



DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE INDIANA 47522 5001

N00164.AR 000908
NSWC CRANE
5090.3a
IN REPLY REFER TO
5090/S4.7.1
Ser RP3/4334
3 NOV 2001

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Corrective Action Section
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center submits the final report for the Dye Burial Ground, Solid Waste Management Unit (SWMU) 02, RCRA Facility Investigation (RFI). Enclosure (1) contains responses to comments as well as change pages with instructions. The permit required Certification Statement is provided as enclosure (2).

If you require any further information, my point of contact is Mr. Thomas J. Brent, Code RP3-TB, at 812-854-6160, email thomas.brent@navy.mil.

Sincerely,

JAMES M. HUNSICKER
Manager, Environmental Protection
By direction of the Commanding Officer

Enclosures: 1. Final SWMU 02 RFI
2. Certification Statement

Copy to:
ADMINISTRATIVE RECORD
SOUTHNAVFACENGCOM (Code ES31) (w/o encl)
IDEM (Doug Griffin)
TTNUS (Ralph Basinski) (w/o encl)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Christina D. Freeman, for
SIGNATURE

Manager, Environmental Protection
TITLE

11/9/04
DATE

5090
Ser RP3/4334

3 Nov 2004

The letter Ser RP3/4334 was for the Final RFI Report for the Dye Burial Ground SWMU 02. Updated pages added to report dated 7/10/023.

**SWMU 2 RESPONSES TO EPA COMMENTS DATED MARCH 19, 2004 AND
RESPONSES TO COMMENTS ON OTHER ISSUES RELATED TO
NSWC CRANE ECOLOGICAL RISK ASSESSMENTS**

BACKGROUND

The Navy prepared ecological risk assessments (ERAs) for NSWC Crane SWMUs 1, 2, 3, 4, 5, 9, and 10 and submitted them to US EPA Region 5 for review. US EPA Region 5 reviewed the risk assessments and provided initial comments on several of the ERAs. The US EPA then provided further comments on the ERAs. These more recent comments were transmitted to the Navy via e-mail on March 19, 2004 by Peter Ramanauskas. The following statements were contained in the e-mail.

"Attached please find an electronic copy of our comments on Crane's ecological risk assessments. These comments were generated by looking at SWMU 3 as the example case, but apply to the eco risk assessments done at the other SWMUs (1, 2, 4, 5, 9, 10) and those assessments should be revisited to make any corrections needed. Some comments specific to certain SWMUs are provided at the end of the document.

I will presume that we will be getting on a conference call at some point after you have had a chance to review these comments. At that time, I would like to revisit the topic of PBT upper trophic level dose modeling at the SWMUs and the Navy's rationale for not modeling."

US EPA's comments of March 19, 2004 consisted of 5 general comments, 29 comments specific to SWMU 3 (Jeep Trail / Little Sulphur Creek), and 2 comments specific to SWMU 2 (Dye Burial Grounds). These comments were discussed in a meeting and various conference calls with EPA Region 5. A list of the teleconferences is provided below:

- April 1, 2004 conference call with the Navy, US EPA, and TtNUS
- June 9, 2004 technical meeting with the Navy, TtNUS, US EPA, and IDEM.
- July 8, 2004 conference call with TtNUS and US EPA
- July 15, 2004 conference call with TtNUS and US EPA
- July 23, 2004 conference call with TtNUS and US EPA
- September 9, 2004 conference call with the Navy, TtNUS, US EPA

During the course of the meeting and conference call various other issues were identified. Based on the teleconferences identified above, the Navy consolidated the original comments specific to SWMUs 2 and 3 from March 19 into a consolidated and renumbered set of comments. Added to these renumbered comments were additional issues that were raised during the teleconferences and during other communications among Navy and US EPA representatives. *These renumbered comments represent all outstanding US EPA comments concern ERAs conducted to date at NSWC Crane, including the ERA for SWMU 2.* Table 1 depicts the renumbering of the original March 19 US EPA comments and it includes the additional issues that were raised in the teleconferences but were not included in the original March 19 US EPA comments.

The revised general responses to the March 19, 2004 comments and other issues that were raised by US EPA are provided in a separate document that was mailed to US EPA on August 16, 2004. That general responses document also includes a description of a revised ERA process that will be used for future ERAs but is not applicable to the SWMU 2 RFI. US EPA's comments on the August 16, 2004 submittal were resolved in a conference call that was held

among the Navy, TtNUS, and EPA Region 5 on September 9, 2004. This document reflects the resolution of all issues identified by EPA.

This Response to Comments (RTC) document addresses all unresolved March 19 comments and additional issues tabulated in Table 1. The comments are divided, below, into three sections – five General Comments, 26 Specific Comments, and 2 Dye Burial Ground Specific Comments. Each section of comments begins with the number 1. In several cases, the comments were subdivided (e.g., 1a, 1b, 1c, 1d, and 1e) to facilitate the generation and tracking of responses. Comments appear in **bold** text and responses appear in regular text. Text that has been incorporated word for word into the revised SWMU 2 ERA is presented in italicized text. In addition, a revised section 7 (the ERA) for the SWMU 2 RFI report is being submitted separately with other RFI report change pages. *It will be necessary to have a copy of the revised Section 7.0 available when reviewing the responses below because several responses refer to the revised Section 7.0.*

GENERAL COMMENTS FROM EPA'S 3/19/04 E-MAIL

1a. Comment: The use of alternate benchmarks for ecological risk needs to be based on a chronic no observed adverse effect level (NOAEL) threshold (see Section 1.3.1 of the 1997 ERA Guidance, EPA 540-R-97-006) for the most sensitive receptor likely to be exposed to contaminants at the site.

Response: The Navy agrees that screening levels for ecological risk assessment (ERA) need to be based on NOAELs for the most sensitive receptor likely to be exposed to contaminants at the site for the purposes of chemicals of potential concern (COPC) selection. For that reason, only Region 5 Ecological Data Quality Levels (EDQLs) were used as the screening levels to select COPCs (i.e., see Section 7.4 of the SWMU 2 RFI report). The alternate benchmarks were only used in Step 3a to further evaluate the chemicals that were retained as COPCs for specific endpoints, not the most sensitive endpoint. For example, an alternate benchmark based on risks to plants was used to evaluate risks to plants in Step 3a. However, regardless of the risks to plants, that chemical was evaluated to determine risks to invertebrates (if toxicity data were available) and/or mammals/birds (if the chemical was bioaccumulative). Also, as agreed to in the July 23, 2004 and September 9, 2004 conference calls, alternate benchmarks based on lowest observable adverse effects levels (LOAELs) can be evaluated in Step 3a as long as the effects of the benchmark are clearly discussed.

For the SWMU 2 ERA, additional explanations of the alternate benchmarks are provided in the revised Sections 7.6.1.1 and 7.6.1.2 of the SWMU 2 RFI report.

1b. Comment: A clarification statement must be made if the alternate benchmarks do not represent a chronic NOAEL for the most sensitive receptor or are being applied to flag serious (i.e., acute) ecological problems needing immediate action (e.g., interim measures) and the intended use is clear with respect to risk management.

Response: In many cases alternate benchmarks used to further evaluate potential risks from COPCs do not represent chronic NOAELs. As agreed to in the July 23, 2004 and September 9, 2004 conference calls, alternate benchmarks based on lowest observable adverse effects levels (LOAELs) can be evaluated in Step 3a as long as the effects of the benchmark are clearly discussed. The Navy agrees to explain the basis of the alternate benchmarks so their intended use with respect to risk management in the ERA is clear.

For the SWMU 2 ERA, additional explanations of the alternate benchmarks are provided in the revised Sections 7.6.1.1 and 7.6.1.2 of the SWMU 2 RFI report.

1c. Comment: Any alternate benchmark needs to provide supporting information that it will be protective of the most sensitive receptor and explain how it will refine conservative assumptions (as stated in the Navy Policy for Conducting Ecological Risk Assessments).

Response: The Navy does not agree that alternate benchmarks need to be protective of the most sensitive receptor because alternate benchmarks are developed for particular receptor groups, which are not necessarily the most sensitive receptor group. The alternate benchmarks were only used in Step 3a to further evaluate potential risks to specific receptor groups (i.e., plants, invertebrates) from the chemicals that were retained as COPCs. See above response to comment 1b.

No changes were made to the SWMU 2 RFI report ERA to address this comment.

1d. Comment: After reviewing the Navy Policy for Conducting Ecological Risk Assessments and revisiting the work plan for SWMU #3, no discussion is provided on developing an alternate benchmark that would deviate from a chronic no adverse effect level (NOAEL).

Response: Alternate benchmarks used in Step 3a were discussed in QAPPs and ERAs for the existing SWMUs (i.e., see Section 9.2.3 of the approved WP for SWMU 2). As agreed to in the July 23, 2004 and September 9, 2004 conference calls, alternate benchmarks based on LOAELs can be used in Step 3a as long as the effects of the benchmark are clearly discussed.

For the SWMU 2 ERA, the explanations of the alternate benchmarks are provided in the revised Sections 7.6.1.1 and 7.6.1.2 for the SWMU 2 RFI report.

1e. Comment: For some chemicals, alternate benchmarks are appropriate when metal toxicity in surface water is controlled by water hardness and site water hardness is greater than 50 ppm. Likewise, sediment benchmarks that are developed using an equilibrium partitioning (EqP) equation (see footnote "s" in the Region 5, RCRA Ecological Screening Levels table) may be adjusted if site sediment data shows total organic carbon (TOC) is greater than one percent. Also a specific State water quality Criteria or Tier II value may be applied, as appropriate, for the site.

Response: The Navy agrees that hardness and TOC can be used to adjust alternate benchmarks, as appropriate, and also that Tier II values may be appropriate for sites.

It was not necessary to use hardness or TOC to adjust the screening values at SWMU 2. Also, it was not necessary to use Tier II values for the SWMU 2 ERA.

No changes were made to the SWMU 2 RFI report ERA to address this comment.

2. Comment: Screening ecological risk benchmarks will be based on toxicity. Therefore, background soil data will not be used as an alternate benchmark. Specifically, the OSWER policy (Role of Background in the CERCLA Cleanup Program, April 26, 2002, OSWER 9285.6-07P) recommends that constituents that exceed risk-based screening concentrations be retained and addressed in the risk characterization. This OSWER policy is available at: <http://www.epa.gov/superfund/programs/risk/tooltrad.htm> and the above recommendation is found in the section on Consideration of Background in Risk Assessment.

Response: The Navy agrees that site-specific background soil data should not be used as an alternate benchmark. The soil background data was used to select chemicals as COPCs as was presented in the approved QAPPs. However, as discussed in the June 9, 2004 technical meeting at Crane, the Navy agreed that background will not be used to select chemicals as COPCs in future ERAs at Crane. In future ERAs, chemicals that were detected at concentrations greater than the screening levels but below background will be qualitatively discussed as the first part of the Step 3a evaluation. During the July 23, 2004 conference call, it was agreed that for the reports that have already been completed which used background to select COPCs, the Navy would just need to add a statement to the executive summary (ES) and the ERA to indicate that background was used to select the COPCs, however based on current US EPA and Navy guidance, background will not be used to select COPCs in future ERAs.

Background data was discussed in Step 3a of the SWMU 2 ERA (Sections 7.6.1.1, 7.6.1.2, and 7.6.1.3) to indicate that a chemical was retained as a COPC because it was detected at concentrations that exceeded the screening level and background concentrations. The background soil data was also discussed for a few chemicals to indicate that the screening levels were well below background concentrations or to show that the chemical concentrations in the site samples were only slightly greater than background. This was not done to indicate that there were no risks, only that there may be no site-related risks.

The background data used in the SWMU 2 Step 3a discussions include the base wide soil background data set and upgradient surface water and sediment samples.

The following text was added to the revised SWMU 2 RFI report to address this comment:

- Executive Summary, page ES-3, end of ERA section: *“As presented in Tables 7-1, 7-2, and 7-3 several chemicals were eliminated as COPCs because they were not detected at concentrations greater than background concentrations. For soil, these chemicals included aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, iron, lead, manganese, nickel, selenium, vanadium, and zinc. For sediment, these chemicals included aluminum, antimony, arsenic, beryllium, cadmium, chromium, iron, lead, nickel, selenium and vanadium. Manganese was eliminated as a COPC for surface water because site concentrations did not exceed background concentrations. Therefore, risks to these chemicals were not evaluated in the ERA, however, any risks would be within background risks and not related to site activities. Note that the use of background concentrations to select chemicals as COPCs was done in accordance with the approved work plan for SWMU 2. However, based on current U.S. EPA and Navy guidance, background will not be used to select chemicals as COPCs for future ERAs at NSWC Crane.”*
- Section 7.6.1.1, end of first paragraph: *“As presented in Table 7-1 several chemicals were eliminated as COPCs because they were not detected at concentrations greater than background concentrations. For soil, these chemicals included aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, iron, lead, manganese, nickel, selenium, vanadium, and zinc. Therefore, risks to these chemicals were not evaluated in the ERA, however, any risks would be within background risks and not related to site activities.”*
- Section 7.6.1.2, end of first paragraph: *“As presented in Table 7-2, several chemicals were eliminated as COPCs because they were not detected at concentrations greater than background concentrations. For sediment, these chemicals included aluminum, antimony, arsenic, beryllium, cadmium, chromium, iron, lead, nickel, selenium, and vanadium. Risks to these chemicals were not evaluated in the ERA, however, any risks would be within background risks and not related to site activities.”*
- Section 7.6.1.3, end of first paragraph: *“As presented in Table 7-3, manganese was eliminated as a COPC because it was not detected at concentrations greater than background concentrations. Risk to manganese was not evaluated in the ERA, however, any risks would be within background risks and not related to site activities.”*

3a. Comment: Supporting information is needed to justify how "Magnitude of criterion exceedance" and "Frequency of chemical detection" can be used to determine there is no need for further site evaluation and/or chemical toxicity is of no concern.

Response: The "magnitude of exceedance" and the "frequency of detection" were used to select chemicals as COPCs because even if a chemical was detected in one sample at a concentration that slightly exceeded a screening level it was still retained as a COPC. The "magnitude of exceedance" and the "frequency of detection" were used qualitatively to determine if it is likely that the chemical is causing a risk to ecological receptors. For example, if a chemical concentration in one sample is just slightly greater than a no effects level it is unlikely that the chemical is causing significant risks. Also, if a chemical is detected at relatively low concentrations in 1 of 15 samples (and not detected in the other samples), it is also unlikely that the chemical is causing a significant risk. Therefore, these two factors are applied using professional judgment, in consideration of the following factors (as examples):

- Number of samples that had chemical concentrations that were greater than an EDQL (or other benchmark/toxicity data)
- Area represented by samples that had chemical concentrations that were greater than an EDQL (or other benchmark/toxicity data)
- Is the EDQL (or other benchmark/toxicity data) a no-effects level or a low-effects level
- Chemical concentrations compared to detection limit
- Heterogeneity of chemicals across the site

During the September 9, 2004 conference call, it was agreed that the Navy would provide the rationale for using "magnitude of exceedance" and "frequency of detection" in the Step 3a evaluation, where appropriate, which could then be reviewed and commented on by US EPA. However, frequency of detection alone would not be used to eliminate chemicals as COPCs. The context must be presented (FOD, area represented by samples, magnitude of exceedances, number of samples, etc.).

The use of "magnitude of exceedance" and the "frequency of detection" was not necessary in the SWMU 2 Step 3a evaluation.

No changes were made to the SWMU 2 RFI report ERA to address this comment.

3b. Comment: If this is a procedure to address hot spots, the risk assessment will still need to delineate the area where the chemical concentration exceeds the chronic NOAEL for the most sensitive receptor.

Response: The procedure can be used to address hot spots, but it can also be used to show that the potential for risks are low, as discussed above. The Navy provides chemical tag maps that present the chemical concentrations at each sample location that exceed a screening level. For the SWMU 2 RFI report, the tag maps are provided in Section 4.0.

No changes were made to the SWMU 2 ERA to address this comment.

4. Comment: State what method(s) will be employed to determine metal bioavailability along with site specific field measurements that are being used (or reference a section of the report where this is discussed).

Response: The following method was used to evaluate metal bioavailability as part of SWMU 2 ERA for Crane:

- The form of the chemical that was used to conduct the toxicity tests that serve as the basis for the criteria may be discussed. For example, many of the toxicity tests used to develop

screening levels for metals use highly bioavailable forms of the metal, such as metal salts, which in many cases are much more toxic than equivalent concentrations of the metals in field collected soils¹.

See revised Section 7.6.1.1 (for copper) of the SWMU 2 RFI report ERA for how bioavailability was qualitatively discussed in the SWMU 2 ERA.

5a. Comment: Only the maximum concentration (see Section 1.2.2 and Step2 of the 1997 ERA Guidance, EPA 540-R-97-006) will be compared against the Region 5, RCRA ESLs to screen COPCs.

Response: Only the maximum concentrations were compared against the Region 5, RCRA EDQLs to select chemicals as COPCs in the existing ERAs [note the ESLs will be used for screening in future ERAs] (i.e., see Section 7.3 of the SWMU 2 RFI report).

No changes were made to the SWMU 2 RFI report ERA to address this comment.

5b. Comment: If used, alternate benchmarks need to be based on a chronic NOAEL for the most sensitive receptor likely to be present.

Response: As agreed to in the July 23, 2004 and September 9, 2004 conference calls, alternate benchmarks based on LOAELs can be evaluated in Step 3a as long as the effects of the benchmark are clearly discussed.

To address this comment, the basis of the alternate benchmarks was provided in revised Sections 7.6.1.1 and 7.6.1.2 of the SWMU 2 RFI report ERA so their intended use with respect to risk management in the ERA is clear.

5c. Comment: Supporting information is needed to justify how an average concentration will apply to the most sensitive receptor likely. Average concentrations can be applied following Step 3a when a conceptual model, assessment endpoints, exposure areas and sampling frequency are clearly defined.

Response: Average concentrations were used in Step 3a for a few chemicals. As discussed in the July 23, 2004 and September 9, 2004 conference calls, average concentrations can be used as long as it is made clear how the average concentrations relate to the exposure area for the receptors that are being protected. When average concentrations are used, the conceptual model, assessment endpoints, exposure areas and sampling frequency will be clearly defined.

The use of average concentrations in the SWMU 2 Step 3a evaluation was not necessary.

No changes were made to the SMWU 2 RFI ERA to address this comment.

¹ Allen, Herbert E. 2002. Bioavailability of Metals in Terrestrial Ecosystems: Importance of Partitioning for Bioavailability to Invertebrates, Microbes, and Plants. Society of Environmental Toxicology and Chemistry.

GENERAL ISSUES FROM SPECIFIC COMMENTS IN EPA'S 3/19/04 E-MAIL, 6/19/04 MEETING, AND VARIOUS TELECONFERENCES

1. Comment: For chemicals that are known to be persistent bio-accumulative toxic chemicals, an earthworm is not an adequately sensitive receptor.

Response: The Navy agrees that for chemicals that are known to be persistent bio-accumulative toxic chemicals, an earthworm is likely not the most sensitive receptor, but the section of the report referenced by this comment was the Step 3a evaluation of risks to plants and invertebrates. The Step 3a evaluation of risks to wildlife was presented in a later section of the ERA and bioaccumulative chemicals are included in that evaluation.

Section 7.6 of the SWMU 2 ERA has been revised and now clearly presents the process followed when conducting the ERA to indicate that bioaccumulative chemicals in soil are evaluated both for risks to plants and invertebrates and also for risks to wildlife. See revised Section 7.6.2 of the SWMU 2 RFI report for the evaluation of bioaccumulative chemicals that were carried through the food chain model.

2. Comment: The Dutch "Indicative Levels" shows that plant and animal life is seriously impaired (i.e., 50% of the species experience negative effects) and does not represent a screening benchmark (i.e., chronic NOAEL) as described in general comment number one.

Response: As agreed to in the June 9, 2004 technical meeting, the Dutch numbers will not be used in the ERAs and all discussions related to the Dutch numbers will be removed from the existing ERAs. The only exceptions would be in a few instances when the ecological basis of the numbers can be justified; the justification will be included in the ERA.

References to the Dutch numbers for copper were deleted from the SWMU 2 RFI report ERA.

3. Comment: The Canadian Soil Quality Guidelines does not clearly state that a Residential/Parkland value is a chronic NOAEL intended to protect sensitive receptors (see general comment # 1).

Response: Information regarding the toxicological bases for the Canadian Soil Quality Guideline (SQG) is now presented in Section 7.6.1.1 of the SWMU 2 RFI report ERA for copper.

4. Concerns with the Canadian protocol include the following:

a. not intended to protect all wild plants and animals as noted in the land use definition "parkland is defined as a buffer zone between areas of residency and campground areas and excludes wild lands such as national or provincial parks"

Response: The agricultural Canadian SQG indicates that the values must protect resident and transitory wildlife and native flora. The residential/parkland SQG indicates that like the agricultural land use, the values must ensure that the soil is capable of sustaining soil-dependent species and does not adversely affect wildlife from direct soil contact. Because the soil contact SQGs (based on protecting plants and invertebrates) are the same for the agricultural and residential/parkland land uses, they are designed to protect native flora. Regarding the protection of animals (i.e., mammals and birds), as indicated in response to Comment 4c, the Navy is not using the Canadian SQG to evaluate animals.

No changes were made to the SWMU 2 RFI report ERA to address this comment.

b. **the guideline uses a lowest observed effect concentration (LOEC) rather than a NOAEL. note, the “no potential effects range” (NPER) benchmark uses a LOEC**

Response: The Canadian SQGs use various uncertainty factors to approximate no effects levels, or low levels of potential effects. As discussed above, the toxicological basis for the Canadian SQGs is now presented in the ERAs when they are used.

The toxicological basis for the Canadian SQGs was added to Section 7.6.1.1 of the SWMU 2 RFI report ERA for copper.

c. **food web exposure to insectivores (e.g., shrew or robin) does not appear to be incorporated into the guideline. The Canadian soil value for naphthalene needs more documentation.**

Response: Food web exposure to insectivores (e.g., shrew or robin) is not incorporated into the Canadian SQG, but the SQGs were not used by the Navy to evaluate risks to food chain receptors in the ERAs. The SQGs were only used to evaluate risks to plants and invertebrates.

Naphthalene was not a COPC in soil for the SWMU 2 ERA.

No changes were made to the SWMU 2 RFI report ERA to address this comment.

5. **Comment: The recently released U.S. EPA report, Ecological Soil Screening Level (Eco-SSL) for the following chemicals will replace the Region 5, RCRA ESL and needs to be used as the soil screening benchmark: aluminum, antimony, barium, beryllium, cadmium, cobalt, iron, lead, and dieldrin.**

Response: The Navy agrees to use the US EPA Eco SSLs when selecting chemicals as COPCs in soil in future ERAs. The Eco SSLs will be discussed in Step 3a of the existing ERAs as agreed to in the July 23, 2004 conference call.

There is no Eco-SSL for copper, the only chemical retained as a COPC in surface soil at SWMU 2; therefore, no changes were made to the SWMU 2 RFI report ERA to address this comment.

6 **Comment: The ORNL benchmarks are not chronic NOAELs and do not represent the most sensitive receptor (see general comment # 1).**

Response: As presented in the response to comment No. 1, the ORNL benchmarks were not used as screening values to select chemicals as COPCs. The ORNL benchmarks were only used in Step 3a to further evaluate risks to plants and invertebrates. Therefore, they do not need to be chronic NOAELs or represent the most sensitive receptors. Also, as presented in the response to comment No. 1, the basis of the alternate benchmarks will be presented in the ERA so that its intended use with respect to risk management is described.

During the September 9, 2004 conference call, it was agreed that alternate benchmarks, which are effects levels for plants and invertebrates could be used as NOAELs, for purposes of COPC screening, if they correspond to an effect of 20 percent or less on the receptor population. The basis for the benchmark would have to be clearly presented. This is based on the fact that the US EPA Ecological Soil Screening Levels for plants and invertebrates are based on geometric means of effects concentrations (EC)_{20s}, EC_{10s}, and/or Maximum Acceptable Toxicant Concentrations. Chemical concentrations that are below these values will be eliminated as COPCs. Because a 20 percent reduction in growth or yield (for plants) and 20 percent reduction in growth, reproduction, or activity (for earthworms), were used as the threshold for significant effects for the ORNL benchmarks, chemical concentrations that are less than the ORNL benchmarks will be eliminated as COPCs for that receptor.

The toxicological basis for the ORNL benchmarks was added to Section 7.6.1.1 of the SWMU 2 RFI report ERA for copper.

7 Comment: Eco-SSLs for several chemicals are in development and will replace the Region 5, RCRA ESL. When available the Eco-SSLs need to be used as the soil screening benchmark.

Response: The Navy will use the Eco-SSLs for selecting chemicals as COPCs for future ERAs when they are available and when the ERA is prepared.

No changes were made to the SWMU 2 RFI report ERA based on this comment.

8 Comment: The chemical values in the report "Preliminary Remediation Goals (PRG) for Ecological Endpoints" (ORNL ES/ER/TM-162/R2 August 1997) are not intended to be used for screening, but are thresholds for significant adverse effects.

Response: The Navy agrees that PRGs are not intended for screening, but as stated in the referenced PRG document, "PRGs are intended to correspond to minimal and acceptable levels of effects on the general ecological assessment endpoints as defined in the data quality objectives (DQO) process for ecological risk assessments on the Oak Ridge Reservation (Suter et al. 1994). In general, they correspond to small effects on individual organisms which would be expected to cause minimal effects on populations and communities." Therefore, concentrations below the PRGs are not expected to cause significant adverse effects.

No changes were made to the SWMU 2 RFI report ERA based on this comment.

9 Comment: The "effects range – low" (ERL) value is not an alternate benchmark for a chronic NOAEL, but it is a higher toxicity gradient than the threshold effects level (TEL) used in the EPA Region 5 ESL table. The ERL is the lower 10th percentile concentration of sediment toxicity data and a value where toxicity can be expected. The TEL (not the ERL as stated in the report) is the concentration below which adverse effects are expected rarely.

Response: The Navy agrees that the ER-L is not a chronic NOAEL, but neither is the TEL that is used in the US EPA Region 5 ESL table. As cited in the Consensus-Based Sediment Quality Guidelines article by MacDonald et al., (2000), the ER-L "represents the chemical concentration below which adverse effects would rarely be expected." This definition is similar to that provided for the TEL which "represents the concentration below which adverse effects are expected to occur only rarely" (MacDonald et al., 2000). Also, note that the TEC value (i.e., not toxic), which is used as the revised Region 5 RCRA ESL, incorporates the Ontario lowest effect level (LEL), TEL and ER-L values.

As indicated by US EPA in the July 23, 2004 conference call, although the TEC is more of a LOAEL than a NOAEL, it is acceptable for screening because US EPA is trying to protect benthic invertebrate communities, not populations. Therefore, the values can be greater than no-effects levels.

The toxicological basis of the LEL for manganese is discussed in Section 7.6.1.2 of the SWMU 2 RFI report ERA.

10 Comment: Likewise, the "effects range – median" will represent the 50th percentile of sediment toxicity data and "upper effects threshold" values will be a concentration where adverse impacts would always be expected.

Response: As presented in the consensus article (MacDonald et al., 2000); the ER-M “represents the chemical concentration above which adverse effects would frequently occur.” Therefore, the Navy does not agree that the ER-M is the chemical concentration above which adverse impacts would always occur. As discussed and agreed to by US EPA in the June 9, 2004 technical meeting, the Navy will present one lower effects level and one higher effects level (such as the PEC) to show the range of the effects levels because the lower effects levels and higher effects levels provide probabilities of effect. The Navy will clearly present the basis of those values in the ERAs (where used) and how they were used in the ERA.

The toxicological basis of the SEL for manganese is discussed in Section 7.6.1.2 of the SWMU 2 RFI report ERA.

11 Comment: The screen is a pass-fail process.

Response: The Navy agrees that the screen is a pass-fail process. However, the section of the SWMU 3 RFI report that the comment references (Section 8.6.1.2) is not the screening step. The COPC screens were conducted in earlier sections of the RFI reports (i.e., Section 7.3 for SWMU 2).

No changes were made to the SWMU 2 RFI report ERA based on this comment.

12 Comment: Sediment toxicity needs to be limited to freshwater species with reported chronic NOAELs. The LOEC and NOEC values for TNT, based on marine and estuarine organisms, are not acceptable as alternate benchmarks.

Response: Although freshwater toxicity data/benchmarks are preferred for evaluating risks to organisms in freshwater, marine benchmarks are often used as surrogates for chemicals that do not have freshwater toxicity data/benchmarks. As stated by US EPA in the September 9, 2004 conference call, Chris Ingersoll from USGS indicated that although saltwater species are less sensitive to some chemicals than are freshwater species, it is acceptable to use saltwater sediment values for chemicals that do not have freshwater values. US EPA therefore agreed that saltwater values could be used as long as the uncertainties are discussed in the ERA.

This comment is not applicable to the SWMU 2 ERA. No saltwater sediment values were used for the SWMU 2 ERA.

No changes were made to the SWMU 2 RFI report ERA based on this comment.

The Navy agrees that the freshwater value cited in the text for TNT in Steevens et. al. (2002²) is not a valid value based on the information presented by USEPA during the September 9, 2004 conference call. See response to Comment No. 24 in this attachment for information regarding the toxicity of TNT to sediment organisms.

This comment is not applicable to the SWMU 2 ERA. TNT was not detected in the sediment at SWMU 2.

No changes were made to the SWMU 2 RFI report ERA based on this comment.

² Steevens, Jeffrey A., B.M. Duke, G.R. Lotufo, and T.S. Bridges, 2002. “Toxicity of the Explosives 2,4,6-Trinitrotoluene, Hexahydro-1,3,5-Trinitro-1,3,5-Triazine, and Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine in Sediments to *Chironomus tentans* and *Hyallela azteca*: Low-Dose Hormesis and High-Dose Mortality” in *Environmental Toxicology and Chemistry*. 21:7:1475-1482.

13 Comment: The “probable effects concentration” (PEL) represents a level where adverse effects are frequently expected and is not an alternate benchmark for a chronic NOAEL. The lack of information on the toxicity (i.e., chronic NOAEL) for a chemical needs to result in a decision to continue with the ecological risk assessment process, Steps 3 through 7 (see Section 2.5 of the 1997 ERA Guidance, EPA 540-R-97-006).

Response: As discussed in the June 9, 2004 technical meeting, for chemicals where the only toxicity data available is a higher effects level, it was agreed to carry the chemical through the ERA but it would not be quantitatively evaluated. It was noted during the meeting that this approach was acceptable because usually if there is a problem at the site, it would be caused by other chemicals that have toxicity data.

Barium was the only chemical retained as a COPC in sediment before the Step 3a evaluation that only had a higher effects level (i.e., the AET), but did not have a lower effects level. However, barium was not retained as a COPC after the Step 3a evaluation for other reasons as presented in Section 7.6.1.2 of the SWMU 2 RFI report ERA.

No changes were made to the SWMU 2 RFI report ERA based on this comment.

14 Comment: The “effects range-low” (ER-L) for antimony represent the lower range of sediment toxicity (see specific comment #16) and the “effects range-median” (ER-M) is the median value of sediment toxicity. Neither the ER-L nor the ER-M is alternate benchmarks for a chronic NOAEL.

Response: Navy agrees that neither the ER-L nor ER-M are chronic NOAELs, but neither is the TEL that is used in the US EPA Region 5 ESL table. As indicated by US EPA in the July 23, 2004 and September 9, 2004 conference calls, LOAELs are acceptable for screening benchmarks for sediment invertebrates because US EPA is trying to protect benthic invertebrate communities, not populations. Therefore, the values can be greater than no-effects levels.

No changes were made to the SMWU 2 RFI report ERA to address this comment.

15 Comment: The “apparent effect thresholds” (AETs) were not developed to evaluate ecological risk and they represent a level where adverse biological impacts are always expected and adverse impacts are also known to occur at levels below the AET.

Response: The Navy agrees that the AET represents a level where adverse biological impacts are always expected and adverse impacts are also known to occur at levels below the AET.

No changes were made to the SWMU 2 RFI report ERA to address this comment.

16 Comment: The lack of information on the toxicity (i.e., chronic NOAEL) of chemicals result in a decision to continue with the ecological risk assessment process, Steps 3 through 7 (see Section 2.5 of the 1997 ERA Guidance, EPA 540-R-97-006).

Response: The Navy agrees to carry a chemical through the ERA if there is no toxicity data for that chemical, unless other factors in Step 3a (i.e., frequency of detection) are used to eliminate it from further evaluation. However, the Navy does not agree that chemicals with only higher effects levels need to be evaluated in Steps 3 through 7 of the ERA process. Steps 3 through 7 are the BERA and typically include the collection of site-specific biological data (i.e., toxicity tests, biological surveys, etc.). Therefore, a site should not proceed to a BERA just because a chemical is lacking toxicity data. During the September 9, 2004 conference call, it was agreed that the information contained in Step 3a is consistent with the information presented in other ERAs that

US EPA has reviewed and the Navy can continue to conduct the further risk evaluation in Step 3a.

Toxicological data was lacking for barium in the sediment. However, barium was not recommended for further evaluation after Step 3a based on other factors as discussed in Section 7.6.1.2 for the SWMU 2 RFI report.

No changes were made to the sections based on this comment although changes were made to Sections 7.6.1.2 based on other comments.

17 Comment: It was not clear that the Step 3a evaluation was designed to eliminate chemicals as COPCs for certain groups of receptors and that chemicals that are screened out for one receptor group would still be evaluated for other receptor groups.

Response: The Navy agreed to add text to the beginning of the Step 3a evaluation to indicate the evaluation will consist of screening out chemicals for the various receptor groups, starting with plants/invertebrates, aquatic receptors, and ending with wildlife.

Several pages of text were added to the beginning of Section 7.6 of the SWMU 2 RFI report to explain the ERA process that was followed at the SWMU 2.

18 Comment: The ERA should indicate the State designated water uses for the water bodies at Crane and if there are any threatened, endangered, or special concern species in the water bodies just off-site of Crane (i.e., outside the base boundaries)?

Response: The ERAs will present the recognized water uses as regulated by the State of Indiana and will determine if there may be threatened, endangered, or special concern species in the water bodies just off-site of Crane (i.e., outside the base boundaries).

The SWMU 2 RFI report ERA now presents the recognized water uses as regulated by the State of Indiana and now discusses threatened, endangered, or special concern species in the water bodies just off-site of Crane (i.e., outside the base boundaries).

The following text was added to the end of Section 1.4.7.2 to address the comment regarding the state designated water uses:

"The Sulphur Creek-Little Sulphur Creek waterbody segment designated state water uses are aquatic life support, fish consumption, and primary contact. This waterbody segment was assessed as part of the 2004 Indiana Integrated Water Quality Monitoring and Assessment Report to determine if the waterbody was supporting those uses (IDEM, 2004). The Sulphur Creek-Little Sulphur Creek waterbody segment is fully supporting the aquatic life support and primary contact water uses; it was not assessed for the fish consumption water use (IDEM, 2004)."

The following text was added to the end of Section 1.4.7.2, as "Threatened and Endangered Species", to address the comment regarding if there are any threatened, endangered, or special concern species in the water bodies just off-site of Crane (i.e., outside the base boundaries):

"As discussed above, Little Sulphur Creek discharges off-site to the East Fork of the White River. River otters, a state endangered species, are being reintroduced to Indiana. The otters are expanding from their original release sites into other watersheds including the East Fork of the White River (IDFW, 2000). Also, the East Fork of the White River is the site for an ongoing study of lake sturgeon populations, another state endangered species (IDFW, 2000). Finally, spotted darters, a state endangered species, has been found in the East Fork of the White River (IDFW, 2000). Note that other threatened,

endangered, or special concern species also may be present in the water bodies just off-site of Crane, as well."

See response to Comment No. 22 below for the revised Section 1.4.7.1 threatened and endangered species discussion.

19 Comment: If there is not a screening level for one of the receptors it may be possible to determine that the receptor is less sensitive to the chemical compared to a receptor for which a screening level was developed.

Response: As discussed and suggested by US EPA in the June 9, 2004 technical meeting, if there is not a screening value for one of the receptors an attempt will be made to indicate that other receptors are less (or more) sensitive than the receptors for which a screening level was developed. US EPA also stated during the September 9, 2004 conference call that they often only evaluate risks to wildlife in Step 3 because they are often the most sensitive receptors for many chemicals. If there are no unacceptable risks for the wildlife species then it is assumed that there are no unacceptable risks to plants or invertebrates. Therefore, a qualitative evaluation can be conducted to evaluate risks to the receptor that does not have a screening level or other toxicity data established for a particular chemical, or if toxicity data is limited for a particular receptor.

This type of evaluation was not necessary at SWMU 2.

No changes were made to the SWMU 2 RFI report ERA to address this comment.

20 Comment: Need to develop list of chemicals that will be carried through the food chain model for herbivorous and invertivorous mammals and birds and carnivorous birds and mammals.

Response: As discussed at the June 9, technical meeting, US EPA indicated that the fox and hawk models do not need to be conducted at most sites unless there is really a problem with bioaccumulative chemicals. Also, during the July 23, 2004 conference call, it was agreed that the chemicals that were carried through the food chain model in the ERAs conducted to date, which used the list of important bioaccumulative chemicals from US EPA (2000), EPA/823/R-00/001 was acceptable for those ERAs and the food chain models would not need redone.

Based on the discussions during the September 9, 2004 conference call, US EPA confirmed that the chemicals that were carried through the food chain model for the existing ERAs were acceptable. The Navy agreed to include a brief discussion in the ERA indicating that if the chemical is not accumulating in the food item, then the exposure of the small mammal or bird consuming the food item to the chemical is likely to be low. For that reason, only bioaccumulative chemicals are included in the food chain model.

The following text was added to Section 7.6.2 for the SWMU 2 RFI report (after the third sentence of the first paragraph) to address this comment:

"The primary reason for including only bioaccumulative chemicals in the food chain model is based on the assumption that although wildlife can be exposed to chemicals that do not accumulate in food items (i.e., plants, invertebrates), via direct ingestion of the media (i.e., soil), the exposure of the animal consuming that chemical will be low if the chemical is not accumulating in the food item."

21 Comment: Chemicals with concentrations/doses greater than no-effects levels should be evaluated in Step 3a.

Response: Step 3a will include an evaluation of all chemicals with concentrations/doses greater than no-effects levels.

See Section 7.6 of the SWMU 2 RFI report ERA for the Step 3a evaluation. No additional chemicals were evaluated in Step 3a to address this comment because all chemicals that were retained as COPCs were evaluated in Step 3a.

22 Comment: The ERA should present more qualitative information of the potential for exposure to threatened and endangered (T&E) reptiles at the site (as one reptile species was identified as a T&E species). For example, the ecological risk assessment should include information detailing the likelihood of the presence of reptilian receptors, the mechanisms through which these receptors may be impacted, and possible individual and/or population level impacts to these receptors. Otherwise, without qualification, the sentence, "...there are uncertainties in risks to reptiles because there is a lack of exposure factors for reptiles and a lack of reptile toxicity data for the detected chemicals" is open to interpretation. Revise the document as requested.

Response: During the April 1, 2004 conference call, the Navy agreed to add qualitative information to both existing and future ERAs regarding the potential or likelihood that T&E reptiles (and other T&E species) are present based on the habitat such as the physical factors or site characteristics affecting exposure of reptiles (or other T&E species).

To address this comment, and other comments regarding T&E species, the following text was added to various sections of the SWMU 2 RFI report:

- The third and fourth sentences were deleted from the fourth paragraph of Section 1.4.7.1 and the following text was added after the fourth paragraph in Section 1.4.7.1 of the SWMU 2 RFI report: *"An Endangered Species Management Plan for NSWC Crane was prepared in October 2000 (Comarco Systems, Inc., 2000). As part of this plan, the federal and state endangered and threatened species and species of special concern for the facility were identified. This was accomplished by the compilation of a large amount of information on species present at NSWC Crane. Information included in the Endangered Species Management Plan (Comarco Systems, Inc., 2000) was obtained from studies and surveys conducted by the Navy and other agencies and groups (such as research institutions). A small subset of these studies include the Inventory of Neotropical Migratory Birds, Mist Net and Radiotelemetry Surveys for the Indiana bat, Bobcat Trapping, Rattlesnake Survey, Purdue University Wildlife Studies, and several fish surveys and bird counts. These studies and others that were used in compiling a list of endangered species present at NSWC Crane are described in more detail in the Endangered Species Management Plan (Comarco Systems, Inc., 2000).*

Numerous wildlife species are present throughout NSWC Crane. Of these species, some are listed as endangered and threatened species or species of special concern. NSWC Crane occupies Daviess, Greene, Lawrence, and Martin counties in Indiana, although only a very small portion of NSWC Crane is in Daviess, Greene, and Lawrence counties. The Fanshell pearly mussel, tubercled blossom, ring pink, and clubshell are listed as federally endangered species within Martin, Daviess and Lawrence counties. Additionally, the Northern riffleshell and rough pigtoe are listed as federally endangered species in Martin County. These invertebrate species are not likely to be present at SWMU 2 because they prefer medium to large rivers with moderate currents and gravel substrates as habitat. The habitat that these species prefer is absent at NSWC Crane. Additionally, none of these species was identified in Comarco Systems Inc., 2000 as observed at NSWC Crane. The Indiana bat is listed as federally endangered in Greene, Lawrence, and Martin counties but not in Daviess County. See Section 7.2.5.1, Carnivorous Birds and Mammals, for a discussion of the likelihood that the Indiana Bat is present at SWMU 2. Only the bald eagle is listed as a federal threatened species in all

four counties. The bald eagle is not likely to be present at SWMU 2 due to a lack of vast expanses of water (i.e., the preferred hunting habitat for the bald eagle) at this SWMU. There are no records of any other species at NSWC that are federally listed as endangered or threatened.

Ten species listed as endangered by the Indiana Department of Natural Resources have been recorded at NSWC and include the Indiana bat, bobcat, timber rattlesnake, bald eagle, osprey, loggerhead shrike, yellow crowned night heron, Virginia rail, king rail, and Henslow's sparrow (Comarco Systems Inc., 2000). No state-listed threatened species have been recorded at NSWC Crane. Bald eagles (as discussed above) and ospreys are not expected to occur at SWMU 2 due to the absence of preferred foraging habitat (large open waters). Similarly, the Virginia rail and king rail are found in marshes and mudflats, the Henslow's sparrow is found in damp fields, and the yellow crowned night heron is primarily a bird of swamps. These habitats are absent from SWMU 2. The loggerhead shrike prefers open fields with scattered trees, but is occasionally found in open woodlands. Thus, use of the site by the loggerhead shrike would be occasional at most.

Some species that are listed as Federal species of concern in Comarco Systems, Inc. (2000) are also state endangered species (IDNR, 2002). These include the Northern Harrier (Daviss County), American bittern (Greene County), and sedge wren (Lawrence County). These species are not endangered in Martin County. The majority of NSWC Crane is located in Martin County so it is unlikely that operations at NSWC Crane are affecting these species' populations significantly. See Section 7.7.1 for a discussion of the uncertainties associated with not quantitatively evaluating risks to these species in the ERA.

Previous studies conducted at NSWC Crane (Nelson et al., 1987) identified 21 amphibian species and 22 reptile species (including skinks, lizards, snakes, and turtles). As part of the Endangered Species Management Plan for NSWC Crane (Comarco Systems, Inc., 2000), federal and state endangered and threatened species and species of special concern for the facility were identified, and included one reptilian species. The timber rattlesnake (Comarco Systems Inc., 2000) was identified as a federal endangered species. No state-listed threatened species have been recorded at NSWC Crane. The prime timber rattlesnake habitat is forested land on higher dry ridges with a south or southwestern exposure. SWMU 2 is located on a high dry ridge, so it is possible that the timber rattlesnake is present at the SWMU.

The Rare Animals of Indiana list (Indiana DNR, 2002) was reviewed to verify that no change in status of the timber rattlesnake had occurred since October 2000. This list is much larger than that presented in Comarco Systems, Inc. (2000) and is not reiterated here; however, it was verified that the timber rattlesnake did not experience a change in status. Also, the County Distribution of Indiana's Federally Threatened, Endangered, Proposed, and Candidate Species list (USFWS, 2002) was reviewed to verify that no change in status had occurred since October 2000."

- The following text was added to the end of the last sentence in the second paragraph in Section 7.7.1 of the SWMU 2 RFI report: "(see below for a discussion of potential risks to the timber rattlesnake)"
- The following text replaces the last paragraph of Section 7.7.1 of the SWMU 2 RFI report: "There are also uncertainties for potential risks to protected species (i.e., endangered, threatened, or species of special concern) at the site because risks to those species were not specifically evaluated in the ERA. Risks to these species were not specifically calculated so the uncertainties of not calculating risks to these species are presented here. Risks to these species were considered qualitatively, however, using surrogate receptor species. An Endangered Species Management Plan for NSWC Crane was

prepared in October 2000 (Comarco Systems, Inc. 2000). As part of this plan, the federal and state endangered, threatened, and species of special concern for the facility were identified as described in Section 1.4.7 of this report. Several birds, mammals, and one reptile are listed species that are present at NSWC Crane. Of the mammals, the risks to the Indiana bat were concluded to be negligible because none of the COPCs in the sediment and surface water were considered to be bioaccumulative; therefore, food chain modeling was not conducted for this species. Risks to the bobcat from contaminants at SWMU 2 also are expected to be negligible because of the general absence of bioaccumulative chemicals detected in the surface soil at the site (only copper) and the large home range of the bobcat versus the small size of the site. Risks to large carnivorous mammals and birds are expected to be negligible so risks to the bobcat, bald eagle, Northern harrier, and osprey are expected to be negligible.

Of the birds, there is a potential that some of them may be present in the area around SWMU 2, because of the open grass area at the site and/or the wooded area surrounding the SWMU. However, based on the most conservative food chain model (maximum exposure parameters and the NOAEL as the TRV), adverse risks to herbivorous and carnivorous (insectivorous) birds were not expected. Loggerhead shrikes and the sedge wren consume mostly aboveground insects such as caterpillars, beetles, spiders, and flies, as opposed to the worms that are consumed by the American robin in the food-chain model. Because worms are in direct contact with exposure to the soil, it is expected that they would have greater levels of contaminants at SWMU 2 than aboveground insects; therefore, risks to the robin from consuming worms are expected to be greater than risks to the loggerhead shrike and sedge wren from consuming aboveground insects. Risks to the worm eating American robin from chemicals in the surface soil and surface water were determined to be low; therefore, risks to the loggerhead shrike and sedge wren also are expected to be even lower than risks to robins. The American bittern is a marshland loving bird that feeds on fish, frogs, eels, insects, and water snakes. Because there is very little aquatic habitat present at SWMU 2, the presence of the American bittern is unlikely. Therefore, no risks to the listed birds from contaminants at SWMU 2 would be expected.

Finally, there are uncertainties in risks to reptiles because there is a lack of exposure factors for reptiles and a lack of reptile toxicity data for the detected chemicals. As discussed in Section 1.4.7.1, one threatened reptilian species is listed as potentially present at NSWC Crane. Based on the preferred habitat of the timber rattlesnake and the ecology of SWMU 2, this species may potentially inhabit areas of SWMU 2. Risks to these species were not specifically calculated so uncertainties exist as to how this species would be affected if an exposure to site chemical concentrations occurred. However, because copper was the only bioaccumulative chemical retained as a COPC in the soil, and because it was detected at similar concentrations to background, risks to the timber rattlesnake from chemicals related to SWMU 2 are not expected."

23 Comment: Surface soil exposures and sub-surface soil exposures should be examined (if applicable) for receptors at the site. In order to examine these exposures, soil sampling depth classes need to be developed. U.S. EPA has suggested the 0 to 0.5 foot below ground surface (ft bgs) as being reflective of surface soils exposure pathways, and 0.5 to 2 foot bgs as reflective of subsurface soil exposure pathways, based on best professional judgment and experience with other sites in the region and across the nation.

U.S. EPA clearly understands that earthworms, plants, and burrowing wildlife will not necessary restrict foraging or burrowing activities to these specific depth classes; however, it should be realized that these receptors of concern are representative species that are used to estimate risk for all of the potential receptors residing at, or otherwise using, the site.

It should also be noted that this recommendation has been provided to assist in the design of future sampling events. That is, it is not necessary to revise the ecological risk assessment based on collection of a new data set.

However, future sampling activities should be designed to incorporate this approach, or sound rationale should be provided for the Navy's selection of 0 to 1 ft bgs and 0 to 2 ft bgs for examining various soil exposures for receptors at the Site.

The rationale should clearly state why the Navy feels it is not necessary to separate surface soil and sub-surface exposure pathways, and why it is appropriate to use two different soil sampling depth classes depending on the analytes being examined (e.g., 0 to 1 ft bgs for inorganic parameters and 0 to 2 ft bgs for dye parameters at SWMU 2.)

Response: Generally at NSWC Crane surface soil samples are collected from a depth of 0 to 2 feet (excepting volatiles which are collected from a depth of 0.5 feet to 2 feet). Samples for each fraction are collected from the entire interval. In some cases historical information or the need for data to support a CMS may warrant collection of fractions from different depths.

The Navy does not agree that samples from two separate intervals within the top two feet need to be collected to evaluate ecological risk. Most ecological receptors will be exposed to contaminants in the top two feet of soil as they move through the soil column.

For future ERAs, surface soil intervals will be chosen on a site-specific basis and the rationale for the choice of the surface interval would be provided in the planning documents and in the ERA.

No changes were made to the SWMU 2 RFI report ERA to address this comment.

24 Comment: The paper by Steevens et. al., 2002. does not provide specific chronic NOAEL or LOAEL data. Steevens et. al. showed that TNT had a LC₅₀ of 28.9 mg/kg with a 95% CI of 25.8 to 32.5 for survival of *Hyalella azteca* (an amphipod) which is a severe adverse effect. The alternate benchmark of 25 mg/kg for TNT is in the severe effects range and is misleading when presented as a refinement chronic NOAEL.

Response: As was discussed during the September 9, 2004 conference call, the TNT values from Steevens et. al., 2002 do not appear valid because the TNT degraded quickly in the sample so the measured concentrations were much less than the nominal concentrations. Therefore, because nominal concentrations were used to calculate the LC₅₀ value, the calculated LC₅₀ is not appropriate and would be much lower using measured concentrations. The Navy agreed not to use the TNT values from Steevens et. al., 2002 for the reason discussed above.

Based on a conference call between TtNUS, US EPA Region 5, and the US Army Corps of Engineers (USACE) on October 6, 2004, Jeff Steevens from USACE indicated that NOECs and LOECs for nitroaromatic compounds were developed in a paper by Conder, et. al., 2004³. The study calculated NOECs and LOECs for nitroaromatic compounds and in order to convert the values from nmol/kg to mg/kg, an average molecular weight of 200 was used. The average molecular weight was based on the approximate average molecular weights of TNT, ANTs, and DNTs of 227, 197, and 167, respectively. Based on this study, the NOEC, LC50, and LOEC for survival of 112, 184 and 304 nmol/g, respectively, converted to 22.4, 36.8 and 60.8 mg/kg, respectively.

³ Conder, J.M., T.W. La Point, J.A. Steevens, and G.R. Lotufo. 2004. Recommendations for the Assessment of TNT Toxicity in Sediment. Environmental Toxicology and Chemistry. Vol. 23, No. 1. pp. 141-149.

Note that TNT was not a COPC at SWMU 2.

No changes were made to the SWMU 2 ERA to address this comment.

25 Comment: Other tests by Steevens et. al. resulted in *Chironomous tenans* (a midge) growth being greater when RDX and HMX was present at all test concentrations with respect to the control. The RDX concentration of 711.2 mg/kg did have a significant increase in growth which was incorrectly stated in the risk assessment. All of the Steevens et. al. LOEC and NOEC are not acceptable as alternate benchmarks.

Response: As was discussed during the September 9, 2004 conference call, EPA indicated that they may consider the RDX and HMX values because they were based on measured concentrations but the Navy should try to locate other lines of evidence. The following additional of evidence were located regarding the toxicity of HMX and RDX to aquatic organisms:

- One study cited in Talmage et al., 1999 indicated that a sediment pore-water concentration at the limit of HMX solubility would not be acutely toxic to the three organisms that were tested (a midge, isopod, and amphipod).
- One study cited in Talmage et al., 1999 indicated that a sediment pore-water concentration of 15 mg/L of RDX would not be acutely toxic to the three organisms that were tested (a midge, isopod, and amphipod).

Explosives were not managed at SWMU 2 and were not considered in the RFI.

No changes were made to the SWMU 2 ERA to address this comment.

26 Comment: The sediment quality benchmarks presented by Talmage (Talmage et. al. 1999. Reviews of Environmental Contamination and Toxicology, vol. 161, pages 1-156) needs to be presented as alternate benchmarks: TNT = 0.09 mg/kg, RDX = 0.01 mg/kg and HMX = 0.005 mg/kg.

Response: Talmage et al., 1999 indicated that the secondary chronic value (SCV) of 0.33 mg/L (which was used to calculate the sediment quality benchmark (SQB) using equilibrium) is overly conservative and a value of >3.3 mg/L is a more realistic interim value until additional toxicity tests are performed. If the more realistic value is used, the SQB increases from 0.005 mg/kg to 0.05 mg/kg, which is still low compared to the empirical data. Therefore, the Navy believes that the empirical data cited in Comments Nos. 24 and 25 above, are more appropriate for use in determining if a chemical needs to be retained as a COPC after Step 3a of the ERA.

Explosives were not managed at SWMU 2 and were not considered in the RFI.

No changes were made to the SWMU 2 ERA to address this comment.

SPECIFIC ISSUES FOR SWMU 2 FROM EPA'S 3/19/04 E-MAIL

Specific Comment DBG-1: The Navy's second response to Comment ERA-2 does not appear acceptable. The intent of US EPA's original comment and follow-up comment to the Navy's first response was a request for more qualitative information of the potential for exposure to threatened and endangered (T&E) reptiles at the site (as one reptile species was identified as a T&E species). For example, the ecological risk assessment should include information detailing the likelihood of the presence of reptilian receptors, the mechanisms through which these receptors may be impacted, and possible individual and/or population level impacts to these receptors. Otherwise, without qualification, the sentence, "...there are uncertainties in risks to reptiles because there is a lack of exposure factors for reptiles and a lack of reptile toxicity data for the detected chemicals" is open to interpretation. Revise the document as requested.

Response: The following text was inserted at the end of the new 11th paragraph in Section 1.4.7.1 (formerly paragraph 5 - note in the first bullet of the response to Comment No. 22, new text will be added to this section):

"As part of the Endangered Species Management Plan for NSWC Crane (Comarco Systems, Inc., 2000), federal and state endangered and threatened species and species of special concern for the facility were identified, and included one reptilian species. The timber rattlesnake (Comarco Systems Inc., 2000) was identified as a federal endangered species. No state-listed threatened species have been recorded at NSWC Crane. The prime timber rattlesnake habitat is forested land on higher dry ridges with a south or southwestern exposure. SWMU 2 is located on a high dry ridge, so it is possible that the timber rattlesnake is present at the SWMU.

The Rare Animals of Indiana list (Indiana DNR, 2002) was reviewed to verify that no change in status of the timber rattlesnake had occurred since October 2000. This list is much larger than that presented in Comarco Systems, Inc. (2000) and is not reiterated here; however, it was verified that the timber rattlesnake did not experience a change in status. Also, the County Distribution of Indiana's Federally Threatened, Endangered, Proposed, and Candidate Species list (USFWS, 2002) was reviewed to verify that no change in status had occurred since October 2000."

As noted in the last bullet of the response to Comment No. 22 above, the following text was added to the end of Section 7.7.1:

"Finally, there are uncertainties in risks to reptiles because there is a lack of exposure factors for reptiles and a lack of reptile toxicity data for the detected chemicals. As discussed in Section 1.4.7.1, one threatened reptilian species is listed as potentially present at NSWC Crane. Based on the preferred habitat of the timber rattlesnake and the ecology of SWMU 2, this species may potentially inhabit areas of SWMU 2. Risks to these species were not specifically calculated so uncertainties exist as to how this species would be affected if an exposure to site chemical concentrations occurred. However, because copper was the only bioaccumulative chemical retained as a COPC in the soil, and because it was detected at similar concentrations to background, risks to the timber rattlesnake from chemicals related to SWMU 2 are not expected."

Specific Comment DBG-2: The Navy's second response to Comment ERA-3 does not appear acceptable. The basis for US EPA's original comment and follow-up comment to the Navy's first response was that surface soil exposures and sub-surface soil exposures should be examined (if applicable) for receptors at the site. In order to examine these exposures, soil sampling depth classes need to be developed. US EPA has suggested the 0 to 0.5 foot below ground surface (ft bgs) as being reflective of surface soils exposure pathways, and 0.5 to 2 foot bgs as reflective of subsurface soil exposure pathways, based

on best professional judgment and experience with other sites in the region and across the nation. US EPA clearly understands that earthworms, plants, and burrowing wildlife will not necessary restrict foraging or burrowing activities to these specific depth classes; however, it should be realized that these receptors of concern are representative species that are used to estimate risk for all of the potential receptors residing at, or otherwise using, the site.

It should also be noted that this recommendation has been provided to assist in the design of future sampling events. That is, it is not necessary to revise the ecological risk assessment based on collection of a new data set. However, future sampling activities should be designed to incorporate this approach, or sound rationale should be provided for the Navy's selection of 0 to 1 ft bgs and 0 to 2 ft bgs for examining various soil exposures for receptors at the Site. The rationale should clearly state why the Navy feels it is not necessary to separate surface soil and sub-surface exposure pathways, and why it is appropriate to use two different soil sampling depth classes depending on the analytes being examined (e.g., 0 to 1 ft bgs for inorganic parameters and 0 to 2 ft bgs for dye parameters.)

Response: See Response to Comment 23.

No changes were made to the SWMU 2 ERA to address this comment.

**TABLE 1
CROSSWALK TABLE RELATING MARCH 19, 2004 COMMENTS FROM
US EPA AND GENERAL ISSUES TO CONSOLIDATED AND RENUMBERED COMMENTS**

Original Comment Number from March 19, 2004 E-Mail	Consolidated Comment Number for General Comments	Consolidated Comment Number for Specific Comments/Other Issues
General Comments		
1	1a,1b,1c,1d,1e	
2	2	
3	3a,3b	
4	4	
5	5a,5b,5c	
Specific Comments for SWMU 3		
1		2
2		1,2
3	1a, 5a	
4	5a	1,2,6
5	5a	2,3,4
6	5a	2,5,6
7	5a	2,5,6
8	5a	2,5,6
9		2,3,4,7
10	5a	1,2,3,4,6,7,8
11		5
12	5a	2,5,8
13	5a	1,2,4,8
14	5a	2,6,7,8
15	5a	2,4,6,7,8
16		9,14
17		Not applicable ⁽¹⁾
18		11
19		12,24
20		Not applicable ⁽¹⁾
21		Not applicable ⁽¹⁾
22		10,13,16
23	5a	9,10,15
24		15
25		9,10
26		9
27		9
28		16
29		9
Specific Comments for SWMU 2		
1		Specific Comment DBG-1
2		Specific Comment DBG-2
Other Issues		
Not applicable ⁽²⁾		17,18,19,20,21,24,25,26

1 - The comment was specific for a chemical that was not detected at SWMU 2. No general issue was identified for the comment.

2 - The specific comments in this row are based on other issues that were discussed with US EPA and were not specifically identified in the March 19, 2004 e-mail from US EPA.