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NSY PORTSMOUTH
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LETTER AND U S NAVY RESPONSE TO U S EPA REGION I, MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION AND HEW HAMPSHIRE FISH AND GAME COMMENTS REGARDING OFFSHORE HUMAN HEALTH MEDIA PROTECTION STANDARDS NSY PORTSMOUTH ME
1/19/1996
NAVFAC NORTHERN

DEPARTMENT OF THE NAVY
NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
10 INDUSTRIAL HIGHWAY
MAIL STOP, #82
LESTER, PA 19113-2090

IN REPLY REFER TO

5090
Code 1823/JMC

JAN 19 1996

Ms. Meghan Cassidy
U.S. Environmental Protection Agency New England Region
JFK Federal Building, HAN-CAN 1
Boston, MA 02203-2211

Ms. Nancy Beardsley
Maine Department of Environmental Protection
State House Station 17
Augusta, ME 04333-0017

Subj: OFFSHORE HUMAN HEALTH MEDIA PROTECTIONS STANDARDS, PORTSMOUTH NAVAL SHIPYARD, KITTERY, ME

Dear Ms. Cassidy and Ms. Beardsley:

Enclosed are the responses to the review comments provided by EPA, MEDEP and New Hampshire Fish & Game. Because of the complex nature of this report, these comments had been provided for your review in draft form, September 20, 1995. Based on this preliminary review no changes to the responses were required. We propose that a submittal date for the revised document be developed following the RAB presentation of this document.

These comment responses have also been sent to the members of the Restoration Advisory Board. If you have any questions on this matter please call me at (610) 595-0567 extension 117.

Sincerely,

Jim Conroy

JAMES M. CONROY, PE
LT, CEC, USN
Remedial Project Manager
By direction of the Commanding Officer

Encl: Response to EPA Comments of August 8, 1995
Response to MEDEP Comments of July 27, 1995
Response to NH Fish & Game Comments of August 7, 1995

cc w/enclosure:
NOAA (K. Finkelstein)
US Fish & Wildlife Service (K. Munney)
ATSDR (L. House)
ME Dept. of Marine Resources (D. Card)
NH Fish & Game (J. Nelson)
NH DPHS-BHRA (J. Dreisig)
NEHC (C. Grosse)
PNS (Code 121.10, F. Endyke)

REVISED DRAFT CHAPTER 2: MEDIA PROTECTION STANDARDS
FOR
OFF-SHORE MEDIA BASED ON HUMAN HEALTH RISKS
RESPONSES TO REGULATORY AGENCY COMMENTS
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY - REGION I COMMENTS DATED AUGUST 8, 1995

General Comments

1. **Comment**: The $1x10^{-6}$ risk level is defined as the incremental risk of an individual developing cancer (as defined in the NCP and in Risk Assessment Guidance for Superfund). EPA does not evaluate population risks under CERCLA as the text indicates throughout. Correct text where needed (noted on pages 2-10 and 2-26).

   Response:

   The definition of "cancer level risk", obtained from the USEPA 1991 document will be replaced with the following definition, derived from Risk Assessment Guidance for Superfund. Volume I. Human Health Evaluation Manual (Part A). EPA/540/1-89/002:

   "A cancer risk level is defined as the incremental probability of developing cancer over a lifetime, as a result of exposure to a potential carcinogen (i.e., incremental or excess individual lifetime cancer risk)". [Relates to MEDEP Comment Number 3.]

2. **Comment**: Some EPA references cited in the text are missing letters for publications with the same data. For example, see EPA (1991) on page 2-10, 2-14, 2-26; EPA (1993) on page 2-17.

   Response:

   The document will be reviewed to insure that citations are complete and that letters for publications are included, as appropriate, in these citations.

3. **Comment**: EPA does not believe that the risk assessment should include consumption of surface water from the Piscataqua estuary system as a possible route of exposure since the Piscataqua River is a saline water body.

Response:

The formulas used for the calculation of surface water MPS do allow for the inclusion of terms to account for possible exposure to contaminants by inhalation, other dietary factors, and the ingestion of contaminated water. The calculations used to generate surface water MPS did include a value for water consumption (2 liter/day). However, ingestion of seawater was not a consideration for these calculations; a value of "0" was incorporated into these calculations to reflect that ingestion of water did not add to the total contaminant dose. However, that ingestion of water was not a consideration for these calculations is not clear in either the text or Table 2-3. This portion of the document will be revised so that this is clear to the reader. [Relates to MEDEP Comment Number 16.]

Specific Comments

4. **Comment**: Page 2-15: Some of the reference doses (RfDs) are inconsistent with currently available values in IRIS. Any updated RfD values should be inserted into the calculations.

   Response:

   Updated toxicity values will be used as described in MEDEP Comment Numbers 8 and 13.

5. **Comment**: Page 2-15: The RfD for DDT should be used to calculate a MPS for DDE.

   Response:

   Although it wasn't done in the human health risk assessment, the RfD for DDT will be used to generate surface water and sediment MPS for DDE. It should be noted that surface water and sediment MPS were calculated for this contaminant using a cancer slope factor. [Relates to MEDEP Comment 20.]

6. **Comment**: Page 2-15, footnote #2: The arithmetic mean of invertebrate BCFs for organic arsenic should be used rather than the geometric mean.

   Response:

   Page 2-15, footnote #2 will be changed to correct this typographical error. The footnote will read as follows: "Arithmetic mean of invertebrate BCFs reported for organic form of Arsenic (EPA, 1985).

7. **Comment**: As indicated on page 2-25, "the ability of BCFs to reasonably predict the potential bioaccumulation of organic contaminants decreases for

contaminants with log K_{ow} values greater than 6.5". Given this information the text should discuss the uncertainties associated with the calculated BCFs for PCBs.

Response:

Agree with reviewer; a discussion addressing this issue will be added to the uncertainty section. [Relates to MEDEP Comment Number 22.]

8. **Comment**: In addition to the above comments EPA agrees with, and would like clarification regarding, comments #18, #19, #24, #26 and #29 as stated in the Maine Department of Environmental Protection's letter to the Navy dated July 27, 1995.

Response:

See response to MEDEP Comment Numbers 18, 19, 24, 26, and 29.

STATE OF MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION COMMENTS DATED JULY 27, 1995

General Comments

1. Comment: The methodology that was used in the development of the Offshore Media Protection Standards (MPS) is based on a modification of the methodology used in the USEPA document entitled: Assessment and Control of Bioconcentratable Contaminants in Surface Waters (1991). This methodology relies on a back-calculation of a surface water concentration of bioconcentratable contaminant from the concentration of contaminant in biota based upon the human consumption of contaminated biota that results in an acceptable risk level. In general, the proposed MPS are based on assumptions that result in conservative analyses and MPS. A major assumption in this case is that there exists an equilibrium between the sediments to which the biota are exposed and the overlying surface water. This is an extremely conservative assumption. It is more likely that the sediment concentrations are in equilibrium with the sediment pore water, but not the surface water.

   A second assumption is that the surface water from the Piscataqua estuary system will be used as a drinking water source for people in the area who might also be consuming the seafood. This assumption significantly lowers the proposed MPS. It should be noted that the original risk assessment conducted for the contaminated seafood did not include this drinking water parameter. The Piscataqua is a saline water body that, for all intents and purposes will not be used as a drinking water source.

   Many of the proposed MPS have little basis in reality. For example; the proposed MPS for arsenic is based on the theoretically mean values obtained in York Harbor. Is 0.735 mg/kg arsenic correct? As a "reality check", the MPS data was compared with the data from the National Status & Trends Program for Marine Environmental Quality Report (NOAA, 1988). Although the comparison is not rigorous, it allows the risk manager to put perspective into the proposed MPS values. Normalized concentrations of As from fairly pristine Maine harbors (Machias Bay, Frenchmans Bay, Penobscot Bay, and Casco Bay) range from 10.75 mg/kg - 19.78 mg/kg, significantly higher than that value presented for York Harbor. On the other hand, the MPS proposed for the concentration of cadmium in sediments is orders of magnitude greater than the values found in sediments (see comment below).

   Response:

   As noted in the minutes of the meeting held April 11, 1995, the primary concerns that EPA/MEDEP had with respect to the Draft Human Health MPS

Proposal was that the MPS established for biota be translated into MPS for sediment and surface water. The preliminary strategy for developing surface water and sediment MPS was discussed March 8, 1995 and again, during the April 11, 1995 meeting in Boston. At this meeting, HNUS reviewed information submitted to EPA/MEDEP on April 5, which included a list of contaminants that would be addressed in the MPS document, the approach that would be used to develop surface water and sediment MPS, identification of formulas that would be used, and a listing of input parameters. It was noted that the list of contaminants of concern and many of the input parameters were taken from the McLaren/Hart final Human Health Risk Assessment Report for Off-shore Media dated May 10, 1994. The fact that this approach to developing surface water and sediment MPS would be predicated on the adoption of conservative assumptions (e.g., that contaminant concentrations in pore water are equal to concentrations in the water column) was also emphasized at this meeting.

HNUS's response to EPA/MEDEP comments (April 17, 1995) re-emphasized that the McLaren/Hart document would serve as the source of values used to develop the Human Health MPS and that this methodology was based on conservative assumptions. However, several of the toxicity values used in the McLaren/Hart document will be updated as stated in the response to MEDEP Comment Number 8.

The purpose of the MPS document is to provide information that will aid in the development of remedial strategies for the NSY Portsmouth. As such, it does not necessarily represent the final set of values that will be used for this purpose. The final selection of a remedial strategy will consider the conservative assumptions used in the development of the MPS, uncertainties associated with parameter selection and the formulas used to calculate MPS, and NCP criteria.

Ingestion of seawater was not included in the calculation of these MPS values. The ingestion of water is discussed in greater detail in the response to MEDEP Comment Number 16.

Data used to generate background concentrations for mercury and arsenic will be included in an appendix table in the revision of Chapter 2.0. Mean values generated using these data will also be included in this table [relates to MEDEP Comment Number 23].

The calculation of the sediment MPS for cadmium is based, in part, on the average AVS concentrations measured in Portsmouth Harbor. The formula used to generate the sediment MPS for cadmium employed the average reported value of AVS to predict how much cadmium could be present in these sediments and still not represent risk to humans. As noted in response to MEDEP Comment Number 26, a conversion factor of 1000 had inadvertently

been included in the formula used to calculate the sediment MPS for cadmium. Removal of this conversion will reduce the cadmium MPS. Although these formulas predict a value for a sediment MPS for cadmium, it doesn't necessarily mean that this amount of cadmium is actually present in these sediments; it simply indicates that cadmium could be added to sediments in these concentrations and still not represent a health risk. There is no real relationship between the predicted sediment MPS (which is based on AVS) and reported background concentrations.

Specific Comments

1. <u>Comment</u>: The sediment MPS values for metals were derived using a proposed methodology which estimates the quantity of metal which will react with amorphous sulfides (i.e., acid volatile sulfide or AVS) or adsorb to sediment organic carbon [USEPA, 1993]. The suggested formula for sediment MPS is:

   Sediment MPS = AVS + Water MPS * f_{oc} *K_{oc}

   where,

   AVS = acid volatile sulfide
   f_{oc} = fraction organic carbon
   K_{oc} = organic carbon partition coefficient

   However, this equation is invalid for sediments which contain significant quantities of more than one metal which will react with AVS (i.e., Cu, Pb, Cd, Zn, and Ni). <u>The sediment MPS that were developed for cadmium are therefore invalid, since significant concentrations of other metals, most notably lead, are also present in site sediments</u>. The methodology cannot be used for two or more metals because each of the metals will react with AVS in order of increasing solubility. For example, lead will react with AVS before cadmium, thereby reacting with some or all of the available AVS. Therefore, these metals must be considered as a group. Because of this, the sediment MPS for inorganics needs to be developed using an alternative methodology.

   <u>**Response**</u>:

   It was recognized that the five cationic metals (copper, lead, cadmium, nickel and zinc) have differing affinities for AVS; the presence of two or more of these metals in sediments therefore alters the amount of AVS available for binding the various cations (EPA, 1994). While this relationship was understood, it was deliberately disregarded in the development of a sediment MPS for cadmium in that it was felt implementation of the MPS was most practicable if based on a single contaminant. However, using the equations listed below, it is possible to account for the presence of other divalent metals and generate a sediment MPS for cadmium.

The equilibrium models developed by EPA (1994) indicate that metals act in an additive fashion when binding to AVS, "That is, each of the five metals: Cu, Pb, Cd, Zn, and Ni will bind to the AVS and be converted to CuS, PbS, CdS, ZnS, and NiS in this sequence; i.e., in the order of increasing solubility" (EPA, 1994). The term _[SEM_i] is the excess SEM for each of the ith metals. The least soluble metal sulfide considered in EPA (1994) is copper sulfide. If the copper SEM is less than the AVS (SEM_{Cu} < AVS), then all of the copper SEM is present as copper sulfide and no additional SEM is present so the _[SEM_{Cu}] = 0. The remaining AVS is _[AVS] = [AVS] - [SEM_{cu}]. This computation is repeated for the next least soluble metal (Pb). In essence, AVS is "assigned" to the metals in the sequence of their solubility products from the lowest to the highest: $SEM_{Cu} < SEM_{Pb} < SEM_{Cd} < SEM_{Zn} < SEM_{Ni}$. That is, AVS would be complexed first to copper, followed by lead, etc. until AVS is exhausted. Once AVS is depleted, the remaining metals exist as excess SEM.

In accordance with EPA guidance (EPA, 194), the following general equation takes into account a) the presence of multiple metals and their affinity for AVS and b) and the effect of sediment organic carbon on cadmium availability in those instances when all AVS has been bound:

1) MPS_{Cd} Sediment = (AVS - SEM_{Cu} - SEM_{Pb}) + (MPS_{Cd}water * Kd,OC,i * foc)

In the event that the available AVS has been exhausted by SEM_{Cu} and SEM_{Pb} (i.e., AVS - SEM_{Cu} - $SEM_{Pb} \leq 0$), equation 1 is simplified such that only the impact of sediment organic carbon on determining the availability of cadmium is considered (EPA, 1994):

2) MPS_{Cd} sediment = (MPS_{Cd} water * $Kd_{i}OC,_{i}$ * f_{oc})

Site-specific AVS and SEM data for copper, lead, and cadmium are available. These data and either equation 1 or 2 (depending on whether or not excess AVS exists after accounting for SEM_{Cu} and SEM_{Pb}), will be used to account for the presence of other metals when calculating sediment MPS for cadmium and incorporated in the revised report. [Relates to MEDEP Comment Numbers 17 and 26.]

2. <u>Comment</u>: There is significant uncertainty in calculating BAFs from BCFs, as the authors acknowledge. The report indicates that this uncertainty just for estimating Kow may be an order of magnitude. The parameters used in the calculations also introduce uncertainties. The authors should acknowledge and discuss the implications of these other sources of uncertainty. These include:

the use of Fundulus BCF as an analog for flounder - These species are quite

different phylogenetically, trophically, and in feeding type. As a consequence, there may be significant differences in BCF;

Pimephales is a freshwater minnow and is a poor analog for flounder in estimating a BCF. The report should address the uncertainty associated with the use of this BCF for flounder;

the use of 60,000 as the BCF for mercury - The uncertainties here include the fact that this BCF was calculated for a small fish at trophic level 3 (a source of uncertainty in itself) and is used in the report as a BCF for lobster and mussel;

The most conservative surface water MPS are for arsenic, cadmium, and mercury (derived from eating mussels) which each have significant uncertainty associated with their calculation of a BAF. Specifically, the calculated BAF for arsenic uses an average BCF for all invertebrates; the calculated BAF for cadmium uses a BCF from a different species; and the calculation of a mercury BAF uses a separately calculated BCF for a small fish.

The report should analyze the effect of each of these sources of uncertainty, especially in light of the fact that the calculated surface water MPS are often less than the Ambient Water Quality Criteria for ingestion by orders of magnitude.

It is recommended that, given all the sources of uncertainty in this analysis, that the Navy measure site specific BAFs for this area.

<u>Response</u>:

A more indepth discussion of uncertainties associated with the various parameters used to generate MPS values will be incorporated into the revision of Chapter 2.0. While it is true that the MPS values are generally much lower than Ambient Water Quality Criteria that address exposure to contaminants via ingestion, it should be borne in mind that these values are based on conservative values generated in the human health risk assessment produced by McLaren/Hart (1994). When the conservative nature of this assessment and its attendant uncertainties are added to conservative assumptions and uncertainties associated with paramaterizing the models used to develop the various MPS, generation of MPS values less than the AWQC is not unexpected.

As noted in Chapter 2.0, use of BAFs to predict uptake of chemicals from the environment is preferred over the use of BCFs (USEPA, 1993a; 1993b). Ideally, this BAF is measured in the field, preferably site-specific, at or near the top of the food chain. "However few BAFs have been measured accurately and their application to sites other than the specific ecosystem where they were developed is problematic and subject to uncertainty" (USEPA, 1991).

While using site-specific BAFs may be desirable, the USEPA (USEPA, 1993a; 1993b) cautions that determining these values is difficult and subject to uncertainty. As discussed in Chapter 2.0 on page 2-8, "USEPA recommends that Food Chain Multipliers (FMs) and BCFs be used to derive BAFs for organic chemicals when site-specific BAFs are not available; to date, site-specific BAFs have not been calculated for the NSY Portsmouth." Because site-specific field measured BAFs were not available at the time that this document was prepared, USEPA recommended alternate procedures were used(e.g., BCFs and Food Chain Multipliers) to calculate chemical and species-specific BAFs.

Since this draft document was submitted for review and comment, NCCOSC completed the Draft Final Estuarine Ecological Risk Assessment (July 19, 1995). This document describes the derivation of site-specific bioaccumulation factors for several NSY Portsmouth contaminants of concern. Site-specific BAFs generated in this document for lobster and flounder will be used in MPS calculations, where appropriate. No site-specific BAF or BCF was developed for mussels. However, site-specific data are available for both mussel tissue and surface water contaminant concentrations so that calculation of site-specific BCFs may be possible, at least for some contaminants. [Relates to MEDEP Comment Number 19.]

3. **Comment**: Section 2.3.1. The definition of carcinogenic risk, as it appears on page 2-10 is not technically correct and should be changed.

Response:

The definition of "cancer level risk", obtained from the USEPA 1991 document will be replaced with the following definition, derived from Risk Assessment Guidance for Superfund. Volume I. Human Health Evaluation Manual (Part A). EPA/540/1-89/002:

"A cancer risk level is defined as the incremental probability of developing cancer over a lifetime, as a result of exposure to a potential carcinogen (i.e., incremental or excess individual lifetime cancer risk)." [Relates to EPA Comment Number 1.]

4. **Comment**: Section 2.3.2. Some words appear to be missing from the second sentence of the first paragraph of this section, which appears on page 2-10.

Response:

The second sentence in the first paragraph on this page will be re-written as follows:

In addition, these MPS will also take into account the potential health risks that

each of these contaminants may represent to humans.

5. **Comment**: Figure 2-2. A reference to the EPA (1991a) document from which the formulae were taken should be included on this Figure.

Also, it would be helpful if the non-carcinogenic formula were adjusted to omit the [(DT + IN) *WT] term in the numerator, since this term reduces to zero in all calculations in the document. The descriptions of the formula in Section 2.3.2.1 should also reflect this change.

Response:

Figure 2-2 will be amended so that it includes a reference to the EPA (1991a) document that served as the source of the formulae summarized in this figure.

The term [(DT + IN)*WT] was included for completeness. Inclusion of all possible exposure pathways in the formulas summarized in Figure 2-2 was discussed during the April 11, 1995 meeting between EPA Region I, MEDEP, the Navy and HNUS. However, the reviewer is correct; this term does reduce to zero. If the values listed in Table 2-3 are utilized in all calculations using these formulas, no confusion should arise in performing these calculations. Therefore, modifications to Figure 2-2 are unnecessary but the text will be modified so that it is clear that these terms are included for the sake of completeness but reduce to zero in this instance.

6. **Comment**: Figure 2-2 has an equation for calculation of sediment MPS from surface water MPS, but there is no explanation in the text. The uncertainties associated with surface water MPS calculations are transferred into the development of sediment MPS using this method. In addition, the text should provide an explanation and justification for adding AVS into the sediment MPS calculation. Also, why does the equation on figure 2-2 use equilibrium partitioning for estimating MPS for sediment inorganics and metals? EP does not apply to inorganics and metals (see comment above).

Response:

Section 2.4.1 does indicate that surface water MPS were used to calculate sediment MPS; a reference to Section 2.3 and Figure 2-2 is included in this section of the document. The inclusion of surface water MPS into formulae used to generate sediment MPS is repeatedly mentioned throughout the section of the document that discusses methods used to derive sediment MPS. The uncertainties sections (2.4.2.1.4 and 2.2.2.2.4) associated with the generation of sediment MPS also indicates that the uncertainties associated with the development of surface water MPS also apply to the development of sediment MPS.

Sediment MPS were developed using methods/procedures summarized in "Equilibrium Partitioning Approach to Predicting Metal Bioavailability in Sediments and the Derivation of Sediment Quality Criteria for Metals". This document was a briefing report prepared by the US EPA Office of Water and Office of Research and Development and submitted to the EPA Science Advisory Board in December, 1994. Chapter 2.0 of this EPA document discusses the equilibrium partitioning method (EqP) and its use in the development of sediment quality criteria for nonpolar organic chemicals, noting that this method is also utilized in the development of sediment quality criteria for metals. Much of the remainder of this document provides a summary of the technical information used to support the use of EqP in the development of sediment quality criteria for metals.

The text will be reviewed and modified, as appropriate, to clarify these issues.

7. **Comment**: Table 2-3. The units for % lipid shown in this table should be represented as a fraction, not as they are shown. Additionally, the % lipid for assessing inorganics will have little, if any impact on the analysis and therefore, these values should be represented as "1", or not appear at all.

Response:

Tissue-specific lipid values were expressed as "%" in Table 2-3 but were converted to fractions when calculating MPS. To reduce potential confusion, these values will be expressed as fractions in Table 2-3 [relates to MEDEP Comment Number 9]. Table 2-3 lists "general parameters" used in various MPS calculations. It wasn't intended to be specific for either metals or organics. It is agreed that tissue lipid content is unlikely to impact tissue concentrations of most inorganics; this is reflected., indirectly, in the K_{ow} values summarized in Table 2-4. Because Table 2-3 is a general table, modifications to this table are unnecessary. However, the text will be reviewed and modified to clarify that lipid content should have little or no impact on the uptake of metals.

8. **Comment**: Toxicity Factors (Table 2-4)
   - There is a new (6/95) arsenic oral CPF -- 1.5 $(mg/kg/day)^{-1}$
   - There is a new (5/95) methyl mercury oral RfD -- 0.0001 mg/kg/day
   - EPA Region I has adopted EPA Headquarters Provisional Guidance for PAH CPFs. The B(a)P number is currently 7.3 $(mg/kg/day)^{-1}$. The adjusted values should be listed in the table, not just explained in the text (Section 2.3.3.2):

Benzo(a)anthracene	0.73 $(mg/kg/day)^{-1}$
Benzo(a)pyrene	7.3 $(mg/kg/day)^{-1}$
Chrysene	0.0073 $(mg/kg/day)^{-1}$
Indeno(123cd)pyrene	0.73 $(mg/kg/day)^{-1}$

Response:

These updated toxicity factors will be incorporated into the calculations used to generate surface water and sediment MPS. The values currently present in Table 2-4 will be replaced with these updated values. [Relates to MEDEP Comment Number 24 and EPA Comment Number 4.]

9. **Comment**: MPS Risk Calculations. MPS calculations were spot-checked; all appear to have been done correctly, assuming that the % lipid values are expressed as a fraction, rather than as a whole number.

Response:

Tissue-specific lipid values were expressed as "%" in Table 2-3 but were converted to fractions when calculating MPS. To reduce potential confusion, these values will be expressed as fractions in Table 2-3. [Relates to MEDEP Comment Number 7.]

10. **Comment**: Section 2.9. Due to the differences in chemical concentrations in parts of the shellfish, as well as preferences for consuming these parts, MPS should be based on an analysis of the meat, tomalley, and whole lobster. These calculations should be presented to the project manager such that an informed decision can be made as to the "correct" MPS.

Response:

An additional analysis of the impacts that ingestion of tomalley might have on MPS values will be incorporated into the revision of Chapter 2.0. The revised document will calculate MPS based on the ingestion of lobster tissue and lobster tissue + tomalley. The percent contribution of tomalley to total lobster ingested will be addressed in the same manner that it was handled in the Seafood Ingestion Risk Assessment produced by HNUS (1994). In the Seafood Ingestion Risk Assessment, a typical lobster serving size of 0.144 kg was assumed to consist of 83% lobster tail meat and 17% tomalley, based on information supplied by MEDFARR. [Relates to MEDEP Comment Number 31.]

11. **Comment**: The State of Maine DEP requires that cumulative site risks be addressed for each receptor as they would be exposed to the media/chemicals at the site. Cumulative site risks should be addressed for exposures at this site. As an example, there are 13 carcinogenic compounds identified, each MPS is set to 10^{-5} carcinogenic risk. The total risk exceeds the MEDEP risk limit of 10^{-5}.

Response:

Health risks associated with this facility were addressed in a separate document produced by McLaren/Hart (1994). The McLaren/Hart human health risk assessment did examine cumulative risks associated with exposure to multiple chemicals/media associated with the Shipyard. This information is summarized in sections 5 and 6 of the McLaren/Hart risk assessment. The risk assessment has received approval from both EPA Region 1 and MEDEP. As noted in the introduction section of Chapter 2.0, the primary objective of this document was to develop media protection standards (MPS) for surface water and sediment based on human health risks identified for the Portsmouth Naval Shipyard. Chapter 2.0 used much of the same information contained in the human health risk assessment to develop MPS for those chemicals determined to pose a health risk to humans.

It is not clear why the comment references the use of a 10^{-5} carcinogenic risk to develop MPS values. A 10^{-6} carcinogenic risk, rather than a 10^{-5} carcinogenic risk, was used to develop MPS values. *NOTE: The Navy has discussed this issue with MEDEP and it has been resolved.*

12. **Comment**: p. 2-5: (EPA's letter to the Navy) Why is it more likely that adults rather than children will be subsistence fish consumers? This statement should be referenced.

Response:

The following response was provided by USEPA Region I: "Best professional judgement was used. It is the belief of EPA Region I that children would not have a diet of 50% mussels."

13. **Comment**: p. 2-15, Table 2-4: Some of the reference doses (RfDs) attributed to McLaren/Hart are inconsistent with currently available values in IRIS. Specifically, the RfD for cadmium is 0.005 (IRIS, 2/1/94) rather than 0.001, and the RfD for phenylmercuric acetate is 0.00008 (IRIS, 5/1/91) rather than 0.00006.

Response:

These updated toxicity factors will be incorporated into the calculations used to generate surface water and sediment MPS. It should be noted that methylmercury, rather than phenylmercuric acetate is being evaluated at NSY Portsmouth. [Relates to EPA Comment Number 4.]

14. **Comment**: p. 2-10: The last sentence on this page should be reworded to indicate that the listed compounds are not noncarcinogens, rather, that they have noncarcinogenic health effects. Several are, in fact, carcinogens.

Response:

The last sentence on page 2-10 will be re-worded to read as follows:

Although a number of the following contaminants exhibit both carcinogenic and noncarcinogenic health effects, this section of the document will generate MPS using noncarcinogenic endpoints (e.g., RfD values). Contaminants addressed in this section include: aldrin, cadmium, p'p-DDT, heptachlor, heptachlor epoxide, hexachlorobenzene, lindane, mercury, and arsenic (Table 2-1). [Relates to MEDEP Comment Number 25.]

15. **Comment**: p. 2-11: What is the rationale behind the equations for media protection standards (MPS) formulas for surface water and sediment? A discussion of the derivation of these formulas is required. (see also comments 16 and 17)

Response:
Section 2.3.1 provides a discussion of the rationale and methodologies used to develop surface water MPS and the documents that served as the source for much of the underlying rationale and formulas summarized in this section of the document. Section 2.4.1 provides similar information with respect to the development of sediment MPS. This portion of the text will be reviewed and modified, as necessary, to clarify this discussion.

16. **Comment**: p. 2-11: In the MPS equations, it appears to be unnecessary to include either the factor accounting for ingestion of 2 liters/day of seawater, or the factor to accounting for other dietary and inhalation exposures.

Response:

The formulas used for the calculation of surface water MPS do allow for the inclusion of terms to account for possible exposure to contaminants by inhalation, other dietary factors, and the ingestion of contaminated water. The calculations used to generate surface water MPS did include a value for water consumption (2 liter/day). However, ingestion of seawater was not a consideration for these calculations; a value of "0" was incorporated into these calculations to reflect that ingestion of water did not add to the total contaminant dose. However, that ingestion of water was not a consideration for these calculations is not clear in either the text or Table 2-3. This portion of the document will be revised so that this is clear to the reader. [Relates to EPA Comment Number 3.]

17. **Comment**: p. 2-11: The implications and uses of acid volatile sulfide (AVS) analyses require further explanation, including a more detailed discussion of the limitations of this data. It is unclear how the AVS levels relate to total metal concentrations, and the magnitude of fluctuations in AVS levels related to seasons, storm events, and dredging is not described.

Response:

It is assumed that the reviewer is referring to Section 2.4.2.2 (page 2-33) that contains a discussion of the relationship between AVS and divalent metals. This section of the document will be reviewed and expanded, as necessary, to provide a more detailed discussion of this topic. Section 2.4.2.2.4 will also be reviewed and the discussion of the influence that season, dredging and storm events will be expanded to provide a clearer understanding on how these factors influence AVS concentrations. [Relates to MEDEP Comment Number 1.]

18. **Comment**: p. 2-14: Does the average % lipid calculated for flounder and lobster really account for the impacts of size, sex, season, condition, etc.? If so, please explain, if not, this sentence should be deleted.

Response:

Agree with reviewer; this sentence will be deleted. [Relates to EPA Comment Number 8.]

19. **Comment**: p. 2-14 - 2-15, and Table 2-4: "...bioconcentration factors for closely related species were used instead." The flounder BCF for arsenic is approximated using a BCF for arsenic V in fathead minnows. Similarly, BCFs for cadmium in flounder and mussels are approximated using a whole organism value for the common mummichog, and a BCF reported for oysters, respectively. Justification for these substitutions should be provided, particularly since uptake and metabolism of arsenic in freshwater and saltwater fishes has been suggested to follow different pathways (see K. Trapp's memo, included in April 11 Meeting Minutes (5090 Ser 2478))

Response:

Ideally, species-specific BCF values would have been employed for all three species considered. Unfortunately, the number of species and contaminants for which BCF values have been quantified are limited. EPA water quality criteria manuals, documents produced by the US Fish and Wildlife Service, databases maintained by the Army Corp of Engineers and EPA (e.g., IRIS) and other sources of this type of information were searched to identify species-specific

BCF values. When such values could not be identified, BCF values for "surrogate" species were used. It is acknowledged that the use of BCF values obtained from surrogate species introduces uncertainty to these calculations [relates to MEDEP Comment Number 2]. The discussion concerning the lack of species-specific BCF values will be expanded to include information summarized in this comment, as will the discussion of uncertainty pertaining to the use of alternate BCF values. [Relates to EPA Comment Number 8.]

20. **Comment**: p. 2-15: The RfD for DDT should be used as a surrogate for DDE, permitting calculation of MPS for this contaminant.

Response:

Although it wasn't done in the human health risk assessment, the RfD for DDT will be used to generate surface water and sediment MPS for DDE. It should be noted that surface water and sediment MPS were calculated for this contaminant using a cancer slope factor. [Relates to EPA Comment Number 5.]

21. **Comment**: p. 2-15, footnote #2: Why was the geometric mean (rather than the arithmetic mean) of invertebrate BCFs reported for organic arsenic selected?

Response:

Page 2-15, footnote #2 will be changed to correct this typographical error. The footnote will read as follows: "Arithmetic mean of invertebrate BCFs reported for organic form of Arsenic (EPA, 1985)."

22. **Comment**: p.2-15, 2-25: The log K_{ow} for PCBs is 6.91, as indicated on Table 2-4. On p. 2-25, it is stated that "the ability of BCFs to reasonably predict the potential bioaccumulation of organic contaminants decreases for contaminants with log K_{ow} values > 6.5. In light of this information, are the calculated BCFs for PCBs acceptable?

Response:

As noted on pages 2-14 and 2-25, methods for predicting the bioavailability of "superlipophilic" organic compounds have yet to be developed. In the case of indeno(1,2,3-cd)pyrene (K_{ow} = 7.7), the EPA recommended BCF value of 100,000 was employed in MPS calculations, rather than using the K_{ow} for this chemical to develop a predicted BCF. The K_{ow} for indeno(1,2,3-cd)pyrene certainly suggests that this chemical can be categorized as being superlipophilic and that the use of EPA's recommended BCF of 100,000 is appropriate in this instance. However, as noted on page 2-25, it is not known whether this BCF value under or overpredicts the bioavailability of this chemical; perhaps the

physical structure (e.g., large-sized molecule) of this chemical is such that it doesn't readily cross cell membranes. In this instance, use of a BCF of 100,000 may overpredict its bioavailability. In the case of PCBs (K_{ow} = 6.91), a BCF value of 100,000 could have been employed, rather than using the formulas listed in the Chapter 2.0 document to predict a BCF value. However, because PCBs are known to readily bioaccumulate, it was felt that extrapolating a BCF value from the Kow was appropriate and would be more indicative of the tendency of these compounds to bioaccumulate than would the BCF of 100,000. Substituting the predicted BCF value used in MPS calculations with the BCF of 100,000 would result in a less conservative MPS value. As was the case with indeno(1,2,3-cd)pyrene, use of this BCF value may also result in an over or under prediction of PCB bioavailability. The document will be revised, as appropriate, to incorporate a discussion of this uncertainty. [Relates to EPA Comment Number 7.]

23. **Comment**: p. 2-18, Table 2-15 and following: How were average concentrations of mercury and arsenic in York Harbor sediments calculated? Is York Harbor clean enough to serve as the standard for protecting human health for these two contaminants?

Response:

Data used to generate background concentrations for mercury and arsenic will be included in an appendix table in the revision of Chapter 2.0. Mean values generated using these data will also be included in this table [relates to MEDEP's General Comment].

The York Harbor sampling locations were believed to be outside the area impacted by the NSY Portsmouth. As noted in the reviewer's General Comments, arsenic concentrations were less than those reported from fairly pristine Maine harbors (Machias Bay, Frenchmans Bay, Penobscot Bay, and Casco Bay) which range from 10.75 mg/kg - 19.78 mg/kg. However, although these areas are categorized as "pristine", it does not necessarily mean that no human health effects have been associated with these areas (e.g., natural concentrations of As may result in unacceptable tissue concentrations in seafood).

As the reviewer infers in this comment, and specifically addresses in MEDEP Comment Number 27, the issue of what constitutes an "acceptable" background location has been the subject of much discussion. York Harbor was chosen because it is not believed to be impacted by contaminants from NSY Portsmouth and both surface water and sediment samples had been collected and analyzed for the majority of the contaminants that were the focus of the Chapter 2.0 document. It is recommended that the Navy, USEPA Region I, MEDEP, and Halliburton NUS discuss alternative means of establishing

"background" for the purpose of identifying appropriate sediment MPS for arsenic and mercury and to serve as a basis of comparison for other calculated human health MPS. One possible consideration is to explore the use of "crustal ratio" that has been employed in the ecological risk assessment to evaluate metal enrichment by inorganic constituents (NCCOSC 1995). However, although this method is appropriate for arsenic, it does not work particularly well for mercury. It is recommended that alternate sources of background concentration data, such as data reported for the Maine harbors, be considered.

24. **Comment**: p. 2-27, section 2.3.3.2, third paragraph: The slope factors for the four PAHs are consistent with EPA Region 1 policy. However the first sentence of this paragraph should be corrected to read that the slope factor for benzo(a)pyrene is 7.3 mg/kg/dayE-1, rather than 5.8 mg/kg/dayE-1.

Response:

These updated toxicity factors will be incorporated into the calculations used to generate surface water and sediment MPS. [Relates to MEDEP Comment Number 8.]

25. **Comment**: p. 2-29, section 2.4.2: First sentence should be reworded to indicate that the listed compounds are not noncarcinogens, rather, that they have noncarcinogenic health effects. Several are, in fact, carcinogens.

Response:

The first sentence in section 2.4.2 will be re-worded to read as follows:

Although a number of the following contaminants exhibit both carcinogenic and noncarcinogenic health effects, this section of the document will generate MPS using noncarcinogenic endpoints (e.g., RfD values). Contaminants addressed in this section include: aldrin, cadmium, p'p-DDT, heptachlor, heptachlor epoxide, hexachlorobenzene, lindane, mercury, and arsenic (Table 2-1). [Relates to MEDEP Comment Number 14.]

26. **Comment**: p. 2-32, Table 2-12: The calculated sediment MPS for cadmium is 5870 mg/kg. The magnitude of this value suggests either an error in computations or in the MPS formula.

Response:

The formula for this calculation was reviewed and found to contain a conversion factor of 1000. Upon review, it was determined that incorporation of this value into the formula was not necessary. Elimination of this value

decreases the resultant MPS value for cadmium by approximately two orders of magnitude. [Relates to MEDEP Comment Number 1 and EPA Comment Number 8.]

27. **Comment**: p. 2-50: Why is York Harbor considered the best site for background? This issue has been the focus of extensive discussion, and a summary of how York Harbor was selected would be helpful.

Response:

The York Harbor sampling locations were believed to be outside the area impacted by the NSY Portsmouth. As noted in the reviewer's General Comments, arsenic concentrations were less than those reported from fairly pristine Maine harbors (Machias Bay, Frenchmans Bay, Penobscot Bay, and Casco Bay) which range from 10.75 mg/kg - 19.78 mg/kg. However, although these areas are categorized as "pristine", it does not necessarily mean that no human health effects have been associated with these areas (e.g., natural concentrations of As may result in unacceptable tissue concentrations in seafood).

As the reviewer states, the issue of what constitutes an "acceptable" background location has been the subject of much discussion. York Harbor was chosen because it is not believed to be impacted by contaminants from NSY Portsmouth and both surface water and sediment samples had been collected and analyzed for the majority of the contaminants that were the focus of the Chapter 2.0 document. It is recommended that the Navy, USEPA Region I, MEDEP, and Halliburton NUS discuss alternative means of establishing "background" for the purpose of identifying appropriate sediment MPS for arsenic and mercury and to serve as a basis of comparison for other calculated human health MPS. One possible consideration is to explore the use of "crustal ratio" that has been employed in the ecological risk assessment to evaluate metal enrichment by inorganic constituents (NCCOSC 1995). However, although this method is appropriate for arsenic, it does not work particularly well for mercury. It is recommended that alternate sources of background concentration data, such as data reported for the Maine harbors, be considered. [Relates to MEDEP Comment Number 23.]

Appendix. Table A-3

28. **Comment**: Presumably "drywet" should read "dry weight" throughout the table. Why are these values presented?

Response:

The data presented in Table A-3 were obtained in an electronic format from NCCOSC. Table A-3 was prepared from this file with minor modification. However, because data listed in the column headed "drywet" were not employed in the calculations used in Chapter 2.0, they will be eliminated from this table when the document is revised.

29. **Comment**: Why are the mean lipid values presented for each sampling station?

Response:

Flounder and lobsters were collected from numerous sampling locations within the estuary. These sampling stations were grouped by area (e.g., Back Channel, Clark Cove). Mean values were calculated for each area (not sampling station) to identify possible differences in lipid content of organisms collected from various areas. However, MPS calculations were based on the mean lipid values for all organisms (e.g., all lobster) collected from the estuary, rather than employing area-specific mean lipid values. In order to reduce possible confusion, the mean lipid values calculated for each species collected from these study areas will be removed from this table. [Relates to EPA Comment Number 8.]

30. **Comment**: Since arithmetic means are listed in table 2-3, calculations of means should be shown.

Response:

Agree with reviewer; calculations used to generate arithmetic mean lipid values listed in Table 2-3 will be incorporated into the revised document.

31. **Comment**: Lipid values for lobsters are based on claw/tail tissue only. Additional calculations of lipid levels and MPS should be provided which include hepatopancreas and claw/tail tissues. (Hepatopancreas lipid levels are nearly double the levels in tail/claw tissue, as indicated in table "slipid" from An Evaluation of Contaminant Levels Measured in Lobster and Winter Flounder Samples Collected From Portsmouth Harbor and Reference Locations in the Gulf of Maine, 5090 Ser 2505/1823/JMC.)

Response:

Revision of Chapter 2.0 will include MPS calculations that incorporate the potential impact that ingestion of tomalley might have on exposure to chemical contaminants [relates to MEDEP Comment Number 10].

32. **Comment**: Table A-3 indicates that 9 analyses of flounder fillets from unknown locations were used to determine lipid levels in flounder, and 10 lobsters from unknown locations contributed to the lipid level determined for lobsters. What is the origin of these samples?

Response:

All data were obtained from NCCOSC. These samples were collected from the estuary, but location of these particular sampling stations within the estuary could not be identified. NCCOSC has been contacted and the location of these stations identified. This information will be included in the revision of Chapter 2.0.

STATE OF NEW HAMPSHIRE FISH AND GAME DEPARTMENT COMMENTS DATED AUGUST 7, 1995

1. **Comment**: It is of concern that the general methods used to develop surface water MPS (p.2-6) are fresh water references. Does this mean there are no differences in the "...processes that determine the movement of chemicals between different environmental compartments (eg. surface water and biota)..." for fresh versus salt water? Since water transfer across living membrane is in part dependent upon the molality of solutes within the aqueous phases should we not expect different osmotic rates in general between fresh and marine waters? Are the octanol-water partition coefficients corrected for marine waters?

   Response:

   There is no question that the physical and biological parameters considered in these formulas may differ when moving from freshwater to marine environments. The extent to which salinity and other attendant water quality differences would influence these values is not known but is an acknowledged data gap. For instance, in a report submitted to the Science Advisory Board (USEPA 1994; "Equilibrium Partitioning Approach to Predicting Metal Bioavailability in Sediments and the Derivation of Sediment Quality Criteria for Metals"), the authors recommended that organic partitioning coefficients be developed for copper, cadmium, zinc, lead and nickel under marine conditions. While the reviewer raises a valid point, it should be borne in mind that this is an area of active investigation and data are limited.

   Octanol-water partition coefficients are laboratory measured values and reflect a chemical's partitioning between octanol (which serves as a surrogate for lipids) and water. Laboratory-grade water is used in these measurements; measurements using water collected from freshwater or marine locations is not typically used. The partition coefficient is typically not adjusted to account for the potential effects, if any, that differences in water quality characteristic might have on this relationship.

   A statement acknowledging that methods used to derive these MPS are primarily based on data collected from freshwater, rather than marine, systems will be included in the Uncertainty section of Chapter 2.0.

2. **Comment**: On p. 2-7 there is a statement from the USEPA - Great Lakes reference that speaks on the determination of bioaccumulation factors. It says: "...few BAFs have been measured accurately and their application to sites other than the specific ecosystem where they were developed is problematic and subject to uncertainty." Clearly no site-specific BAFs are available for NSY Portsmouth. All this argues for the development of site-specific measured accumulation factors and/or concentration factors.

Response:

The section of the document to which the reviewer is referring reads as follows:

"Because the BAF accounts for the uptake of by aquatic organisms of a chemical from all sources, it is used preferentially over the BCF to predict uptake of chemicals from the environment (USEPA, 1993a; 1993b). USEPA (1993a; 1993b) has identified three methods for deriving BAFs:

1. A BAF measured in the field, preferably site-specific, at or near the top of the food chain. However few BAFs have been measured accurately and their application to sites other than the specific ecosystem where they were developed is problematic and subject to uncertainty (USEPA, 1991)."

This portion of the USEPA document is discussing *field* measured BAFs and the difficulty in measuring these values accurately. While using site-specific BAFs may be desirable, the USEPA (1993a; 1993b) cautions that determining these values is difficult and subject to uncertainty. As discussed in Chapter 2.0 on page 2-8, "USEPA recommends that Food Chain Multipliers (FMs) and BCFs be used to derive BAFs for organic chemicals when site-specific BAFs are not available; to date, site-specific BAFs have not been calculated for the NSY Portsmouth." Because site-specific field measured BAFs were not available at the time that this document was prepared, USEPA-recommended alternate procedures were used (e.g., BCFs and Food Chain Multipliers) to calculate chemical and species specific BAFs.

Since this draft document was submitted for review and comment, NCCOSC has completed the Draft Final Estuarine Ecological Risk Assessment (July 19, 1995). This document describes the derivation of site-specific accumulation factors for several NSY Portsmouth contaminants of concern. Site-specific BAFs generated in this document for lobster and flounder will be used in MPS calculations, where appropriate. No site-specific BAF or BCF has been developed for mussels. However, site-specific data are available for both mussel tissue and surface water contaminant concentrations so that the

calculation of site-specific BCFs may be possible, at least for some contaminants.

3. Comment: Throughout the report PCBs are unspecified as to their particular arochlor. Whereas arochlors vary as to their toxicity and carcinogenicity shouldn't the PCBs be further identified as to their degree of chlorination (i.e.,. specified as to discrete archlors?) Once done shouldn't the entire exercise of developing contaminant specific MPS' be directed at individual arochlors, not lumped as PCBs?

Response:

As noted in the response to MEDEP's General Comment, the development of MPS was based, in large part, on data used by McLaren/Hart to characterize risks to humans. This document only evaluated risks associated with exposure to "total PCBs" -not individual arochlors. It is recommended that re-calculating risks associated with the individual arochlors be discussed by the Navy, USEPA Region I, and MEDEP. Should this discussion indicate recalculation of health risks associated with individual arochlors is warranted, these calculations will be completed and HNUS will generate MPS values for those arochlors identified as representing a potential health risk to humans.

4. Comment: The section 2.3.2.4 Uncertainties seems to add further doubt as to the application of referenced fresh water methods to marine waters. On p.2-25 it mentions unknown methods by which octanol-water partition coefficients were generated. We share the authors uncertainty.

Response:

The issue of uncertainty introduced to these calculations as a result of measurement error applies not only to K_{ow} values but also to all other parameters used to derive the MPS. However, because K_{ow}s values are so integral to the calculations used to derive MPS, uncertainties associated with this parameter are likely to have broader impacts on these calculations. The recent USEPA document, Technical Basis for Deriving Sediment Quality Criteria for Nonionic Organic Contaminants for the Protection of Benthic Organisms by using Equilibrium Partitioning (EPA-822-R-93-011) recommends that K_{ow} values generated using the slow stir flask method be used in EqP, in that K_{ow}s generated via this method exhibit the least amount of variability. However, identifying the method used to derive K_{ow}s is seldom possible; many of the databases that report K_{ow} values don't always include the primary source from which these data were obtained.

5. **Comment**: Would it be possible to get either the drafters of this report or someone from EPA revise the conclusions to fully present their findings?

Response:

The summary section of Chapter 2.0 will be reviewed and expanded, as necessary, to provide a more complete summary of the findings in this section of the document.