]P in OU6 should be 260 µg/kg, not 20 µg/kg. Although 20 µg/kg may represent DTSC's screening value for residential exposure to B[a]P, as previously mentioned, residential development is not possible in OU6. Consequently, according to recent DTSC policy (DTSC 1994), the occupational screening level should be used for screening and to evaluate the appropriateness of sample quantitation levels.

All detected concentrations for B[a]P as measured by DTSC in the split samples were far below even the conservative screening values for occupational exposures. In fact, all concentrations in the split samples were even below the ultraconservative screening levels for OU6 based on residential exposures. It should also be noted that it cannot automatically be assumed that PAHs in OU6 are associated with petroleum products. PAHs can arise from incomplete combustion of organic matter including naturally occurring fires. It is likely that the low levels of B[a]P detected in the split samples are likely to represent naturally occurring background conditions.

The Navy will make the requested calculations and communicate the results to DTSC.

Comment 5: The Navy reasoned that construction workers are not to be considered receptors at OU6 because no construction could occur because of this OU's designation as a wetland. Therefore an industrial scenario should be considered for personnel working in OU6. This rationale needs to be clearly discussed in the risk assessment. DTSC ordinarily used a value of 100 milligrams per day (mg/day) soil ingestion for an industrial worker working outside; a value of 50 mg/day would be utilized for an office worker employed indoors on the property. A value of 100 mg/day should be used for the industrial scenario at OU6 because workers would be outside and possibly in contact with soils and sediments.

Response: *The Navy will modify the narrative to explain in more detail why a residential exposure scenario was not evaluated in the OU6 RI.*

The Navy used the appropriate intake value for soil ingestion required by both EPA and DTSC. According to Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" (EPA 1991) and Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure (EPA 1993), the RME soil intake value for occupational exposures is 50 mg/day. Furthermore, according to DTSC (1992) risk assessment guidelines there is no value for commercial/industrial ingestion of soil other than 50 mg/day. Both DTSC and EPA recommend an ingestion rate of 100 mg/day only for residential exposures. Fifty mg/day is used for commercial/industrial exposures even when workers may come in contact with soils because the work day is only 8 hours. For example, because it is assumed residents are exposed 24 hours per day and commercial/industrial for 8 hours per day, daily ingestion rates translate into 4.2 milligram per hour (mg/hour) for a resident while the commercial/industrial receptor ingests 6.2 mg/hour. Consequently, it is already assumed that commercial/industrial exposures to soil are relatively intense. According to EPA (1989) the only exposures where increased soil ingestion should be assumed is for construction work involving soil excavation. Construction involving soil excavation is precluded in OU6 because it is a wetland.

Although DTSC supplemental risk assessment guidance requires a value of 50 mg/day for commercial/industrial exposures, the Navy will recalculate the risks based on 100 mg/day as recommended by the DTSC toxicologist and will communicate the results to DTSC.

3.0 RESPONSE TO COMMENTS

The following sections present the responses to comments on the OU6 Final Remedial Investigation Report. Section 3.1 presents EPA's general comments and responses and Section 3.2 and 3.3 present DTSC's general and specific comments, respectively.

3.1 EPA COMMENTS

Comment 1: The total petroleum hydrocarbons (TPH) section was deleted from the SOILS SAMPLES section of Chapter 4 (Nature and Extent) and should be retained. It was in the Draft Final and removed from the Final.

Response: *The section on TPH was inadvertently omitted and will be incorporated into the final report.*

Comment 2: Table 4-6 in the Final (Draft Final Table 4-10) appears to have mislabeled columns. TPH (oil) in the Draft Final is the same as TPH (diesel) in the Final. This appeared to be too coincidental. In my conversation with Lynn Davies, she said the Final version (Table 4-6) is the correct version, but the last column's header (TPH extractable as other diesel components) still needs to be corrected. Please submit a new page.

Response: *A new page will be submitted.*

Comment 3: The Navy has still not added additional text regarding "acceptable risk" as you agreed to, based on EPA's comment #12 on the Draft and comment #12 on the Draft Final.

Response: *The Navy apologizes for this oversight and will add the statement that EPA currently considers a carcinogenic risk between 1E-6 and 1E-4 to be an acceptable risk range but that EPA Region 9 considers risk in this range to be a potential risk in some cases. Therefore, EPA Region 9 will consider site-specific data when determining whether remedial action needs to be taken.*

Comment 4: The Hazard Index section of Table 6-43 is missing (Recreational Scenario-Inhalation of Particulates). Table 6-50 is repeated in its place. Please submit this part of the Table 6-43.

Response: *The table will be submitted.*

3.2 DTSC GENERAL COMMENTS

Comment 1: The purpose of conducting a baseline human health risk assessment is to characterize the potential adverse health effects, evaluate uncertainty, and summarize risk information. Many of the statements in this document which only reflect the preparers (sic) opinion should be placed in a separate appendix or forward (sic). Statements regarding uncertainty can be place in the uncertainty section.

Response: *According to EPA (EPA 1989), the risk assessment should be adequately explained and the risks qualified so that risk managers and all stakeholders are aware of the various assumptions underlying the risk estimates. Qualifying risk estimates is important so that actual site-related can be properly interpreted. In this regard, the Navy relied exclusively on EPA guidelines and toxicity data bases. Although no specific references were cited in this comment, the Navy will provide specific EPA reference for those comments thought to represent "only the preparer's opinion."*

Comment 2: Innumerable statements about the EPA acceptable risk range of 10^{-6} to 10^{-4} are made throughout the document. However, the fact that the 10^{-6} level is considered a point of departure by DTSC was ignored despite past written and verbal comments requesting that it be included. Additionally, there are also frequent statements about how a background study was not performed and so the inorganic chemicals were included as chemicals of concern and they elevated the risk even though they probably represent background levels. In fact, as repeatedly mentioned by the regulatory agencies, the inorganics background levels have been established for OU2 RI and there is no need to conduct any additional background sampling or expensive statistical analysis.

Response: *The Navy recognizes that a 1E-6 carcinogenic risk level is the point of departure for DTSC. This information was unintentionally omitted in the last revision and will be included in the final OU6 RI. Although it is important to include this information in the RI report, it is also necessary to include risk management information developed by EPA which is stated in the Comprehensive Environmental Response Compensation, an Liability Act (CERCLA) and in more recent EPA directives. It is also important to include EPA Region 9 policy.*

The Navy concurs that there is no need to collect any additional background samples. The Navy also agrees that for the purposes of the risk assessment, background levels have been adequately established for the base in general. However, the distinction between OU6 and the rest of the base must be highlighted because there are likely significant differences between OU2 and OU6 background levels: This is because OU2 consists of native soils while dredged fill material comprises much of OU6. The Navy believes this information is relevant for OU6 RI investigation and is important to communicate in the RI report. The Navy will again review the background section of the OU6 RI report to ensure the narrative correctly explains this distinction and will modify any inconsistencies accordingly.

Comment 3: Future changes in the document should be clearly identified. This may be done in several ways: by submitting revised pages with the reason for the changes noted, by the use of strikeout and underline, by the use of shading and italics, or by cover letter stating how each of the comments here have been addressed.

Response: *The Navy will comply with this request.*

3.3 DTSC SPECIFIC COMMENTS

Comment 1: Page 2-2, 3rd Paragraph. Groundwater was not considered in this risk assessment. This is not in accordance with DTSC guidance. It is our understanding that groundwater for OU6 will be considered in the basewide risk assessment and in the OU1 and OU5 feasibility study reports.

Response: *Groundwater was not evaluated in the OU6 RI because there are no complete pathways for exposure. That is, because all agencies concurred that residential development will not occur in OU6 due to its wetland status, no wells could be legally installed in OU6. However, as indicated in DTSC's comment, the Navy will evaluate groundwater in the station-wide risk assessment and in the OU1 and OU5 feasibility study (FS) reports.*

Comment 2: Figure 4-9. Several high values of soil lead are noted along Lindbergh Avenue and at the Northwest corner of Patrol Road indicating sources of lead contamination in OU6.

Response: *There are no known sources of lead along Lindbergh Avenue and at the northwest corner of Patrol Road. Since these samples were collected, NASA has excavated the Lindbergh Avenue storm drain channel and surrounding soil to remediate lead, chromium, and mercury contamination detected in soil samples there. Consequently, the concentrations detected in surface soil samples collected in October 1993 do not represent the concentrations currently present along Lindbergh Avenue. After excavation lead was detected at 220 parts per million (ppm), 180 ppm, and 170 ppm in soil samples collected at 20 feet intervals from the north end of the Lindbergh Avenue storm drain channel. NASA plans to excavate further and resample these locations.*

Lead has been detected at two locations along the northwest corner of Patrol Road Ditch above the 95 UCL for OU6. However, these locations do not appear to be hot spots. Lead in the two samples was detected at 200 and 239 mg/kg, which was approximately twice the 95 UCL concentration of 127.

The Navy calculated the blood lead levels based on an exposure point concentration of 200 ppm using the California lead model. The results showed that the expected 95 percentile blood lead level concentration in children is 4.9 micrograms per deciliter (μg/dL), which is below the benchmark toxic levels of either 10 or 15 μg/dL.

Additionally, EPA generally considers soil concentrations of 500 mg/kg to be potential triggering levels. Lead concentrations below 500 mg/kg do not typically warrant remediation at most sites.

Comment 3. Figure 4-12. A high soil nickel value is noted closed to a location to where a lead value was noted. Does there appear to be a source of contamination for these high values?

Response: *There is a typographical error corresponding to sample SSLA-003. The nickel concentration at this location that was reported as 1,210 mg/kg should have been 92.7 mg/kg. As noted in the previous response, however, the soil at this location is targeted for removal due to the elevated lead concentrations.*

Comment 4: Page 6-10, 1st Paragraph. The second to last sentence of this paragraph is unclear as to what actually was done especially regarding exposure parameters.

Response: *This section will be clarified and will detail how exposure parameters were selected.*

Comment 5: Page 6-11, 1st Paragraph. To reiterate a point we made in DTSC's comments on March 4, 1994, we observed many individuals running, walking, roller blading and biking during our site visit in February 1994. It appeared that individuals use this area as part of regular fitness program and may use the area for this purpose up to five days per week, perhaps more for individuals living nearby who also work on the base.

Response: *Although it is possible that a recreational receptor could be exposed to contaminants in OU6 for 5 days per week, it is highly unlikely. Thus, risks based on 5 days per week would likely represent the upper-bound or maximum estimate of risks that may be unreasonable, and does not represent the RME risk.*

According to EPA (EPA 1989), RME risks calculated in the baseline risk assessment are intended to represent the lifetime risks for the same individual. Although DTSC may have observed many different individuals in OU6 at any given time, the number of individuals observed is not germane to the risk assessment. What is important is consistently observing the same individual in OU6 over the period of 30 years. This is because the calculated RME risk represents the risks to a single individual over the exposure duration. As specifically explained in EPA (1989) risk assessment guidance (emphasis in original):

Once reasonable exposure pathway combinations have been identified, it is necessary to examine whether it is likely that the <u>same</u> individuals would <u>consistently</u> face the RME as estimated in Chapter 6. Remember that the RME estimate for each exposure pathway includes many conservative and upper-bound parameter values and assumptions (e.g., upper 95th confidence limit on amount of water ingested, upper-bound duration of occupancy of a single residence).

The Navy has concluded that although many different receptors have been observed in OU6, it is unreasonable to assume that the same recreational receptor will consistently conduct his or her recreational activities in OU6 for 5 days a week for 52 weeks a year for 30 years.

Most recreational receptors vary their activities and are not consistently exposed to the same geographical location over their lifetime. Even the most active recreational receptor will not likely be continuously exposed to OU6 at the same exposure frequency and duration as they get older. For example, it is unlikely that a person who starts jogging in OU6 at 20 years of age, will begin jogging in OU6 for 5 days a week every week during the year (regardless of weather conditions) for 30 years without respite until the receptor is 50 years of age.

The Navy believes the assumption of recreational exposure for the same individual at 3 days per week for 30 years is conservative and represents the RME exposure. However, the Navy will recalculate the risks in response to DTSC's request and will communicate the results to DTSC.

Comment 6: <u>Page 6-13, Last Paragraph</u>. Unless modeling results are available to document the assertion that "volatile organic compounds (VOCs) in OU6 will be completely volatilized in the near future", the inhalation pathway for VOCs should be included. The facility has been has been already transferred to NASA and thus the future scenario is in fact now occurring.

Response: *All VOCs were detected at extremely low concentrations. In fact, at the concentrations detected, VOCs posed virtually no risks as estimated based on the predominant exposure pathways. Risks ranged between 1E-8 and 1E-16 for VOCs. These risk levels are two to 10 orders of magnitude less than DTSC's point of departure.*

Based on the extremely low VOC concentrations and estimated current risk, the Navy did not believe modeling of VOC exposure point concentrations, which can be labor and time intensive, was warranted or necessary. According to EPA guidance, evaluation of VOC inhalation is included in the risk assessment when receptors are expected in buildings with crawl spaces or basements. VOCs are included in these cases because they can be trapped and concentrate in these areas when evaporation occurs through the vadose zone. However, these exposure pathways are incomplete in OU6 because no residential housing or business offices will be built in OU6. Although modeling can be carried out for VOCs in OU6, the modeled concentrations will be extremely low because the extremely low concentrations detected in the vadose zone would be even further reduced after mixing with ambient air at the ground surface.

However, modeling will be conducted to either substantiate the assumption that VOCs will quickly evaporate or the Navy will determine an exposure point concentration for inhalation of VOCs and calculate the associated risks.

Comment 7: Page 6-16, Last Paragraph. After reading this paragraph we had difficulty in understanding exactly what was done with regards to soil/sediment exposure. Tables 6-6 and 6-15 indicate an exposure frequency of 250 days per year for the occupational receptor and 156 days per year for recreational exposure; both of these receptors should be considered to be exposed to soils and/or sediments for 250 days per year.

Response: *Exposure for occupational receptors was assumed to be 250 days per year. However, the 250 days per year was divided between the annual wet and dry seasons with regard to exposure to soil, surface water, and sediments. This approach will be further clarified in the exposure assessment narrative. For recreational exposures, 156 days per year likely represents the RME.*

Comment 8: Page 6-20, 1st Complete Paragraph. To our knowledge, dermal absorption of inorganics is not generally considered to be insignificant. DTSC guidance specifies that a value of 1% dermal penetration be used for inorganics, except for arsenic and cadmium where specific measured values of 3% and 0.1% respectively are available (DTSC, 1994).

Response: *One of the most important factors in evaluating dermal absorption is the particular mineralogic form in which each inorganic chemical exists in OU6 soils. The conservative values suggested by DTSC are values presented in the Preliminary Endangerment Assessment (PEA) guidance (DTSC 1993), which is intended only to be used for screening purposes and not used in a baseline human health risk assessment (HHRA). Furthermore, the values suggested by DTSC deviate from EPA guidance and are likely to be upper-bound estimates corresponding to dermal absorption for inorganic chemicals in the pure form.*

Nevertheless, the Navy will recalculate the risks in response to DTSC's request and will verbally communicate the results to DTSC.

Comment 9: Page 6-22, 4th Paragraph. The possible essentiality of arsenic is still controversial, the Department has not heard of any evidence in humans. It is our understanding that the substitution of arsenic for phosphorous in biochemical reaction is a proposed mechanism for arsenic toxicity and is not known to be associated with any essential requirement for this element.

Response: *The description of arsenic toxicity was taken directly from EPA guidance (EPA 1989) and toxicity data bases. For example, the Health Assessment Document for Inorganic Arsenic (Final Report, EPA 1984) states:*

> *Furthermore, there appears to be a nutritional requirement for low levels of arsenic in certain experimental animals and this may also be the case for man.*

Numerous peer review publications (Anke et al. 1978, Nielsen et al. 1974, Nielsen et al. 1978, Underwood 1977, Uthus et al. 1983, and Schwartz 1977) have identified many pathological changes in experimental animals fed arsenic-deficient diets. Although the putative physiological role has yet to be determined, these dose-dependent pathological changes indicate that trace levels of arsenic may be an essential component of a healthy diet. The Navy relied exclusively on EPA toxicity information in the description of arsenic toxicity.

The specific biochemical mechanism for the putative essential nature as well as the tumorigenic mechanism have not been established. However, some experts believe substitution of arsenic for phosphorus in some biochemical reactions is essential. The etiology of skin and lung tumors, on the other hand, presumably involves a direct interference of repair or replication of DNA possibly due to substitution of arsenic for the structural form of phosphorus in the DNA backbone.

The narrative will be modified or the reference to phosphorus deleted.

Comment 10: Page 6-23, 1st Paragraph. The last sentence of the paragraph at the top of page 23 could be true for any substance, not just arsenic. Please simply report the results of the assessment (please also see General Comment No. 1).

Response: *Although it may be applicable for any chemical, this is a direct quote from the EPA Integrated Risk Information System (IRIS) data base (EPA 1994a), which the Navy is required to use in the HHRA for developing the toxicity profiles. The specific EPA reference was mistakenly omitted, but will be added. The Navy intended to present this toxicity information not to mislead or diminish the toxicity of arsenic, but to communicate to the readers the uncertainty underlying the EPA-derived toxicity value.*

Comment 11: Page 6-29, 2nd Paragraph. The last two sentences of this paragraph states that reduction of hexavalent to trivalent chromium in vivo is a significant detoxification mechanism. Although may be true in general, it is our understanding that the toxicity (especially carcinogenicity) of hexavalent chromium occurs after the hexavalent species is absorbed across the cellular membrane and then reduced to the trivalent form. The cellular damage being accomplished by the trivalent form or some transient partially reduced intermediate species such as Cr^{+4} that occurs along the pathway of reduction from the hexavalent to the trivalent state.

Response: *Trivalent chromium is an essential nutrient and is not the carcinogenic form. The reduction of hexavalent chromium to trivalent chromium acts as the primary detoxifying mechanism. As stated in the Agency for Toxic Substance and Disease Registry toxicological profile for chromium (ATSDR 1992):*

In the lungs, chromium(VI) can be reduced to chromium(III) by ascorbate. The reduction of chromium(VI) by ascorbate results in a shorter residence time of chromium in the lungs and constitutes the first defence against oxidizing reagents in the lungs.

A similar protective biochemical reaction occurs in the gastrointestinal tract. As stated by ATSDR (1992):

The first defense against chromium(VI) after oral exposure is the reduction of chromium(VI) to chromium(III) in the gastric environment where ascorbate also plays an important part (Samitz 1970).

Another P-450 mediated chemical reaction can involve the reduction of chromium(VI) to chromium(V) through a one-electron transfer. Reactions of chromium(V) and DNA have resulted in DNA adducts that may be the initiating carcinogenic mechanism. However, this pathway does not involve trivalent chromium.

The Navy believes the description of chromium toxicity is correct.

Comment 12: Page 6-30, 3rd Paragraph. It is our understanding that copper poisoning occurs in individuals afflicted with Wilsons disease, a specific inherited metabolic disorder. However, chronic copper poisoning in general (especially from environmental exposure) is not referred to as Wilsons disease unless it specifically occurs in an individual carrying the genetic defect.

Response: *The Navy regrets the typographical error regarding the description of Wilson's disease. The sentence should have read: "Chronic copper toxicity is usually manifest only in Wilson's disease which is an inborn metabolic deficiency caused by a metabolic defect." This sentence was intended to convey that chronic copper toxicity is rarely seen due to normal homeostatic mechanisms, but that some individuals lacking the copper-binding ceruloplasmin protein may be genetically predisposed to copper-induced pathological changes. The paragraph will be modified accordingly.*

Comment 13: Page 6-31, 1st Two Sentences. Although an RfD is not available for copper on IRIS, the 1994 HEAST (EPA 1994b) list the drinking water standard of 1.3 mg/L, based on gastrointestinal irritation, under the oral RfD for copper. An RfD for risk assessment purposes can be derived based on the value of 1.3 mg/L by assuming 2 liters of water consumption per day and a 70 kg body weight individual. Please see comment below for Table 50 regarding hierarchy of toxicity criteria.

Response: *See Navy's response to DTSC Comment 3, Section 2.0.*

Comment 14: Page 6-36, 3rd Paragraph. The bulk of the evidence supporting nickel's carcinogenicity has come from studies of workers exposed to nickel refinery dust which is mainly composed of nickel subsulfide and nickel oxide. In addition, nickel subsulfide was carcinogenic in inhalation studies in rats. The subject paragraph could be read as implying that nickel carbonyl is the only nickel compound that has been implicated as carcinogenic.

Response: *The Navy did not intend to imply that the only carcinogenic form of nickel is nickel carbonyl. The toxicity profile will be clarified.*

Comment 15: Page 6-37, 4th Paragraph. This paragraph states RfDs have not been derived for PCBs; IRIS currently lists RfDs for Arochlor 1016 Arochlor 1248.

Response: *IRIS (EPA 1994a) also lists an RfD for PCB 1254. The toxicity information will be modified.*

Comment 16: Page 6-39, 1st Paragraph. DTSC does not list cancer slope factors for any compounds. DTSC uses criteria developed by the Office of Environmental Health Hazard Assessment (OEHHA) of Cal/EPA. OEHHA has recently published a revised list of potency Equivalency Factors for PAHs.

Response: *The correct California agency responsible for developing cancer potency factors will be referenced.*

Comment 17: Page 6-39, 2nd Paragraph. It is sulfur and not phosphorous that selenium substitutes for in certain biochemical reactions. If there were a hemostatic mechanism for maintaining a certain level of selenium in the body, selenium would not accumulate in exposed individuals and selenium toxicity would not occur.

Response: *Although selenium does substitute for sulfur in the glutathione peroxidase enzyme (Klaassen, Amdur, and Doull 1986), it can also replace phosphorus. According to Casarett and Doull (1975):*

> *While the biochemical role of selenium as an essential element is not clear, selenium can replace phosphate in certain reductases.*

Furthermore, a homeostatic mechanism operates to maintain low levels of selenium but it can be overwhelmed. According to Klaassen, Amdur, and Doull (1986):

> *Within certain physiological limits, the body appears to have a homeostatic mechanism for retaining trace amounts of selenium and excreting the excess material. Selenium toxicity occurs when the intake exceeds the excretory capacity (McConnel and Portman 1952; Schroeder and Mitchener 1972).*

The toxicity narrative will be expanded to incorporate DTSC's comment on sulfur substitution.

Comment 18. Page 6-43, 3rd Paragraph. As indicated above under General Comment No. 2, numerous statements about the EPA acceptable risk range of 10^{-6} to 10^{-4} are made throughout the document. However, the fact that the 10^{-6} level is considered a point of departure by DTSC was not included despite past written and verbal comments requesting that it be included.

Response: *This information was omitted and will be added to the final RI.*

Comment 19. Page 6-45, 1st Paragraph. The last two sentences in the paragraph state that the EPA, as compared to DTSC, carcinogenic risks for the particulate inhalation pathway differ because the inhalation CSF for arsenic is 50 $(mg/kg\text{-}day)^{-1}$ for U.S. EPA and 12 $(mg/kg\text{-}day)^{-1}$ for CAL/EPA. In fact the differences between the two are small since EPA also applies an inhalation absorption factor for arsenic of 0.3 to the arsenic inhalation CSF to produce an effective inhalation CSF of 15 for the compound.

Response: *This additional information will be added to the discussion.*

Comment 20. Page 6-45, 2nd Paragraph. The third sentence states that the carcinogenic risks are most likely overestimated. Such statements appear throughout the document. Indeed the reader may wonder why the document was prepared at all given the number of such statements. We feel these types of statements are opinions and do not properly belong in the main body of the risk assessment which we understand is being prepared using DTSC/U.S. EPA guidance. Statements about uncertainty can appear in the uncertainty section. We feel other statements reflecting the preparers (sic) opinion belong outside the main body of the risk assessment in an appendix or foreward where the preparers opinions are clearly identified and separated from regulatory agency guidance.

Response: *The statement in the RI, while correct, is a qualification of the risk estimates. As such, it does belong in the uncertainty section as DTSC suggests. It will be moved and inserted into the exiting narrative.*

It should be noted that the purpose of such statements is to inform the risk managers and stakeholders that, due to the conservative assumptions made in the risk assessment, it is highly unlikely that risks were underestimated for the RME receptor.

The Navy has confidence that the person reading the RI will not "wonder why the document was prepared at all," but rather will feel confident that the Navy conducted the risk assessment according to DTSC and EPA guidance and used conservative assumptions to estimate risk. With regard to DTSC and EPA guidance, the Navy believes that precise risk estimates for actual exposures are not generated by simply using DTSC and EPA guidance. Both DTSC and EPA advocate using conservative exposure assumptions that compound the conservatism of the risk assessment. The intent of DTSC and EPA risk assessment guidance is to ensure that risks are not underestimated for the RME or average receptor.

Comment 21. Page 6-48, 4th Paragraph. As mentioned in DTSC's comments of March 4, 1994, the Department has its own lead model. Although its use is not necessary in the current risk assessment for OU6, the DTSC lead spreadsheet model should be used in risk assessments for other operating units for which lead is a contaminant as well as in the basewide risk assessment. The DTSC lead spreadsheet can be obtained by calling the number 916/327-2500.

Response: *The Navy will use the California lead model in all future risk assessments at MFA.*

Comment 22: Page 6-51, 6th Paragraph: Please see General Comment No. 2 and Specific Comment No. 20. We feel this paragraph may raise many questions among the risk managers and stakeholders about the validity of the entire process. Paragraph 6 is like a summation the entire risk assessment. In essence this paragraph implies the entire risk assessment is invalid. As it is mentioned above, the inorganics background levels have been established for MFA and thus would greatly simplify OU6 risk assessment.

Response: *The purpose of the risk assessment is to estimate the RME and average risk associated with OU6. However, it is also important assure the reader that the risk estimates are not precise estimates of risk under likely exposure conditions. Characterizing the risks in such a manner gives the public the assurance that risk estimates are conservative and are not best estimates for the average receptors.*

Comment 23: Page 6-52, 2nd Paragraph: Please see Comment No. 18. The value of 1.1E-04 for total carcinogenic risk for the future occupational risk scenario is well beyond the point of departure for carcinogenic risk of 10-6 used by DTSC. Decisions about acceptable risk are decisions made by DTSC and U.S. EPA, it is inappropriate for the Navy to attempt to make this decision.

Response: *According to the Federal Facilities Agreement (FFA), the Navy is a full and equal partner in all risk management decisions at MFA. The narrative describing acceptable risk levels discussed in the are taken from the CERCLA, which the Navy is required to recognize according to the FFA. It should be noted that the text in the OU6 RI does not significantly differ from the narrative in past RI reports reviewed and approved by both DTSC and EPA Region 9.*

It is unclear what specific modifications DTSC is requesting in this comment. However, the Navy will include additional risk management information in this section if DTSC provides detailed suggestions.

Comment 24: Table 6-6: The reference cited (EPA 1993c, Statement of Work for Organic Analysis) is not an official agency source of information on exposure assessment for the future average occupational exposure scenario. It concerns mainly chemical analysis not exposure assessment.

Response: *This typographical error will be corrected.*

Comment 25: Table 6-7: The table appears to have the rows out of alignment (body weight of 1.0 E-6?). DTSC specifies a value of 5800 square centimeters (cm^2) for body surface area and 1.0 for soil adherence for both the current and future occupational scenario the appropriate corrections should be made in the table and the calculations.

Response: *The table alignment will be corrected.*

Comment 26: Table 6-8: Please see Comment No. 24. The DTSC guidance specifies a value of 20 cubic meters per day (m^3/day) as the inhalation rate for an industrial scenario.

Response: *The intake value of 1.25 m^3/day corresponds to a daily intake of 30 m^3/day which is more conservative than 20 m^3/day. If DTSC feels 30 m^3/day is too conservative, the Navy will modify the inhalation rate.*

Comment 27: Table 6-9: For the future occupational exposure scenario, the exposure time should be 8 hours/day. As per DTSC earlier comment the volatile chemical inhalation pathway needs to be included for the future occupational scenario.

Response: *The exposure time for future occupational exposures was assumed to be 8 hours per day as shown in Table 6-6 and 6-8. It was assumed that the occupational exposure to surface water would be limited to 1 hour per day. The Navy's response to possible inhalation of VOCs was presented in the response to DTSC specific comment 6.*

Comment 28: Table 6-12: Does dermal contact with surface water imply swimming or wading? If so, the body surface area of 5800 cm^2 is too small. A whole body surface area value of 23,000 cm^2 as specified in DTSC (1992) guidance should be used for recreational exposure.

Response: *Although OU6 is classified as a wetland, the surface water never reaches sufficient depth to either swim or wade. In fact, the 5800 cm^2 surface area is probably conservative because the water level in OU6 rarely exceeds approximately 6 inches, corresponds to the surface area below the ankle. The surface area of the lower leg does not even approach 5800 cm^2. Additional explanation will be added to the text.*

Comment 29: Table 6-13: Please see Comment No. 5. Given our observations on our site visit we feel many people exercise regularly on site and a value of 250 days/yr should be used for the recreational exposure.

Response: *Although many people may exercise regularly in OU6, the same individual will not likely exercise 5 days a week, each week consecutively, for 30 years in OU6. Please see response to DTSC specific comment 5.*

Comment 30: Table 6-14: DTSC specifies a value of 1.0 for a soil adherence factor. The reference EPA 1992d given in this table is not listed in the reference section. Please see our earlier comment regarding reference EPA 1993c.

Response: *The reference will be corrected.*

Comment 31: Table 6-39 and 40: Despite the statements made in the document about cancer risk for the site arising from background levels of inorganic constituents, an inspection of these tables reveals that for the future Occupational Scenario, the scenario with the highest cancer risk, the majority of the risks is contributed by two related industrial compounds, Arochlor 1254 and 1260. Most of the remaining risk is contributed by arsenic. The range of values reported for arsenic in soil, 2.4 to 11.3 ppm, does not seem incongruent with background levels of arsenic seen at other Bay area sites. It is unfortunate that available background data was not used so that this observation could be verified and used in the risk assessment.

Response: *The Navy concluded that it was scientifically untenable to assume background levels for OU6 and OU2 are comparable due to the different soil types. Although arsenic levels likely represent background levels, the Navy could not make this unequivocal assumption.*

Comment 32: Table 50: Copper was not included in the hazard index calculations, evidently because the RfD for this compound is not listed on IRIS. DTSC has commented on this in March 4 letter. Please also see out comment above about an RfD value for copper in the HEAST manual. DTSC guidance is very clear that in the event an RfD is not available on IRIS, then HEAST should be consulted. For chemicals not available in HEAST the DTSC toxicologist assigned to the site should be contacted.

Response: *See Navy's response to DTSC specific comment 3, Section 2.0.*

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