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December 1, 2009

U.S. Environmental Protection Agency - Region II
290 Broadway – 22nd Floor
New York, New York 10007-1866

Attn: Mr. Adolph Everett, P.E.
Chief, RCRA Programs Branch

Re: Contract N62470-02-D-3052
Navy CLEAN, District III
Contract Task Order (CTO) 108
U.S. Naval Activity Puerto Rico (NAPR)
Draft Final Steps 6 and 7 of the Baseline Ecological Risk Assessment for SWMU 1
Naval Activity Puerto Rico
RCRA/HSWA Permit No. PR2170027203

Dear Mr. Everett:

Michael Baker Jr., Inc. (Baker), on behalf of the Navy, is pleased to provide you with one hard copy of the replacement pages for the Draft Steps 6 and 7 Baseline Ecological Risk Assessment for SWMU 1, Naval Activity Puerto Rico, for your review and approval. These replacement pages make up the Draft Final Steps 6 and 7 Baseline Ecological Risk Assessment for SWMU 1. Directions for inserting the replacement pages into the Draft Steps 6 and 7 Baseline Ecological Risk Assessment for SWMU 1 are provided for your use. Also included with the copy of the replacement pages is one electronic copy provided on CD of the Draft Final Steps 6 and 7 Baseline Ecological Risk Assessment for SWMU 1, Naval Activity Puerto Rico.

This document is being submitted in accordance with EPA comments dated September 17, 2009. The Navy responses to these comments are attached for your review.

If you have questions regarding this submittal, please contact Mr. Mark Davidson at (843) 743-2124. Additional distribution has been made as indicated below.

Sincerely,
**MICHAEL BAKER JR., INC.**

Mark E. Kimes, P.E.
Activity Coordinator

Attachments

cc: Mr. David Criswell, BRAC PMO SE (letter only)
Mr. Mark E. Davidson, BRAC PMO SE (1 hard copy and 1 CD)
Mr. Pedro Ruiz, NAPR (1 CD)
Mr. Tim Gordon, US EPA Region II (1 hard copy and 1 CD)
Mr. Carl Soderberg, US EPA Caribbean Office (1 hard copy and 1 CD)
Mr. Felix Lopez, US F&WS (1CD)
Mr. Anthony Scacifero, TechLaw, Inc. (1 CD)
Ms. Willmarie Rivera, PREQB (1CD)
Ms. Gloria Toro, PREQB (1 hard copy and 1 CD)
Mr. John Swenfurth, CH2M Hill, Tampa (1 CD)

**NAVY RESPONSES TO EPA COMMENTS DATED SEPTEMBER 17, 2009 ON THE DRAFT STEPS 6 AND 7 OF THE BASELINE ECOLOGICAL RISK ASSESSMENT FOR SWMU 1 DATED JULY 1, 2009**

*(EPA comments are provided in italics, while the Navy responses are provided in regular print)*

## EPA GENERAL COMMENTS

***1.*** *Please include a stand alone executive summary with tables that summarizes the potential for ecological risk for each receptor group at the site. The executive summary should provide a condensed summary of the BERA which is a helpful tool for the risk management decision makers.*

**Navy Response:** The draft document will be revised to include a stand-alone executive summary with tables embedded within the text that summarize the potential for risk for each receptor group evaluated by the BERA.

***2.*** *Food web modeling results from the Screening-Level Ecological Risk Assessment (SERA) and Step 3a identified lead in surface soil as an ecological Chemical of Potential Concern (COC) for the terrestrial avian omnivores and herbivores. According to the BERA, the Navy decided to only model food web exposures to the terrestrial avian omnivores in the BERA, based on the assumption that omnivores are more likely than herbivores to ingest surface soil while eating. It is unconventional to remove a receptor from further evaluation without using risk exposure parameters and site data to prove that the site-related risks are negligible. Please respond to this comment by providing the results of the food web model for the terrestrial avian herbivore (morning dove) exposed to lead in surface soil. This additional information will ensure that future risk management decisions regarding the terrestrial avian herbivore are based on site-specific data.*

**Navy Response:** The Navy offers the following points of clarification relative to this comment. Section 2.4.3 of the draft document states that, "*Lead in surface soil was identified as an ecological COC for terrestrial avian omnivore and herbivore food web exposures at SWMU 1. However, an assessment endpoint was not selected for avian herbivore food web exposures. This decision was based on the Step 3a risk calculation (Baker, 2006a), which showed that avian omnivores represent the more exposed feeding guild and are at greater risk to lead in surface soil (NOAEL-based HQ of 2.42 for the American robin versus a NOAEL-based HQ of 1.34 for the mourning dove). Because avian omnivores are at greater risk to lead in surface soil, a conclusion of acceptable risk to avian omnivores in the BERA also would apply to avian herbivores. If the BERA concludes that potential risks to avian omnivores from lead in surface soil are not acceptable, corrective action objectives (CAOs) derived for the protection of avian omnivores also would be protective of avian herbivores.*" The document did not make a statement that only terrestrial avian omnivores were modeled based on an assumption that omnivores are more likely than herbivores to ingest surface soil while eating. It is noted that this approach was presented in the Final Steps 3b and 4 of the Baseline Ecological Risk Assessment for SWMUs 1 and 2, Naval Activity Puerto Rico, Ceiba, Puerto Rico (Baker, 2007), which was approved by the EPA in their letter dated February 13, 2007. Based on the language contained within the draft document and EPA-approval of the Final Steps 3b and 4 Report, the Navy does not believe additional action related to this comment is necessary.

3. *The BERA indicates that the American robin is a suitable surrogate to represent the yellow-shouldered black bird, which is a federally endangered species present at the site. Conservative exposure parameters and Toxicity Reference Values (TRVs) should be used when assessing risk to an endangered species to ensure full protection. The Hazard Quotients (HQs) are calculated using three TRVs, namely: the No Observable Adverse Effect Level (NOAEL), the Lowest Observable Adverse Effect Level (LOAEL), and the Maximum Acceptable Toxicant Concentrations (MATCs). The calculation of these additional HQs can be misleading, even though the risk characterization for the terrestrial avian omnivore relies only on the NOAELs. It is suggested that the Navy state in the third bullet in Section 2.5.4, Data Evaluation and Interpretation – Comparison of mean terrestrial avian omnivore dietary intakes to literature-based toxicity reference values on Page 2-30, that only NOAELs are used to assess the potential ecological risk for an endangered species. It is also suggested that the Navy remove the calculation of HQs using LOAELs and MATCs from Table 4-20, Summary of Maximum Hazard Quotient Values for American Robin Dietary Exposures to Copper, Lead, and Tin in SWMU 1 and Upland Reference Area No. 2 Surface Soil, and any references in the text. It is also suggested that the Navy remove the use and reference to LOAEL-HQs and MATC-HQs for the West Indian manatee since it, too, is an endangered species evaluated in the BERA. These requested changes do not modify any of the conclusions but will make the text more transparent.*

**Navy Response:** The Navy respectfully disagrees that the calculation of and reference to MATC- and LOAEL-based risk estimates should be removed from the draft document. Although not considered when determining the acceptability of risk for American robin and West Indian manatee dietary exposures to ecological COCs in surface soil and Ensenada Honda sediment, respectively, MATC- and LOAEL-based HQ values for each ecological receptor provide perspective on the range of potential risks since the NOAELs listed in Tables 2-8 and 2-9 are, in part, artifacts of dose selection and do not represent actual threshold effects. As such, the calculation and presentation of MATC-based HQs and LOAEL-based HQs reduce the inherent uncertainty associated with NOAEL-based risk estimates. MATC- and LOAEL-based HQ values also provide an additional line of evidence supporting a conclusion of unacceptable risk. It is noted that Sections 5.2 and 5.3 (risk characterization for terrestrial avian omnivores and West Indian manatees, respectively) only make reference to NOAEL-based HQ values when statements are made regarding the acceptability/unacceptability of potential risks.

The EPA comment also requests that the Navy state in the third bullet item in Section 2.4.4 (note that the correct reference should be to the fourth bullet item, not the third bullet item) that only NOAELs are used to assess the potential ecological risk for endangered species. Although text within the fourth bullet item in Section 2.5.4 states that, "*As a measure of conservatism, conclusions regarding the acceptability of risk for individual chemicals are based on HQ values derived using NOAEL values*", the text will be revised to clearly indicate that the American robin is being used as a surrogate for the yellow-shouldered blackbird and that conclusions regarding the acceptability of risk will are based on HQ values derived using NOAEL values.

4. *MATCs for specific chemicals are derived by taking the geometric mean of the NOAELs and LOAELs values for a given chemical. The calculation of MATCs could not be verified because the input values are not provided in the document. Please provide the input values in a table to allow for independent review. This comment does not need to be addressed if the use of MATCs is removed from Steps 6 and 7 in response to the previous general comment.*

**Navy Response:** As stated within the draft document, as well as General Comment No. 4 above, the MATC for a given chemical was derived by taking the geometric mean of the NOAEL and LOAEL value. NOAEL,- MATC-, and LOAEL-based toxicity reference values (TRVs) are

included within Tables 2.8 and 2.9 for each chemical identified as an ecological COC for terrestrial avian omnivore and West Indian manatee dietary exposures. Therefore, it is unclear why the MATC-based TRVs listed within the tables could not be verified by independent review. If the commenter is referring to the species-specific input parameters used to derive MATC-based HQ values (i.e., food ingestion rates and body weights), these values are identified in Sections 2.5.4 and 4.2.3.1 for the American robin and Sections 2.5.4 and 4.2.4.2 for the West Indian manatee. If the commenter is not referring to verification of MATC-based TRVs or MATC-based HQ values, the comment requires clarification so the specific request is understood.

5. *Several different receptors were evaluated in the SERA and Step 3a, but were not carried into the BERA. It would help future reviewers if the Navy included a table referencing all of the receptors for the site with a brief explanation for the method each is included or excluded from the BERA.*

**Navy Response:** Rational for excluding receptors from additional evaluation in the BERA was previously presented and discussed within the Final Additional Data Collection Report and Screening-Level Ecological Risk Assessment and Step 3a of the Baseline Ecological Risk Assessment at SWMUs 1 and 2 (Baker, 2006). For many of the receptor/receptor groups eliminated from further evaluation, extensive evaluation and analysis was required. For example, over six pages of text evaluating multiple lines of evidence were presented to support the elimination of estuarine wetland benthic invertebrates from further evaluation in the BERA. For this reason, construction of a table containing a brief explanation of the methods used to include or exclude a receptor from the BERA is not realistic. Therefore, all reviewers (present and future) are requested to review the document referenced above for the specific lines of evidence used for each chemical-receptor combination. However to assist reviewers, Section 2.3 will be revised to include a table listing the assessment endpoints, risk questions, and measurement endpoints selected for the screening-level ERA and Step 3a of the BERA, as well as a table listing each receptor/receptor group evaluated and the chemicals, if any, identified as ecological COCs. Also, please see the response to EPA Specific Comment Nos. 1 and 2 below.

**SPECIFIC COMMENTS**

1. ***Section 2.3, Ecological Chemicals of Concern, Third paragraph, Page 2-8:*** *This paragraph addresses the food web modeling results from the SERA and Step 3a for the terrestrial avian receptors (i.e., morning dove, American robin, and red-tailed hawk). However, the red-tailed hawk is not explicitly included in the discussion. Please summarize the results for this receptor to justify its removal from further consideration.*

**Navy Response:** The red-tailed hawk is not included within the discussion because this avian receptor was eliminated from further evaluation in Step 3a of the Navy ERA process (no ecological COCs were identified for red-tailed hawk dietary exposures). Specific rational justifying the elimination of the red-tailed hawk from further consideration in Steps 3b through 7 of the ERA process can be found within the USEPA-approved *Final Additional Data Collection Report and Screening-Level Ecological Risk Assessment and Step 3a of the Baseline Ecological Risk Assessment at SWMUs 1 and 2* (Baker, 2006). However, the third paragraph in Section 2.3 will be revised to include text stating that no chemical was identified as an ecological COC for terrestrial avian carnivore (i.e., red-tailed hawk) dietary exposures. Also, please see the Navy response to EPA General Comment No. 5 above.

2. ***Section 2.3, Ecological Chemicals of Concern, Forth paragraph, Page 2-8:*** *This paragraph discusses the evaluation of lower aquatic trophic level receptors (i.e., aquatic plants, invertebrates, and fish) and upper aquatic trophic level receptors (i.e., great blue heron, belted kingfisher, spotted sandpiper, double-crested cormorant and West Indian manatee) conducted in the SERA and Step 3a. However, the results from the evaluation of the aquatic plants, invertebrates, and fish are not discussed. It is therefore unclear why fish and benthic invertebrates were not further evaluated in the BERA. Please briefly discuss the results of the lower tropic level evaluation in the paragraph.*

**Navy Response:** Estuarine wetland and open water benthic invertebrate and fish communities were not included within the discussion because these receptor groups were eliminated from further evaluation in Step 3a of the Navy ERA process (no ecological COCs were identified for red-tailed hawk dietary exposures). Specific rational justifying the elimination of estuarine wetland and open water fish and benthic invertebrate communities from further consideration in Steps 3b through 7 of the ERA process can be found within the USEPA-approved *Final Additional Data Collection Report and Screening-Level Ecological Risk Assessment and Step 3a of the Baseline Ecological Risk Assessment at SWMUs 1 and 2* (Baker, 2006). However, the fourth paragraph In Section 2.3 will be revised to include text stating that no chemical was identified as an ecological COC for estuarine wetland and open water benthic macroinvertebrate and fish communities. Also, please see the Navy response to EPA General Comment No. 5 above.

3. ***Section 2.5.4, Data Evaluation and Interpretation, Page 2-30:*** *A mean food ingestion rate of 0.00383 kg/day-dry-weight is used in the food web modeling for the American robin. The conversion of this ingestion rate to grams of food per grams of bird per day (g/g-day) equals 0.330 (assuming 85% earthworm moisture content and bird body weight of 77.3g). Comparing this converted value to the food ingestion rates listed in the 1993 USEPA Wildlife Exposures Handbook (EPA/300/R-93/187) shows that the food ingestion rated used in the BERA is much smaller than the 1993 EPA food ingestion rates (0.89 g/g-day and 1.52 g/g-day). The re-calculation of the American robin food web modeling is not necessary since the results of the BERA showed unacceptable risks to the American robin. However, if future soil clean-up goals for the site are back calculated using the American robin food web model, then a more appropriate food ingestion rate will need to be developed.*

**Navy Response:** The Navy offers the following points of clarification relative to this comment. As discussed in Section 2.5.4, the food ingestion rate (FIR) of the American robin varies based on the percentage of invertebrates in the total diet (i.e., FIR decreases as the percentage of invertebrates in the total diet increases [Levey and Karasov, 1989]. This is supported by information contained within Section 2.1.15 of the Wildlife Exposure Factors Handbook (USEPA, 1993) which states that, "*Robins as well as other fruit-eating birds exhibit a low digestive efficiency for fruits; Karasov and Levey (1990) estimated the metabolizing energy coefficient (MCE) (i.e., the proportion of food energy that actually is assimilated) for robins eating a mixed fruit diet to be only 55 percent, perhaps because of the low retention time of the digested matter in the gut (Levey and Karasov, 1992). The short retention time might be an adaptation to eating fruit because large quantities of fruit must be processed to obtain an adequate protein intake.*" The Wildlife Exposure Factors Handbook further states that, "*In contrast, when eating insects, robins (as well as other bird species) exhibit a higher digestive efficiency of approximately 70 percent (Levey and Karoslov, 1989). Moreover, the energy content of insects tends to be higher than that of most fruits, particularly on a wet-weight basis (see Chapter 4). Thus, during the spring when robins are consuming insects, they should consume a smaller amount relative to their body weight than when eating fruit…*" Because the diet of the American robin was assumed to be 90.9 percent earthworms and 9.1 percent soil, the

FIR rate used in the BERA (0.00383 kg/day-dry weight or 0.33 g/g-day) was weighted to reflect the absence of plant material. A review of the food ingestion rates contained within the Wildlife Exposure Factors Handbook (0.89 g/g-day and 1.52 g/g-day [USEPA, 1993]) indicates that values were either measured from robins feeding entirely on fruit (in the case of the FIR reported as 0.89 g/g-day) or from robins feeding mostly on fruit (in the case of the FIR reported as 1.52 g/g-day). Therefore, it is not surprising that the FIRs contained within the Wildlife Exposure Factors Handbook are higher than the FIR used in the BERA. Based on the assumed diet of the American robin, and the information quoted above, the Navy believes that the FIR used in the BERA is an appropriate value based on the assumed diet of the robin. Furthermore, the Navy believes a FIR of 0.00383 kg/day-dry weight is appropriate for the derivation of clean-up goals.

4. ***Section 2.5.4, Data Evaluation and Interpretation, Page 2-30:*** *The last paragraph on this page lists the American robin's exposure diet as 90.9 percent earthworms and 0.091 percent surface soil. It appears that fraction of surface soil should be 9.1 percent instead of 0.091 percent as the total diet should equal 100 percent. Please change the percent surface soil accordingly.*

**Navy Response:** The percent soil in the diet of the American robin will be changed from 0.091 percent to 9.1 percent.

5. ***Section 3.2.2, Earth Worm Toxicity Test, Second paragraph, Page 3-6:*** *The first sentence states, "[e]ach reference area and SWMU 1 surface soil sample was tested using eight replicate chambers, with ten worms per replicate (eight earthworms per sample)." Accordingly, it would appear that the total number of earthworms per sample should be eighty instead of eight. Please correct the number of earthworms tested per surface soil sample.*

**Navy Response:** The total number of earthworms tested per sample will be changed from eight to eighty.

6. ***Section 4.2.2.1.1, Evaluation of Toxicity Test Negative Control and Reference Surface Soil Samples, First paragraph, Page 4-17:*** *The second to the last sentence in this paragraph states, "[a]s evidenced by Table 4-16, control survival was 100 percent in each replicate test chamber." Table 4-16, Correlation Coefficient and Coefficient of Determination Values, is not the appropriate table reference. The reference should be to Table 4-15, Eisenia Fetida Toxicity Test Results and Associated Analytical Data. Please correct the table reference accordingly.*

**Navy Response:** The reference to Table 4-16 will be changed to Table 4-15.

7. ***Section 4.2.4, Turtle Grass Tissue and Co-located Sediment Samples, Bullet 1, Page 4-27:*** *The calculation of the daily intake for the West Indian manatee includes the maximum concentration of a particular chemical in turtle grass. The maximum turtle grass concentrations listed under bullet 1 represents wet weight values. Please revise this bullet to include only dry weight concentrations because these are the appropriate units for the dietary intake equation. The HQ calculations in Table 4-25, Summary of Maximum Hazard Quotient Values for West Indian Manatee Dietary Exposures to Ecological Chemicals of Concern in SWMU 1 Sediment, appear to be based on daily intake values based on dry weight turtle grass concentrations.*

**Navy Response:** The turtle grass concentrations will be changed from wet weight concentrations to dry weight concentrations.

8. ***Section 7.0, Uncertainties, Lines of Evidence, Pages 7-2 and 7-3:*** *The uncertainty analysis could be further strengthened by including a discussion on the uncertainties associated with using American robins as a surrogate for the federally endangered yellow-shouldered black bird. This discussion should address the differences in the diet of these two birds. The yellow-shouldered black bird is an arboreal feeder who consumes mostly insects and spiders, while the American robin is an omnivore feeding mostly on earthworms. Earthworms are at the bottom of the terrestrial invertebrate food chain, whereas insects such as spiders are near the top of the insect food chain. This means that concentrations of bioaccumulating chemicals like 4,4-DDD may be higher in the spiders than the earthworms. Consequently, the potential exists for the yellow-shouldered blackbird to be exposed to higher concentrations of bioaccumulating chemicals than the American robin.*

**Navy Response:** Limited data is available regarding the diet preferences of the yellow-shouldered blackbird; however, available information from the literature indicates that spiders represent a minor contribution to the total diet. Wetmore (1916) analyzed the stomach contents of 55 yellow-shouldered blackbirds at eleven undisclosed locations within Puerto Rico. The stomach content data from this investigation (available at http://fwie.fw.vt.edu/WWW/esis/lists/e104009.htm) show that representatives of the order Arachnida contributed only 7.83 percent by weight to their total diet. This compares to a 35.21 percent by weight contribution by Coleoptera (beetles), a 28.32 percent by weight contribution by Lepidoptera (moths and butterflies), a 9.06 percent by weight contribution by Homoptera (e.g., cicadas and aphids), and a 9.90 percent by weight contribution by plant material. Furthermore, given that yellow-shouldered blackbirds are arboreal, it can be concluded that spiders consumed by yellow-shouldered blackbirds also are arboreal and are not likely to bioaccumulate ecological COCs to the extent that forest litter spiders do. Finally, it is noted that the USEPA (2005) did not consider ecological soil screening level development appropriate for arboreal insectivores (mammals and birds) because they do not forage from terrestrial environments. The stomach content data reported by Wetmore (1916), as well as the exclusion of arboreal avian insectivores from ecological soil screening level development by the USEPA (2005), supports the assertion that the American robin (modeled as a ground insectivore) can be can be protectively used as a surrogate receptor for the yellow-shouldered blackbird.

Although information presented above does not indicate that yellow-shouldered blackbirds are likely to be exposed to higher concentrations of bioaccumulating chemicals than the American robin, Section 7.0 will be revised to include a discussion of the uncertainty associated with use of the American robin as a surrogate for the yellow-shouldered blackbird. The discussion will include the information presented above.

9. ***Table 4-20, Summary of Maximum Hazard Quotients Values for American Robin Dietary Exposures to Copper, Lead and Tin in SWMU 1 and Upland Reference Area No 2 Surface Soil:*** *Table 4-20 summarizes the HQs for the American robin. It is suggested that the Navy add a column to this table titled "Residual Risk" where the reference HQ is subtracted from the SWMU 1 HQ. Those residual risk values above 1.0 should be highlighted to show that the potential risk is site related. It would also be helpful if Table 4-20 was amended accordingly, even though the difference between the site and the reference is discussed in the text.*

**Navy Response:** Table 4-20 will be revised as requested to include a column showing residual risk hazard quotient values.

**References used in Navy responses to EPA comments:**

Baker Environmental, Inc. (Baker). 2007. *Final Steps 3b and 4 of the Baseline Ecological Risk Assessment for SWMUs 1 and 2, Naval Activity Puerto Rico, Ceiba, Puerto Rico*. Coraopolis, Pennsylvania. January 10, 2007.

Baker. 2006. *Final Additional Data Collection Report and Screening-Level Ecological Risk Assessment and Step 3a of the Baseline Ecological Risk Assessment at SWMUs 1 and 2, Naval Activity Puerto Rico, Ceiba, Puerto Rico.* Coraopolis, Pennsylvania. May 18, 2006.

Levey, D.J. and W.H. Karasov. 1989. Digestive Responses of Temperate Birds Switched to Fruit or Insect Diets. *Auk*. 106:675-686.

Wetmore, A. 1916. Birds of Puerto Rico. *U.S. Department of Agriculture Bull*. 326:1-140.

United States Environmental Protection Agency (USEPA). 2005. *Guidance for Developing Ecological Soil Screening Levels*. Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-55.

USEPA. 1993. *Wildlife Exposure Factors Handbook*. Office of Research and Development, Washington, D.C. EPA/600/R-93/187a.

**PREQB GENERAL COMMENTS**

1. *Use of Historical, Upland Soil versus Emergent Wetland Sediment Data. An explanation and look-up table of cumulative data usage from all historical soil/sediment samples of upland and vegetated wetland habitats is needed to clearly identify which subsets of samples were used to calculate soil risks to plants, soil invertebrates, and the American robin. It is not sufficiently clear whether exposures of American robins (and yellow-shouldered blackbirds) were calculated exclusively for terrestrial habitats or if combined foraging risks in uplands and emergent wetlands were estimated. It also is not clear whether: (a) cumulative, historical surface soil data from prior studies, such as those presented in Tables 2-2, 2-3, 2-5 and 2-6, were combined with more recent data such as those in Table 4-11; (b) which historical data from these five tables are included in the data summaries and risk calculations of Tables 4-14, 4-19, and 4-20; and (c) if emergent wetland sediment data are included in these data summaries and risk calculations of Tables 4-14, 4-19, and 4-10. Please provide a table summarizing which datasets were used in the current report and clarify which subsets of terrestrial soil and emergent wetland sediment were used to assess risks to each receptor group.*

**Navy Response:** The Navy offers the following points of clarification relative to this comment. Appropriate sections include text identifying the specific surface soil data sets used in the derivation of risk estimates for terrestrial invertebrate direct contact exposures and American robin dietary exposures. For example, The first sentence in the second paragraph within Section 4.2.1 states that, "*The quick-turn analytical results for the SWMU 1 surface soil samples presented in Table 4-11 were combined with the analytical results for surface soil collected during the 1996 RFI and 2004 additional data collection field investigations (see Table 2-3) into a unified data set*." The third sentence in the second paragraph within Section 4.2.1 also states that, "*The unified data set summarized in Table 4-14 was used to derive risk estimates (i.e., HQ values) for terrestrial invertebrate exposures to ecological COCs in surface soil*." This clearly explains that a unified data set consisting of surface soil samples collected during the 1996 RFI,

2004 additional data collection field investigation, and 2007 BERA field investigation (i.e., data presented in Tables 2-3 and 4-11) were combined into a unified data set, and the unified data set was used to derive risk estimates for terrestrial invertebrate direct contact exposures. With regard to the American robin, the fifth sentence in the third paragraph within Section 4.2.3.1 states that, "*Surface soil concentrations used in the dietary intake equation also were 95 percent UCL of the mean concentrations derived for the data set summarized in Table 4-11 (data set for surface soil samples collected during the 1996 RFI, 2004 additional data collection investigation, and BERA field investigation; see Appendix G*)." Although specified within appropriate sections, a summary of the analytical data used to derive terrestrial invertebrate and American robin risk estimates are summarized below:

- Risk estimates for terrestrial invertebrate direct contact exposures to ecological COCs in SWMU 1 surface soil were derived using a combined data set consisting of surface soil collected during the 1996 RFI, 2004 additional data collection field investigation, and BERA field investigation (i.e., surface soil data presented in Tables 2-3 and 4-11 and summarized in Table 4-14).

- Risk estimates for American robin dietary exposures to ecological COCs in SWMU 1 surface soil (95 percent UCL of the mean HQ values presented in Tables 4-19 and maximum HQ values presented in Table 4-20) were derived using (1) a combined data set consisting of surface soil collected during the 1996 RFI, 2004 additional data collection field investigation, and BERA field investigation (i.e., surface soil data presented in Tables 2-3 and 4-11 and summarized in Table 4-14), and (2) earthworm tissue data presented in Table 4-17.

- Risk estimates for American robin dietary exposures to ecological COCs in reference area surface soil (maximum HQ values presented in Table 4-20) were derived using the reference area surface soil analytical data presented in Table 4-12 and the earthworm tissue analytical data presented in Table 4-18.

The combined surface soil data set used in the derivation of American robin dietary exposures does not include sediment analytical data collected from obvious wetland habitat [i.e., black and red mangrove communities]. All available analytical data for estuarine wetland sediment samples were previously evaluated in Steps 1 through Step3a of the ERA process using a unique list of receptors/receptor groups (benthic invertebrates, fish, aquatic plants, spotted sandpiper, belted kingfisher, and great blue heron (Baker, 2006). As no unacceptable risks were indicated by the Step 3a evaluation, these data were not subjected to additional evaluation in the BERA, nor were additional estuarine wetland sediment samples collected during the BERA field investigation. It is acknowledged, that some samples collected during the 1996 RFI, 2004 additional data collection field investigation, and BERA field investigation and evaluated as surface soil were likely collected at locations containing white mangroves. Samples collected from white mangrove communities cannot be specifically identified since descriptions of surrounding vegetation were not recorded in field note books during sampling activities. However, all samples evaluated as surface soil in The BERA (see Tables 2-3 and 4-11) were collected from locations that lacked saturated soils, fiddler crab burrows, and pneumatophores (characteristic of black mangroves).

Some confusion may exist regarding three samples collected during the 1996 RFI and designated 1SD01, 1SD02, and 1SD03. As evidenced by the footnote within Table 2 of the draft report, these three samples were re-designated as surface soil based on observations made in the field during the 2003 additional data collection investigation. Although re-designated and evaluated as surface soil, the sample identification numbers assigned to these samples during the 1996 RFI

were not changed. As discussed in the Navy Response to PREQB Page-Specific Comment No. 1 below, the text in Section 2.3 will be revised to indicate that these three samples were evaluated as surface soil throughout the ERA process at SWMU 1.

2. *Total Organic Carbon (TOC) Adjustments of Soil Benchmarks for DDT Compounds. The DDD, DDE and DDT soil benchmark criteria used to calculate hazard quotients (HQs) for invertebrates were based on an assumed TOC content of 2 percent, but all 6 surface soil samples included in Table 4-1 had TOC concentrations ranging from 2.5 to 5.9 percent. Please recalculate soil invertebrates' hazard quotients (HQs) using the site-specific data for all soil samples. Also, please use sample-specific soil TOC data for the subset of toxicity testing soil samples to further evaluate statistical correlations between these "TOC-normalized" HQs and observed toxicity test results, to help clarify the soil toxicity drivers.*

**Navy Response:** The soil screening value for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT (401 µg/kg) will be adjusted using site-specific TOC data. The adjusted soil screening value will be used to revise the 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT HQ values presented in Table 4-14 and discussed within Section 4.2.1. For additional information on the methodology used to adjust the soil screening value using site-specific TOC data, please see the Navy response to PREQB Page-Specific Comment No. 16.

With regard to the portion of this comment requesting the use of sample-specific soil TOC data for the subset of toxicity testing soil samples to further evaluate statistical correlations between TOC normalized HQs and observed toxicity test results, the Navy respectfully disagrees that this analysis is necessary and offers the following points of clarification. The statistical evaluations performed on the earthworm survival and growth (i.e., weight loss) data included pair-wise linear regressions, as well as a variable selection routine (All Possible Regressions analysis) followed by a multiple regression analysis. The linear regression analysis indicated that TOC and pH had a significant influence on both earthworm responses. The variable selection routine and multiple regression analysis was performed to further evaluate the relationship between surface soil TOC, pH, and ecological COC concentrations (including 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT) in surface soil and earthworm responses in the toxicity tests (i.e., survival and growth). As such, the potential influence that TOC has on ecological COC toxicity (including 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT) and earthworm responses in the toxicity tests was evaluated by the statistical methods employed. The method requested by the comment above represents a variation of the method presented within the draft report and would not change the conclusions of the analysis.

A simple analysis using the earthworm growth data can show that inclusion of sample-specific soil screening values within the variable selection routine would not change the conclusions of the analysis. As discussed in Section 4.2.2.2, the variable selection routine and multiple regression analysis performed on the growth data indicated that mercury, zinc, and TOC had a significant influence on earthworm growth. An evaluation that included sample-specific soil screening values for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT would not result in their identification as "soil toxicity drivers". As evidenced by Table 4-15, earthworms in four SWMU 1 surface soil samples showed a significant increase in weight loss relative to weight loss by earthworms in reference area surface soil sample 1B-REF-SS03. In three of these samples (1B-SS09, 1B-SS29, and 1B-SS39), 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT concentrations are less than the soil screening value derived using sample-specific TOC concentrations (704 µg/kg for 1B-SS09, 854 µg/kg for 1B-SS29, and 213 µg/kg for 1B-SS39). The sum of the 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT concentrations in these three samples (92 µg/kg in 1B-SS09, 367 µg/kg in 1B-SS29, and 195 µg/kg in 1B-SS39) also are less than sample specific screening values. Earthworm weight

loss in seven SWMU 1 surface soil samples (1B-SS19, 1B-SS33, 1B-SS37, 1B-SS46, 1B-SS48, 1B-SS49, and 1B-SS50) was not significantly greater than weight loss by earthworms in any reference area surface soil samples even though 4,4'-DDD, 4,4'-DDE, and/or 4,4'-DDT concentrations in each sample exceed sample-specific screening values. This analysis clearly demonstrates that inclusion of sample-specific soil screening values as an additional independent variable within the variable selection routine would not influence the results of the analysis presented within the draft report. In summary, the potential influence that TOC has on ecological COC toxicity and earthworm responses in the toxicity tests was evaluated by the statistical methods employed. The method requested by the comment above simply represents a variation of the method presented within the draft report and, if employed, would not influence the analysis.

**PREQB PAGE-SPECIFIC COMMENTS**

1. *Section 2, Table 2-2. Although Table 2-2 identifies historical surface soil, estuarine sediment, and open water sediment samples collected during the SLERA and Step 3A of the BERA, it is not clear if the emergent estuarine wetland sediment samples were combined with upland surface soil samples when calculating exposures and risks to plants, soil invertebrates, and the American robin in the current report. Please add text to clarify how emergent wetland soil and sediment data were used.*

**Navy Response:** The Navy offers the following points of clarification relative to this comment. Table 2-2 provides a summary of the analytical data used to conduct Steps 1 through 3a of the ERA process. As discussed in the response to PREQB General Comment No. 1 above, all available analytical data for samples collected from the estuarine wetland (black and red mangrove communities) were evaluated as sediment in Steps 1 through 3a using the following receptor/receptor group: benthic invertebrates, fish, aquatic plants, avian invertebrate consumers (i.e., spotted sandpiper), and avian piscivores (i.e., belted kingfisher and great blue heron). Because unacceptable risks were not indicated by the Step 3a evaluation, estuarine wetland sediment analytical data were not evaluated in the BERA, nor were additional estuarine wetland sediment samples collected during the BERA field investigation. As no estuarine wetland sediment data are presented within the draft report, and data used to assess terrestrial invertebrate direct contact exposures and American robin dietary exposures are clearly referred to as surface soil data throughout the report, the Navy believes that it is sufficiently clear that only surface soil data was use to derive risk estimates in the current report.

Three samples collected during the 1996 RFI and identified as sediment (i.e., 1SD01 through 1SD03) were re-designated and evaluated as surface soil in the SERA and Step 3a of the BERA (Baker, 2006) based on observations made in the field during the 2003 additional data collection investigation (i.e., they were collected from vegetated swales containing upland vegetation). Although re-designated and evaluated as surface soil, the sample identification numbers assigned to these samples during the 1996 RFI were not changed. This information is contained in a foot note included within Table 2-2 of the draft document. However, to clarify that these three sediment samples were re-designated and evaluated as surface soil throughout the ERA process at SWMU 1, the text in Section 2.3 will be revised to include the information presented above.

2. *Section 2, Tables 2-8 & 2-9, Ingestion-Based Screening Values. Most ingestion-based screening values used to calculate manatee risks were the same toxicity reference values (TRVs) used by USEPA to derive the Eco-SSLs for mammals (e.g., arsenic, cadmium, copper, and selenium). Although the correct values were used for these avian and mammalian TRVs, the footnotes in these tables do not fully reflect the basis for the*

*USEPA's selection/use of TRVs when deriving EcoSSLs for arsenic (birds), cadmium (birds), copper (birds and mammals), DDT compounds (birds and mammals), lead (birds), and selenium (mammals). Please add the following footnote for each of these TRVs to Tables 2-8 and 2-9, as well as the text clarifications about TRVs for these COCs: "These TRVs chosen by USEPA for use in developing EcoSSLs were the highest bounded NOAELs that are lower than the lowest bounded LOAELs for each receptor group."*

**Navy Response:** Tables 2-8 and 2-9, as well as the text within appropriate sections, will be revised as requested.

3. *Section 2, Tables 2-8 & 2-9, Ingestion-Based Screening Values. Please explain why Table 2-9 presents a lower mammalian reproductive NOAEL of 8.23 mg/kg BW/day (reported for pigs) for use in the manatee risk calculation for zinc rather than the geometric mean (GM) for mammalian reproduction and growth NOAELs of 75.4 mg/kg BW/day used by USEPA (2007) to derive the Eco-SSL for zinc. Please also discuss the uncertainties and implications of using this lower zinc TRV for the BERA conclusions and risk management decisions for the manatee.*

   **Navy Response:** The NOAEL used by the USEPA to derive the mammalian Eco-SSL for zinc (75.4 mg/kg-BW/day) was derived by calculating the geometric mean of literature-based NOAEL values for growth and reproduction endpoints (USEPA, 2007). Ingestion-based HQ values for the West Indian manatee were calculated by dividing maximum dietary intakes by literature-based toxicity reference values adjusted to reflect differences in body weights between mammalian test species and the West Indian manatee. Because the TRV used by the USEPA to derive a mammalian ecological SSL for zinc is a geometric mean of NOAEL values from several studies that used different test species, an adjustment to reflect differences in body weights between the test species and the West Indian manatee could not be performed. Therefore, a chronic NOAEL and LOAEL value based on a single test species was identified from the list of studies used by the USEPA to develop the mammalian ecological SSL for zinc. The value selected (8.23 mg/kg-BW/day) represents the minimum NOAEL for reproduction cited by the USEPA (2007). It is noted that Section 2.4.1.9 includes the rational presented above for using a mammalian reproductive NOAEL of 8.23 mg/kg-BW/day for TRV development.

   The uncertainty associated with using the more conservative NOAEL value is the likely overstatement of potential risks to the West Indian manatee. However, as evidenced by Table 4-25 of the draft document, use of the more conservative HQ value did not result in the calculation of an unacceptable risk estimate (HQ is less than 1.0 [0.25]). Therefore use of the more conservative NOAEL value had no impact on BERA conclusions, nor would it be expected to have any impact on risk management decisions.

4. *Page 2-5, Section 2.2.3.2. The second paragraph, the scientific name for the magnolia warbler should be corrected to dendroica magnolia.*

**Navy Response:** The scientific name for the magnolia warbler will be corrected.

5. *Page 2-6, Section 2.2.3.3. The first paragraph when discussing the distribution of the Golden Coqui, the area of collection should be corrected to Cayey instead of Cayeye.*

**Navy Response:** The spelling of Cayey will be corrected.

6. *<u>Page 2-8, Section 2.3, Ecological Chemicals of Concern.</u> The last paragraph on page 2-8 states that "The SERA and Step 3a of the BERA also evaluated lower trophic level aquatic receptor group and upper trophic level receptor exposures to chemicals in SWMU 1 estuarine wetland and Ensenada surface water and sediment." However, the subsequent text does not summarize the Step 3a results and conclusions for plants, invertebrates, and fish exposed to sediment and surface water COCs. Please add text to summarize these results, which presumably will clarify why no sediment and surface water risks were calculated in the current report for lower trophic level receptors in the aquatic and estuarine wetland habitats of SWMU 1.*

**Navy Response:** Please see the Navy response to PREQB Page-Specific Comment No. 13. As specified within the referenced response, the text in Section 2-8 will be revised and supplemented with additional tables to clarify why certain chemical-pathway-receptor combinations were not subjected to additional evaluation in the BERA.

7. *<u>Page 2-11, Section 2.4.1.3.</u> The first paragraph identified the valence state of Cadmium $Cd^{+2}$ as trivalent the text should be corrected to divalent.*

**Navy Response:** Section 2.4.1.3 will be revised to show the correct valence state for $Cd^{+2}$.

8. *<u>Page 2-13, Section 2.4.1.4.</u> The last paragraph of this section on page 2-13 erroneously states that "A 4-week survival and growth study using the pig (Sus scrofa) indicated that a dose of <u>4.05</u> mg/kg-BW/day (oral in diet) had no effect on survival and body weight change (Allcroft et al., 1961 as cited in USEPA, 2007a)." The correct mammalian TRV cited from Allcroft et al. and used by USEPA is 5.6 mg/kg BW/day, as correctly cited in Table 2-9. This erroneous value appears to be carried over from the corresponding sentence in the previous paragraph about the avian TRV used by USEPA, correctly cited there as 4.05 mg/kg-BW/day. Please correct this value in the text and also clarify that it was chosen by USEPA as the avian TRV because it is "equal to the highest bounded NOAEL below the lowest bounded LOAEL for reproduction, growth, or survival."*

**Navy Response:** Section 2.4.1.4 will be revised to show the correct NOAEL value. The text within this section also will be revised to clarify why the NOAEL value of 5.6 mg/kg-BW/day was selected by the USEPA as the TRV for mammalian ecological soil screening level development.

9. *<u>Pages 2-19, 2-30, and 4-21, Sections 2.4.1.8, 2.5.4 and 4.2.3.1 and Table 2-8</u>. The last paragraph in Section 2.4.1.8 states "Tin in SWMU 1 surface soil has the potential to impact terrestrial plants and invertebrates. A single toxicological benchmark was identified from the literature (50 mg/kg [toxicological benchmark for plants]; Efroymson et al., 1997a)." However, potential avian exposures to tin via earthworm ingestion are discussed in the 3rd bullet on page 2-30 [and in Section 3.2.3 Earthworm Tissue on page 3-6]: "Although antimony, copper, and tin were not identified as ecological COCs for terrestrial avian omnivore food web exposures in Step 3a of the ERA process (Baker, 2006a and 2007), dietary intakes also were estimated for these three metals using earthworm tissue concentrations (see Section 3.2.2) since maximum soil concentrations for these three metals were detected in surface soil collected during the BERA field investigation." Table 2-8 presents an avian TRV for tin and Table 4-19 indicated potential avian risk from exposures to tin. Section 4.2.3.1 stated: "As evidenced by the table, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, copper, lead, and tin NOAEL-based HQ values using 95 percent UCL of the mean surface soil and earthworm tissue concentrations are greater than 1.0." Please revise the discussion of Section 2.4.1.8 and other text sections,*

*as needed, to clarify that tin was identified and evaluated as a COC for American robin dietary exposures.*

**Navy Response:** The Navy offers the following points of clarification relative to this comment. As discussed in Section 2.4.1, the conceptual model for SWMU 1, including the evaluation of the toxicity of the chemicals presented in Sections 2.4.1.1 through 2.4.1.10, focuses on the contaminant-receptor combinations where the potential for unacceptable risk was identified in Step 3a of the BERA (Baker, 2006). Because tin was not identified as an ecological COC for terrestrial avian omnivore dietary exposures in Step 3a of the BERA, the discussion presented in Section 2.4.1.8 does not include a toxicity evaluation for terrestrial avian dietary exposures to tin in SWMU 1 surface soil. Even though tin was not identified as an ecological COC in Step 3a of the BERA, this metal was evaluated for terrestrial avian omnivore dietary exposures in the Draft Steps 6 and 7 Report because the maximum concentration in SWMU 1 surface soil was detected in a surface soil sample collected during Step 6 of the BERA (i.e., BERA field investigation). By evaluating tin for terrestrial omnivore food web exposures, the uncertainty associated with the analytical data used in the Step 3a evaluation was addressed (a conclusion of acceptable risk was based on existing data that did not include the current maximum concentration).

10. *<u>Page 2-9, Section 2.4, Conceptual Model and Figure 2-13.</u> The conceptual model for wildlife exposures via food ingestion pathways excludes exposure pathways for birds foraging within the estuarine, emergent wetland habitats for which historical surface soil/sediment data are available (e.g., data in Table 2-3 from the 1996 RFI). Please: (a) verify that wetland soil/sediment data were not used in the BERA; (b) if not used, explain why the wetland was not included as part of the American robin's foraging area; and (c) discuss the potential for additional increments of site-related risk to occur to populations of robins and other birds from wetland foraging, both here and in the risk characterization and uncertainty sections of the BERA.*

**Navy Response:** Navy responses to items a through c are presented below.

(a) Estuarine wetland analytical data for estuarine wetland sediment collected from black and red mangrove communities were not evaluated in the BERA. These data were evaluated in Steps 1 through 3a of the ERA process using the following receptor/receptor group: benthic invertebrates, fish, aquatic plants, avian invertebrate consumers (spotted sandpiper), and avian piscivores (belted kingfisher and great blue heron). As unacceptable risks were not indicated by the Step 3a evaluation, estuarine wetland sediment analytical data were not evaluated in the BERA.

(b) Terrestrial avian insectivores, such as American robins, are not expected to forage at locations containing saturated soils (i.e., black mangrove communities) or at locations with standing water (such as those that exist in red mangrove communities). Therefore, analytical data for samples collected from black and red mangrove communities were not included in the evaluation of American robin dietary exposures. Instead, these analytical data were evaluated in Steps 1 through 3a of the ERA process using the receptors identified within the Navy's response to Item a above. In addition, please see the Navy response to PREQB General Comment No. 1.

(c) The Navy does not believe it is necessary to conduct the requested analysis since the estuarine wetland analytical data were previously evaluated in Steps 1 through 3a of the ERA process using a list of avian receptors likely to forage within this habitat (i.e., spotted sandpiper, belted kingfisher, and great blue heron). As the Step 3a evaluation did not identify

any unacceptable risks to these avian receptors, the Navy does not believe additional evaluation of these data in the BERA is necessary.

11. *<u>Page 2-29, Section 2.5.4, Data Evaluation and Interpretation – Use of Total Organic Carbon Data.</u> It is stated on page 2-29 that benchmark criteria, such as the mean of the Dutch target and intervention values for pesticides were applied "assuming a default organic carbon content of 0.02 (2.0 percent) (MHSPE, 2000)." However, as noted in General Comment 3, the actual mean TOC concentrations measured in SWMU 1 and reference soils [mean of 3.63% in Table 4-1] should have been used to adjust the surface soil benchmark criteria before calculating HQs for soil invertebrates. Using TOC-adjusted soil HQs also provides valuable context when evaluating the earthworm toxicity test results and may further clarify the extent to which DDD, DDE, and/or DDT were drivers of the observed earthworm toxicity. Because the regressions performed did indicate a strong influence of TOC on the toxicity test results, the soil benchmark criteria for these COCs should be adjusted using site average TOC content for these media and the site-wide HQs should be revised. Soil HQs based on TOC-adjusted criteria for DDD, DDE and DDT also should be calculated for the earthworm toxicity test samples and then used in a supplemental statistical analysis of correlations between these TOC-adjusted HQs and the toxicity test results.*

**Navy Response:** Please see the Navy response to PREQB General Comment No. 2.

12. *<u>Section 3, Table 3-5, SWMU 1 and Upland Reference Area No. 2 Sampling and Analytical Program.</u> This table does not indicate which soil samples were collected from terrestrial versus emergent wetland habitats but at least 3 soil samples (coded as SD in Table 2-3) had been collected from the estuarine wetland during the RFI. Please add comments and/or footnotes to Table 3-5 to indicate for each SWMU 1 and Reference Area surface soil sample: (a) whether it was collected from a terrestrial or emergent wetland habitat; and (b) the type of plant community from which it was sampled (e.g., upland meadow, red mangrove wetland, black/white mangrove community). Please refer to these habitat data when adding report text to clarify the use of analytical data from upland versus wetland samples in the exposure assessments for each of the ecological receptor groups, as requested in General Comment 1 and Specific Comments 1 and 4.*

**Navy Response:** Please see the Navy Response to PREQB General Comment No. 1 and PREQB Page-Specific Comment Nos. 1 and 10.

13. *<u>Pages 3-1 to 3-4, Section 3.1 Verification of BERA Field Sampling Design & Figure 3-1 – Lack of Reference Wetland.</u> Although media samples were analyzed for terrestrial and open water (marine) reference habitats, there is no discussion of a reference habitat sampling and analysis program in emergent, estuarine wetland reference habitats similar to those that were sampled for sediment and surface water between SWMU 1 and Ensenada Honda. Please: (a) explain why reference wetlands were not sampled; (b) present any available sediment and surface water analytical data for potential estuarine reference wetlands that have not been impacted by SWMU 1 or other NAPR facilities and activities; and (c) discuss the SWMU 1 BERA results for estuarine emergent wetlands within the context of information on background risks within such potential reference wetland habitats.*

**Navy Response:** The Navy offers the following points of clarification relative to this comment. As evidenced by Table 2-3, estuarine wetland surface water and sediment data were collected during the 2003 and 2004 additional data collection field investigations. These data were

evaluated in the Final Additional Data Collection Report and Screening-Level Ecological Risk Assessment and Step 3a of the Baseline Ecological Risk Assessment at SWMUs 1 and 2 (Baker, 2006). The evaluation included screening-level and refined risk calculations for plant, invertebrate, and fish communities, avian invertebrate consumers, and avian piscivores, as well as and statistical comparisons to background concentrations. No unacceptable risks were indicated for any of the receptor/receptor groups. Therefore, the BERA did not include a sampling program or evaluation of the estuarine wetland system. The commenter is referred to the above referenced document for the estuarine wetland analytical data used in Steps 2 and 3a of the ERA, as well as the specific evaluations that resulted in a conclusion of no unacceptable risks.

To assist reviewers, Section 2.3 will be revised to include a table listing the assessment endpoints, risk questions, and measurement endpoints selected for the screening-level ERA and Step 3a of the BERA, as well as a table listing each receptor/receptor group evaluated and the chemicals, if any, identified as ecological COCs. The text in Section 2.3 also will be revised to make clearer the specific chemical-receptor combinations subjected to additional evaluation in Steps 3b through 7 of the BERA.

14. *Page 3-4, Section 3.2, BERA Field Investigation and Section 4.2.3, Earthworm Tissue. The text on page 3-4 states that "earthworm and seagrass tissue analytical data were used in place of modeled tissue concentrations to estimate dietary intakes for American robin and West Indian manatee food web exposures, respectively." However, using only COC concentrations measured in earthworm samples to calculate American robin exposures fails to incorporate all available surface soil analytical data from prior investigations. Only 14 of the 23 to 37 surface soil samples in Tables 2-5 & 2-6 (14 of 69 to 89 soil samples in Table 4-14) were used for the earthworm uptake study. The average COC concentrations detected in a small, spatially-limited subset of earthworm tissue samples, thus, may not be representative of average tissue burdens ingested by robins throughout the SWMU-affected portions of their foraging areas. Analytical data for the paired samples of soils-earthworms should be used to calculate average bioaccumulation factors (BAFs) or derive site-specific uptake regressions for the paired datasets. Those BAFs/regressions then should be applied to the average COC concentrations measured in sediments and surface soils of all affected habitats to estimate an average, site-wide food concentration. At a minimum, please: (a) apply this alternative method to derive a second set of dietary doses and risk calculations for robins to provide additional context and insight for evaluating potential risks and discussing related uncertainties regarding COC bioaccumulation and exposure; or (b) document that the range and average COC concentrations in the surface soil samples used in the earthworm toxicity/uptake studies are representative of the soil COC concentrations exhibited among all historical samples throughout SWMU 1.*

**Navy Response:** The Navy offers the following points of clarification relative to this comment. The soil removal action recommended in Section 6.2 as part of the interim corrective measure (ICM) will address unacceptable risks to terrestrial avian omnivores from exposures to 4'4,-DDD, 4,4'-DDE, 4,4'-DDT, copper, lead, and tin in surface soil. Locations subjected to soil removal actions will be identified by deriving clean-up goals using the procedures discussed in the comment above. Specifically, BAF values will be derived for paired surface soil-earthworm tissue data sets. The individual BAF values will be used to derive 95 percent upper confidence limit (UCL) of the mean BAF values. Finally, the 95 percent UCL of the mean BAF values will be used in conjunction with the food web model presented in Section 4.2.3.1 to derive surface soil concentrations that result in a NOAEL-based HQ value of 1.0 for each chemical. These surface soil concentrations will represent clean-up goals for the ICM. Therefore, all available surface soil data for 4'4,-DDD, 4,4'-DDE, 4,4'-DDT, copper, lead, and tin will be considered by the ICM.

The BERA concluded that four metals (antimony, cadmium, mercury, and zinc) are not bioaccumulating in SWMU 1 surface soil at concentrations that would impact terrestrial avian omnivore populations. The arithmetic mean concentration of these four metals in SWMU 1 surface soil tested for toxicity (40.6 mg/kg for antimony, 6.1 mg/kg for cadmium, 0.58 mg/kg for mercury, and 1,499 mg/kg for zinc) exceed their average concentration in all samples collected at SWMU 1 (14.1 mg/kg for antimony, 3.6 for cadmium, 0.25 mg/kg for mercury, and 585 mg/kg for zinc; see Table 4-14). With the exception of cadmium, samples submitted for toxicity testing also included known maximum concentrations (220 mg/kg for antimony, 5.7 mg/kg for mercury, and 5,410 mg/kg for zinc). The known maximum cadmium concentration was detected in a surface soil sample collected during the 1996 RFI (83.8 mg/kg in 1SS07; see Table 2-3). This concentration could not be duplicated or exceeded by the BERA surface soil samples collected at or contiguous to the historical location (i.e., 1BSS36 through 1B-SS40; see Table 4-11). However, the next three highest known concentrations were detected in surface soil samples submitted for toxicity (25 mg/kg, 18 mg/kg, and 15 mg/kg). The location of the maximum cadmium concentration (1SS07) also will be subjected to a soil removal during the ICM to address the elevated lead concentration detected in BERA surface soil sample collected at this location (1B-SS36).

Because the method identified in the comment above will be used to derive clean-up goals to address terrestrial avian omnivore dietary exposures to 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT, copper, lead, and tin in SWMU 1 surface soil during the ICM, the Navy does not believe additional evaluation of these six chemicals is necessary. The Navy also does not believe additional evaluation of antimony, cadmium, mercury, and zinc are necessary based on (1) their arithmetic mean and/or maximum concentration in surface soil submitted for toxicity testing (arithmetic means in surface soil submitted for toxicity testing exceed arithmetic means in all samples collected at SWMU 1; in the case of antimony, mercury, and zinc, known maximum concentrations were detected in surface soil submitted for toxicity testing), and/or (2) their co-location with ecological COCs at sample points that will be subjected to the ICM soil removal action.

15. *<u>Pages 4-9 to 4-10, Section 4.1.2.3, Comparison of Analytical Data to Screening Values.</u> Tables embedded on pages 4-9 and 4-10 comparing maximum sediment concentrations in Reference Areas No. 1 and 2 to marine sediment criteria incorrectly cite the TEL for arsenic from MacDonald et al. (1994) as 7.4 mg/kg. Please correct the arsenic sediment TEL as 7.24 mg/kg in all relevant tables.*

**Navy Response:** The embedded tables will be revised to show the correct TEL value for arsenic

16. *<u>Pages 4-10 to 4-12, Section 4.2.1, Quick-Turn Surface Soil Samples, and Table 4-14.</u> As noted in General Comment 2, site-specific TOC concentrations should have been used to calculate TOC-adjusted soil benchmark criteria for DDD, DDE and DDT before calculating soil HQs for these pesticides in Table 4-14. Please revise both the soil criteria used and resultant HQ calculations for these COCs in Table 4-14 using all available soil TOC data (e.g., 9 samples in Table 3-5).*

**Navy Response:** The default soil screening value for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT (401 µg/kg) will be adjusted to reflect the site-specific TOC content of SWMU 1 surface soil using the following formula (MHSPE, 2000):

$$\text{Screening Value}_a = (\text{Screening Value}_d)(\text{TOC}/10)$$

where:

| | | |
|---|---|---|
| Screening $\text{Value}_a$ | = | Adjusted soil screening value (µg/kg) |
| Screening $\text{Value}_d$ | = | Default soil screening value (µg/kg) |
| TOC | = | Site-specific total organic carbon (percent) |

The site-specific total organic carbon value used to adjust the default soil screening values will represent the average percent organic carbon content for twenty surface soil samples collected during verification of the field sampling design (six surface soil samples; see Tables 3-1 and 4-1) and BERA field investigation (fourteen surface soil samples; see Tables 3-5 and 4-15). These twenty surface soil samples represent all SWMU 1 surface soil samples that have been analyzed for TOC. The adjusted screening value will then be used to revise the 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT risk estimates presented in Table 4-14. The text in Section 4.2.1 also will be revised to include the methodology used to derive the site-specific screening value. Finally, the text in sections referencing HQ values within Table 4-14 also will be revised to reflect the new HQ values.

17. *<u>Page 4-18, Sections 4.2.2.1.2, Survival and 4.2.2.1.3, Weight Loss.</u> These discussions of the survival and weight loss effects observed during the earthworm toxicity testing include conclusions that may be premature, stating "The analytical data indicate that some physical and/or chemical parameter other than ecological COC concentrations may be responsible for or influencing the observed biological response." However, subsequent discussions of statistical correlations among the test results in Section 4.2.2.2 demonstrate that "earthworm survival increased" and "weight loss decreased as soil TOC concentrations increased." Because the toxicity of organic COCs such as DDD, DDE and DDT often is a function of TOC concentration, the role of these pesticides as drivers of the observed toxicity cannot be ruled out unless a lack of significant correlation exists between reduced worm weight/survival and the TOC-normalized soil invertebrate HQs for these COCs. Please: (a) perform supplemental correlation analyses among the test results and HQs revised for DDD, DDE and DDT using soil criteria adjusted for sample-specific TOC, as requested in prior comments; and (b) modify these discussions and conclusions regarding potential drivers of earthworm toxicity.*

**Navy Response:** Please see the Navy Response to PREQB General Comment No. 2.

18. *<u>Page 4-18, Section 4.2.2.1.4.</u> The last sentence of this section concludes that "The absence of a significant reduction in earthworm reproduction in each SWMU 1 surface soil sample relative to each reference area surface soil sample is a line of evidence supporting minimal risk on this test endpoint." Although the site versus reference sample differences may not be statistically significant, it is qualitatively noteworthy that earthworm reproduction occurred in only 3 of the 14 site-derived soil samples, whereas it was observed in all of the control and reference soil samples. Please add text here to acknowledge this aspect of the results and also discuss this observation in Sections 5.0, 6.0 and 7.0 as an uncertainty in the interpretation of these reproductive effects results.*

**Navy Response:** Text will be added to Sections 4.2.2.1.4, 5.1.2, 6.1, and 7.0 acknowledging that reproduction did not occur in three of fourteen SWMU 1 soil samples, whereas reproduction was observed in each reference sample. Although this acknowledgement will be added to the text, the Navy believes that the conclusions of the statistical evaluations are correct. Mean reproduction by earthworms in each reference area surface soil sample was extremely low, ranging from 0.038 to 0.065 juveniles/cocoons per surviving earthworm. Furthermore, for a given reference area

surface soil sample, the number of replicates with evidence of reproduction was low (ranging from 20 percent to 40 percent). Given these facts, it is not surprising that the statistical evaluations performed by the toxicity testing laboratory did not detect a significant decrease in reproduction in SWMU 1 surface soil relative to reproduction in reference area surface soil.

19. *Pages 4-18 to 4-19, Section 4.2.2.2. Because only upland surface soil was used in the earthworm toxicity testing, please revise the subheading for this section by replacing "Sediment" with "Soil." The same edit is needed at the end of the first sentence of the second paragraph on page 4-19, to replace "sediments" with "soils."*

**Navy Response:** The heading for Section 4.2.2.2 and the first sentence in the second paragraph of Section 4.2.2.2 will be revised to reflect the actual material (i.e., surface soil) tested for toxicity using *Eisenia fetida*.

20. *Page 4-21, Section 4.2.2.2. The last paragraph of this section, at the top of page 4-21, concludes appropriately that "the lack of a dose-response relationship in the data paired with the significant pair wise and multiple regression results suggest that the bioavailability and toxicity of the ecological COCs are being influenced by TOC." It also is stated that "this modifying factor, as well as other factors...., prevent the establishment of a clear relationship between individual ecological COC concentrations in surface soil and earthworm responses in the toxicity tests." However, as noted in prior comments, this latter conclusion may be premature for DDD, DDE and/or DDT, since the possible role of these pesticides as drivers of the observed toxicity to earthworms cannot be ruled out without further evaluating potential correlations between the test results and revised HQs for these COCs that are based on site-specific, TOC-adjusted soil benchmark criteria.*

**Navy Response:** Please see the Navy response to PREQB General Comment No. 2.

21. *Table 4-20. Dietary HQs for the American robin are missing for DDD, DDE and DDT from Table 4-20. Although it is clear from the text that these COCs were not detected in the reference area soils, please add entries for these robin HQs and the NDs to Table 4-20 so that it contains complete HQ comparisons.*

**Navy Response:** Table 4-20 will be revised to show HQ values for American robin dietary exposures to 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT in SWMU 1 and Upland Reference Area No. 2 surface soil. The text in Section 4.2.3.2 also will be revised to include maximum surface soil and earthworm tissue concentrations used in the derivation of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT HQ values.

22. *Pages 5-1 to 5-2, Section 5.1.2 Comparison of SWMU 1 and Reference Area Surface Soil Toxicity Test Results. The final sentence in the first paragraph of this section states that "Statistical evaluations performed on the reproduction data (number of juveniles and cocoons per surviving earthworm in each replicate at test termination) indicated that reproduction in SWMU 1 surface soil was not significantly lower relative to reproduction in the reference area surface soil samples." However, the test results also suggest that site-derived COCs may have reduced reproduction in earthworms, since earthworm reproduction occurred in only 3 of the 14 site samples. Please add this qualitative observation to the discussion and acknowledge that it represents an uncertainty in the test results that should not be overlooked simply because of a lack of statistical significance in the site vs. reference samples. Please conduct a statistical analysis of the reproductive results versus site-specific TOC-normalized HQs for DDD, DDE and DDT*

*to further clarify if the lack of reproduction is correlated with concentrations of these COCs.*

**Navy Response:** the Navy partially agrees with this comment. As indicated in the Navy response to PREQB page-Specific Comment No. 18, text will be added to Sections 5.1.2, 6.1, and 7.0 acknowledging that reproduction did not occur in three of fourteen SWMU 1 soil samples, whereas reproduction was observed in each reference sample. However, the Navy does not believe that a statistical analysis of the reproduction data versus site-specific TOC-normalized HQs for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT is necessary. Identical to the evaluation of the earthworm growth data presented in the Navy's response to PREQB General Comment No. 2, it can be shown that 4,4'-DDD, 4,4'-DDE, and/or 4,4'-DDT are not responsible for the observed earthworm response. Pesticide concentrations in five surface soil samples lacking earthworm reproduction (1B-SS09, 1B-SS13, 1B-SS29, 1B-SS39, and 1B-SS51) are less than sample-specific soil screening values (704 µg/kg for 1B-SS09, 1,907 µg/kg for 1B-SS13, 854 µg/kg for 1B-SS29, 213 µg/kg for 1B-SS39, and 846 µg/kg for 1B-SS51). Furthermore, the 4,4'-DDE concentration in the SWMU 1 surface soil sample with the highest recorded reproduction (600 µg/kg in 1B-SS37) exceeds the sample-specific soil screening value of 547 µg/kg, while the 4,4'-DDE and 4,4'-DDT concentration in the SWMU 1 surface soil sample with the second highest recorded reproduction (0.067 juveniles/cocoons per surviving earthworm) also exceed the sample-specific soil screening value of 862 µg/kg. These data do not indicate that 4,4'-DDD, 4,4'-DDE, and/or 4,4'-DDT are responsible for the observed response. As discussed in the Navy's response to PREQB Page-Specific Comment No. 18, mean reproduction by earthworms in each reference area surface soil sample was extremely low, ranging from 0.038 to 0.065 juveniles/cocoons per surviving earthworm. Furthermore, for a given reference area surface soil sample, the number of replicates with evidence of reproduction was low (ranging from 20 percent to 40 percent). Given these facts, it is not surprising that the statistical evaluations performed by the toxicity testing laboratory did not detect a significant decrease in reproduction in SWMU 1 surface soil relative to reproduction in reference area surface soil.

23. *<u>Page 5-3, Section 5.1.3, Evidence of a Significant Correlation between Laboratory Toxicity Test Results and the Chemical/Physical Characteristics of Surface Soil.</u> As noted in prior comments, the first sentence in the second paragraph of this section may have prematurely concluded that "none of the ecological COCs had a significant influence on earthworm survival and weight loss per surviving earthworm." Please modify this discussion as needed after evaluating the potential correlations among the test results and the revised DDD, DDE and DDT HQs incorporating site-specific TOC-adjusted criteria.*

**Navy Response:** Please see the Navy response to PREQB General Comment No. 18.

24. *<u>Page 6-1, Section 6.1, Conclusions.</u> The third sentence of the second paragraph on page 6-1 states that "The statistical evaluations performed by the testing laboratory indicated that earthworm reproduction (juvenile and cocoon production per surviving earthworm) in SWMU 1 surface soil was not significantly lower than reproduction in each reference area surface soil." As requested in prior comments about similar statements in other report sections, please follow this sentence with an acknowledgement that earthworm reproduction occurred in only 3 of the 14 site samples, which could indicate an adverse site-related effect of one or more COCs on earthworm reproduction. Please also acknowledge that this uncertainty in the interpretation of test results that should not be overlooked simply because of a lack of statistical significance in the site vs. reference samples.*

**Navy Response:** Please see the Navy response to PREQB General Comment No. 18.

**References used in Navy responses to PREQB comments:**

Baker Environmental, Inc. (Baker). 2006. *Final Additional Data Collection Report and Screening-Level Ecological Risk Assessment and Step 3a of the Baseline Ecological Risk Assessment at SWMUs 1 and 2, Naval Activity Puerto Rico, Ceiba, Puerto Rico.* Coraopolis, Pennsylvania. May 18, 2006.

Ministry of Housing, Spatial Planning and Environment (MHSPE). 2000. *Circular on Target Values and Intervention Values for Soil Remediation*. Directorate-General for Environmental Protection, Department of Soil Protection, The Hague, Netherlands. February 4, 2000.

U.S. Environmental Protection Agency (USEPA). 2007c. *Ecological Soil Screening Levels for Zinc (Interim Final)*. Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-73. June 2007.