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# TECHNICAL MEMORANDA AND RESPONSES TO COMMENTS ON SOIL AND RELATED ECOLOGICAL RISK EVALUATIONS AT NCBC SITES 06, 10, AND 11

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# PREFACE

This bound document comprises a collection of reports submitted as documentation to support the Proposed No Action Plans for NCBC Sites 06, 10, and 11 regarding surface soil. Individual Technical Memorandums are included for each site that evaluate the need for remediation of surface soil. Following these are the Navy's response to comments on the Site 11 Demonstration, the August 1996 Document that described the protocol followed in each of the Technical Memoranda. Some of these comments and responses are specific to Site 11, and some are generic in that they apply to the Technical Memo protocol for all three sites. The last document in the series is the response to EPA comments on the Draft Final Facility-Wide Freshwater/Terrestrial ERA. These responses are provided in the context of Sites 06, 10, and 11.

5 December 1996

# TECHNICAL MEMORANDUM

**TO:** Christine Williams, EPA Region I and Richard Gottlieb, RIDEM

**FROM:** Philip Otis, Navy RPM, NCBC Davisville

**SUBJECT:** Soil-Based Remediation Evaluation at Site 06

This memo contains an ecological risk-based evaluation of surface soil concentrations of Chemicals of Concern (COCs) at Site 06 at NCBC. The information is provided as support for conclusions on ecological risk published in the Proposed No Further Action Plan for this site.

The original protocol for this evaluation was circulated to BCT members in August 1996 as a document, *Use of Ecological Risk Assessment Results to Support Remedial Decision-Making: An Example at the NCBC Davisville.* This demonstration document described a protocol and provided examples of its use for Sites 11 and 09 at NCBC. The protocol consisted of 10 sequential steps.

Step 1 Conduct the ERA.

Step 2 Select a Risk Threshold--A Hazard Quotient (HQ) of 10 is selected as a threshold for terrestrial-based receptors, based on the maximum watershed model (data based on ERA modeling).

Step 3 Identify Watershed-Specific Risk Drivers--All COC/ROC HQ combinations in the watershed that exceed the risk threshold are identified (data from ERA).

Step 4 Determine if Risk Drivers Occur at Site Being Evaluated and, if so, Validate Risk Drivers--If none of the risk drivers occur at the site in question (they are at one or more other sites in the watershed), then the process stops here for this site. If risk driver(s) occur at the site in question, then maximum soil concentrations are compared to published benchmark soil concentrations (background, criteria, detection limits). This comparison allows one to evaluate whether the HQ(s) represent unacceptable risk. If benchmark data and elevated HQs are few, this comparison may be done as a tabulation. If not, visual displays are employed (Step 5).

Step 5 Create Decision Diagram for Ecological Risk-Based Cleanup (DDERC)--If a number of HQs and benchmark data are involved, the risk validation of step 4 is best done graphically.

Step 6 Select an Ecological Risk-Based Preliminary Remediation Goal (PRG)--Using the graphical and/or tabular data, a PRG is identified that will reduce ecological risk to desired level.

Step 7 Identify Sample Locations Exceeding PRG in Site Under Investigation

Step 8 Repeat Steps 4 Through 7 for Each Designated Risk Driver COC

Step 9 Determine Extent of Projected Site-Specific Remediation

Step 10 If Necessary, Reassess PRG Selection in Light of Projected Level of Remediation Effort and Ecological Risk Reduction--The PRG selection and proposed remediation effort are evaluated in light of perceived risk reduction and take into account the areal extent of COCs and other factors.

The original August 1996 "demonstration" document provides greater detail for the stepwise process. The Navy acknowledges that comments on the demonstration document were provided by EPA, RIDEM, USFWS, and NOAA in September and October 1996. Responses to those comments accompany this Technical Memorandum.

Site 06 Description

This site is a flat, grassy area, approximately 1/4-acre in size, located between Buildings 38 and 67 near the intersection of Exeter and Bristol streets in the eastern portion of NCBC. The eastern boundary is fenced parallel to Exeter Street, and the western portion is bounded by a paved parking lot. The site is located within the Hall Creek watershed. Between 1970 and 1972, waste chlorinated hydrocarbon solvents were reportedly disposed of in an area of the site. Phase I and II sampling conducted between 1989 and 1993 reported generally low levels of VOC and SVOC in surface soil samples, and elevated metals concentrations (Phase I).

Site 06 Evaluation

Site 06 was evaluated with the stepwise protocol described above.

*Step 1*

A Freshwater/Terrestrial Ecological Risk Assessment for NCBC was completed in 1995 and results reported in the Draft Final version dated 15 February 1996. References to ERA results herein refer to that document.

*Step 2*

As described in the August 1996 "demonstration" document, a risk threshold of HQ = 10 was chosen based on modeled results for terrestrial receptors whose food base derives ultimately from soil (rather than aquatic sediment). These receptors were the hawk, robin, and shrew.

*Step 3*

Identification of watershed-specific risk drivers was based on examining Table 6-9 of the Draft Final ERA. This table contains food web-based, modeled HQs based on the maximum COC concentration in a given watershed. All COC/ROC pairs exhibiting an HQ in excess of 10 for either the hawk, robin, or shrew were identified as possible risk drivers in the watershed. The maximum HQs were used in lieu of average because the latter might cause one to overlook a "risky" location in a watershed containing more than one site.

A total of 17 COC/ROC pairs exhibited HQs exceeding 10. These ranged from HQ = 20.3 for Aroclor 1254/robin to HQ = 2,508.7 for Aroclor 1260/shrew (Table 6-9, Draft Final ERA). Maximum surface soil concentrations corresponding to those values were 17.5 mg/kg Aroclor 1254 and 12,000 mg/kg for Aroclor 1260. In all, 10 COC were associated with maximum HQs exceeding 10 in Hall Creek watershed. In addition to Aroclors 1254 and 1260, there were cadmium, fluorene, DDT, DDE, Aroclor 1248, dieldrin, endrin, and endrin ketone. These are considered potential risk drivers in surface soil at one or more sites in the Hall Creek watershed.

*Step 4*

Because there are 5 IR sites in the Hall Creek watershed, the surface soil data for Site 06 were examined to determine if the site contained any of the potential risk drivers. Of 10 analytes involved, nine were not detected at all in surface soil at Site 06. Only cadmium was detected in surface soil at Site 06 at a maximum concentration of 0.75 mg/kg. Cadmium is a potential risk driver somewhere in the Hall Creek watershed because of the cadmium/shrew maximum HQ of 28.3, and associated maximum surface soil concentration of 2.35 mg/kg. However, at Site 06, the maximum surface soil concentration of 0.75 mg/kg would only produce a shrew HQ of 9. Although this is below the designated risk threshold of 10, it is prudent to examine it further to be sure that a risk from cadmium is not overlooked.

The Site 06 maximum surface soil cadmium concentration of 0.75 mg/kg is compared below to various benchmark values, including soil-screening values and background, and to equivalent soil concentrations for HQ=1 and HQ=10.

| | |
|---|---|
| **0.75 mg/kg** | Site 06 maximum cadmium concentration (equivalent shrew HQ=9) |
| 20 mg/kg | Oak Ridge earthworm screen |
| 3 mg/kg | Oak Ridge plant screen |

| | |
|---|---|
| 5 mg/kg | Beyer (Dutch) screen |
| 1 mg/kg | NOAA Canada background |
| 0.22 - 3.5 mg/kg | Rhode Island background range |
| 0.83 mg/kg | Equivalent shrew HQ=10 |
| 0.08 mg/kg | Equivalent shrew HQ=1 |

The maximum cadmium concentration at Site 06 is lower than all of the commonly available soil screening values and lies in the lower end of the Rhode Island background range. This information supports a judgment that cadmium in surface soil at Site 06 does not pose an unacceptable ecological risk. Also, given the scaled equivalent HQ of 9 associated with the maximum surface soil concentration at Site 06, the exercise again illustrates the conservative nature of the HQs derived via food web modeling in the Terrestrial ERA.

Due to lack of a demonstrated risk from cadmium or other COC in surface soil at Site 06, the soil-based remediation evaluation is halted at Step 4.

## Benchmark Sources

**"Dutch (Beyer) Screen"** Beyer, W.N. 1990. Evaluating Soil Contamination. U.S. Fish and Wildlife Service, Dept. of Interior Biological Report 90(2) July 1990.

**"NOAA Canada background"** NOAA Screening Guidelines for Inorganics and Organics (Quick Reference Cards).

**"Oak Ridge Earthworm Screen"** Will, M. and G. Suter II. 1995. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process. Environmental Sciences Division, Oak Ridge National Laboratory. Prepared for U.S. DOE Office of Environmental Restoration and Waste Management.

**"Oak Ridge Plant Screen"** Will, M. and G. Suter II. 1995. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants: 1995 Revision. Environmental Sciences Division, Oak Ridge National Laboratory. Prepared for U.S. DOE Office of Environmental Restoration and Waste Management.

**"Rhode Island Background"** O'Conner, T. 1995. Background Levels of Priority Pollutant Metals in Rhode Island Soils. RI Dept. Environmental Management, Division of Site Remediation.

5 December 1996

# TECHNICAL MEMORANDUM

**TO:** Christine Williams, EPA Region I and Richard Gottlieb, RIDEM

**FROM:** Philip Otis, Navy RPM, NCBC Davisville

**SUBJECT:** Soil-Based Remediation Evaluation at Site 10

This memo contains an ecological risk-based evaluation of surface soil concentrations of Chemicals of Concern (COCs) at Site 10 at NCBC. The information is provided as support for conclusions on ecological risk published in the Proposed No Further Action Plan for this site.

The original protocol for this evaluation was circulated to BCT members in August 1996 as a document, *Use of Ecological Risk Assessment Results to Support Remedial Decision-Making: An Example at the NCBC Davisville.* This demonstration document described a protocol and provided examples of its use for Sites 11 and 09 at NCBC. The protocol consisted of 10 sequential steps.

Step 1 Conduct the ERA.

Step 2 Select a Risk Threshold--A Hazard Quotient (HQ) of 10 is selected as a threshold for terrestrial-based receptors, based on the maximum watershed model (data based on ERA modeling).

Step 3 Identify Watershed-Specific Risk Drivers--All COC/ROC HQ combinations that exceed the risk threshold are identified (data from ERA).

Step 4 Determine if Risk Drivers Occur at Site Being Evaluated and, if so, Validate Risk Drivers--If none of the risk drivers occur at the site in question (they are at one or more other sites in the watershed), then the process stops here for this site. If risk driver(s) occur at the site in question, then validation proceeds.

Based on comparison of soil concentrations associated with maximum watershed HQs to benchmark soil concentrations (background, criteria, detection limits), a determination is made as to whether the HQ(s) represent unacceptable risk. If benchmark data and elevated HQs are few, this comparison may be done as a tabulation. If not, visual displays are employed (Step 5).

Step 5 — Create Decision Diagram for Ecological Risk-Based Cleanup (DDERC)--If a number of HQs and benchmark data are involved, the risk validation of step 4 is best done graphically.

Step 6 — Select an Ecological Risk-Based Preliminary Remediation Goal (PRG)--Using the graphical and/or tabular data, a PRG is identified that will reduce ecological risk to desired level.

Step 7 — Identify Sample Locations Exceeding PRG in Site Under Investigation

Step 8 — Repeat Steps 4 Through 7 for Each Designated Risk Driver COC

Step 9 — Determine Extent of Projected Site-Specific Remediation

Step 10 — If Necessary, Reassess PRG Selection in Light of Projected Level of Remediation Effort and Ecological Risk Reduction--The PRG selection and proposed remediation effort are evaluated in light of perceived risk reduction and take into account the areal extent of COCs and other factors.

The original August 1996 "demonstration" document provides greater detail for the stepwise process. The Navy acknowledges that comments on the demonstration document were provided by EPA, RIDEM, USFWS, and NOAA in September and October 1996. Responses to those comments accompany this Technical Memorandum.

Site 10 Description

Site 10 consists of three small disposal areas totaling approximately two acres, located near an active firing range in Camp Fogarty and located four miles west of the Main Center. The site is in a low-lying area between the firing range berm and a steep hill, in an area subject to seasonal flooding. Access is restricted by fencing. Between 1950 and 1970, empty cans that had contained weapons cleaning oils and preservatives, and construction debris were disposed at the site. Phase I and II sampling revealed primarily PAH and inorganic analytes at low levels in surface soil samples.

Site 10 Evaluation

Site 10 was evaluated with the stepwise protocol described above.

*Step 1*

A Freshwater/Terrestrial Ecological Risk Assessment for NCBC was completed in 1995 and results reported in the Draft Final version dated 15 February 1996. References to ERA results herein refer to that document.

*Step 2*

As described in the August 1996 "demonstration" document, a risk threshold of HQ = 10 was chosen based on modeled results for terrestrial receptors whose food base derives ultimately from soil (rather than aquatic sediment). These receptors were the hawk, robin, and shrew.

*Step 3*

Identification of watershed-specific risk drivers was based on examining Table 6-9 of the Draft Final ERA. This table contains food web-based, modeled HQs based on the maximum COC concentration in a given watershed. All COC/ROC pairs exhibiting an HQ in excess of 10 for either the hawk, robin, or shrew were identified as possible risk drivers in the watershed.

Table 6-9 revealed only one HQ for terrestrial receptors in excess of 10: a maximum HQ of 19.87 was calculated for the antimony/shrew COC/ROC pair. The maximum surface soil concentration of antimony corresponding to this maximum HQ was 35.8(J) mg/kg (Table 5-7, Draft Final Terrestrial ERA). The "J" qualifier indicates that the true concentration is unknown and the given value is estimated. Antimony is considered to be a potential risk driver in surface soil in the Hunt River watershed.

*Step 4*

Because Site 10 is the only NCBC waste site in the Hunt River watershed, all surface soil samples employed in food web modeling were from Site 10. Consequently, the maximum HQ of 19.87 (ERA Table 6-9) and associated maximum surface soil concentration of 35.8 mg/kg (ERA Table 5-7) are associated with Site 10. To evaluate whether this maximum antimony concentration is a potential ecological risk in surface soil, a comparison is made below to available benchmark data, and to soil concentrations equivalent to HQs of 1 and 10.

| | |
|---|---|
| **35.8 mg/kg** | Site 10 maximum antimony concentration (antimony/shrew HQ=19.87) |
| 5.9 mg/kg | Rhode Island maximum background |
| 5.0 mg/kg | Oak Ridge plant screen |
| 0.48 mg/kg | NOAA U.S. background |
| 18.0 mg/kg | Equivalent shrew HQ=10 |
| 1.8 mg/kg | Equivalent shrew HQ=1 |

Although benchmark data are few (and only the Oak Ridge value is toxicology-based), the fact that the highest value (5.9 mg/kg) is six times lower than the maximum Site 10 concentration requires, in this protocol, that antimony be considered to represent potential ecological risk in surface soil.

*Step 5*

The few HQs and minimal benchmark data obviate the need for graphical displays. The validation process was completed in step 4.

*Step 6*

The Navy acknowledged in the Site 11 Demonstration the that the selection of a cleanup goal or PRG would involve a process of iteration and negotiation with EPA, RIDEM, and other appropriate parties. In the present case of antimony at Site 10, any PRG selected should fall between the highest benchmark value (5.9 mg/kg) and the maximum concentration reflecting unacceptable ecological risk (35.8 mg/kg).

*Step 7*

Figure C-7 from the Draft Final Terrestrial ERA is appended to this technical memo to illustrate Site 10 surface soil sampling locations. The location associated with the maximum surface soil concentration of antimony of 35.8 mg/kg is identified as sample location 10-SS09 in the northernmost disposal area.

*Step 8*

Not applicable.

*Step 9*

Not applicable (see remarks under step 10).

*Step 10*

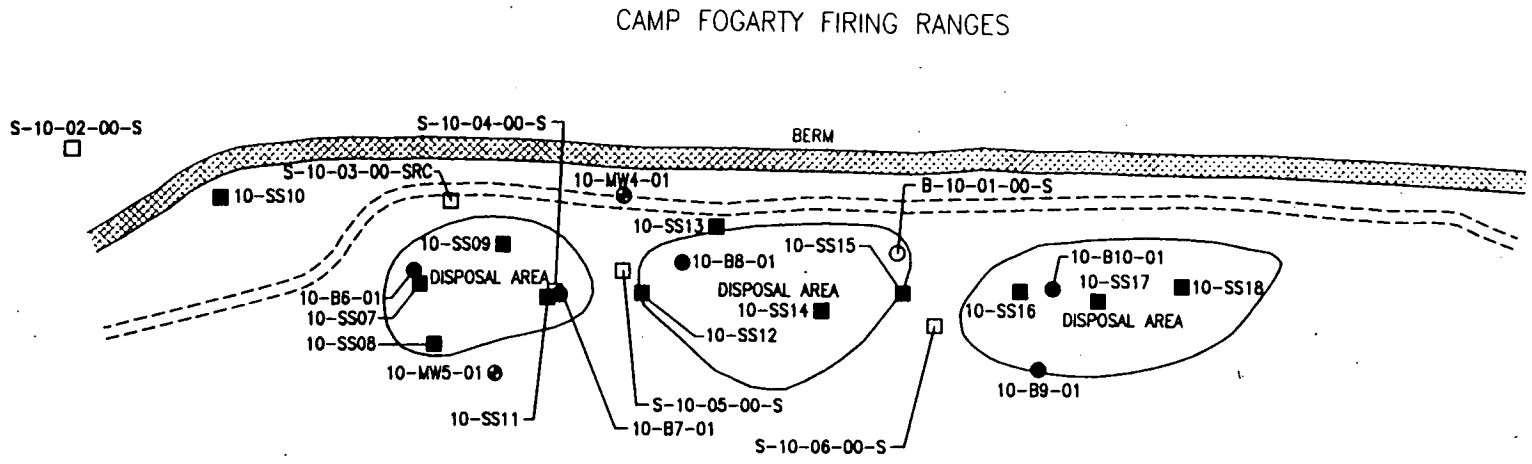
The 35.8 mg/kg value at location 10-SS09 that is driving risk was "J" qualified, i.e., an estimated value. Of 27 sample locations (Figure C-7), only five produced analytical detections of antimony, and four of these -- including the 35.8 mg/kg value -- were estimated values. Only one unqualified concentration was reported, 9.2 mg/kg at sampling location S-10-04-00-S. This concentration was the second highest reported and it equates to a shrew/antimony HQ of 5.3. The fact that antimony was detected in only a few samples, and the single sample "driving" risk is based on a questionable (estimated) concentration, support a decision not to undertake remediation of surface soil due to antimony concentration at Site 10.

## Benchmark Sources

**"NOAA U.S. background"** NOAA Screening Guidelines for Inorganics and Organics (Quick Reference Cards).

**"Oak Ridge Plant Screen"** Will, M. and G. Suter II. 1995. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants: 1995 Revision. Environmental Sciences Division, Oak Ridge National Laboratory. Prepared for U.S. DOE Office of Environmental Restoration and Waste Management.

**"Rhode Island Background"** O'Conner, T. 1995. Background Levels of Priority Pollutant Metals in Rhode Island Soils. RI Dept. Environmental Management, Division of Site Remediation.




B-10-02-00-S

S-10-01-00-S

## LEGEND

- PHASE II MONITORING WELL/ SURFACE SOIL BORING SAMPLE
- PHASE I SURFACE SOIL TEST BORING SAMPLE
- PHASE II SURFACE SOIL TEST BORING SAMPLE
- PHASE I SURFACE SOIL SAMPLE
- PHASE II SURFACE SOIL SAMPLE

N

200 100 0 200

GRAPHIC SCALE IN FEET

NOTES:

1. HORIZONTAL DATUM: RHODE ISLAND GRID, NAD 1927, 1969 ADJUSTMENT.
2. VERTICAL DATUM: NGVD 1929.
3. MAP AND SAMPLING LOCATIONS WERE GENERATED FROM TRC 1994a.

REFERENCE PLANS:

U.S. NAVAL ADVANCE BASE DEPOT, DAVISVILLE R.I., SUB-SURFACE, A.B.D., NAVY DEPT. ACC. NO. 32195, SHEET NO. 2079.

FILE: F:\2960032\3392\DWG\SITE10A

**Figure C-7. Site 10-Camp Fogarty Disposal Area Phase I and II Surface soil sampling locations**

5 December 1996

# TECHNICAL MEMORANDUM

**TO:** Christine Williams, EPA Region I and Richard Gottlieb, RIDEM

**FROM:** Philip Otis, Navy RPM, NCBC Davisville

**SUBJECT:** Soil-Based Remediation Evaluation at Site 11

This memo contains an ecological risk-based evaluation of surface soil concentrations of Chemicals of Concern (COCs) at Site 11 at NCBC. The information is provided as support for conclusions on ecological risk published in the Proposed No Further Action Plan for this site.

The original protocol for this evaluation was circulated to BCT members in August 1996 as a document, *Use of Ecological Risk Assessment Results to Support Remedial Decision-Making: An Example at the NCBC Davisville.* This demonstration document described a protocol and provided examples of its use for Sites 11 and 09 at NCBC. The protocol consisted of 10 sequential steps.

Step 1 Conduct the ERA.

Step 2 Select a Risk Threshold--A Hazard Quotient (HQ) of 10.0 is selected as a threshold for terrestrial-based receptors, based on the maximum watershed model (data based on ERA modeling).

Step 3 Identify Watershed-Specific Risk Drivers--All COC/ROC HQ combinations that exceed the risk threshold are identified (data from ERA).

Step 4 Determine if Risk Drivers Occur at Site Being Evaluated and, if so, Validate Risk Drivers--If none of the risk drivers occur at the site in question (they are at one or more other sites in the watershed), then the process stops here for this site. If risk driver(s) occur at the site in question, then validation proceeds.

Based on comparison of soil concentrations associated with maximum watershed HQs to benchmark soil concentrations (background, criteria, detection limits), a determination is made as to whether the HQ(s) represent unacceptable risk. If benchmark data and elevated HQs are few, this comparison may be done as a tabulation. If not, visual displays are employed (Step 5).

Step 5 Create Decision Diagram for Ecological Risk-Based Cleanup (DDERC)--If a number of HQs and benchmark data are involved, the risk validation of step 4 is best done graphically.

Step 6 Select an Ecological Risk-Based Preliminary Remediation Goal (PRG)--Using the graphical and/or tabular data, a PRG is identified that will reduce ecological risk to desired level.

Step 7 Identify Sample Locations Exceeding PRG in Site Under Investigation

Step 8 Repeat Steps 4 Through 7 for Each Designated Risk Driver COC

Step 9 Determine Extent of Projected Site-Specific Remediation

Step 10 If Necessary, Reassess PRG Selection in Light of Projected Level of Remediation Effort and Ecological Risk Reduction--The PRG selection and proposed remediation effort are evaluated in light of perceived risk reduction and take into account the areal extent of COCs and other factors.

The original August 1996 "demonstration" document provides greater detail for the stepwise process. The Navy acknowledges that comments on the demonstration document were provided by EPA, RIDEM, USFWS, and NOAA in September and October 1996. Responses to those comments accompany this Technical Memorandum. The Site 11 information from the original demonstration has been extracted and incorporated herein.

Site 11 Description

Site 11 is the former Fire Training Area located in the Mill Creek watershed (ERA Figure 3-1). The site is a mowed, grassy field with several large unvegetated areas where fire training exercises had been conducted between 1942 and 1955. Unknown quantities of waste oil, solvents, and other materials were poured onto the ground and ignited and then extinguished. Storm drains on this site drain to nearby Mill Creek. During Phase I and II remedial investigations, thirty-nine surface soil samples were collected (ERA Figure C-8) to characterize nature and extent.

Site 11 Evaluation

Site 11 was evaluated with the stepwise protocol described above.

*Step 1*

A Freshwater/Terrestrial Ecological Risk Assessment for NCBC was completed in 1995 and results reported in the Draft Final version dated 15 February 1996. References to ERA results herein refer to that document.

*Step 2*

As described in the August 1996 "demonstration" document, a risk threshold of HQ = 10 was chosen based on modeled results for terrestrial receptors whose food base derives ultimately from soil (rather than aquatic sediment). These receptors were the hawk, robin, and shrew.

*Step 3*

Identification of watershed-specific risk drivers was based on examining Table 6-9 of the Draft Final ERA. This table contains food web-based, modeled HQs based on the maximum COC concentration in a given watershed. All COC/ROC pairs exhibiting an HQ in excess of 10 for either the hawk, robin, or shrew were identified as possible risk drivers in the watershed.

Because the potentially contaminated area at Site 11 is surface soil, HQs were employed from those receptors whose entire exposure dose via the food web is derived from surface soil, i.e., robin, hawk, and shrew. The maximum watershed model results (ERA Table 6-9) were examined to identify any HQs > 10 for these receptors. In the Mill Creek Watershed which contains Site 11, three COC/receptor pairs produced HQs > 10: selenium/shrew (HQ=16.9), DDT/robin (HQ=55.3), and DDT/hawk (HQ=71.9).

*Step 4*

Site 11 is the only IR site in the Mill Creek watershed, thus the identified HQs exceeding 10 in the watershed result from Site 11 surface soil data. In this validation step, the maximum concentrations of selenium and DDT are tabulated and compared below to available benchmark data, and to soil concentrations equivalent to HQs of 1 and 10.

Selenium:

| | |
|---|---|
| **1.1 mg/kg** | Site 11 maximum selenium concentration (selenium/shrew HQ=16.9) |
| 70 mg/kg | Oak Ridge earthworm screen |
| 2.0 mg/kg | Ontario screening concentration |
| 1.1 mg/kg | Upper limit RI background |
| 0.65 mg/kg | Equivalent to shrew HQ=10 |
| 0.07 mg/kg | Equivalent to shrew HQ=1 |

DDT:

| | |
|---|---|
| **0.31 mg/kg** | Site 11 maximum DDT concentration<br>(DDT/robin HQ=55.3)<br>(DDT/hawk HQ=71.9) |
| 2.0 mg/kg | British Columbia target concentration |
| 0.5 mg/kg | Dutch (Beyer) screen concentration |
| 0.06 mg/kg | Equivalent to robin HQ=10 |
| 0.04 mg/kg | Equivalent to hawk HQ=10 |
| 0.006 mg/kg | Equivalent to robin HQ=1 |
| 0.004 mg/kg | Equivalent to hawk HQ=1 |

In the case of both selenium and DDT, the soil concentrations equivalent to the maximum calculated HQs are lower than the published screening values. For selenium, the maximum soil concentration does not exceed the Rhode Island background range. For both selenium and DDT, the HQ=10 soil equivalent concentrations are at or near detection limits. It is the Navy's judgment that there is no unacceptable ecological risk from either selenium or DDT in surface soil in Mill Creek Watershed, and specifically at Site 11. The fact that elevated HQs point to risk when there is none is a result of the conservative nature of the food web model and resulting HQ calculations. Conservative assumptions in the modeling include entire receptor dose coming from a single site, 100 percent bioavailability of COC, and use of the lowest available toxicity (TRV) data.

For Site 11, the process terminates here as there is no need to investigate individual sample data for possible remediation. No remediation of surface soil is warranted at this site.

## Benchmark Sources

**"British Columbia Target"** NOAA Screening Guidelines for Inorganics and Organics (Quick Reference Cards).

**"Dutch (Beyer) Screen"** Beyer, W.N. 1990. Evaluating Soil Contamination. U.S. Fish and Wildlife Service, Dept. of Interior Biological Report 90(2) July 1990.

**"Oak Ridge Earthworm Screen"** Will, M. and G. Suter II. 1994. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process. Environmental Sciences Division, Oak Ridge National Laboratory. Prepared for U.S. DOE Office of Environmental Restoration and Waste Management.

**"Ontario Screen"** Environment Ontario. 1989. Guidelines for the Decommissioning and Cleanup of Sites in Ontario. Waste Management Branch. ISBN D-7729-5278-7. Queen's Printer for Ontario. Ottawa.

**"Rhode Island Background"** O'Conner, T. 1995. Background Levels of Priority Pollutant Metals in Rhode Island Soils. RI Dept. Environmental Management, Division of Site Remediation.

# Response to Review Comments on Site 11 Demonstration

## EPA General Comments

**Comment 1.** This proposed approach is only suitable at NCBC in circumstances where the ecological risk assessment (ERA) risk characterization suggests that there are not sufficient risks posed by the site to warrant remedial action or when the cumulative effects of the site contaminants over the watershed do not warrant remedial action. In these circumstances a no-action decision is being pursued and therefore further documentation is necessary to support the proposed plan in the absence of a feasibility study (FS). If remedial alternatives are being evaluated, then the Feasibility Study process provides appropriate means to use the ERA findings in remedial decision-making via the steps of establishing Remedial Action Objectives (RAOs) and Preliminary (and Final) Remedial Goals (PRGs).

**Response**: The Navy does not agree that the "approach is only suitable...where there are not sufficient risks posed by the site to warrant remedial action...." Step 6 of the protocol is clearly directed at selecting a remedial action goal. "Remedial alternatives" are not evaluated in this protocol (with the exception of simple action/no action decisions). Rather, it is a decision process to determine whether surface soil at a site requires remediation.

**Comment 2.** Many of the concepts embodied in the proposed Steps should be dealt with in the risk assessment directly. For example, selenium could have been screened out in the selection of COCs in the problem formulation due to the maximum concentration observed falling below an appropriate background (preferably the Site Background would be used for evaluation but the Rhode Island data could have been used if there was not Site Background). If a decision was made to retain selenium due to the high potential for toxicity, then either a discussion of the distribution of selenium concentrations resulting in a HQ >1 and 10 could have been presented in the risk assessment and demonstrated the low potential for risk at the site. If not, discussion in the uncertainties section of the risk characterization should have pointed out that the concentration did not exceed background and that there are few other COCs resulting in HQs >1, therefore unacceptable risk is not present at the site. There is no need for an additional, extraneous document to be generated on a regular basis.

**Response**: With regard to the comment regarding "additional, extraneous documents," the Navy now understands that EPA has agreed to receive and review these documents. We differ on the matter of dealing with the "concepts" in the risk assessment directly. The ERA focuses on the watershed and EEZ level, and not the site level. It is true that, for watersheds containing only one site (Hunt River/Site 10, Mill Creek/Site 11), some inferences could be made regarding site-specific effects of surface soil based on watershed data (i.e., all surface soil data in the "watershed" evaluation are from the one site). However, this would not work

for watersheds with more than one site (Hall Creek, Allen Harbor). Regarding the selenium example cited by the reviewer, the Navy points out that selenium was screened out in surface soil and was not designated as a COC in the Mill Creek watershed. However, it was retained as a COC in surface water and sediment. Because of this, it was included in food-web modeling, and the appropriate soil fractions employed. Consequently, a maximum HQ of 16.9 was calculated for the shrew. Subsequently, in the Site 11 demonstration (and in the Site 11 Technical Memo accompanying these responses) the corresponding surface soil concentration of 1.1 mg/kg was shown to be below tox screening benchmarks and within Rhode Island background, and consequently, selenium was dismissed as a potential unacceptable risk.

**Comment 3.** EPA does not generally support a prescriptive approach to risk management. Sites, contaminants, nature and extent, media, receptors, and remedial alternatives occur in innumerable permutations at sites. The risk management process should be a dynamic, informed discussion between risk assessors, risk managers, and other stakeholders. While this paper may be useful for the site in question at NCBC, EPA will not endorse having this codified as a process to be applied across sites, Navy or otherwise, for the reasons stated above.

**Response**: The Navy does not intend that the protocol be prescriptive or codified, at NCBC or anywhere else. We fully agree with the reviewer's assertion regarding how the risk management process should be done.

**Comment 4.** The demonstration for Site 11 utilized various published screening values as a "reality check" for the food web-based Hazard Quotients (HQS). The screening values for selenium and DDT, the two chemicals of concern (COC) in surface soil at Site 11, must be representative of surface soil samples from an uncontaminated site that sustains a healthy ecosystem, in order to validate comparisons with concentrations of selenium and DDT in surface soil samples from Site 11. Documentation should be provided to confirm that the benchmark values used in the demonstration are valid for comparison with the Site 11 surface soil concentrations and thereby validate the conclusion that no remediation of surface soil at Site 11 is warranted. The EPA has questioned the appropriateness of these screening values in past comment letters. The Navy has not provided the requested justification to date. The Navy must justify the use of such values.

**Response**: The Navy used the commonly available soil-screening benchmark values. They are what is available to EPA and other agencies, and they are what is available to the Navy. The key to using the benchmarks is to use as many as pertain to a given situation, include appropriate background data as available, and make cautious judgments based on the data. Further, note that in responses found later in this document, that the Navy has, at reviewer's requests, removed certain benchmark data from the process, such as Region III BTAG values and maximum U.S. background.

**Comment 5.** The Navy concluded that since selenium and DDT expressed minimal risk in surface soil, no correlation can be made between risks from Site 11 surface soil and risks from sediment in Mill Creek. This conclusion is reasonable, based on the fact that the concentrations of selenium and DDT in the site 11 surface soil samples do not pose unacceptable risks. This conclusion was further supported by the fact that several chemicals with high HQs in sediment were not detected or were detected at low concentrations in the Site 11 surface soil. As noted in the demonstration, "this exercise does not resolve the source of the elevated chemicals in Mill Creek sediment, or whether there is ongoing contamination from an unknown source or whether a past circumstance is responsible" (page 8). The Navy must develop a reasonable evaluation of possible source areas causing the risks to the Mill Creek Watershed. This evaluation may be done as part of the watershed RI/FS. Proposed Plan, ROD process for the groundwater in the Mill Creek.

**Response**: The Navy is prepared to discuss with EPA the elevated HQs in Mill Creek. The individual Technical Memo for Site 11 does not appear to be the appropriate document for this discussion, because the source of sediment chemicals is unknown, but is demonstrably not the surface soil at Site 11.

**Comment 6.** EPA concurs with the review done by the USF&WS that is attached to this comment letter. EPA expects the Navy to respond in writing to both sets of comments.

**Response**: The responses are provided herein.

**EPA Specific Comments**

**Comment 7.** Page 1, paragraph 2. This document should not be appended to the RI which culminates in risk assessment, and should not include "risk management" evaluations. This document should be retained as part of the administrative record and should be referred to in the Proposed Plan for this Site. Additional similar documentation should be provided for the Sites 6 and 10 included in the draft Proposed Plans that are currently under review.

**Response**: Concurrent with submittal of these responses, Technical Memoranda are submitted, one each for Sites 6, 10, and 11, that employ the protocol in question and provide documentation for ecological risk conclusions in the PRAPs. The Navy agrees that they be retained as part of the administrative record, and will reference them in the final PRAPs.

**Comment 8.** Page 2, step 2. A HQ of 10 is not acceptable as an assumed cutoff for establishing a "risk threshold". Multiple HQ values between 1 and 10 could present a situation where unacceptable risks are present, this would be lost if the proposed approach is followed. Region I policy is that in general circumstances and assuming an appropriate risk assessment is done, an

HQ <1 is considered to constitute negligible risk, between 1 and 10 the potential for risk is demonstrated, and >10 risk is probable. Even with this general guideline, circumstances could occur where HQs of <1 could still be of issue, typically in situation with multiple contaminants, or where inappropriate reference toxicity values (RTVs) were selected. Region I usually requests that Hazard Indices be calculated for those contaminants with the same target organ or mode of action. The Navy appears not to have done this step as the information is not included in this document, please reference the section of the ERA where it is calculation occurs. It is true that during the risk management process, residual risks may be accepted, however within the framework of the nine criteria. Risk thresholds should be developed site-specifically, not prescriptively.

**Response**: The Navy has amply demonstrated that individual chemical HQs, not only of 10, but sometimes well in excess of 10, clearly pose no unacceptable ecological risk. To add these HQs together to produce HIs will simply confound the process and leave no means for interpreting the data. As further evidence that HIs are misleading, we point out that 60 percent of the HIs calculated in the mean background watershed model (ERA Table 6-10) exceeded 1.0, the traditional risk threshold. Also, there are no toxicological benchmarks or background data with which to compare an additive total concentration of chemicals associated with an HI calculation. In response to the reviewer's question, the ERA HI calculations are provided in all watershed model Tables 6-7 through 6-11 of the ERA.

**Comment 9.** Page 2, step 4. EPA believes that it is not appropriate to compare HQs to benchmarks at this stage. Any appropriate benchmarks should be used earlier in the process, either at the risk screening stage during problem formulation, during the selection of contaminants of concern, as a measurement endpoint directly, or during the discussion of uncertainty in the risk characterization. If the HQs are considered to be so "conservative" and the risk represented by HQs of greater than 10 is not "real", then something is significantly wrong in the conduct of the risk assessment. Therefore, EPA is re-evaluating the ERA to determine if the outstanding issues noted in the various review letters could be implemented to provide a more realistic risk assessment.

**Response**: The Navy wishes to confirm that it did in fact use benchmarks for screening "earlier in the process." Their use in the accompanying Technical Memoranda for Sites 6, 10, and 11 is in a different context than the original screening. The statement that "something is significantly wrong in the conduct of the risk assessment" is troubling. The risk assessment, and in particular, the food web modeling, incorporates a number of very conservative assumptions such as 100 percent bioavailability of COCs and constant exposure of receptors. During the 14 December 1995 meeting at NCBC, EPA representatives required that the Navy use the lowest available TRVs, thus making an already conservative assessment more so. We are all now reaping the results of such decisions in the form of hazard quotients that do not reflect reality. Notwithstanding, the Navy believes that the ERA is a useable document. It is important however, particularly when evaluating the need for remediation, to recognize the highly conservative nature of the risk assessment, and to adjust procedures as appropriate to support proper remediation decisions.

**Comment 10.** Page 3, step 5. A graphical or map presentation of HQs or HIs is often a very valuable tool in risk management decision-making and one EPA uses frequently. Please provide the graphic for the site and the other sites included in the draft Proposed Plans currently under review.

**Response**: A map would seem superfluous for a site where no HQs posed unacceptable risk. However, we are providing a map of surface soil sampling locations in the accompanying Technical Memo for Site 10. And we further note that the locations of maximum COC concentrations in surface soil are provided in Tables 4-6 through 4-10 of the Freshwater/Terrestrial ERA. With regard to sample media other than surface soil, we refer the reviewers to response to EPA Comment 5 in the accompanying responses to outstanding issues comments on the ERA. This response contains watershed maps corresponding to Sites 06, 10, and 11 that provide maximum sediment HQs by sampling location.

**Comment 11.** Page 3, step 6. Terminology should be consistent with standard RI/FS guidance. PCGs are in fact *Preliminary Remedial Goals* and should be called such.

**Response**: The requested change has been incorporated into each of the accompanying Technical Memos.

**Comment 12.** Page 4, paragraph 2. In general, EPA does not support presenting information for risk management decision-making that is limited solely to the maximum HQs observed at the site. It is far more informative to present a summary of both the average and maximum HQs and HIs for consideration by the decision-makers, so that they may have a picture of the distribution and frequency of risk values. Given this information, they should be able to follow whatever weight of evidence was presented in the risk characterization.

**Response**: The premise of the Navy's protocol is that, if the maximum HQ is shown not to represent unacceptable risk, then nothing else has to be done. If the maximum poses unacceptable risk, than other data, perhaps the mean, or the distribution of HQs and associated soil concentrations would be brought into the process, as the reviewer suggests. It is further noted that, for those watersheds having multiple IR sites (e.g., Hall Creek), use of the maximum HQ rather than the mean ensures that a risk is not overlooked at a site.

**Comment 13.** Page 4, benchmark table. There are a number of extremely inappropriate values included here. First, using the maximum value from a U.S. background soils data set is completely unacceptable and is not allowed in Region I. Background data should be generated specifically for the site (or facility) in question. Preferably the site-specific data set should represent the range of soil types observed at the site. Ontario, British Columbia and Dutch benchmark values should only be considered if in fact one of the objectives during the

benchmark's development is protection of ecological receptors. Primary literature for the derivation of these values should be reviewed and rationales presented if deemed appropriate. The Oak Ridge earthworm screen does not appear to be relevant for the receptors and exposure pathways chosed for the site, otherwise the earthworm should have been included directly in the risk assessment as a measurement endpoint. If there is a need for further evaluation against alternative values EPA suggests performing an iteration of the risk characterization using lowest observed effect levels (LOELs) rather than these artificial and/or inappropriate values presented here.

**Response**: The Navy has responded to this in part under general comment 4 above. Regarding the "extremely inappropriate values," we reiterate that we have removed the maximum U.S. soil background, as well as the Region III BTAG values. As to the request to present rationales for these screening values, we state again that we are using all the available information, the same information that is available to EPA. In fact, some of the same values are apparently used in Region I (per the so-called ESAT memo of 1993). The point is that the Navy, as well as EPA, has to use the available information, and we must all do it cautiously. The statement about the earthworm, we believe, entirely misses the point of the process. In contrast to the ERA, which formally designates endpoints and receptors of concern, this risk-based soil remediation evaluation process uses whatever information is available and appropriate and the earthworm screening values are valid in that regard. In the last statement of the comment, the reviewer has in effect asked that the entire food web-modeling exercise be repeated. This is not necessary.

**Comment 14.** Page 4. EPA believes that a presentation the HQs observed and the respective soil concentration that is equivalent to a HQ of 1 and 10 should be presented rather than present an acutal soil concentration.

**Response**: Step 4 of the protocol has been structured to include soil concentrations equivalent to HQ=1 and HQ=10.

**Comment 15.** Page 4, paragraph 3. Based upon the presented "reality check" it would be EPA's opinion that the risk assessment was flawed, not that the risk isn't "real". Please provide the average values for the HQs with a mapped representation of the distribution of values in the revised demonstration.

**Response**: The Navy does not share EPA's opinion on this matter. And, as we suggested in the above response to EPA comment 9, to the extent that HQs are projecting risk where there is none, this is a direct result of the conservative assumptions used in the risk assessment, such as using the lowest available TRVs. With regard to the requested maps, we ask for clarification regarding what HQs and what distribution of values are being requested.

**Comment 16.** Page 5. See general comment regarding use of the process at sites other than no-action decisions.

**Response**: See response to EPA general comment 1.

**Comment 17.** Figure 1. While some of the benchmarks presented are not appropriate, the figure is a good concept and similar to those used at a number of Region I sites in establishing PRGs and cleanup levels. Region I has not reviewed and does not support the Region III BTAG concentrations, therefore please revise the document appropriately.

**Response**: The Region III BTAG screening values have been removed from the documents.

**FWS Comments**

**Comment 1.** With consideration of several specific comments discussed below, the process outlined by the Navy has the potential of providing a simplified, graphical presentation of site-specific soil related risks scaled against appropriate benchmarks, which may be useful to risk management decision makers. However, we should note that the protocol relies on beginning from a completed ERA for the watershed in which the site being evaluated is located. In the case of NCBC Davisville, we understand that there are still several technical issues identified by EPA regarding the ERA, which remain to be resolved with the Navy.

**Response**: Navy responses to EPA's "outstanding issues" comments on the ERAs accompany this document.

**Comment 2.** The second paragraph of the Preface to the Protocol indicated that the formats for describing the site-specific evaluations and the nature of the ultimate submittal (e.g. discrete technical memoranda, addenda to PRAPs, and /or RIs), have not been established at this time. However, the first paragraph of the Preface indicated the Protocol has already been used to provide site-specific evaluation included in two draft PRAPs (for Site 10 and Sites 6 and 11), which are under concurrent, time-limited review by EPA and RIDEM. We are concerned that items that EPA may wish to have addressed in review of this Protocol may not "catch up" to the finalization of the two draft ("no-action") PRAPs. We should also note that we have just found that the Navy's distribution of the August 14, 1996 draft PRAPs for these sites omitted copies to the US. Fish and Wildlife Service.

**Response**: With this submittal, the Navy believes all requisite documents are brought to the same review stage.

**Comment 3.** The site-specific evaluation of soil related contaminants will not address the potential effects of several PAH's to avian receptor guilds (represented by the robin and the hawk) as these were not estimated in the NCBC ERA because compound-specific toxicity reference values were not found in the literature reviewed.

**Response**: The reviewer is correct in that most PAH compounds could not be modeled for birds because of a lack of suitable toxicity data. If the reviewer is suggesting the use of some sort of surrogate TRVs for PAHs, we point out that schedules do not permit additional modeling exercises at this late date. We have no reason to believe that the results would differ from those evident for the few PAHs for which TRVs were available. Nearly 90 percent of the HQs were less than 1.0 and none exceeded 7.0 (Table 6-8, Freshwater/Terrestrial ERA). This information, in conjunction with the results for the shrew ( no shrew/PAH pairing in any of the three watersheds [Hunt River/Site 10; Mill Creek/Site 11; Hall Creek/Site 6] produced HQs greater than 10) provides an adequate assessment of ecological risk due to PAHs in terrestrial food webs.

**Comment 4.** The site-specific evaluation of current soil conditions, outlined in the Protocol, does not address ecological effects associated with water and sediments, which are identified in the watershed based Facility-Wide ERA. We recommend a mechanism be established to provide similar, separate evaluations for risk management decision making in these watershed media.

**Response**: The Navy indicated in response to EPA comment 5 that it was prepared to discuss with EPA potential risk in aquatic habitats. However, the current protocol is directed specifically at surface soil on a given site. If any subsequent evaluation of risk or potential remediation in aquatic habitats is deemed necessary, the current, site-specific surface soil evaluations will aid such a process.

**Comment 5.** The process of evaluating site-specific risks for soil remedial decision making has the potential of overlooking effects of contaminant/receptor pairings or groups of contaminant/receptor pairings from multiple sites within a watershed. We recommend a mechanism be included in the Protocol to account for such risks in the presentations where appropriate (i.e., ERA results indicate risks to receptors whose ranges, e.g., the hawk or robin, would allow foraging at multiple sites within a watershed having similar COC-specific HQs above threshold values). At NCBC this concern may be most pertinent within the Hall Creek Watershed.

**Response**: While the Navy accepts the reviewer's attempt to import more ecological reality into the evaluation, we don't entirely understand the request or the need for it. If there are three sites in a watershed for example, and a robin forages on all three, its dose will be integrated from the three sites. In the current protocol, each site is examined as if it is the sole source of a receptor's dose. This may not be realistic for some receptors, but it is conservative, and the Navy has taken this approach because the alternative would entail an onerous area-use modeling exercise that would be encumbered by so many assumptions as to be of little ultimate value. It also would predict lower risk than is now predicted.

**Comment 6.** The second Protocol Step (Select a Risk Threshold) recommends a Hazard Quotient >10 (rather than 1) for contaminants evaluated in the facility-wide ERA toxicity-based

food-chain modeling approach. The conservative nature of the selection and adjustment of Toxicity Reference Values in developing the NCBC HQs, a published study by Menzie et al. (1993) and "draft EPA guidance for conducting ERAs at Superfund sites" (no reference provided) are mentioned in support of this recommendation. The selection of the threshold to screen out lower level risks is really a risk management rather than a risk assessment decision. However we would point out that:

a) the Menzie, et al. Ranking of HQs values for risk management decision making may have been predicated on use of more conservative safety-factor "effects" adjustments for LOAEL to NOAEL and/or interspecies differences than were applied in the NCBC ERA (10 and 10 or 100 in Menzie et al. vs. body weight scaling for interspecies differences and a factor of 5 for LOAEL to NOAEL in the ERA):

b) use of chemical/receptor-specific HQs, particularly at a value of 10, may screen out from the risk management decision maker the possible additive effects of multiple contaminants that would be addressed by appropriate, judicious use of Hazard Indices (HIs) for groups of contaminants with similar modes of toxicity.

**Response**: First, the Navy points out that, because we are determining whether or not remediation of surface soil is necessary, we are in the realm of risk management, and using risk assessment results in the decision process. With regard to part a) of the comment, the Navy acknowledges the difference in the uncertainty factor-extrapolations in the Menzie et. al. study and the Navy's ecological risk assessment. However, the Navy's comparison of TRVs (Toxicity Reference Values) derived via the Menzie et al. approach and those derived by the Navy's body-weight scaling approach indicates that the latter are typically more conservative (lower). Therefore, the Navy's use of the Menzie et al. scheme for relating HQs to potential risk as part of the justification for choosing HQ=10 as a risk threshold is also conservative. With regard to part b. of the comment, the Navy reiterates its response to EPA specific comment 9. When HQs are already demonstrably over-predicting risk, adding them together produces nothing of value. As stated earlier, 60 percent of the HIs calculated in the mean background food web model exceeded 1.0.

**Comment 7.** The fourth Protocol Step (Validate Risk Drivers), compares the contaminant/receptor specific HQs found to exceed Threshold values to a variety of benchmark screening values. As noted in the Protocol, this is "most important" step in the process. It is also the one fraught with the greatest potential controversy among reviewers. We would make the following general recommendations:

a) If "background" soil-metal concentrations are used as comparative benchmarks, the following order of preference would be recommended: site specific (i.e. NCBC), State, and region (northeast); and, average values or the range of naturally occurring values be presented vs. the

upper limit. National values would not be recommended as they have the potential of introducing issues unrelated those of concern at the site (the Site 11 demonstration, for example, uses an upper limit of U.S. background values for selenium; a metal that has been observed to naturally occur in soils in some parts of the western U.S. at concentrations that bioaccumulate in plants to concentrations that are acutely toxic to livestock).

b) The source of any benchmark value be provided with appropriate reference citations in applications on the Protocol; the basis of the benchmark effects be determined from its source publication, and be clearly described in the Protocol's application (i.e. human health, agriculture crop, other vegetation, soil microbe, soil invertebrate, food chain model TRV back-calculation, etc): and, that copies of unpublished, not generally available benchmark souse documents be provided in order to support review of Protocol applications within the time frames established among the EPA, RIDEM and the Navy. The lack of such information makes review of the "Site 11 demonstration" of the Protocol's application tenuous at best. For example:

1.) the "Oak Ridge earthworm screen" is described in the cited reference as being based on survival and reproductive effects of selenium to earthworms, with confidence in the benchmark given as "low"; the Site 11 demonstration does not provide any description of how a comparison of direct effects of selenium to invertebrates is related to the food chain related effects to an earthworm predator (the shrew):

2.) a reference to the source of the cited "Upper Limit U.S. Background" for selenium is not provided:

3.) the basis of "Ontario screening concentration" is not described (i.e. is it an ecologically based number, and if so what end-point is it based upon?):

4.) the "Upper limit RI Background" level is from an unpublished RIDEM paper (we do have a draft copy provided by the author);

5.) a full citation for the "British Col(umbia) target conc(entration)" is not provided, nor is the basis of the selected concentration described;

6.) the "Dutch (Beyer) screen conc(entration)" used in the demonstration is a generalized "organochlorinated pesticide" value listed in the Netherlands criteria (as described by Beyer) for "moderately contaminated soils that require additional study to determine the need for cleanup"; the basis for the "Dutch" values is not described by Beyer; and , Beyer specifically cautions in the preface to his paper that, "If data (compiled in his paper) are to be cited, the reader should go to the original source to be sure that the intent of the author is understood. Some of the information included (in his paper) is from drafts. Unfortunately, many of the criteria did not have accompanying explanations of how they were derived, and this limits their application to other situation".

c) The comparisons to benchmarks be made among those with similar ecological or biological endpoints (e.g. not comparing human health effects concentrations to concentrations toxic to soil invertebrates, or those toxic to soil invertebrates to those which may produce adverse effects to food chain receptors -- particularly for contaminants with the potential to bioaccumulate).

**Response**: The Navy shares the reviewer's concern that appropriate benchmark values be used. We have in fact, as this reviewer suggests, deleted the maximum U.S. background values, and also deleted Region III BTAG numbers as EPA requested. Beyond that, we can only reiterate that we are using the only information available, and we are using it as carefully as possible.

**RIDEM Comments**

**Comment 1.** Page 2, step 4, Validate Risk Drivers. Paragraph 1, last sentence. It does not appear that Menze et. al. are indicating "No risk" for HQ > 10.0, but in fact a likelihood there is risk at a chronic vs acute pollutant level. The risk is for chronic effects rather than lethal/acute ones, but it still exists. This should be so noted in the paper.

**Response**: The Navy is not certain of the reviewer's meaning. We did not suggest in the demonstration that Menzie et al. assigned "no risk" for HQs greater than 10. In fact, in the present protocol, if an HQ over 10 is confirmed to exceed benchmarks, it is dealt with as if risk is present. If the reviewer meant to indicate "< 10.0," we would agree that they did not suggest no risk below HQ=10. We do not interpret the Menzie paper in the context of acute and chronic. We can not speak for their analysis, but in the Navy's ERA, only chronic endpoints were chosen. Obviously, if a chemical concentration is high enough, it may cause an acute effect. However, there has been no attempt to predict acute risks; if a chronic threshold is exceeded, there is presumed to be potential risk.

**Comment 2.** Page 4, step 3, Identification of Risk Drivers; whole section. In a discussion of risk drivers it would be very helpful to get a feel for the site's concentrations without having to reference other tables. For example, please state if the HQ of 16.9 (selenium/shrew) is based on maximum or median concentrations found at the site. Please state what the median concentration is for all samples and how that falls in relation to benchmarks. (Median is held by many statisticians as a more reasonable measure of "the middle value" vs mean).

It is suggested that as part of this process that a simple box and whisker plot of pollutant COCs be provided when discussing comparisons like this, especially since HQ> 10 are rejected as a "real world" indication of risk.

**Response**: As stated in Step 4 of the protocol, the maximum watershed HQ is used to identify risk drivers. Because there is only Site 11 in the Mill Creek watershed, that maximum value (and resultant maximum selenium/shrew HQ of 16.9) is from that site. Given that there was only one analytical detection of selenium at Site 11 (24 non-detects) the median concentration would be

essentially at detection limits, i.e., 0.6-0.7 mg/kg. The Navy acknowledges the request for box and whisker plots. Such a procedure may be possible with sites better evaluated graphically. However, in the three Technical Memos submitted for Sites 6, 10, and 11, benchmark and HQ data were few enough that graphical evaluation was not needed.

**Comment 3.** Pages 4 & 5, step 3 and site 09. It may be reasonable to argue that 1.1 ppm selenium is not a significant risk, especially based on the Navy's later discussion concerning the conservative TRV assuming 100% bioavailability (pg 8). However, without a detailed discussion, it appears the Navy is too quickly dismissing HQ> 10 as not of significance. This may not always be the case, since food web models should encompass bioaccumulation and other long-term risks. Chronic risks will always look "conservative" vs acute impacts. Therefore, where HQ > 10 are based on legitimate, realistic dosages at chronic levels for the TRV, the risk may be real and should be considered in remediation issues.

Again, a useful graphical layout could be box and whisker plots shown against benchmark values and HQ concentrations (as in Fig. 1), and would be helpful in getting an overall feel for a site.

The Site 09 example (page 5) is not really a good proof that the methodology is reasonable since this site has known significant risk and should come out high with any rating system. The Navy could have picked a criterion of HQ >100 and low # of benchmarks exceeded and still come out in agreement.

The consideration of off-site transport within the watershed is an important issue, and should continue to be pursued in evaluating a site of concern (as was done on page 8). Overall, there needs to be better agreement concerning HQ > 10. Right now, the Navy appears to follow violations of benchmarks as the primary discussion maker.

**Response**: The Navy does not agree that HQs exceeding 10 represent unacceptable risk, chronic or otherwise, if the COC concentrations that drove the HQs are below benchmark values. The reviewer's comment regarding the Site 09 example seems to question the sensitivity of the protocol. This should be established by the time the procedure is applied to each site at NCBC. We agree that off-site transport is an important issue, but only if there are COCs at unacceptable risk levels on site available for transport. If no COCs in surface soil represent unacceptable risk, then the site is judged not to require remediation of surface soil. Implicit in this, is that the site is not then considered appropriate for investigation of COC transport to an off-site location, such as a stream. In responses to EPA comment 5 and FWS comment 4, the Navy expressed willingness to discuss with EPA and RIDEM the issue of elevated COCs in streams. If this is deemed necessary, it is much more appropriate to follow a potential "transport" trail or pathway from the stream out to potential sources rather than investigate in from isolated, single sites.

## NOAA Comments

**Comment 1.** Conduct ERA. As already stated, before making a remedial decision based on risk assessment results, it is first necessary to have a strong and defensible risk assessment. In this case, the risk assessment has already been completed, so it seems that the approach will be used to integrate the risk assessment results into the remedial decision-making process.

**Response**: Agree.

**Comment 2.** Select a Risk Threshold. This step, as described in the document, appears to be based on the hazard quotient method, whereby environmental concentrations at the site of concern are divided by the appropriate screening guideline. The chronic no observed apparent effects level (NOAEL) was cited as a screening guideline in the document. A risk threshold expressed as a hazard quotient > 10 was used in the examples given, based on work by Menzie et al. (1993) that reported the following risk thresholds:

- 1 < HQ < 10: Indicates a low potential for environmental effects
- 10 < HQ < 100: Indicates significant potential for effects
- HQ > 100: Indicated probable effects

From the examples cited in the document, it appears that remedial decisions are to be made based solely on comparison of environmental concentration of contaminants to appropriate guidance values, without examining other important information that may have been collected as part of the ERA. The examples provided in the document were for terrestrial ecological risk assessments conducted at Sites 09 and 11, the Allen Harbor Watershed and the Mill Creek watershed, respectively. No mention was made of what type of risk thresholds will be selected for the ecological risk assessment that was conducted at the Allen Harbor Landfill and Calf Pasture Point areas. In this risk assessment, a number of measurement endpoints were used, including benthic macroinvertebrate surveys, bioassay, histopathology in mussels, and tissue concentrations of contaminants of concern. These data will need to be incorporated into the remedial decision making process as well. This issue was not addressed in the Navy's proposed approach.

**Response**: The Navy acknowledges that other aspects may need to be considered in the remediation-decision process, particularly at a more complex site such as Site 09. The protocol doesn't preclude this. The protocol is specifically designed to evaluate the need for remediation of surface soil.

**Comment 3.** Identify Watershed-specific Risk Drivers and **[Comment/Step 4]** Validation of Risk Drivers. These steps of the process identify contaminants of concern and receptors of concern based on HQ that exceed the risk threshold. In the example provided on page 4 of the

document, identification of risk divers in Site 11 soils included selenium and DDT, both of which had HQ exceeding 10. However, both were dismissed as contaminants of concern based on comparisons to background concentration of both substances in Rhode Island soils (termed a "reality check" in the document). The document stated: "... it is the Navy's judgement that there is no ecological risk from either selenium or DDT in surface soil in Mill Creek Watershed, and specifically at Site 11. The fact that elevated HQs point to risk when there is none is a result of the very conservative nature of the food-web model and resulting HQ calculations." This conclusion may be valid, but no convincing evidence was presented to support it. Comparisons to background concentrations can be misleading, in that background concentration of chemicals in regional soils occur over a range of concentrations, not a singe concentration. It is quite possible that concentration of a chemical in the high end of the background concentration range could be associated with toxic effects, even though they are within the normal background concentration range for a region.

The primary concern with the example provided is that decisions are being made solely on the basis of comparisons of on-site concentrations with screening guidelines. Such a narrow approach potentially avoids other confounding factors such as the presence of endangered, protected, or sensitive species that may be exposed to multiple chemicals simultaneously, the concentration of which, on an individual basis may be just at or slightly above the selected guidelines. In these "borderline" cases, each of the chemicals may be dismissed as a potential COC because they are not perceived to present a risk by themselves, but may in fact pose a threat to receptors exposed to multiple chemicals simultaneously. In these instances, sites would not be remediated, when in fact remediation of some sort should be carried out.

Several times in the document the authors refer to the "very conservative" (page 4) or the "overly conservative" (page 6) nature of the HQ, giving the impression that they are using the conservativeness of the threshold concentrations as a rationale for eliminating some COC whose HQ may be borderline. The risk assessment process is fraught with uncertainty, typically we know very little about the systems we are studying and know even less about the possible effects of chemicals introduced into these systems. For this reason, the guidelines or toxicity reference values that are used are conservative, with the intent of being protective of the most sensitive species.

**Response**: The Navy acknowledges the cautions expressed by the reviewer regarding comparisons to background. The reviewer raises, as have all previous reviewers, the potential of risk from multiple contaminants. The Navy does not wish to dismiss this theoretical consideration, but suggests that the state of the art provides no means to evaluate or measure it. Calculation of Hazard Indices (HIs) is not an answer; as already indicated, by the strictest definition of risk, 60 percent of background would be subject to remediation. The Navy has not used the conservativeness of the HQs as a rationale for dismissing COCs as warranting remediation. Rather, the fact that concentrations were below benchmarks and could not be

distinguished from regional background was the rationale, and the conservativeness of the HQs was cited as the reasons the two types of data did not reconcile.

**Comment 5.** Create Decision Design for Ecological Risk-based Cleanups (DDERC). This is a useful method for visualizing the relationship of hazard quotients to selected benchmarks (e.g., background concentrations, screening guidelines) and allows the reader a quick reference for measuring HQ against those benchmarks.

**Response**: None required.

**Comment 6.** Select risk-based Preliminary Cleanup Goal. The document did not go into much detail on this step, but it is clear that this step of the process could be problematic. Selecting a cleanup concentration at a site will entail dialog between all interested parties, including the PRPs, resources trustees, and state and federal environmental agencies. This step of the process will require a condensation of all of the information available to decide upon a cleanup goal that is protective and realistically achievable. This section should have been given much more attention, as it is key to the whole process. As presented, it seems awfully simplistic. More discussion should have been devoted to what factors, other than HQ, will be considered in selecting cleanup goals and how the Navy intends to work with other interested parties in selecting those goals.

**Response**: The Navy agrees that this is a critical step of the process and that the protocol discussion of this step appears to be overly simple. This is in part because the Navy realizes it will not unilaterally decide remediation goals. We stated in the protocol that this step would involve iteration and negotiation with EPA and other parties. At a minimum, Step 6 of the protocol can identify a "window" of concentration -- above the benchmarks and below the risk flags (HQs) -- within which to initiate discussions and negotiations among all parties.

**Unnumbered comment.** As stated above, the process itself is sound, but is only as good as the risk assessment upon which it is based. Even with a defensible risk assessment, how the conclusions of that risk assessment are interpreted and applied to the remedial decision making process will determine whether sites are remediated or not. Although the process is sound, it is not fool-proof. The examples that were provided in the document to demonstrate how the process would be used, indicated that the Navy seemed to be over-simplifying what could be a complex process. Some sort of oversight should be provided to insure some balance to the process.

**Response**: While the Navy does not dispute the reviewer's opinion here, we wish to distinguish between "simple" and "over-simplifying." The tools that we -- meaning the Navy, EPA, and all parties -- have to employ are simple, relative to the complex systems and circumstances we have to deal with. We are attempting to employ them in the most appropriate and judicious manner to

make decisions regarding the complex situations we are confronted with. We do not think this should be construed as "over-simplifying."

## Outstanding Issues on the NCBC Facility - Wide Freshwater/Terrestrial Ecological Risk Assessment

This document contained a number of general comments and background material in the first three pages, followed by a comment-by-comment reiteration of the "status of specific EPA concerns." Because the comment-by-comment section covers all items mentioned in the introductory area of this document, the Navy's responses are based on EPA's specific comments. Any comment indicated as "resolved" by EPA is not addressed here.

**Comment 2.** Unresolved. The EPA maintains that the Navy incorrectly performed the background screening when identifying inorganic chemicals of concern (COCs) in the ERA. In the ERA, the Navy identified inorganic COCs as those compounds with maximum on-site concentrations that are **three times (3x)** greater than their mean background concentrations. The EPA maintains that the Navy was instructed to select **potential** COCs by comparing the maximum site concentration against the mean background concentration for all media. EPA maintains that it is only acceptable to compare the site maximum to the background maximum only when a watershed has a single background sample in sediment or surface water, (soil background ranges were agreed to previously). These potential COCs would then undergo a benchmark screen in which the on-site maximum would be compared against an appropriate ecotoxicity benchmark for each medium, in order to select actual COCs. The Navy maintains that it performed the COC screen as instructed in a December 14, 1995, meeting with EPA. EPA disagrees with the Navy's account with agreements reached.

**Response:** The requested screening tables are attached for the Hunt River/Frenchtown Brook (Site 10), Mill Creek (Site 11), and Hall Creek (Site 06) watersheds. They are identified as amended Tables 4-1, 4-3, and 4-4. In each watershed, several analytes that were not designated as COCs in the ERA, but are in this new screening procedure, are identified. The Navy does not believe that these "new" COCs represent unacceptable risk. In all cases, not only is the watershed mean less than the reference mean, but the watershed maximum is close to the reference mean, exceeding only by a factor of about two and often less. It is to be expected that there is variation in data distributions and the fact that a maximum watershed value exceeds a reference mean is not at all unexpected by the very nature of the test. And it does not in and of itself connote risk. We also point out that half of the "new" COCs were actually carried into the food web modeling because, in the ERA, they were designated as COCs in at least one abiotic medium.

**Comment 3.**. Unresolved. The issue is the same as that discussed in #2.

**Response:** See response to Comment 2 above.

## TABLE 4-1 (AMENDED) COC SCREENING FOR HUNT RIVER WATERSHED (INCLUDES SITE 10)

| Analyt | Wat rsh d Mean (PPM) | Wat rshed Max Hit (PPM) | R ferenc M an (PPM) | B nchmark Criteria (PPM) | Screening Results | |
|---|---|---|---|---|---|---|
| | | | **SEDIMENT** | | | |
| ALUMINUM | 4014 | 7130 | 5075 | No Data | COC | Not a COC in ERA |
| ARSENIC | 0.95 | 1.30 | 1.49 | 6 | | |
| BARIUM | 15.28 | 29.50 | 17.45 | 20 | COC | Not a COC in ERA |
| BERYLLIUM | 0.88 | 1.30 | 3.46 | 0.55 | | |
| CADMIUM | 0.33 | 0.50 | 1.44 | 0.60 | | |
| CHROMIUM | 3.26 | 6.20 | 2.63 | 26 | | |
| COBALT | 2.22 | 3.30 | 3.98 | No Data | | |
| COPPER | 5.82 | 9.70 | 3.50 | 16 | | |
| LEAD | 23.18 | 66.30 | 23.35 | 31 | COC | Not a COC in ERA |
| MANGANESE | 175.84 | 413.00 | 108.05 | No Data | COC | |
| NICKEL | 1.99 | 3.30 | 2.23 | 16 | | |
| SELENIUM | 0.34 | 0.33 | 1.79 | 1 | | |
| VANADIUM | 6.96 | 12.20 | 7.80 | No Data | COC | Not a COC in ERA |
| ZINC | 39.68 | 63.40 | 58.95 | 120 | | |
| | | | **SURFACE SOIL** | | | |
| ALUMINUM | 6456.11 | 13000 | 8060 | 47000 | | |
| ANTIMONY | 4.75 | 35.80 | 4.57 | 8.80 | COC | |
| ARSENIC | 1.16 | 3.60 | 2.97 | 4.80 | | |
| BARIUM | 34.94 | 192.00 | 16.00 | 290 | | |
| BERYLLIUM | 1.07 | 2.90 | 0.53 | 0.55 | COC | |
| CADMIUM | 0.55 | 4.70 | 0.27 | 5 | | |
| CHROMIUM | 6.82 | 17.90 | 6.27 | 250 | | |
| COBALT | 3.35 | 8.90 | 3.03 | 50 | | |
| COPPER | 38.15 | 330.00 | 7.00 | 100 | COC | |
| CYANIDE | 0.26 | 0.90 | 0.55 | 10 | | |
| LEAD | 105.13 | 655.00 | 20.73 | 200 | COC | |
| MANGANESE | 199.13 | 507.00 | 130.67 | 5 | COC | |
| MERCURY | 0.05 | 0.15 | 0.02 | 2 | | |
| NICKEL | 4.05 | 14.10 | 4.77 | 100 | | |
| SELENIUM | 0.25 | 0.52 | 0.53 | 2 | | |
| SILVER | 0.33 | 0.89 | 0.46 | 20 | | |
| THALLIUM | 0.32 | 0.28 | 0.46 | 5 | | |
| VANADIUM | 11.18 | 35.00 | 12.63 | 150 | | |
| ZINC | 128.49 | 566.00 | 31.03 | 350 | COC | |
| | | | **SURFACE WATER** | | | |
| ALUMINUM | 0.1665 | 0.1840 | 0.2175 | 0.0870 | | |
| ANTIMONY | 0.0004 | 0.0007 | 0.0002 | 0.0300 | | |
| ARSENIC | 0.0002 | 0.0002 | 0.0003 | 0.0360 | | |
| BARIUM | 0.0085 | 0.0113 | 0.0108 | 0.3400 | | |
| BERYLLIUM | 0.0008 | 0.0013 | 0.0013 | 0.0053 | | |
| CADMIUM | 0.0003 | 0.0003 | 0.0002 | 0.0004 | | |
| CHROMIUM | 0.0004 | 0.0007 | 0.0004 | 0.0106 | | |
| COBALT | 0.0012 | 0.0015 | 0.0016 | 0.2500 | | |
| COPPER | 0.0013 | 0.0020 | 0.0004 | 0.0035 | | |
| LEAD | 0.0002 | 0.0004 | 0.0002 | 0.0005 | | |
| MANGANESE | 0.0299 | 0.0309 | 0.0269 | 2.5000 | | |
| MERCURY | 0.000001 | 0.000001 | 0.000002 | 0.000012 | | |
| NICKEL | 0.0006 | 0.0006 | 0.0007 | 0.0082 | | |
| VANADIUM | 0.0003 | 0.0005 | 0.0002 | 0.3700 | | |
| ZINC | 0.0271 | 0.0336 | 0.0213 | 0.0309 | COC | |

Note: Benchmark criteria are from Table 4-16 of Freshwater/Terrestrial ERA except: Aluminum surface soil (mean U.S. background) and surface water (AWQC).

## TABLE 4-3 (AMENDED) COC SCREENING FOR MILL CREEK WATERSHED (INCLUDES SITE 11)

| Analyte | Watershed Mean (PPM) | Watershed Max Hit (PPM) | Reference Mean (PPM) | Benchmark Criteria (PPM) | Screening Results | |
|---|---|---|---|---|---|---|
| | | | **SEDIMENT** | | | |
| ALUMINUM | 5070 | 8680 | 4126.67 | No Data | COC | Not a COC in ERA |
| ARSENIC | 6.33 | 14.80 | 3.60 | 6 | COC | |
| BARIUM | 47.16 | 125.00 | 29.23 | 20 | COC | |
| BERYLLIUM | 1.98 | 3.90 | 1.43 | 0.55 | COC | |
| CADMIUM | 1.38 | 5.10 | 0.81 | 0.6 | COC | |
| CHROMIUM | 14.43 | 42.50 | 26.42 | 26 | COC | Not a COC in ERA |
| COBALT | 11.09 | 66.10 | 12.78 | No Data | COC | |
| COPPER | 27.56 | 50.60 | 28.22 | 16 | COC | Not a COC in ERA |
| LEAD | 95.09 | 203.00 | 38.17 | 31 | COC | |
| MANGANESE | 182.56 | 509.00 | 180.87 | No Data | COC | |
| MERCURY | 0.13 | 0.22 | 0.11 | 0.15 | COC | |
| NICKEL | 10.45 | 25.80 | 17.28 | 16 | COC | Not a COC in ERA |
| SELENIUM | 1.20 | 3.20 | 0.79 | 1 | COC | |
| VANADIUM | 16.12 | 39.70 | 11.63 | No Data | COC | |
| ZINC | 107.64 | 224.00 | 79.63 | 120 | COC | |
| | | | **SURFACE SOIL** | | | |
| ALUMINUM | 4025.64 | 10200 | 8060 | 47000 | | |
| ANTIMONY | 4.04 | 7.90 | 4.57 | 8.8 | | |
| ARSENIC | 0.97 | 2.40 | 2.97 | 4.80 | | |
| BARIUM | 15.29 | 55.40 | 16.00 | 290 | | |
| BERYLLIUM | 0.42 | 0.87 | 0.53 | 0.55 | COC | Not a COC in ERA |
| CADMIUM | 0.19 | 0.41 | 0.27 | 5 | | |
| CHROMIUM | 4.62 | 11.40 | 6.27 | 250 | | |
| COBALT | 2.16 | 7.50 | 3.03 | 50 | | |
| COPPER | 6.37 | 14.40 | 7.00 | 100 | | |
| CYANIDE | 0.33 | 1.60 | 0.55 | 10 | | |
| LEAD | 12.85 | 39.30 | 20.73 | 200 | | |
| MANGANESE | 82.41 | 190.00 | 130.67 | 5 | COC | Not a COC in ERA |
| MERCURY | 0.06 | 0.11 | 0.02 | 2 | | |
| NICKEL | 3.90 | 12.10 | 4.77 | 100 | | |
| SELENIUM | 0.34 | 0.72 | 0.53 | 2 | | |
| SILVER | 0.09 | 0.06 | 0.46 | 20 | | |
| VANADIUM | 6.66 | 14.00 | 12.63 | 150 | | |
| ZINC | 32.20 | 81.60 | 31.03 | 350 | | |
| | | | **SURFACE WATER** | | | |
| ALUMINUM | 0.0237 | 0.0376 | 0.0469 | 0.087 | | |
| ANTIMONY | 0.00022 | 0.00027 | 0.00016 | 0.0300 | | |
| ARSENIC | 0.00029 | 0.00043 | 0.00020 | 0.0360 | | |
| BARIUM | 0.02020 | 0.02280 | 0.02490 | 0.3400 | | |
| BERYLLIUM | 0.00012 | 0.00021 | 0.00019 | 0.0053 | | |
| CADMIUM | 0.00010 | 0.00014 | 0.00017 | 0.0004 | | |
| CHROMIUM | 0.00109 | 0.00123 | 0.00115 | 0.0106 | | |
| COBALT | 0.00316 | 0.00388 | 0.00174 | 0.2500 | | |
| COPPER | 0.00088 | 0.00128 | 0.00078 | 0.0035 | | |
| LEAD | 0.00024 | 0.00032 | 0.00039 | 0.0005 | | |
| MANGANESE | 0.37517 | 0.42850 | 0.36000 | 2.5000 | | |
| MERCURY | 0.000001 | 0.000001 | 0.000002 | 0.000012 | | |
| NICKEL | 0.00252 | 0.00270 | 0.00229 | 0.0082 | | |
| SELENIUM | 0.00035 | 0.00055 | 0.00026 | 0.005 | | |
| THALLIUM | 0.00001 | 0.00002 | 0.00001 | 0.04 | | |
| VANADIUM | 0.00048 | 0.00053 | 0.00061 | 0.3700 | | |
| ZINC | 0.01395 | 0.01595 | 0.01570 | 0.0309 | | |

Note: Benchmark criteria are from Table 4-16 of Freshwater/Terrestrial ERA except: Aluminum surface soil (mean U.S. background) and surface water (AWQC).

## TABLE 4-4 (AMENDED) COC SCREENING FOR HALL CREEK WATERSHED (INCLUDES SITE 06)

| Analyte | Watershed Mean (PPM) | Watershed Max Hit (PPM) | Refer nce Mean (PPM) | Benchmark Criteria (PPM) | Screening Results | |
|---|---|---|---|---|---|---|
| | | | **SEDIMENT** | | | |
| ALUMINUM | 5356 | 13000 | 5795 | No Data | COC | Not a COC in ERA |
| ARSENIC | 6.94 | 17.50 | 1.58 | 6 | COC | |
| BARIUM | 19.65 | 50.60 | 8.20 | 20 | COC | |
| BERYLLIUM | 0.59 | 1.60 | 0.23 | 0.55 | COC | |
| CADMIUM | 0.89 | 2.60 | 0.70 | 0.6 | COC | |
| CHROMIUM | 14.71 | 44.30 | 20.50 | 26 | COC | Not a COC in ERA |
| COBALT | 3.85 | 9.20 | 2.08 | No Data | COC | |
| COPPER | 39.07 | 195.00 | 29.50 | 16 | COC | |
| CYANIDE | 0.79 | 1.10 | 1.58 | 10 | | |
| LEAD | 63.96 | 201.00 | 87.55 | 31 | COC | Not a COC in ERA |
| MANGANESE | 184.88 | 565.00 | 63.25 | No Data | COC | |
| MERCURY | 0.10 | 0.29 | 0.29 | 0.15 | | |
| NICKEL | 289.95 | 2810.00 | 6.45 | 16 | COC | |
| SELENIUM | 0.67 | 0.97 | 0.91 | 1 | | |
| SILVER | 0.55 | 0.85 | 1.15 | 1 | | |
| VANADIUM | 21.31 | 77.10 | 18.70 | No Data | COC | |
| ZINC | 106.29 | 304.00 | 40.85 | 120 | COC | |
| | | | **SURFACE SOIL** | | | |
| ALUMINUM | 5340.58 | 14100 | 8060 | 47000 | | |
| ANTIMONY | 3.08 | 6.30 | 4.57 | 8.8 | | |
| ARSENIC | 1.47 | 6.70 | 2.97 | 4.8 | COC | Not a COC in ERA |
| BARIUM | 24.40 | 433.00 | 16.00 | 290 | COC | |
| BERYLLIUM | 0.52 | 2.10 | 0.53 | 0.55 | COC | |
| CADMIUM | 0.40 | 2.00 | 0.27 | 5 | | |
| CHROMIUM | 12.83 | 96.40 | 6.27 | 250 | | |
| COBALT | 3.89 | 12.30 | 3.03 | 50 | | |
| COPPER | 15.37 | 144.00 | 7.00 | 100 | COC | |
| CYANIDE | 0.28 | 4.90 | 0.55 | 10 | | |
| LEAD | 54.22 | 628.00 | 20.73 | 200 | COC | |
| MANGANESE | 108.61 | 337.00 | 130.67 | 5 | COC | Not a COC in ERA |
| MERCURY | 0.04 | 0.21 | 0.02 | 2 | | |
| NICKEL | 7.83 | 64.80 | 4.77 | 100 | | |
| SELENIUM | 0.28 | 0.72 | 0.53 | 2 | | |
| SILVER | 0.27 | 0.50 | 0.46 | 20 | | |
| THALLIUM | 0.23 | 0.95 | 0.46 | 5 | | |
| VANADIUM | 11.60 | 42.90 | 12.63 | 150 | | |
| ZINC | 72.29 | 735.00 | 31.03 | 350 | COC | |
| | | | **SURFACE WATER** | | | |
| ALUMINUM | 0.00500 | 0.00900 | 0.03430 | 0.087 | | |
| ANTIMONY | 0.00028 | 0.00035 | 0.00010 | 0.0300 | | |
| ARSENIC | 0.00037 | 0.00050 | 0.00084 | 0.0360 | | |
| BARIUM | 0.00855 | 0.01200 | 0.00468 | 0.3400 | | |
| BERYLLIUM | 0.00004 | 0.00006 | 0.00005 | 0.0053 | | |
| CADMIUM | 0.00003 | 0.00007 | 0.00002 | 0.000369 | | |
| CHROMIUM | 0.00066 | 0.00095 | 0.00383 | 0.0106 | | |
| COBALT | 0.00202 | 0.00298 | 0.00028 | 0.2500 | | |
| COPPER | 0.00065 | 0.00090 | 0.00186 | 0.00347 | | |
| LEAD | 0.00026 | 0.00042 | 0.00022 | 0.000541 | | |
| MANGANESE | 0.30638 | 0.65800 | 0.02035 | 2.5000 | | |
| MERCURY | 0.000001 | 0.000001 | 0.000001 | 0.000012 | | |
| NICKEL | 0.00193 | 0.00297 | 0.00073 | 0.008217 | | |
| SELENIUM | 0.00023 | 0.00014 | 0.00364 | 0.005 | | |
| THALLIUM | 0.00001 | 0.00002 | 0.00000 | 0.04 | | |
| VANADIUM | 0.00028 | 0.00049 | 0.00186 | 0.3700 | | |
| ZINC | 0.00633 | 0.00897 | 0.00351 | 0.0308618 | | |

Note: Benchmark criteria are from Table 4-16 of Freshwater/Terrestrial ERA except: Aluminum surface soil (mean U.S. background) and surface water (AWQC).

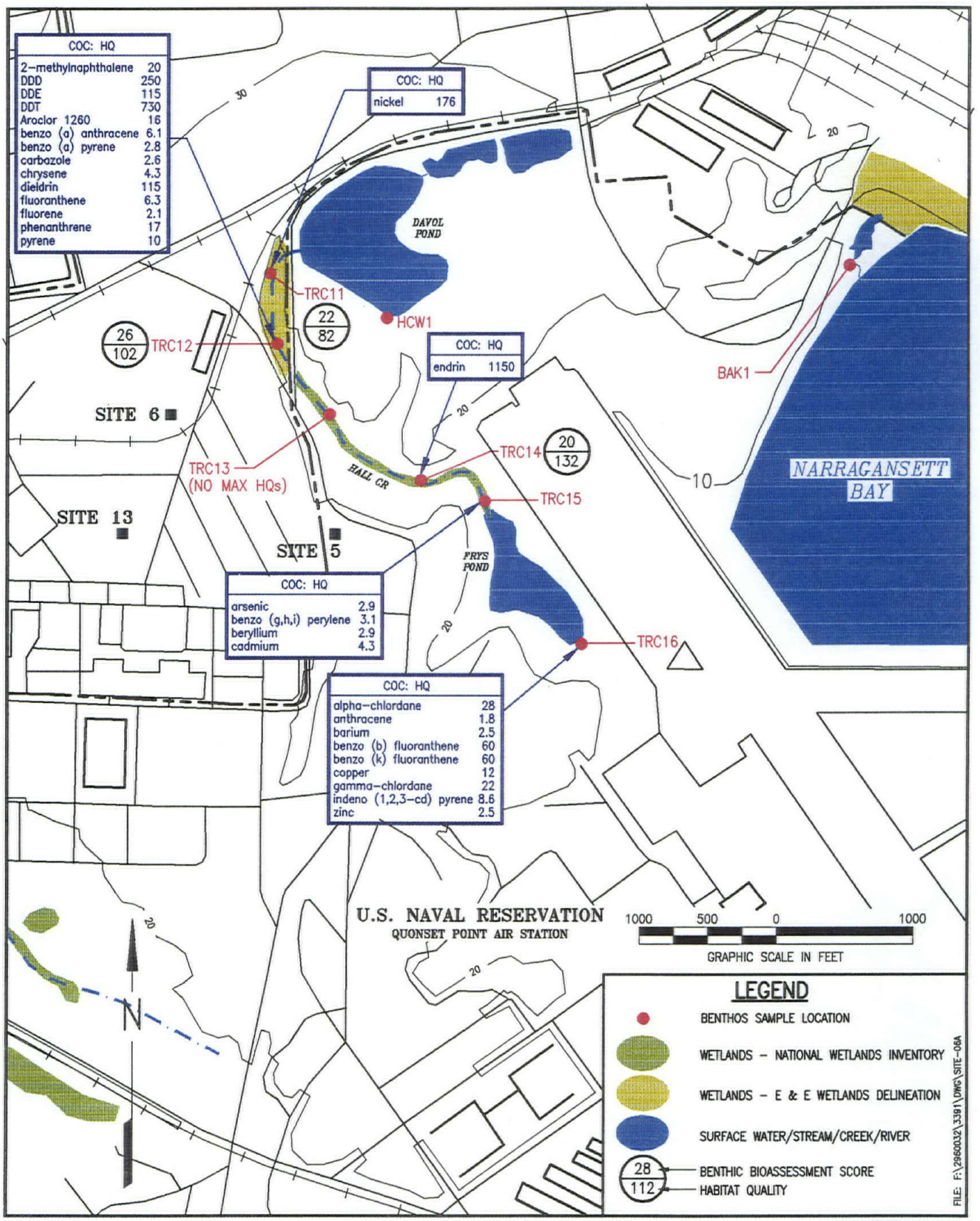
**Comment 4.** Unresolved. The EPA recommended that a single spreadsheet be included in the ERA that would consolidate site maximum concentrations, background concentrations, and respective benchmark criteria. This would make it easier to verify the COC screening and simplify the document. The Navy maintains that this is a mere formatting change and that all information needed to verify the COC screening is present in the ERA. This information should be presented in this manner in a site specific evaluation.

**Response:** See response to Comment 2 above.

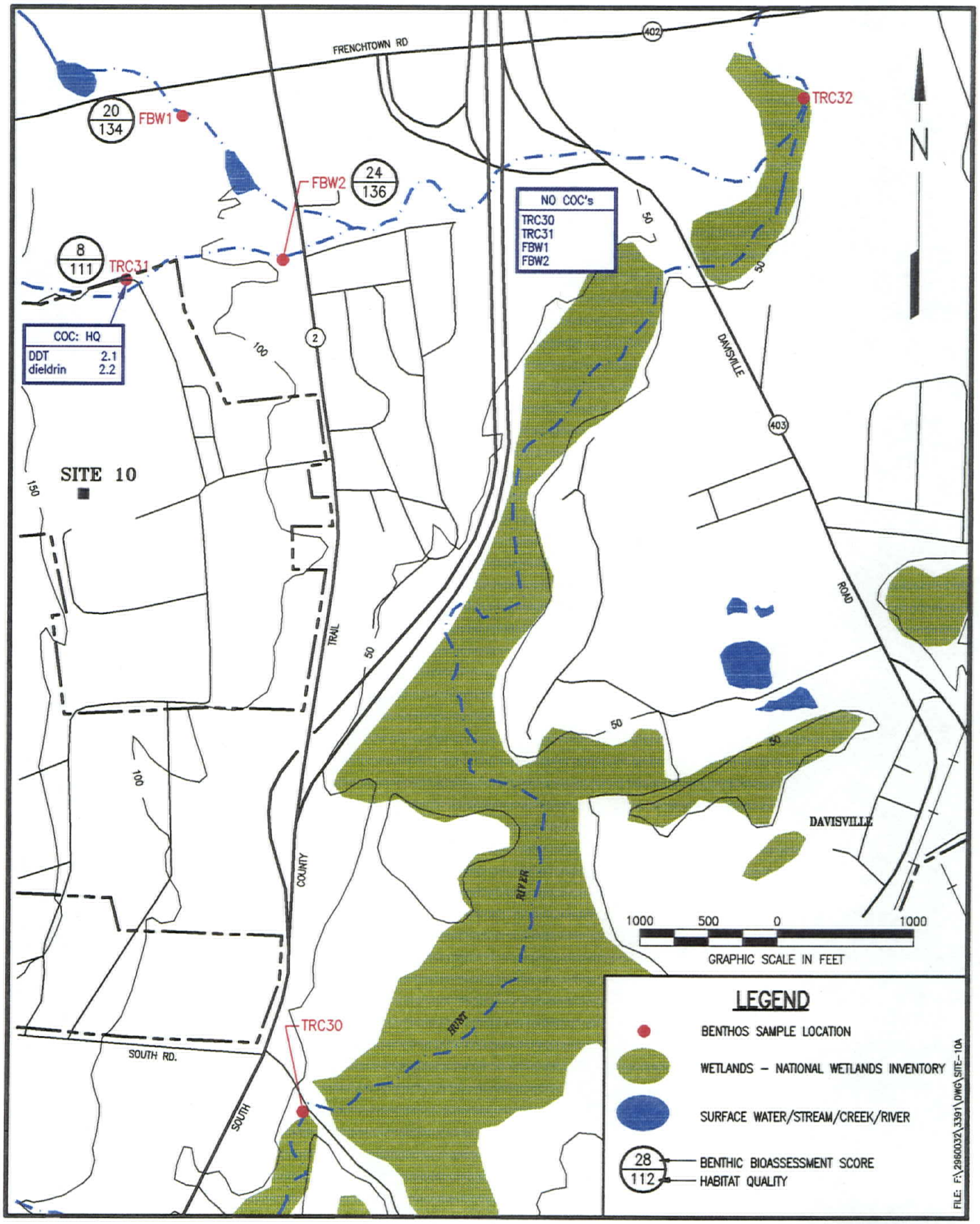
**Comment 5.** Unresolved. The EPA maintains that the benthic community analyses were performed incorrectly in the ERA. Benthic habitat and community metrics for reference locations were averaged across watersheds, resulting in an underestimate of impairment for some sites. The Navy had been asked "nearly two years ago" to qualitatively assess and report any obvious spatial correlation between elevated sediment or surface water hazard quotients/hazard indices (HQs/HIs) and impairment of benthic communities. The Navy must use the watershed specific reference stations when evaluating spatial correlations between benthic impairment and elevated COC levels, not an NCBC watershed-wide average.

**Response:** With regard to possible spatial correlations between HQs/HIs and benthic community indices, the Navy provides the accompanying maps of Hall Creek, Hunt River/Frenchtown Brook, and Mill Creek watersheds, pertinent to Sites 06, 10, and 11, respectively. Superimposed on the maps for each appropriate sampling station are benthic bioassessment scores and associated habitat ratings, and a tabulation of maximum watershed HQs. The interpretation of the COC:HQ lists is as follows. For each sampling station, the COCs and associated HQs are listed that were the maximum recorded for the watershed and that occurred at that sampling station. For example in the Hall Creek/Site 06 map, the location of the maximum HQs in the watershed for arsenic, benzo(g,h,i)perylene, beryllium, and cadmium was at sampling station TRC15. Note that the benthic community was not evaluated at all stations for which sediment chemical data exist.

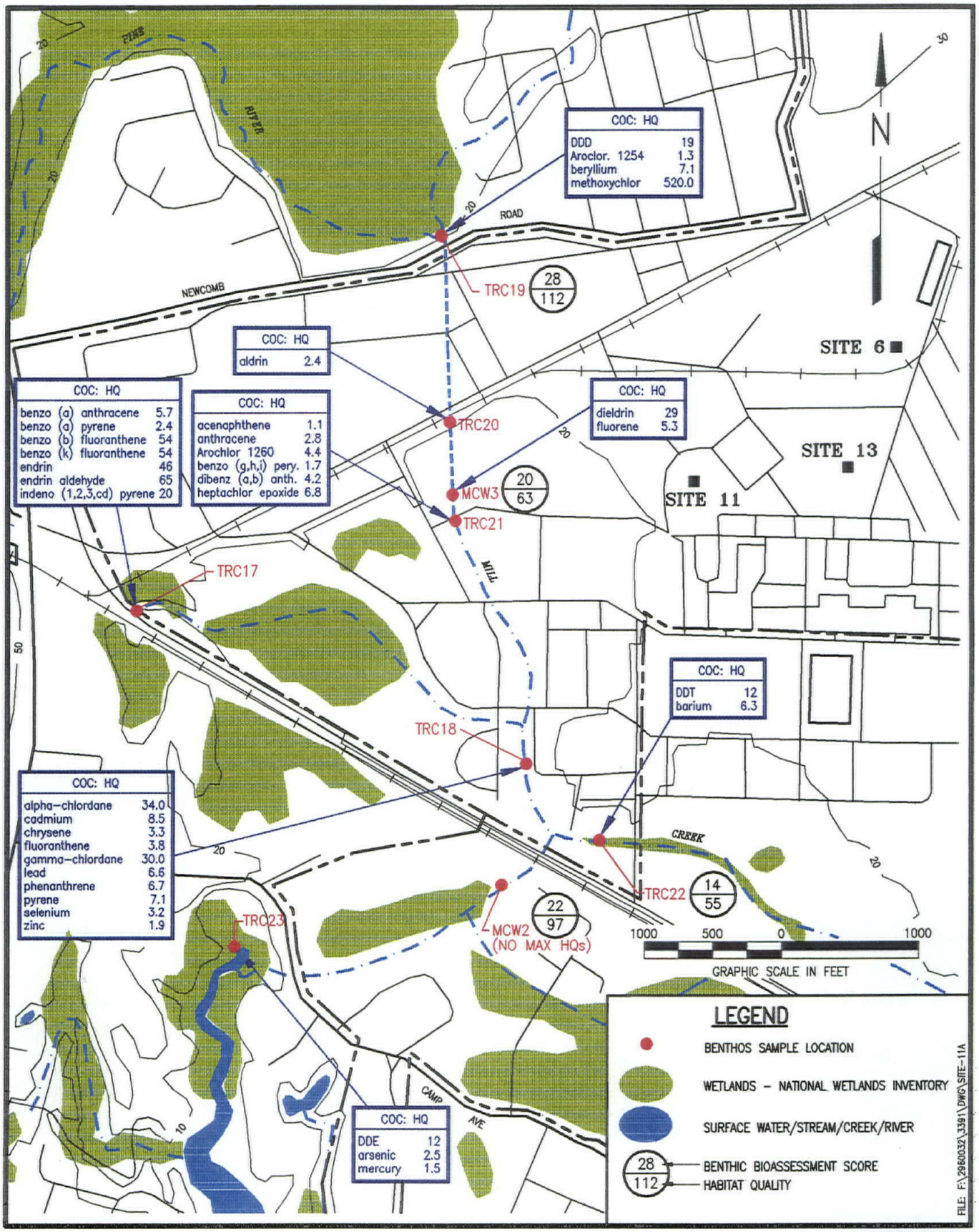
None of the watersheds illustrates an obvious correlation between elevated sediment COC HQs and benthic data. In Hall Creek, the most impacted station (TRC12), based on the number of maximum watershed COC HQs, exhibited the highest benthic bioassessment score (26). In Hunt River/Frenchtown Brook, only two sediment COCs were identified, both at sampling Station TRC31. This station also had the lowest benthic community index (8); however, the Navy doesn't believe a correlation is supportable here, given only two COCs and low HQs, and the high benthic community index a short distance downstream at sampling station FBW2 (see also the discussion in Section 3.5.3.1 of the terrestrial ERA regarding the natural stress experienced by this location due to periodic drying). In Mill Creek, there is very little difference in benthic community indices from upstream to downstream. Sampling station TRC22 exhibited the lowest benthic index (14) but it also has the lowest habitat rating. If the




HALL CREEK/SITE 06: Distribution of maximum watershed sediment COC HQs and benthic bioassessment scores.




HUNT RIVER/FRENCHTOWN BROOK/SITE 10: Distribution of maximum watershed sediment COC HQs and benthic bioassessment scores.




MILL CREEK/SITE 11: Distribution of maximum watershed COC HQs and benthic bioassessment scores.

habitat at TRC22 was normalized to a rating of 100, the corresponding benthic index would be 25. In terms of number of maximum COC HQs and absolute value of HQs, sampling stations TRC17 and TRC18 in the western tributary are the highest. The closest sampling station downstream of this tributary (MCW2) had a relatively high benthic index and no maximum COC HQs. This assessment provides no information that would prompt revision of the conclusions contained in the freshwater/terrestrial ERA.

Regarding the suggested incorrect use of reference station data in the benthic evaluation, the Navy does not agree. The use of multiple-station reference data is supported by the original RBP document, the new (draft) RBP document, and various biocriteria and other documents supported by or sponsored by EPA. Nonetheless, the Navy is willing to include the single station reference data in Figures 3-8 through 3-11 of the terrestrial ERA.

**Comments 6-10.** Unresolved. The EPA maintains that the presentation of data is inadequate and that data used to support specific arguments are scattered throughout the document, so that it is difficult to determine the probable risks presented at the watershed and ecological exposure zone (EEZ) levels. The EPA has recommended that the Navy develop roll-up risk calculation tables in the ERA and has provided a sample EEZ roll-up table for the Hall Creek Watershed. The Navy maintains this is a mere formatting change and that all information needed to assess the risk at these sites is present in the ERA. EPA requires this evaluation in order to provide backup for conclusions made in the Sites 6, 10 & 11 Proposed Plans.

**Response:** Watershed and EEZ-specific roll-up tables are attached for the Hunt River/Frenchtown Brook (Site 10), Mill Creek (Site 11), and Hall Creek (Site 06) watersheds.

**Comment 11.** Unresolved. The EPA maintains that EEZ-specific roll-up tables of risk quotients are needed, so that the significance of the EEZ in driving the watershed risk can be determined. EEZ-specific data are currently presented in raw output tables without discussion. The Navy maintains that the presentation of EEZ-specific data is adequate and that all information needed to assess the risk at these sites is currently included in the ERA. EPA requires this evaluation in order to provide backup for conclusions made in the Sites 6, 10 & 11 Proposed Plans.

**Response:** See response to Comments 6 - 10 above.

**Comment 12a.** Unresolved. The EPA maintains that aluminum must be included in the COC screening because it has the potential to reach toxic levels and its availability may be affected by contamination-induced soil acidification. The Navy maintains that aluminum is a common and natural soil constituent, as EPA maintains that all inorganics are naturally occurring at some level. EPA reminds the Navy that risk management decisions should not be made at the beginning of an ERA. This two step background and benchmark criteria COC screen, therefore, must also be applied to aluminum.

## ROLL-UP TABLE OF MEAN AND MAXIMUM HAZARD INDICES (HI) FOR EACH EEZ AND THE EEZ-WEIGHTED WATERSHED MEAN AND MAXIMUM FOR THE HALL CREEK WATERSHED (INCLUDES SITE 06)

| Watershed | EEZ | Chemical Class | Robin Mean | Robin Max | Term Mean | Term Max | Mink Mean | Mink Max | Shrew Mean | Shrew Max | Hawk Mean | Hawk Max | Heron Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hall Creek | efs | metal | | | | | 39.85 | 39.85 | | | | | 58.84 |
| Hall Creek | efs | pah | | | | | 0.41 | 0.41 | | | | | |
| Hall Creek | efs | pcb | | | | | 4.59 | 4.59 | | | | | 0.69 |
| Hall Creek | efs | pest | | | | | 0.20 | 0.20 | | | | | 15.65 |
| Hall Creek | eow | metal | | | 43.81 | 29.92 | 49.74 | 49.74 | | | | | 63.13 |
| Hall Creek | eow | pah | | | | | 1.56 | 1.27 | | | | | |
| Hall Creek | eow | pcb | | | | | 3.36 | 3.36 | | | | | 0.93 |
| Hall Creek | eow | pest | | | 7.80 | 7.80 | 0.17 | 0.17 | | | | | 38.76 |
| Hall Creek | fch | metal | | | 30.00 | 48.64 | 11.11 | 32.29 | | | | | 27.04 |
| Hall Creek | fch | pah | | | | | 0.71 | 2.23 | | | | | |
| Hall Creek | fch | pcb | | | | | 3.77 | 9.38 | | | | | 0.72 |
| Hall Creek | fch | pest | | | 114.45 | 653.43 | 0.75 | 2.58 | | | | | 576.26 |
| Hall Creek | upl | metal | 2.05 | 6.84 | | | 0.82 | 5.33 | 7.98 | 44.28 | 2.24 | 10.46 | |
| Hall Creek | upl | pah | | 2.28 | | | 1.01 | 16.72 | 0.42 | 10.71 | 1.21 | 44.09 | |
| Hall Creek | upl | pcb | 7.25 | 506.16 | | | 252.01 | 18055.37 | 54.78 | 3405.76 | 27.68 | 1924.71 | 2.37 |
| Hall Creek | upl | pest | 31.00 | 603.54 | | | 1.34 | 72.92 | 6.03 | 323.59 | 41.77 | 843.92 | 3.53 |
| Hall Creek | upl | svoc | | | | | | | 0.11 | 4.02 | | | |
| Hall Creek | wsum | metal | 2.08 | 6.86 | 19.74 | 13.49 | 21.25 | 31.11 | 7.98 | 44.28 | 2.27 | 10.49 | 29.61 |
| Hall Creek | wsum | pah | | 2.28 | | | 1.70 | 17.73 | 0.43 | 10.73 | 1.21 | 44.09 | 0.13 |
| Hall Creek | wsum | pcb | 7.25 | 506.16 | | | 254.27 | 18059.09 | 54.78 | 3405.76 | 27.68 | 1924.71 | 2.96 |
| Hall Creek | wsum | pest | 31.00 | 603.54 | 3.51 | 3.52 | 1.61 | 73.72 | 6.03 | 323.59 | 41.78 | 843.92 | 165.92 |
| Hall Creek | wsum | svoc | | | | | | | 0.11 | 4.02 | | | |

Note: EEZ - efs - estuarine forested scrub shrub; eow = estuarine open water; fch = freshwater channelized; upl = upland; wsum = EEZ-weighted watershed HIs. Data compiled from Tables 6-13 and 6-14 of Freshwater/Terrestrial ERA. Blank cells indicate all individual COC HQs in a chemical class were less than 0.1.

| ROLL-UP TABLE OF MEAN AND MAXIMUM HAZARD INDICES (HI) FOR EACH EEZ AND THE EEZ-WEIGHTED WATERSHED MEAN AND MAXIMUM FOR THE HUNT RIVER/FRENCHTOWN BROOK WATERSHED (INCLUDES SITE 10) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Watershed | EEZ | Chemical Class | Robin Mean | Robin Max | Mink Mean | Mink Max | Shrew Mean | Shrew Max | Hawk Mean | Hawk Max | Heron Mean | Heron Max |
| Hunt/French | fch | metal | | | 4.29 | 8.01 | | | | | 20.47 | 28.34 |
| Hunt/French | fch | pah | | | 0.17 | 0.30 | | | | | | |
| Hunt/French | fch | pest | | | | | | | | | 7.76 | 10.60 |
| Hunt/French | upl | metal | 3.77 | 7.80 | 0.96 | 7.28 | 2.93 | 21.74 | 4.08 | 10.25 | | 0.49 |
| Hunt/French | upl | pah | | | 0.88 | 6.72 | 0.53 | 4.08 | | | | |
| Hunt/French | upl | pest | 1.74 | 2.50 | | | 0.78 | 1.11 | 2.27 | 3.25 | 0.20 | 0.29 |
| Hunt/French | wsum | metal | 3.78 | 7.81 | 5.25 | 15.28 | 2.94 | 21.74 | 4.08 | 10.26 | 20.64 | 28.86 |
| Hunt/French | wsum | pah | | | 1.05 | 7.02 | 0.54 | 4.10 | | | | |
| Hunt/French | wsum | pest | 1.75 | 2.50 | | | 0.78 | 1.11 | 2.27 | 3.25 | 7.96 | |
| | | | | | | | | | | | | |

Note: EEZ - fch = freshwater channelized; upl = upland; wsum = EEZ-weighted watershed HIs. Data compiled from Tables 6-13 and 6-14 of Freshwater/Terrestrial ERA. Blank cells indicate all individual COC HQs in a chemical class were less than 0.1.

| ROLL-UP TABLE OF MEAN AND MAXIMUM HAZARD INDICES (HI) FOR EACH EEZ AND THE EEZ-WEIGHTED WATERSHED MEAN AND MAXIMUM FOR THE MILL CREEK WATERSHED (INCLUDES SITE 11) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Watershed | EEZ | Chemical Class | Robin Mean | Robin Max | Mink Mean | Mink Max | Shrew Mean | Shrew Max | Hawk Mean | Hawk Max | Heron Mean | Heron Max |
| Mill Creek | fch | metal | | | 19.01 | 50.79 | | | | | 33.46 | 65.47 |
| Mill Creek | fch | pah | | | 1.00 | 1.67 | | | | | | |
| Mill Creek | fch | pcb | | | 0.42 | 1.19 | | | | | | |
| Mill Creek | fch | pest | | | | | | | | | 31.29 | 56.00 |
| Mill Creek | upl | metal | 1.27 | 1.58 | 0.78 | 1.98 | 9.98 | 28.65 | 1.11 | 1.38 | | |
| Mill Creek | upl | pah | | | 0.79 | 6.32 | 0.32 | 3.84 | | | | |
| Mill Creek | upl | pcb | | | | 0.15 | 1.19 | 2.49 | | | | |
| Mill Creek | upl | pest | 3.60 | 55.25 | | | | | 5.56 | 73.83 | 0.41 | 6.49 |
| Mill Creek | wsum | metal | 1.31 | 1.62 | 16.06 | 42.74 | 9.98 | 28.66 | 1.15 | 1.42 | 26.84 | 52.51 |
| Mill Creek | wsum | pah | | | 1.59 | 7.66 | 0.33 | 3.86 | | | | |
| Mill Creek | wsum | pcb | | | 0.41 | 1.10 | 1.19 | 2.49 | | | | |
| Mill Creek | wsum | pest | 3.61 | 55.25 | | | | | 5.57 | 73.84 | 25.52 | 51.30 |

Note: EEZ - fch = freshwater channelized; upl = upland; wsum = EEZ-weighted watershed HIs. Data compiled from Tables 6-13 and 6-14 of Freshwater/Terrestrial ERA. Blank cells indicate all individual COC HQs in a chemical class were less than 0.1.

## PROBABLISTIC HAZARD INDICES FOR THREE NCBC DAVISVILLE WATERSHEDS BASED ON STOCHASTIC AND ARITHMETIC MODELED MEAN

| | R bin | | Hawk | | H r n | | Shrew | | Mink | | Tern | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANALYTE | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic |
| **HUNT RIVER/ FRENCHTOWN BROOK WATERSHED (Includes Site 10)** | | | | | | | | | | | | |
| **Inorganics** | | | | | | | | | | | | |
| ANTIMONY | -- | -- | -- | -- | -- | -- | 7.493 | 2.636 | 7.278 | 5.251 | -- | -- |
| BERYLLIUM | -- | -- | -- | -- | -- | -- | 0.026 | 0.026 | 0.129 | 0.132 | -- | -- |
| COPPER | 0.036 | 0.012 | 0.092 | 0.029 | 0.014 | 0.010 | 0.211 | 0.066 | 0.127 | 0.061 | -- | -- |
| LEAD | 0.298 | 0.285 | 0.279 | 0.236 | 0.362 | 0.369 | 0.333 | 0.300 | 0.164 | 0.163 | -- | -- |
| MANGANESE | 2.818 | 3.083 | 2.762 | 2.693 | 14.758 | 14.744 | 0.065 | 0.067 | 0.192 | 0.199 | -- | -- |
| ZINC | 0.713 | 0.407 | 2.128 | 1.155 | 5.048 | 5.531 | 0.069 | 0.037 | 0.093 | 0.090 | -- | -- |
| **t tal ( HI )** | **3.864** | **3.787** | **5.260** | **4.113** | **20.182** | **20.653** | **8.197** | **3.133** | **7.983** | **5.896** | -- | -- |
| **PAHs** | | | | | | | | | | | | |
| BENZO(A)ANTHRACENE | -- | -- | -- | -- | -- | -- | 1.458 | 0.539 | 2.462 | 1.046 | -- | -- |
| BENZO(A)PYRENE | -- | -- | -- | -- | -- | -- | 0.082 | 0.033 | 0.120 | 0.057 | -- | -- |
| BENZO(B)FLUORANTHENE | -- | -- | -- | -- | -- | -- | 0.005 | 0.001 | 0.006 | 0.003 | -- | -- |
| BENZO(K)FLUORANTHENE | -- | -- | -- | -- | -- | -- | 0.002 | 0.001 | 0.003 | 0.001 | -- | -- |
| CARBAZOLE | -- | -- | -- | -- | -- | -- | 0.010 | 0.006 | 0.005 | 0.005 | -- | -- |
| CHRYSENE | -- | -- | -- | -- | -- | -- | 0.004 | 0.001 | 0.003 | 0.001 | -- | -- |
| DIBENZOFURAN | -- | -- | -- | -- | -- | -- | 0.075 | 0.064 | 0.023 | 0.024 | -- | -- |
| FLUORANTHENE | -- | -- | -- | -- | -- | -- | 0.020 | 0.008 | 0.003 | 0.002 | -- | -- |
| **total ( HI )** | -- | -- | -- | | -- | -- | **1.655** | **0.654** | **2.625** | **1.138** | -- | -- |
| **P sticides** | | | | | | | | | | | | |
| 4,4'-DDT | 1.791 | 1.750 | 2.446 | 2.276 | 7.102 | 7.866 | 0.007 | 0.006 | 0.003 | 0.003 | -- | -- |
| DIELDRIN | 0.041 | 0.040 | 0.150 | 0.140 | 0.269 | 0.051 | 0.836 | 0.780 | 0.417 | 0.219 | -- | -- |
| **t tal ( HI )** | **1.832** | **1.790** | **2.595** | **2.416** | **7.372** | **7.917** | **0.842** | **0.786** | **0.420** | **0.222** | -- | -- |
| **MILL CREEK WATERSHED (Includes Site 11)** | | | | | | | | | | | | |
| **Inorganics** | | | | | | | | | | | | |
| ARSENIC | 0.007 | 0.006 | 0.006 | 0.004 | 0.557 | 0.535 | 0.590 | 0.462 | 6.268 | 5.716 | -- | -- |
| BARIUM | 0.025 | 0.016 | 0.020 | 0.012 | 0.460 | 0.478 | 0.186 | 0.115 | 1.208 | 1.158 | -- | -- |
| BERYLLIUM | -- | -- | -- | -- | -- | -- | 0.010 | 0.010 | 0.312 | 0.269 | -- | -- |
| CADMIUM | 0.021 | 0.017 | 0.002 | 0.001 | 0.032 | 0.032 | 2.922 | 2.279 | 0.597 | 0.614 | -- | -- |
| COBALT | 0.014 | 0.009 | 0.016 | 0.010 | 0.207 | 0.287 | 0.190 | 0.120 | 0.554 | 0.616 | -- | -- |
| LEAD | 0.033 | 0.035 | 0.031 | 0.029 | 1.671 | 1.501 | 0.036 | 0.037 | 0.169 | 0.169 | -- | -- |

## PROBABLISTIC HAZARD INDICES FOR THREE NCBC DAVISVILLE WATERSHEDS BASED ON STOCHASTIC AND ARITHMETIC MODELED MEAN

| | Robin | | Hawk | | Heron | | Shr w | | Mink | | T rn | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANALYTE | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic |
| **MILL CREEK WATERSHED Cont'd. (Includes Site 11)** | | | | | | | | | | | | |
| MANGANESE | 1.216 | 1.306 | 1.184 | 1.146 | 13.913 | 15.286 | 0.028 | 0.028 | 0.182 | 0.193 | -- | -- |
| MERCURY | 0.157 | 0.134 | 0.174 | 0.140 | 1.672 | 1.697 | 0.929 | 0.751 | 1.025 | 1.029 | -- | -- |
| SELENIUM | 0.089 | 0.060 | 0.040 | 0.026 | 0.415 | 0.447 | 8.284 | 5.279 | 5.529 | 5.666 | -- | -- |
| VANADIUM | 0.004 | 0.004 | 0.002 | 0.002 | 0.041 | 0.040 | 1.289 | 1.214 | 7.594 | 7.566 | -- | -- |
| ZINC | 0.097 | 0.102 | 0.287 | 0.290 | 14.173 | 14.787 | 0.009 | 0.009 | 0.210 | 0.211 | -- | -- |
| **total ( HI )** | **1.662** | **1.689** | **1.762** | **1.659** | **33.141** | **35.090** | **14.473** | **10.303** | **23.648** | **23.207** | -- | -- |
| **PAHs** | | | | | | | | | | | | |
| ACENAPHTHENE | 0.024 | 0.031 | 0.411 | 0.514 | 0.090 | 0.099 | 0.019 | 0.024 | 0.041 | 0.052 | -- | -- |
| ANTHRACENE | 0.018 | 0.011 | 0.199 | 0.120 | 0.054 | 0.048 | 0.002 | 0.001 | 0.002 | 0.265 | -- | -- |
| BENZO(A)ANTHRACENE | -- | -- | -- | -- | -- | -- | 1.351 | 0.326 | 2.957 | 1.308 | -- | -- |
| BENZO(A)PYRENE | -- | -- | -- | -- | -- | -- | 0.049 | 0.017 | 0.114 | 0.071 | -- | -- |
| BENZO(B)FLUORANTHENE | -- | -- | -- | -- | -- | -- | 0.003 | 0.001 | 0.010 | 0.006 | -- | -- |
| BENZO(G,H,I)PERYLENE | -- | -- | -- | -- | -- | -- | 0.204 | 0.164 | 0.517 | 0.476 | -- | -- |
| BENZO(K)FLUORANTHENE | -- | -- | -- | -- | -- | -- | 0.002 | 0.001 | 0.006 | 0.003 | -- | -- |
| CARBAZOLE | -- | -- | -- | -- | -- | -- | 0.004 | 0.004 | 0.015 | 0.014 | -- | -- |
| CHRYSENE | -- | -- | -- | -- | -- | -- | 0.003 | 0.001 | 0.004 | 0.002 | -- | -- |
| DIBENZ(A,H)ANTHRACENE | -- | -- | -- | -- | -- | -- | 0.039 | 0.046 | 0.097 | 0.093 | -- | -- |
| DIBENZOFURAN | -- | -- | -- | -- | -- | -- | 0.047 | 0.052 | 0.073 | 0.080 | -- | -- |
| FLUORANTHENE | -- | -- | -- | -- | -- | -- | 0.032 | 0.005 | 0.007 | 0.004 | -- | -- |
| FLUORENE | 0.023 | 0.030 | 0.427 | 0.523 | 0.091 | 0.093 | 0.008 | 0.010 | 0.020 | 0.024 | -- | -- |
| INDENO(1,2,3-CD)PYRENE | -- | -- | -- | -- | -- | -- | 0.114 | 0.082 | 0.435 | 0.374 | -- | -- |
| PHENANTHRENE | 0.096 | 0.052 | 0.002 | 0.001 | 0.002 | 0.002 | 0.008 | 0.004 | 0.004 | 0.003 | -- | -- |
| PYRENE | -- | -- | -- | -- | -- | -- | 0.012 | 0.002 | 0.008 | 0.004 | -- | -- |
| **total ( HI )** | **0.161** | **0.125** | **1.039** | **1.158** | **0.237** | **0.242** | **1.898** | **0.741** | **4.310** | **2.779** | -- | -- |
| **Pesticides** | | | | | | | | | | | | |
| 4,4'-DDD | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | -- | -- |
| 4,4'-DDE | 0.017 | 0.010 | 0.121 | 0.070 | 0.011 | 0.009 | 0.012 | 0.007 | 0.007 | 0.005 | -- | -- |
| 4,4'-DDT | 2.876 | 3.605 | 3.861 | 4.689 | 28.109 | 30.614 | 0.011 | 0.013 | 0.010 | 0.011 | -- | -- |
| ALDRIN | 0.217 | 0.203 | 0.959 | 0.860 | 0.945 | 1.003 | 0.033 | 0.030 | 0.020 | 0.020 | -- | -- |
| ALPHA-CHLORDANE | 0.002 | 0.002 | 0.004 | 0.003 | 0.011 | 0.010 | 0.006 | 0.004 | 0.004 | 0.003 | -- | -- |
| DIELDRIN | 0.020 | 0.018 | 0.073 | 0.063 | 0.138 | 0.132 | 0.413 | 0.350 | 0.326 | 0.307 | -- | -- |
| ENDRIN | 0.004 | 0.004 | 0.025 | 0.023 | 0.041 | 0.026 | 0.211 | 0.187 | 0.260 | 0.176 | -- | -- |

## PROBABLISTIC HAZARD INDICES FOR THREE NCBC DAVISVILLE WATERSHEDS BASED ON STOCHASTIC AND ARITHMETIC MODELED MEAN

| | Robin | | Hawk | | H ron | | Shrew | | Mink | | Tern | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANALYTE | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic |
| **MILL CREEK WATERSHED Cont'd. (Includes Site 11)** | | | | | | | | | | | | |
| ENDRIN ALDEHYDE | 0.002 | 0.002 | 0.007 | 0.009 | 0.025 | 0.025 | 0.085 | 0.103 | 0.145 | 0.139 | -- | -- |
| GAMMA-CHLORDANE | 0.003 | 0.002 | 0.029 | 0.021 | 0.013 | 0.010 | 0.007 | 0.005 | 0.006 | 0.005 | -- | -- |
| HEPTACHLOR EPOXIDE | 0.001 | 0.001 | 0.002 | 0.002 | 0.004 | 0.004 | 0.008 | 0.007 | 0.004 | 0.004 | -- | -- |
| METHOXYCHLOR | 0.001 | 0.001 | 0.002 | 0.002 | 0.009 | 0.004 | 0.016 | 0.015 | 0.023 | 0.015 | -- | -- |
| **total ( HI )** | **3.143** | **3.848** | **5.085** | **5.742** | **29.307** | **31.837** | **0.802** | **0.721** | **0.806** | **0.686** | -- | -- |
| **PCBs** | | | | | | | | | | | | |
| AROCLOR-1254 | 0.062 | 0.056 | 0.270 | 0.235 | 0.431 | 0.408 | 1.379 | 1.194 | 0.326 | 0.304 | -- | -- |
| AROCLOR-1260 | 0.002 | 0.002 | 0.008 | 0.007 | 0.022 | 0.023 | 0.011 | 0.010 | 0.505 | 0.482 | -- | -- |
| **total ( HI )** | **0.064** | **0.058** | **0.278** | **0.242** | **0.453** | **0.430** | **1.391** | **1.204** | **0.831** | **0.786** | -- | -- |
| **HALL CREEK WATERSHED (Includes Site 6)** | | | | | | | | | | | | |
| **In rganics** | | | | | | | | | | | | |
| ARSENIC | 0.009 | 0.009 | 0.007 | 0.007 | 0.735 | 0.730 | 0.681 | 0.700 | 7.868 | 7.826 | 0.222 | 0.217 |
| BARIUM | 0.213 | 0.026 | 0.171 | 0.019 | 0.193 | 0.200 | 1.625 | 0.182 | 0.847 | 0.519 | 0.128 | 0.136 |
| BERYLLIUM | -- | -- | -- | -- | -- | -- | 0.021 | 0.013 | 0.089 | 0.086 | -- | -- |
| CADMIUM | 0.077 | 0.036 | 0.007 | 0.003 | 0.027 | 0.017 | 10.762 | 4.832 | 0.606 | 0.369 | 0.017 | 0.011 |
| COBALT | 0.015 | 0.016 | 0.018 | 0.017 | 0.096 | 0.100 | 0.213 | 0.215 | 0.234 | 0.233 | 0.154 | 0.160 |
| COPPER | 0.015 | 0.005 | 0.039 | 0.012 | 0.072 | 0.068 | 0.091 | 0.027 | 0.289 | 0.247 | 0.098 | 0.093 |
| LEAD | 0.137 | 0.147 | 0.128 | 0.122 | 0.945 | 0.939 | 0.151 | 0.155 | 0.179 | 0.161 | 0.228 | 0.224 |
| MANGANESE | 1.576 | 1.712 | 1.539 | 1.501 | 15.047 | 16.064 | 0.035 | 0.037 | 0.186 | 0.205 | 14.023 | 27.447 |
| NICKEL | 0.001 | 0.001 | 0.007 | 0.007 | 0.211 | 0.067 | 0.009 | 0.010 | 0.294 | 0.095 | 0.101 | 0.031 |
| VANADIUM | 0.010 | 0.007 | 0.006 | 0.004 | 0.070 | 0.073 | 3.315 | 2.115 | 13.692 | 13.843 | 0.139 | 0.142 |
| ZINC | 0.812 | 0.229 | 2.414 | 0.649 | 22.578 | 21.019 | 0.078 | 0.021 | 0.342 | 0.302 | 7.070 | 6.515 |
| **total ( HI )** | **2.867** | **2.188** | **4.336** | **2.340** | **39.974** | **39.277** | **16.983** | **8.307** | **24.627** | **23.886** | **22.180** | **34.975** |
| **PAHs** | | | | | | | | | | | | |
| 2,4-DINITROTOLUENE | -- | -- | -- | -- | -- | -- | 1.140 | 0.112 | 0.278 | 0.063 | -- | -- |
| 2-METHYLNAPHTHALENE | 0.006 | 0.001 | 0.106 | 0.010 | 0.010 | 0.002 | 0.820 | 0.079 | 0.020 | 0.003 | 0.000 | 0.000 |
| ANTHRACENE | 0.149 | 0.015 | 1.669 | 0.160 | 0.163 | 0.032 | 0.012 | 0.001 | 0.015 | 0.002 | 0.012 | 0.008 |
| BENZO(A)ANTHRACENE | -- | -- | -- | -- | -- | -- | 3.341 | 0.310 | 5.930 | 0.912 | -- | -- |
| BENZO(A)PYRENE | -- | -- | -- | -- | -- | -- | 0.223 | 0.022 | 0.332 | 0.059 | -- | -- |
| BENZO(B)FLUORANTHENE | -- | -- | -- | -- | -- | -- | 0.007 | 0.001 | 0.015 | 0.004 | -- | -- |
| BENZO(G,H,I)PERYLENE | -- | -- | -- | -- | -- | -- | 0.422 | 0.194 | 0.731 | 0.421 | -- | -- |

## PROBABLISTIC HAZARD INDICES FOR THREE NCBC DAVISVILLE WATERSHEDS BASED ON STOCHASTIC AND ARITHMETIC MODELED MEAN

| | Robin | | Hawk | | Her n | | Shrew | | Mink | | Tern | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANALYTE | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic | Stochastic | Arithmetic |
| **HALL CREEK WATERSHED Cont'd. (Includes Site 6)** | | | | | | | | | | | | |
| BENZO(K)FLUORANTHENE | -- | -- | -- | -- | -- | -- | 0.005 | 0.001 | 0.010 | 0.002 | -- | -- |
| CARBAZOLE | -- | -- | -- | -- | -- | -- | 0.073 | 0.007 | 0.018 | 0.010 | -- | -- |
| CHRYSENE | -- | -- | -- | -- | -- | -- | 0.008 | 0.001 | 0.008 | 0.002 | -- | -- |
| DIBENZOFURAN | -- | -- | -- | -- | -- | -- | 0.821 | 0.081 | 0.109 | 0.062 | -- | -- |
| FLUORANTHENE | -- | -- | -- | -- | -- | -- | 0.075 | 0.005 | 0.014 | 0.002 | -- | -- |
| FLUORENE | 1.035 | 0.060 | 19.222 | 1.055 | 1.608 | 0.113 | 0.381 | 0.020 | 0.722 | 0.042 | 0.012 | 0.009 |
| INDENO(1,2,3-CD)PYRENE | -- | -- | -- | -- | -- | -- | 1.253 | 0.116 | 2.218 | 0.308 | -- | -- |
| N-NITROSO-DI-N-PROPYLA | -- | -- | -- | -- | -- | -- | 0.068 | 0.006 | 0.081 | 0.013 | -- | -- |
| PHENANTHRENE | 0.616 | 0.074 | 0.011 | 0.001 | 0.002 | 0.001 | 0.053 | 0.006 | 0.010 | 0.002 | 0.001 | 0.000 |
| PYRENE | -- | -- | -- | -- | -- | -- | 0.024 | 0.002 | 0.010 | 0.003 | -- | -- |
| **t tal ( HI )** | **1.805** | **0.149** | **21.007** | **1.227** | **1.783** | **0.148** | **8.727** | **0.965** | **10.522** | **1.908** | **0.025** | **0.018** |
| **Pesticid s** | | | | | | | | | | | | |
| 4,4'-DDD | 0.008 | 0.000 | 0.029 | 0.001 | 0.012 | 0.010 | 0.007 | 0.000 | 0.007 | 0.005 | 0.003 | 0.002 |
| 4,4'-DDE | 1.087 | 0.093 | 8.080 | 0.662 | 0.051 | 0.034 | 0.787 | 0.065 | 0.065 | 0.021 | 0.009 | 0.007 |
| 4,4'-DDT | 190.887 | 30.889 | 262.705 | 40.188 | 491.035 | 412.324 | 0.730 | 0.111 | 0.197 | 0.138 | 96.150 | 82.276 |
| ALPHA-CHLORDANE | 0.217 | 0.012 | 0.438 | 0.022 | 0.044 | 0.009 | 0.639 | 0.032 | 0.074 | 0.006 | 0.052 | 0.045 |
| DIELDRIN | 3.243 | 0.119 | 12.018 | 0.414 | 1.093 | 0.118 | 67.294 | 2.308 | 12.249 | 0.581 | 0.025 | 0.018 |
| ENDRIN | 0.719 | 0.027 | 4.264 | 0.150 | 0.406 | 0.057 | 34.805 | 1.216 | 10.484 | 0.596 | 0.013 | 0.010 |
| ENDRIN KETONE | 1.012 | 0.049 | 4.431 | 0.209 | 0.389 | 0.039 | 51.502 | 2.394 | 10.365 | 0.633 | 0.006 | 0.005 |
| GAMMA-CHLORDANE | 0.344 | 0.018 | 3.166 | 0.160 | 0.270 | 0.022 | 0.804 | 0.040 | 0.432 | 0.025 | 0.060 | 0.046 |
| **total ( HI )** | **197.517** | **31.206** | **295.130** | **41.806** | **493.299** | **412.612** | **156.570** | **6.167** | **33.872** | **2.005** | **96.316** | **82.409** |
| **PCBs** | | | | | | | | | | | | |
| AROCLOR-1248 | 3.112 | 0.157 | 13.952 | 0.667 | 1.437 | 0.331 | 217.955 | 10.436 | 48.800 | 4.224 | 0.070 | 0.062 |
| AROCLOR-1254 | 9.091 | 0.442 | 39.994 | 1.868 | 3.695 | 0.547 | 207.122 | 9.489 | 12.241 | 0.814 | 0.160 | 0.147 |
| AROCLOR-1260 | 220.016 | 6.654 | 865.688 | 25.141 | 70.482 | 2.279 | 1203.089 | 34.858 | 8430.010 | 250.421 | 0.023 | 0.017 |
| **total ( HI )** | **232.219** | **7.254** | **919.634** | **27.676** | **75.615** | **3.157** | **1628.167** | **54.783** | **8491.051** | **255.459** | **0.253** | **0.226** |

Note: Data compiled from Tables 6-7 and 6-8 of the Freshwater/Terrestrial ERA.

**Response:** Aluminum is a principal natural constituent of soils. The naturally occurring aluminum in soils is generally found in aluminosilicates mineral phases such as clays or feldspars. As a result, the amount of aluminum in any single soil sample is often directly correlatable to the quantity of fine material present in any given sample. Eastern U.S. soils are reported by Shacklette and Boerngen (1884) to range from to 0.7 to >10%. The values are reported to follow a log normal distribution with geometric mean 3.3% and standard deviation 2.87. Site soil values (reported in Appendix B.1-3 of the ERA) were found to be consistent with this distribution and the maximum of all sites was 3.8%.

EPA's OHMTADS database suggests that aluminum in soil is generally not present in a toxic/available form unless significantly acidic soils are also present. Extreme lowering of site pH may cause a perfectly natural soil to present toxicity. As low soil pHs are not known from the site and the aluminum levels are consistent with independently documented regional background levels, aluminum is not expected to be associated with risk. At the reviewer's request, aluminum has been included in the amended metal screening tables (see response to Comment 2 above).

**Comment 12b.** Unresolved. The EPA has requested that the ERA clearly distinguish between use of dissolved and total ambient water quality criteria (AWQC) values when comparing metal concentrations at the site to AWQC. Although dissolved values are preferred from a COC bioavailability perspective, the use of total values is necessary for some metals at the site because AWQC do not exist for the dissolved form. The Navy's response suggests that the EPA comment was misinterpreted. If the Navy would like another copy of the January 1996 Eco-Update or the Office of Water Policy on use of dissolved AWQC for selected inorganics, please contact EPA.

**Response:** This comment was previously dealt with in the April '96 Response to Comments. All screening levels and site values will be designated as to whether they represent "total", "dissolved", or "total recoverable" levels.

**Comment 13.** Unresolved, but overcome by events (OBE). The EPA has requested that the ERA include some discussion on surface water COC concentrations, and upstream to downstream gradients in selected watersheds. Currently this information is presented only as raw data (Tables 3-31 and 3-32 in the ERA). The Navy's response suggests that the EPA comment was misinterpreted.

**Response:** The Navy assumes that no further action is required because the comment has been "overcome by events."

**Comment 14** Unresolved. The EPA has requested that the Navy provide a better discussion/justification for using sediment data normalized to iron and aluminum content when comparing upstream and downstream values. The Navy responded that both normalized and un-normalized data are presented in the ERA, and did not address the request for inclusion of

additional discussion. Scientific rational for using this approach and a conclusive discussion of its practical significance from an ecological risk prospective must be provided.

**Response:** The iron and aluminum content of sediments was used as a surrogate to a detailed grain size or surface area analysis, since it is well established the fine materials in sediments generally contain the bulk of iron and aluminum present. The larger grains are generally comprised of quartz and other silicates. The EPA has pointed to iron staining in Hall Creek as evidence that this invalidates this approach. It is the Navy's position that this does not invalidate the approach for the following reasons: 1) iron staining can occur through a variety of natural processes, particularly in areas where reduced iron is a natural component of soil, sediment and/or ground/seep waters, 2) the normalized aluminum values are fairly consistent throughout the stream. If the iron staining is indeed the result of a natural process then normalization becomes even more important not less important. The fact that the normalized aluminum levels are similar seems to indicate that aluminum roughly follows the iron + aluminum levels throughout Hall Creek. Were iron staining caused by an unnatural process, such as release of ferric chloride, it is unlikely that normalized aluminum would remain so constant.

**Comment 18.** Unresolved. The EPA maintains that chemicals cannot be eliminated from consideration as chemicals of concern simply because they are common laboratory contaminants. In practice, no data should be provided to risk assessors until the data pass both the data validation and usability assessment. Accordingly, other justification for elimination of these chemicals must be provided, such as their elimination based on COC screening (comparisons to reference mean and benchmarks) and comparisons to amounts of contaminants contained in blanks or other applicable data usability/data validation information. The Navy maintains that exclusion of these chemicals was done with "regulatory review and consideration" (May 15, 1996). The EPA **does not recall** such a discussion (July 2, 1996).

**Response:** All of the common laboratory contaminants, phthalates, acetone, methylene chloride, and chloroform, that were detected in site 6, 10, or 11 samples were at low concentrations. Dutch soil screening levels do not exist for acetone, but screening levels do exist for the more toxic chlorinated aliphatic compounds. All of the VOA screening levels are in the tens of ppm while actual soil levels of these three VOA are in the low ppb range. Total phthalates also fall below Dutch soil screening levels. As a result, these compounds would be screened from consideration whether or not they could be positively identified as laboratory contaminants.

**Comment 20.** Unresolved. The EPA has requested additional project-specific technical justification for the use of only 500 iterations of the stochastic model. The Navy has responded that 500 iterations are adequate, but has not agreed to provide the requested justification. Please provide the requested justification.

**Response:** In this model, only abiotic concentrations and feeding fractions are allowed to vary. Since only one of the abiotic categories tends to drive the result, and the feeding fractions are not

allowed to vary substantially, 500 iterations are considered to be sufficient. Remember that tens of thousands of iterations are employed when there are several independent factors and that this type of computational model is pseudo $X^n$ in order (that is, more variables significantly affect the number of required iterations).

To clarify further:

Only the feeding fractions (not the feed rate) are allowed to vary slightly < 25% and were represented by a triangular distribution. This means that the literature value reported in the ERA occurs the most frequently with a small probability of achieving the maximum allowable deviation of 25%. Further, the dose presented by any particular food item is linearly related to the abiotic media concentration. Thus, this is a small, nearly negligible perturbation compared to the abiotic media distributions which incorporate the bulk of the variability.

Turning our attention to the master variables (the abiotic media distributions), we realize that terrestrial organisms are exposed to a maximum of 4 different media (water, marine sediment, fresh sediment, and soil). Of these, only one typically drives risk for any particular receptor/COC pairing. As a result, the question of how many iterations are necessary simplifies in most cases to: How many values are necessary to accurately yield the abiotic media distributions? Remember that these distributions are determined from a limited site-specific data set and are represented by:

1) the shape of the distribution (normal, log-normal etc.)
2) parameters that describe the distribution (min, mean, max, geometric mean, standard deviation, central tendency, etc., depending on the predicted shape)

Since these distributions are generally initially determined from a finite number of data points, as a result, we really only need to use slightly more than that initial number of data points to generally achieve the same accuracy present in the original data set. More iterations are only required when two or more media substantially drive risk. Remember that this is at worst an $X^n$ type of problem and that fewer data than $X^n$ are needed to adequately quantify the results within the experimental error. Realize that the biggest weakness is not the number of iterations, but rather the accuracy of the original description of the distributions which is largely driven by the size of the datasets. This is part of the reason that we provide both stochastic and deterministic mean values.

**Comment 21a.** Unresolved. The EPA maintains that chemicals from Table 5-7 (Terrestrial Exposure Parameters) were not carried into the COC selection. The concern centers primarily on Aroclors. One-half of the sample quantitation limit (not the CRQL or the MDL) must be used in risk calculations for all non-detections of chemicals that were detected in at least one sample from the same watershed and medium. The Navy has not responded to this modification of the original comment.

**Response:** It is true that chemicals from Table 5-7 were not carried into the COC selection in the previous chapter. The reviewer is directed to use Appendix B.1.1 instead. Aroclors were never detected in surface water samples in the Hunt River, Sandhill Brook, Mill Creek, and Hall Creek watersheds and are absent from Tables 4-11 through 4-14 for that reason. Table 4-17 is in error and will be corrected. It should further be noted that Table 5-7 contains an entry for Aroclors for surface water in all watersheds based on detection limits alone (except for Allen Harbor where Aroclors were measured above detection limits). The TRV used when no Aroclor specific criteria were available was the most conservative surrogate value.

**Comment 21b.** Unresolved. The EPA has requested that the ERA clearly distinguish between dissolved and total AWQC values when comparing metal concentrations at the site to AWQC. The Navy's response suggests that the EPA comment was misinterpreted.

**Response:** See response to Comment 12b above.

**Comment 22a.** Unresolved. The EPA maintains that corrections are needed to Table 5-7, since it currently contains both misapplications of analytical data and values that are not supported by the raw data tables. On several prior occasions many other data entry errors or contradictions between this and other tables of the ERA were reported to the Navy, (reference letter from Phillip Rury to Steve Storms dated December 11, 1995). These errors appear not to have been corrected and the Navy has not responded to this modification of the original comment.

**Response:** See, in part, response to Comment 21a above. Also note that during production of the draft final ERA, two columns (minimum value and arithmetic mean) were inadvertently deleted from Table 5-7. This will be corrected.

**Comment 22c.** Unresolved. The EPA maintains that the risk calculations for some PAHs and for Total Aroclors at Allen Harbor are inadequate. Risks for all Aroclors, either as specific Aroclors or Total PCBs, must be calculated using the most conservative available surrogate toxicity reference value (TRV) for those PCBs lacking Aroclor-specific TRVs. This approach was agreed to by the Navy in several instances. The USF&WS commented on this issue, citing PAHs, in their comment on the Site 11 Demonstration Document. The Navy has not responded to this modification of the original comment; in their response to the original comment, they maintained that there are no TRVs for the summed product.

**Response:** With regard to Aroclors/PCBs, the Navy stipulates that it did in fact employ surrogate TRVs in the requested fashion. This may be confirmed by examining Table 5-15 in the Freshwater/Terrestrial ERA. The Navy responded to the USFWS comment on the Site 11 Demonstration regarding the lack of modeled PAH HQs for birds (see accompanying responses to comments on the Site 11 Demonstration).

**Comment 22d.** Unresolved. The EPA maintains that the ERA should include tables that report both the maximum HQs and their locations for each watershed and EEZ. Risk managers must be able to identify the locations within each EEZs that are primary contributors to risk, so these sites can be targeted for remediation. The Navy maintains this is a mere formatting change and that all information needed to assess the risk at these sites is currently included in the ERA.

**Response:** The Navy first points the reviewer to Tables 4-6 through 4-14 of the Freshwater/Terrestrial ERA. Note that the maximum concentration in the watershed (columns marked "impacted concentration"), the Hazard Quotient (HQ) (columns marked "benchmark screening index"), and the location of the maximum concentration in fact contain the requested information on a watershed basis. At least for the simpler watersheds, the media equate to EEZs. For example, the sediment data in Table 4-6 (Hunt River) are in fact the FCH or freshwater channelized EEZ. The surface soil data in Table 4-6 are the UPL or upland EEZ. For watersheds with more diverse EEZs, there is not a clear relationship between media and EEZs (i.e., Hall Creek, Allen Harbor). The reviewer appears to be asking for the food web-based maximum HQs to be apportioned among sampling locations within EEZs. This is not a meaningful exercise because the food web-based EEZ HQs are a composite of inputs from several EEZs. On the other hand, for receptors that derive their food base essentially from soil only, i.e., robin, hawk, and shrew, then a watershed HQ equates to the UPL EEZ. This fact is used in the accompanying Technical Memoranda that evaluate the need for surface soil remediation at Sites 06, 10, and 11. Using these protocols, any analyte/HQ combination determined to pose risk would also be identified as to location. Consequently, the Navy believes that, to the extent possible, the requested information has already been provided.

**Comment 24.** Unresolved. The EPA maintains that landfill seeps do present a potential risk because there are exposure pathways and that a discussion of these exposure pathways and scenarios must be included in the final ERA. The seeps are terrestrial points of exposure during both low and high tide, and filtered seep water samples contain up to 8 ppb dissolved PCBs. The Navy maintains that there are no ecological exposure pathways associated with the seeps. This point of contention may not be as critical to resolve if the Navy agrees to cap the landfill with a RCRA "C" cap which should eliminate the seeps caused by rainwater infiltration, thus severing the current exposure pathway.

**Response:** This comment is in regard to Site 09.

**Comment 25.** Unresolved. The issue is similar to that discussed in #5. The EPA maintains that the Navy had been asked nearly two years ago to qualitatively assess, report, and discuss any obvious spatial correlation between elevated HQs/HIs and impairment of benthic communities. The Navy maintains that all information needed to assess the risk at these sites is currently included in the ERA. However, the current presentation and interpretations of these data are misleading and scientifically indefensible at the EEZ and watershed levels.

**Response:** See response to Comment 5 above.

**Additional Issue from Marine ERA that effects the Terrestrial ERA.**

**Response to Comments 9 & 10** - The Navy must use non-normalized sediment to biota BAFs in the food chain models.

**Response:** The Navy did use non-normalized sediment to biota BAFs in the food chain models. To illustrate, note that the mean of oyster and ribbed mussel BAFs for any metal in Table 6.3-1 of the Marine ERA equals the benthos BAF for corresponding metals in Table 5-10 of the Freshwater/Terrestrial ERA. Note further that the benthos (or fish) BAFs for organic compounds in Table 5-10 of the Freshwater/Terrestrial ERA do not equal the corresponding organic compound BSAFs in Table 6.3-1of the Marine ERA. This is because the benthos and fish BSAFs received from SAIC were converted to BAFs using lipid and TOC data, i.e., the BSAFs were converted back to non-normalized BAFs before use in the food web modeling.

**Marine ERA**

EPA's 9 October 1996 comments included several on the Marine ERA. The Navy does not include responses here because it is not pertinent to Sites 06, 10, and 11.