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

IN REPLY REFER TO:
5090/S4.7.1
Ser PRCR4/7053
16 FEB 2007

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 responses to comments provided by the U. S. EPA on May 2, 2006 as enclosure (1). The subject of the comments was the Draft RCRA Facility Investigation (RFI) Report for Solid Waste Management Unit (SWMU) 13 (Mine Fill B). The permit required Certification Statement is presented as enclosure (2).

If you require any further information, my point of contact is Mr. Thomas J. Brent, Code PRCR4-TB, at 812-854-6160, email thomas.brent@navy.mil.

Sincerely,

J. M. Hunsicker
J. M. HUNSICKER
Environmental Site Manager
By direction of the Commanding Officer

Enclosures: 1. Response to Comments for the SWMU 13 RFI Report
2. Certification Statement

Copy to:
ADMINISTRATIVE RECORD
NAVFAC MW (Howard Hickey) (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.

James Hunsucker

SIGNATURE

Manager, Environmental Protection

TITLE

2/16/07

DATE

NAVY RESPONSES TO U.S. EPA COMMENTS DATED MAY 2, 2006 ON THE MINE FILL B (SWMU 13) DRAFT RFI REPORT

United States Environmental Protection Agency (U.S. EPA) Region 5 comments, dated May 2, 2006, are shown in bold font. Navy responses to each comment are shown in regular font. Text changes to the RFI are shown in italic font enclosed in quotation marks in the response.

Comment 1:
Page ES-2 states that soils containing PCBs were removed during remediation of explosives contaminated soil at MFB. Clarify this to state that not all PCB impacted soils were removed as this RFI continued to investigate them.

The following sentences have been added at the end of paragraph 5 on Page ES-2:

"Confirmation sampling indicated that the remaining soils contained PCBs in excess of 10 milligrams per kilogram (mg/kg). Some residual PCB contamination still remained near Buildings 166 and 171 as of 1992 (Halliburton NUS, 1992)."

We are in the process of preparing an Interim Measure Work Plan (IMWP) for the purpose of remediating PCB contaminated soil. As noted in the RFI, PCB contamination has not been delineated. Additional sampling has been conducted. Information from this sampling will be used to develop the final interim measure. The RFI will be modified to include the results of this sampling.

Comment 2:
The second paragraph on page ES-5 states that the siltstone and shale layers between the middle and lower water bearing zones are an effective aquitard and prevent shallow groundwater and contaminants from reaching the deeper groundwater beneath the ridge. However, the previous sentence contradicts this with the statement that minor concentrations of contaminants have been detected in the deeper water-bearing zones. There has been some migration to the lower aquifer.

Response: The shales and siltstones that lie below the Puz water-bearing zone are considered to be an effective aquitard because groundwater is perched within the Puz zone, there is a significant drop in hydraulic head between the Puz wells and the Plz wells below (see Figure 4-14), and very little contamination was detected in the Plz wells. The use of the term "aquitard" does not suggest that the shales and siltstones are completely impermeable. The term is used to suggest that the hydraulic conductivity of the shales and siltstones are significantly lower than the hydraulic conductivity of the sandstones units, thereby retarding but not completely eliminating downward flow. In order to clarify the text, Page ES-5, paragraph 2, line 12 has been changed to read *"between the upper and lower water-bearing zones are an effective aquitard, which prevents most of the shallow".*

In addition, the second sentence of the first bullet on Page 6-13 has been changed to read: *"The siltstone and shale layers between the upper and lower water-bearing zones are an effective aquitard and prevent most of the shallow groundwater and contaminants from reaching the deeper portion of the ridge."*

Comment 3:
For the Gully Surface Water on page ES-8, the risk driver is RDX?

Yes, the risk driver is RDX.

Comment 4:
Referring to Table ES-1, Gulley Surface Water, why are Future Recreational User (Lifelong) and Future On-Site Resident (Lifelong) not evaluated for CMS if their overall carcinogenic risk was calculated at 2E-04? Provide footnotes defining 'N/A' and 'NFA'. Add a footnote explaining why no Hazard Indices were calculated for the surface soils near Buildings 166/171 and for 'Lifelong' receptors.

Response: Exposure of recreational users and future residents to PAHs in gully surface water was not recommended for further study in the CMS because of the large uncertainty and overestimation of risks associated with this exposure route, as discussed in Sections 7.5.2.2 and 7.6.2 of the HHRA. The reasons for this recommendation are as follows:

1. The elevated risks for these receptors were based mainly on dermal contact with surface water. The risks for dermal contact were three to four orders of magnitude greater than risks by ingestion. The dermal risks were calculated using the U.S. EPA model presented in RAGS-Part E, which, according to the EPA guidance, tends to overestimate intakes and risk for some chemicals (e.g., PAHs, PCBs, and dioxins).

2. Studies have shown that PAHs in aqueous solutions do not penetrate the skin. For this reason, TtNUS was instructed by U.S. EPA Region 4 not to evaluate risks for dermal contact with PAHs in water. Based on an evaluation by a Region 4 toxicologist, the uncertainty associated with the aqueous dermal pathway for PAHs is "greater than a billion fold".

3. The intermittent nature of the surface water in the gullies which are often dry. Therefore, a complete exposure pathway is not always present.

4. The high turbidity of the gully surface water samples. The presence of suspended matter in the surface water samples tends to inflate the measured PAH concentrations.

The following footnotes have been added to Table ES-1:

- *"N/A – Not Applicable. Risks were not calculated for the specified receptor/exposure pathway or the calculated risks were acceptable.*

- *NFA – No Further Action*

- *No noncarcinogenic Hazard Indices were calculated for surface soils near Buildings 166 and 171 because no noncarcinogens were identified as COPCs for surface soil.*

- *Hazard Indices (i.e., child + adult) are not summed for 'Lifelong' receptors because, according to U.S. EPA risk assessment guidance, it is not correct to sum noncancer risks for child and adult receptors."*

Comment 5:
Tables 1-4 and 1-5 should include units (mg/kg).

Tables 1-4 and 1-5 have been revised to indicate that the units of measurement are milligrams per kilogram (mg/kg).

Comment 6:
Referring to the last paragraph on page 3-11, what is meant by the phrase "native sample concentration by at least 25%"? In the third paragraph of page 3-12, what is meant by the phrase "elevated RBTLs not problematic"?

Response: The last paragraph on page 3-11 referring to an increase of at least 25 percent is poorly worded. It has been changed to the following: "*These are the results of marginally valid QC spikes that did not increase the native sample concentration by at least 25 percent.*"

The idea is that the imprecision of laboratory results is often as great as +/- 25 percent or even greater. Therefore, if the amount of spike added to a matrix spike or matrix spike duplicate does not increase the native sample concentrations by at least 25 percent, the percent recovery cannot be computed accurately. This compromises the use of the spiked sample as a QC sample.

Regarding the question about "RBTLs", the "RBTLs" should be "*MDLs*" and the text has been changed to reflect this.

Comment 7:
The first paragraph of Section 5.2.2 discusses PCB contaminated soil which originated from an on-site borrow source. What were the additional investigations done by the Navy to determine the source/extent of the PCB contamination at the borrow source? Email from Christine Freeman (NSWC) dated January 7, 2002 indicated the material was from a pile within the Crane landfill gate and additional investigation was being conducted.

Response:

After further investigation by the Navy, it was determined that there is no additional information available regarding the source/extent of PCB contamination at the borrow source.

Comment 8:
Referring to the discussion of PCB contamination in the last paragraph of page 5-8, is the Navy planning an Interim Measures excavation of PCB impacted soils and/or continued investigation of any potential PCB migration down the drainage areas?

Response: The Navy is planning an interim Measure to remove PCB contaminated soil. Additional samples have been collected in soil and sediment drainage areas to provide information necessary to determine the location and quantities of PCB contaminated soil and sediment that requires remediation. Confirmation samples will be collected to verify that the elevated PCB contamination is satisfactorily removed. The goal will be to excavate all PCB contamination that exceeds pre-determined limits. If PCB contamination is elevated in the drainage channels, that contamination will also be excavated.

The second and third sentences of last paragraph of page 5-8 are duplicate sentences. One of them has been deleted.

The sixth sentence of the last paragraph of page 5-8 is essentially a duplication of the fifth sentence and has also been deleted.

Comment 9:
The last paragraph of Section 5.3.1 discusses potential remaining sources of RDX which could be contributing to surface water and seep contamination. Mention should be made of other potential sources currently under investigation such as the MFB sumps, building trenches, etc.

Response: Potential sources of RDX and other explosives contamination are still being evaluated, so additional changes may also be made to explain this in more detail. Explosives under building foundations, however, cannot be investigated safely until the buildings have been removed and the associated potential explosion hazard eliminated.

The last sentence of the last paragraph of Section 5.3.1 has been changed as follows: *"Other potential sources of RDX in surface water may be groundwater that has leached RDX from soils*

and discharged from the hillside, as well as building, sump- or trench-related RDX contamination that may have migrated in overland flow from soils near the sumps and building trenches or through groundwater that accumulates soil contamination from these sources."

In the third sentence of the last paragraph of Section 5.3.1, "mainstream" has been changed to "*main stream.*"

Comment 10:
On Figure 5-3, 13SD11(G) is shown to have an RDX detection of 2.2 ppm and is flagged with an 'H' indicating exceedence of the human health screening value of 4.4 ppm.

Response: On Figure 5-3, 13SD11 (G), the value of 2.2 mg/kg should not have an "(H)" flag. The flag has been removed. In addition, the very small font size "2501" for DNX at 13SW11 (G) in Round 1 (R-1) is extraneous and has been deleted. There was no detection of DNX at that location in Round 1; the indicated detection of 35 ug/L of DNX in Round 2 (R-2) has been verified to be correct.

Comment 11:
Referring to the fourth sentence of Section 6.1, further explain how COPCs discussed in this section are representative of all other site related contaminants not discussed. Explanation of why COPCs not discussed are not ecological or human health risk drivers would be useful.

Response: Section 6 presents and discusses information on the mobility, biodegradation characteristics, and extent of most, but not all, of the human health and ecological COPCs identified in Sections 7 and 8. Section 6 does discuss all of the chemicals considered to be **primary** COPCs and COCs at SWMU 13 (chemicals listed in Tables 7-20, 8-6, 8-7, 8-8, and 8-11, and retained for CMS). The COPCs and COCs listed in Table 6-1 are the ones that, through the risk assessments (Sections 7 and 8), were determined to be the primary contaminants at Site 13. Some of the COPCs, such as dioxin congeners, several SVOCs, and several VOCs, were detected at SWMU 13, but were detected very infrequently, were detected at low concentrations, and/or do not pose a significant human health or ecological risk. Please see Sections 7 and 8 for COPCs requiring no further action. Section 6 concentrates on the COPCs that are considered to be the primary contaminants of concern. There are no chemicals listed in Table 6-1 or discussed in Section 6 that are used to represent other COPCs.

A new sentence has been added to the end of the paragraph in order to clarify the purpose of Section 6: "*These processes and their effects on fate and transport will be discussed in this section.*"

In order to address the EPA comment and to clarify the text, the first paragraph in Section 6.1 has been changed to read:

"COPCs present at SWMU 13 belong to five primary groups: energetic compounds, PAHs, PCBs, metals, and inorganic nitrogen compounds. Numerous COPCs identified in Sections 7 and 8 (e.g., dioxin congeners, several SVOCs, and several VOCs) were detected very infrequently and/or detected at low concentrations, and were determined not to pose a significant risk (please see Sections 7 and 8 for chemicals dismissed as COPCs); these chemicals are not discussed in Section 6. Section 6 concentrates on the COPCs that are considered to be the primary contaminants of concern. The primary chemical and biological factors which affect the mobility, migration, biodegradation, and persistence of these chemicals are solubility, adsorption/desorption, biodegradation, photolysis, and plant uptake. These processes and their effects on fate and transport will be discussed in this section."

Comment 12:
The discussion of contaminant mobility, attenuation, and persistence presented in Section 6.1 should include a discussion of the photolysis of RDX in water under natural sunlight conditions (see ATSDR RDX Toxicity Profile Section 5.3.2.2). Section 6.1.3 (or the Contaminant Migration section on page 6-7) should discuss the potential for explosives contaminant migration from annual autumnally discarded foliage from tree leaves (and other sampled vegetation). The conceptual site model should be modified as needed based on that evaluation.

Response: In response to the first sentence of this comment, a "Section 6.1.4 Abiotic Degradation" has been added to the RFI report (just prior to Section 6.2) which discusses photolysis and hydrolysis of organic COCs, including RDX. The new Section 6.1.4 is provided below:

"6.1.4 Abiotic Degradation

Organic chemicals can degrade abiotically. One means of abiotic degradation is hydrolysis, where the compound reacts with water to form two or more new compounds. "At neutral or acidic pH values, RDX does not hydrolyze to an appreciable extent in freshwater or seawater (Talmage et al., 1999)." Reported hydrolysis half-lives of 170 days to several years indicate that hydrolysis is not a significant degradation process for RDX in natural water (Sikka et al., 1980; Spanggord et al., 1980a). Hydrolysis of other organic contaminants at SWMU 13 are not known to be significant.

Photolysis can be a primary abiotic degradation mechanism in translucent surface water (e.g., ponds, creeks, drainage ditches, and streams). Photolysis is the decomposition of a compound into simpler units when the parent compound absorbs radiation (e.g., sunlight). Photolytic degradation rates are typically slowed by high turbidity and increasing depth of water. RDX absorbs ultraviolet light with wavelengths between 240 and 350 nm (Etnier, 1986) and undergoes rapid photolysis in water (Sikka et al., 1980; Spanggord et al., 1980b). Spanggord and others (1980b) measured half-lives for RDX of 13, 14, and 9 days in distilled water, Holsten River water (Tennessee), and pond water, respectively. The photolytic degradation rate of RDX in the three types of water were much higher than the degradation rate of HMX (Spanggord et al., 1980b). This was attributed to the fact that RDX has greater molar absorptivity. Nitrite, nitrate, and formaldehyde were identified as photolytic transformation products of RDX and HMX.

Just and Schnoor (2004) determined that RDX was photodegraded in reed canary grass leaves exposed to simulated sunlight. The primary degradation products were nitrous oxide and 4-nitro-2,4-diazabutanal. This is the first time that 4-nitro-2,4-diazabutanal has been measured in plant tissues following phytotransformation of RDX. These compounds, along with nitrite and formaldehyde, were also detected in aqueous RDX systems exposed to the same simulated sunlight. Results showed that the initial products of RDX photodegradation in translucent plant tissues were similar to products formed from aqueous photolysis of RDX. The detection of similar RDX degradation products in both aqueous and plant-based systems suggests that RDX may be initially transformed by similar mechanisms in both systems. Direct photolysis of RDX via ultraviolet irradiation passing into the leaves is hypothesized by Just and Schnoor (2004) to be responsible for the observed transformations. In addition, membrane-bound "trap chlorophyll" in the chloroplasts may shuttle electrons to RDX as an indirect photolysis transformation mechanism.

TNT is another energetic compound that is susceptible to photolytic degradation. In laboratory studies (Spanggord et al., 1980; Talmage et al., 1999) TNT photolyzed rapidly in natural water, with half-lives of 0.5-22 hours. In field studies, TNT declined within a short distance of discharge points. Because photolytic degradation decreases with the intensity of the irradiating light, this type of degradation is least likely or least rapid when dissolved in turbid water or in water bodies covered by tree canopy. At NSWC Crane many of the drainage channels are tree-covered.

Hence, photolysis is expected to be retarded, except in areas where drainage channels receive ample sunlight.

Photolysis is not believed to be a potentially significant degradation mechanism for the other site-related organic contaminants."

As noted in the second and third sentences of this comment, the Navy agrees that leaves will probably carry some RDX back down to the ground during autumn and winter months. However, most of the leaves falling to the ground (i.e., leaf litter in the forest) will decay in place and the RDX will either biodegrade during decay or will be returned to the soil column, where it could recycle back up into the vegetation. Section 6.1.3 will be revised, as follows, to include this additional aspect of phytoremediation:

"6.1.3 Plant Uptake

Recent research by the United States Army Corps of Engineers (USACE) (May et al., 2003) suggests that plant uptake and phytoremediation may also be removing, degrading, and volatilizing RDX and TNT from the soils at the Ammunition Burning Grounds (SWMU 3) at NSWC Crane. Vegetation samples were collected from trees and shrubs located on the northwest side of the ridge containing SWMU 13. This location was chosen because RDX-contaminated groundwater was considered most likely to be present and being taken up by plants. Results of the leaf analyses showed a relatively high frequency (> 35 percent) of detections of RDX, MNX, HMX, and 2,6-dinitrotoluene in the 16 vegetation samples that were analyzed (see Tables 3-35 and 3-36). Thus, the trees and vegetation on the northwest side of the ridge appear to be taking up groundwater and energetic compounds as groundwater discharges to the hillside. The energetic compounds may be photolytically degraded in the leaves while the leaves are still on the trees (see Section 6.1.4).

Leaves will probably carry some RDX and HMX back down to the ground during autumn and winter months. However, most of the leaves falling to the ground (i.e., leaf litter in the forest) will decay in place and the RDX and HMX will either biodegrade during decay or will be returned to the soil column, where it could recycle back up into the vegetation. No data are available to quantify RDX and HMX degradation rates in the leaf litter or the underlying soil."

Comment 13:
What were the calculated sizes of the Exposure Units for the six buildings referenced in the first bullet of page 7-22?

Response: The areas provided below were based on calculations from maps included in the Interim Measures Report for SWMU 13 and professional judgment. Also included in the calculated areas are sections that were not contaminated, but were used to define (i.e., bound) the extent of contamination. The estimated areas are consistent with past practices at NSWC Crane that allowed up to 2-acres (approximately 87,000 ft^2) of area to be considered an exposure unit for residential use. Industrial use would allow even larger areas. Expansion of any of the areas would have reduced the estimated risks whereas reducing any of the areas would not have changed the conclusions of the risk assessments.

- Building 165 – Approximately 70,000 ft^2. Of this, only about 1,000 ft^2 (2 grid areas out of 32) required remediation.

- Building 166 – Approximately 45,000 ft^2. Of the 53 grid areas evaluated in this area, 22 grids required remediation.

- Buildings 167/168/2500 – Approximately 55,000 ft^2. Of the 33 grid areas evaluated in this area, 12 grids required remediation.

- Building 171 – Approximately 25,000 ft^2. Of the 35 grid areas evaluated in this area, 12 grids required remediation.

- Buildings 172/173/2501 – Approximately 100,000 ft^2. Of the 108 grid areas evaluated in this area, 84 grids required remediation.

- Building 174 – Approximately 100,000 ft^2. Of this, about 1,000 ft^2 (3 grid areas) were evaluated. None required remediation.

Comment 14:
Section 7.3.4 refers to a non-existent Appendix X.

Response: The reference should be to Appendix I and has been corrected.

Comment 15:
The last sentence of Section 7.3.4.4 states that the same exposure times, frequencies, and durations used to assess dermal exposure to water were used to estimate intakes for ingestion of water. Provide clarification of this sentence as the values for those parameters presented in Tables 7-14 and 7-15 appear to be different between different receptors. Provide similar clarification for the "same exposure frequency and duration" statement made in Section 7.3.4.2.

Response: The exposure times, frequencies, and durations are different for different receptors. The sentences in Sections 7.3.4.2 and 7.3.4.4 have been revised as follows:

<u>Section 7.3.4.2</u>

"The same exposure frequencies and durations used in the estimation of dermal intakes were used to estimate exposure via incidental ingestion for each respective receptor."

<u>Section 7.3.4.4</u>

"The same exposure times, frequencies, and durations used to assess dermal exposure to water were used to estimate intakes for ingestion of water for each respective receptor."

Comment 16:
Referring to the second bullet on page 7-41, provide a copy of the Region 4 email and the additional supporting studies showing aqueous PAH does not penetrate the skin.

Response: The two references have been included in Appendix I of the SWMU 13 report. One is the e-mail from Dr. Ted Simon of Region 4 recommending that dermal contact with PAHs in water not be evaluated. The second is an <u>Estimation of the Dermal Permeability Coefficient for PAHs for Coal-Tar Shampoo Experiments</u> provided by Dr. Simon.

Comment 17:
The second to last bullet on page 7-23 states that the EPC for groundwater receptors is the arithmetic average of the wells in the highly concentrated area of the plume. It does not seem that a "highly concentrated area" is determined for each of the COCs individually when calculating the EPC. The uncertainty discussion on page 7-53 states that risks decrease when the explosives plume is extended to include maximum concentrations of all metal COPCs. Why wouldn't a separate evaluation for EPC be done for the most highly concentrated area of metals (or other COPCs) in groundwater similar to what is done for explosives? Provide copy of the Supplemental Guidance to RAGS: Estimating Risk from Groundwater Contamination (ERGC), Internal Draft, December 1993 referred to by EPA Region 4.

Response: The reason that a separate evaluation of the most highly contaminated area was not performed for metals was because distinct plume areas could not be determined for metals as was done for explosives. For most metals, the highest concentrations were found at locations 13MWT05 and 13MWT25 which are located at opposite ends of the site. However, for the sake of completeness and to ensure that risks have not be underestimated, risks for metals in groundwater have been reevaluated and the discussion on page 7-53 has been revised as follows:

"As discussed in Section 7.5.2.2, risks for groundwater were based on the assumption that EPCs for groundwater were the concentrations in the most highly contaminated area of the explosive groundwater plume. The use of these averages is recommended by U.S. EPA Regions 1 and 4 (U.S. EPA, 2000). The plume area used for averaging was selected based on concentrations of explosives, especially RDX (see Section 7.3.3). This area also included maximum concentrations of some metals (e.g., iron, lithium, manganese, and nickel). Using the most contaminated part of the plume may result in overestimation of risks for explosives and several metals. However, the maximum concentrations of some metals were outside this plume area (e.g., aluminum, chromium, barium, and vanadium at location 13MWT05) and risks could be underestimated for these metals. Because of this uncertainty, an additional evaluation of risks for metals in groundwater was performed and is presented below.

Fifteen metals were identified as COPCs for groundwater at SWMU 13. For purposes of this discussion, these metals fall into the following three categories:

- *Metals with maximum concentrations within the explosive plume (i.e., iron, lithium, manganese and nickel) that were evaluated in the risk assessment. Since the maximum concentrations of these metals were included in the risk evaluation, risks were not likely underestimated, and these will not be discussed further.*

- *Metals with maximum concentrations that were less than MCLs and PRGs (i.e., antimony, barium, beryllium, cadmium, cobalt, lithium, nickel, and zinc). Risks for these metals are minimal and are not discussed further.*

- *Metals with concentrations that were greater than MCLs and PRGs in one or more samples but the concentrations were outside the explosive plume and were not included in the risk assessment calculations (i.e., aluminum, arsenic, chromium, and vanadium). Risks for these metals could be underestimated and an additional evaluation is warranted. The highest concentrations of these metals occurred at locations 13MWT05 and 13MWT25. Risks for the average concentrations of these locations were calculated for all receptors. The results of the reanalysis indicated that risks for workers and recreational users were acceptable but risks for the future child and adult residents exceeded U.S. EPA benchmarks. The results for child and adult residents are presented in the following tables.*

Comparison of Hazard Quotients (HQs) Calculated in the HHRA for SWMU 13 vs. HQs Based on Most Highly Contaminated Wells - Future Child Residents				
COPC	*EPC Used in Risk Assessment (ug/L)*	*Hazard Quotient from Risk Assessment*	*Average of MWT05 and MWT25 (ug/L)*	*Hazard Quotient Based on MWT05 and MWT25*
Aluminum	*2,800*	*0.3*	*106,000*	*10*
Arsenic	*1.25*	*0.4*	*22*	*7*
Chromium	*2.2*	*0.08*	*117*	*4*
Vanadium	*1.8*	*0.2*	*114*	*11*
Total HI		*1*		*32*

Comparison of Hazard Quotients (HQs) Calculated in the HHRA for SWMU 13 vs. HQs Based on Most Highly Contaminated Wells - Future Adult Residents				
COPC	*EPC Used in Risk Assessment (ug/L)*	*Hazard Quotient from Risk Assessment*	*Average of MWT05 and MWT25 (ug/L)*	*Hazard Quotient Based on MWT05 and MWT25*
Aluminum	*2,800*	*0.08*	*106,000*	*3*
Arsenic	*1.25*	*0.1*	*22*	*2*
Chromium	*2.2*	*0.02*	*117*	*1*
Vanadium	*1.8*	*0.05*	*114*	*3*
Total HI		*0.25*		*9*

In regard to cancer risks for the lifelong resident, the ILCR for exposure to arsenic in groundwater increased from $3x10^{-5}$ to $6x10^{-4}$ when using the average concentration from the most contaminated wells (22 ug/L).

As can be seen from the comparisons presented above, the ILCR and HQs based on exposure to the most highly contaminated wells are between one and two orders of magnitude greater than the risks calculated in the risk assessment. However, there is considerable uncertainty associated with the concentrations in samples collected from locations MWT05 and MWT25. An examination of the analytical results for the filtered samples associated with the unfiltered samples shows that aluminum, arsenic, chromium, and vanadium were not detected in either of the filtered samples (13GWT0502-F and 13GWT0525-F). For example, aluminum was detected in Sample 13GWT0502 at a concentration of 139,000 ug/L but the result in the associated filtered sample was 164 U ug/L (not detected). The filtered sample results indicate that suspended matter in the unfiltered samples has affected the analysis of these metals resulting in elevated concentrations. An additional factor in regard to aluminum is that since the risk assessment for SWMU 13 was completed (July 2005), the U.S. EPA has withdrawn the RfD for aluminum. Therefore, risks for aluminum could not be calculated if the risk assessment were performed at the present time. The conclusions of the above analysis indicate that there is great uncertainty in the risks calculated for aluminum, arsenic, chromium, and vanadium based on concentrations in the most contaminated wells resulting in an overestimation of risks."

The document "Supplemental Guidance to RAGS: Estimating Risk from Groundwater Contamination (ERGC)" referred to by EPA Region 4 could not be found.

Comment 18:
There is still an open question concerning risk to aquatic receptors in Boggs Creek. The preliminary conclusion was that there was unacceptable risk to sediment dwelling organisms from several metals. The Navy has indicated that they intend to do some additional mainstream sediment sampling in the "unnamed tributary" to Boggs Creek and that the data was anticipated to be available by the end of August 2005. We need to determine how this new information will be used and where it will be presented. The options appear to be an addendum to the ERA report or inclusion of the new information in the CMS phase of the project.

Response: Additional mainstream sediment samples were collected and analyzed for metals in the unnamed tributary to Boggs Creek and Turkey Creek in May 2005. Sediment samples were collected in Boggs Creek, upstream and downstream of where the mainstream enters Boggs Creek. Sediment samples were also collected in Turkey Creek, downstream of where the gullies from SMWU 13 enter Turkey Creek. The ERA has been modified to incorporate the results of the new sampling data. The additional data was presented in a new section of the ERA, just prior to the Uncertainty Analysis. The results of this evaluation concluded that the six metals retained as COPCs in the mainstream sediment samples were detected at lower concentrations in Boggs

Creek sediment, and the concentrations were generally less than upper-effects levels for sediment invertebrates, within upgradient concentrations, or within background sediment concentrations for SWMU 13, with few exceptions. Therefore, it is not likely that site-related concentrations of metals are significantly impacting sediment invertebrates in Boggs Creek. In Turkey Creek, the maximum detected concentrations for all of the metals were found in the furthest downstream sample, and the metals do not appear to be related to SWMU 13. Therefore, any potential impacts to sediment invertebrates from metals in Turkey Creek are not site-related.

In summary, no chemicals detected in the sediment are retained for further evaluation of potential risks to sediment invertebrates in a BERA because any potential risks to sediment invertebrates are considered acceptable.

ADDITIONAL NOTE

The SWMU 13 Internal Draft RFI report will be updated as needed to include the results of the new soil, sump, and sediment sampling data.