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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
JOHN F. KENNEDY FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203-0001

May 23, 1996

Mark Evans, Remedial Project Manager
U.S. Department of the Navy
Naval Facilities Engineering Command
Northern Division
10 Industrial Highway
Code 1823, Mail Stop 82
Lester, PA 19113-2090

Re: Draft Final Phase II Remedial Investigation for the Naval Submarine Base in Groton, CT

Dear Mr. Evans:

I am writing in response to your request for EPA to review the *Draft Final Phase II Remedial Investigation ("RI")* dated March 1996. EPA's review focused on the report's consistency with the responses to EPA comments on the Draft Phase II RI, technical adequacy, and the conclusions reached. Generally, the revised Phase II RI report contains information that adequately addresses EPA comments on the Draft Report and the conclusions regarding further activities at individual sites are reasonable. I am concerned, however, with the large number of errors that EPA identified in the data tables and risk calculations. Detailed comments are provided in Attachment A.

No Further Action is proposed at several sites (*e.g.*, Area A Wetlands, Area A Weapons Center, OBDANE) where groundwater contaminant concentrations exceed applicable standards and/or soil contaminant concentrations indicate a potential to impact groundwater quality. The RI must explain how groundwater transport of contaminants to off site areas where exposure may occur will be prevented.

Although the groundwater is classified as GA, EPA has based its review on the assumption that groundwater at the Naval Submarine Base ("NSB") is not ingested. I expect that this issue will be resolved between the Navy and the Connecticut Department of Environmental Protection ("CTDEP") shortly as it has significant bearing on the remedial action decisions in the RI. Please forward copies of any relevant correspondence regarding this matter to EPA.

The quality of the human health risk assessment protocol and clear organization of the RI report are to be commended. The selection of contaminants of concern, computation of exposure point concentration, identification of toxicity criteria, exposure equations, and exposure assumptions were all consistent with current EPA policy. It would be helpful if uncertainties for each of the site-specific ecological risk assessments were discussed in more detail. Issues such as, but not

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limited to, home range factors, low confidence for certain threshold values, and chemical speciation could enhance the discussion already presented in the uncertainty section.

Additional discussion is necessary to identify the results and specific uncertainties associated with the ecological risk assessment. For example, risk to vegetation at numerous locations was correlated with exceedances of magnesium and aluminum concentrations in soil. *Table 3-17: Summary of Benchmark Values Used to Identify Ecological Contaminants of Concern*, lists a benchmark value of 2.0 ppm for magnesium. EPA could not locate a value for magnesium within the document text. Magnesium is a common constituent of soil found at concentrations significantly higher than 2 ppm. In addition, the aluminum value is derived from the results of a single test and confidence in this value is low (Will and Suter, 1994).

The uncertainty section should also discuss risk associated with exposure to chromium. The benchmark values selected for various terrestrial receptors was solely based on hexavalent chromium. While this form of chromium is very toxic and soluble compared to trivalent, the majority of the chromium found is in the trivalent form. In the Area A wetlands ecological risk assessment, risk to the short-tailed shrew from maximum concentrations of chromium would be reduced by approximately one thousand times assuming chromium existed as 50% trivalent (still very conservative) using the NOAEL value of 2737 mg/Kg/d for Cr^{+3} found in Opresko, 1994.

Another general concern is the use of ECOSAR to develop benchmark concentrations for organics in the soil invertebrate risk evaluation, particularly in the case of pesticides such as DDT. The resulting benchmark is 1000 mg/L for this compound. I understand there is a lack of data regarding endpoint values, but this concentration in an aqueous form seems quite high. LC50 values found in Verschueren, 1983 for various insect species fall in the range of 5 ug/L. Considering that the earthworm is only a surrogate species for terrestrial invertebrates, this method for benchmark development, at least for DDT, appears to be underestimated. Consequently, elimination of COCs based on threshold values from this method should be regarded carefully.

In the various site related appendices, tables associated with aquatic COC selection need to have units changed from mg/Kg to mg/L.

In the site specific tables, *Earthworm Hazard Quotients*, footnotes need to be included to define the reference source for the various BAF values as a number of sources were used.

In the various tables within the text and appendices, chromium is identified as CrVI. Was chromium analyzed as CrVI? If not, then change "CrVI" to "Cr" to signify total chromium.

Please explain why certain background values are missing (*e.g.*, cadmium and lead for surface water in Area A Wetlands and Weapons Center).

In the discussion of risk to various media, it is important to include an evaluation of those exceedances representative of acute values (*e.g.*, acute AWQC and SEL) in addition to criteria such as ER-Ls, LEL and chronic AWQC to better represent the magnitude of any potential ecological effects.

The calculation of the site-specific sediment quality benchmarks listed in the sediment tables in the appendices appear to be too high. Please review these calculations and foc values used for each site and note them in the text. If changes are made then subsequent recalculation of HQ values will be necessary.

The cadmium bioaccumulation factor selected for terrestrial invertebrates appears to be quite low. Although species dependent, the average concentration factor for cadmium has been referenced in other literature sources as 27 (Ireland). This is likely to impact the calculated exposure to the shrew in the Area A wetlands. Consideration of this point is recommended and the risk estimate should be revised.

Chapter 3: General Data Evaluation Procedures

Although current Region I policy allows use of most provisional reference doses, there are three exceptions. Presently there are no EPA-approved RfDs for aluminum, copper, and iron. The provisional RfDs for aluminum, copper, and iron are not appropriate because they are based on allowable daily intakes, not an adverse effect level. Consequently, Region I does not advocate quantitative estimation of risk from exposure to these compounds and it should therefore be omitted from the risk assessment.

EPA's IRIS database identifies a gastrointestinal absorption factor for cadmium from water of 5% in comparison to the value of 3% reported in this table. Such a change would affect only the dermal exposure evaluation pathways and move the RfD dermal value from the 1.5E-5 value to 2.5E-5 mg/kg/day. This would not significantly impact the risk assessments that follow. The RfD value reported in Table 3-10 for cadmium is for water. A separate RfD value is available in IRIS for cadmium in food (1E-3 mg/kg/day). Since the value for cadmium in food is generally only used for exposures associated with the ingestion of soil, use of the more conservative RfD for water is likely to have only a small effect (*e.g.*, overstating risk by a factor of two) for soil ingestion exposure pathways.

The reference dose for manganese has been updated on the IRIS system since December 1995. The new value on IRIS (1.4E-1 mg/kg/day) is quite a bit higher than the value presented in Table 3-10 (5E-3 mg/kg/day). Region I advocates adjustment (suggested modifying factor of three) of the manganese reference dose to account for dietary exposure to drinking water and soil. The net effect of such adjustments renders the reference dose for manganese in soil and drinking water 2.4E-2 mg/kg/day, approximately 20-fold higher than the RfD in Table 3-10. The net effect would render the risks attributed to this compound 20-fold lower than currently stated in the RI and manganese may no longer be a "major contaminant of concern." Since manganese repeatedly

appeared in the risk summaries as a major risk driver, the risk (non-carcinogenic hazards) should be recalculated and the recommendations for remedial action or further investigation revisited. Recalculation of the risks from exposure to manganese will change the "risk drivers," and may also alter the conclusions regarding cleanup.

Chapter 6: Area A Landfill

The recommendation for remedial action at the Area A landfill (*e.g.*, a cap and upgradient interception of surface runoff and shallow groundwater) is based in part on predicted risks for a construction worker via dermal contact with shallow groundwater at the site. This appears to contradict the text in the third bullet on page 6-30 regarding the contributions of manganese to this risk estimates. PCBs were the predominant contributors to the cancer and non-cancer risk estimates for the dermal contact with groundwater. As a result, PCB groundwater data, exposure, and risk assessment should be more thoroughly reviewed. All other exposure pathways (incidental ingestion of soil and dermal contact with soil) for the receptor populations did not exceed EPA's risk management benchmarks. The ecological risk assessment was based on the assumption that the area provided adequate habitat for soil invertebrates and small mammals, and foraging range for avian predators. The risk estimates were based on worst case assumptions and the evaluation of realistic assumptions and do not indicate the need for remedial actions in addition to the capping of the landfill. EPA, CTDEP, and the Navy should discuss the plans for further action at this site, including groundwater monitoring data, risks to the surrounding ecosystems, and modeling results.

Chapter 7: Area A Wetland

In its present condition, the Area A Wetland is a 23 acre, *Phragmites* dominated palustrine wetland. Within the wetlands, there are two small areas of open water, a small pond in the south east portion and an area of open water on the west side adjacent to the dike. Media of interest include sediment, surface water, surface and subsurface wetland soils and groundwater. COCs in the surface water, sediment, and surface soils were evaluated for risk. Although, the conservative risk assessment concluded a potential risk to biota, no further action was recommended for this site because of the conservative nature of the risk assessment, low habitat quality, and lack of visual evidence of ecological receptors utilizing the site.

The recommendation for no further action at the Area A Wetland is also consistent with the findings of the human health risk evaluations conducted for incidental ingestion and dermal contact with soils, surface water, and dermal contact with shallow groundwater in Area A wetland for a construction worker and a site trespasser. All excess cancer risks were below EPA's benchmarks and with the possible exception of manganese in shallow groundwater, non-cancer hazard indices exhibited little concern. In reviewing the hazard quotient evaluated for dermal contact with shallow groundwater by a construction worker, the value attributed to exposure to manganese (HQ = 6) is based on a more conservative reference dose. Reassessment of the

exposure to this compound using the more recent toxicity criteria may reveal that manganese does not exceed EPA's benchmark for non-carcinogenic effects.

Chapter 8: Area A Weapons Center

Although the potential for ecological risk was indicated for all three media, no further action was recommended for this site owing to likely conservative overestimation of risk. Drainage swales are generally dry, and the surface soils are associated with lawn areas providing a limited habitat for ecological receptors. EPA cannot concur with the recommendation for no further action at the Area A Weapons Center because risks evaluated for the future residential exposure scenario exceed EPA's acceptable risk benchmarks. Projected cancer risks for the ingestion of groundwater were driven by exposures to arsenic and dibenz(a,h)anthracene, each exceeding a 1E-4 risk level. Clearly, this phenomenon is not consistent with the no action recommendation. Projected non-cancer risk estimates (HI = 41) were driven by exposure to manganese and iron and should be recalculated with current reference doses.

Chapter 9: Area A Downstream Watercourses and Over Bank Disposal Area

Area A Downstream Watercourses and OBDA provide good habitat for terrestrial and aquatic species. Media of concern in this area are sediment, surface soil, surface water, and biota. The primary COCs are pesticides (primarily DDT and its metabolites, DDD and DDE) and to a lesser extent inorganics. Terrestrial and aquatic exposure pathways were examined, toxicity testing was performed on soil, surface water and sediment and terrestrial and aquatic biological surveys were performed. EPA recommends that you recalculate the manganese risk estimates and then reassess these non-carcinogenic hazards to humans. Ecological risk assessment results indicate that there is a *significant* risk to the aquatic and to a lesser extent the terrestrial community. Dioxin and DDT also pose unacceptable risks to human health in zone 1. EPA recommends a feasibility study to evaluate potential remedial actions to reduce unacceptable risks to aquatic organisms and human health.

EPA's IEUBK model (residential exposure) is only appropriate for average concentrations as input (*see page* 1-18 of EPA's *Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children*). Please revise the calculations for Zone 2 as appropriate.

Chapter 10: Rubble Fill Area at Bunker A-86

The Rubble Fill Area at Bunker A-86 exhibits elevated levels of organic and inorganic contaminants in sediments and soils. Some of the highest levels of contamination detected were located downhill of the initial study area. Contaminants of primary concern are PAHs, arsenic, and to a lesser extent pesticides. The ecological risk assessment indicates a potential risk to terrestrial receptors. EPA concurs that further examination of the extent of contamination in surface soils and the source and fate of sediment contaminants is warranted.

Chapter 11: DRMO

The excess cancer risk from this site slightly exceeded (2E-4) EPA's target risk range owing to exposures (incidental ingestion and dermal contact) with soils. Major contaminants were PCBs, PAHs, and dioxin and were found in the highest amounts in "surface soils" (except dioxin - found in subsurface). Residual soil concentrations of these compounds and lead exceed previous excavation criteria used in the Time-Critical Removal Action of 1995 and the OSWER residential cleanup value for lead of 400 mg/kg. An asphalt cap covers much of the DRMO such that exposure to contaminated soils is unlikely as it would necessitate removal or bypassing the asphalt cap. However, the RI should specify whether any of the surface soil samples were obtained from areas beyond the asphalt cap. Groundwater ingestion was not included in the risk evaluation because the site is close to the Thames River and saline conditions. Generally low levels of groundwater contamination were found, but maximum concentrations of several compounds exceeded MCLs.

As part of the recommended actions for the DRMO, further monitoring of groundwater wells downgradient and adjacent to the area of VOC soil contamination is proposed. However, it has been stated that ingestion of groundwater from the aquifer below the DRMO is unlikely because of salinity. This leaves dermal exposure to VOCs in shallow groundwater as the sole plausible exposure scenario for human health. However, since the site is capped with asphalt, such an exposure scenario is unlikely. Consequently, the recommended monitoring activities will only be used to evaluate ecological effects to the river.

The DRMO ecological risk assessment was performed assuming the presence of terrestrial receptors and their exposure to surface soils. Risk assessment findings indicate potential risk to terrestrial receptors. However, no further action is recommended (other than groundwater monitoring) because of the lack of habitat available for terrestrial receptors. The results from the long-term groundwater monitoring program will confirm whether a no further action decision is justified. I look forward to reviewing the upcoming long-term monitoring and well placement plans for the DRMO. Such a plan should also include sediment sampling in the Thames River along the DRMO to evaluate potential ecological effects to the river.

Chapter 12: Torpedo Shops

As part of the exposure scenario for the Torpedo Shops, groundwater ingestion was evaluated. Maximum concentrations of several compounds (*e.g.*, DEHP, arsenic, chromium, lead) in groundwater exceeded MCLs. Additionally, SSLs for approximately seven compounds were exceeded and therefore may adversely affect the groundwater. Excess cancer risks for the residential ingestion of groundwater exceeded EPA's 1E-4 benchmark largely because of exposures to arsenic and DEHP (1E-3) for the RME scenario. The maximum reported HI for the future residential receptor (4.9E+1) appears to be from ingestion of manganese in groundwater. All risks evaluated in connection with exposure to soils were within or below EPA's target benchmarks.

Although additional sampling is recommended in the vicinity of the leach fields (all media), no further actions are targeted in areas close to buildings 450 and 325. From the map in this section, it appears that these buildings exhibit considerable levels of TPH and PAHs in soils such that they may warrant further investigation. Consequently, EPA concurs with the need for additional sampling and recommends that the risk assessment be recalculated with this data. In particular, risks from BTEX compounds should be assessed.

In contrast to the statement on page 12-31 indicating that low human health and ecological risks are present at the site, considerable risks (in excess of EPA's goal) from groundwater ingestion may be attributed to the site.

Chapter 13: Goss Cove Landfill

Recommendations for the Goss Cove Landfill call for an evaluation of remedial alternatives. Through comparison of media contaminants to ecological guidelines and criteria, sediment toxicity testing and SEM/AVS analyses it was determined that sediment contaminants in Goss Cove presented substantial risk to aquatic organisms. Owing to the risk results and the potential for contaminant transport through groundwater discharge or erosion, EPA concurs that a feasibility study is necessary.

Based on the risk summary as presented in Table 13-19, incidental ingestion of soil by either the future resident or a construction worker was the major exposure pathway of concern leading to slight exceedences of EPA's cancer and non-cancer benchmarks for the RME exposure scenario. Compounds contributing to these risks are primarily PAHs and arsenic (cancer risk) and PCBs and arsenic (non-cancer risk). Although not clear in the RI, soil samples used in the risk assessment for the Goss Cove Landfill were below an asphalt parking lot.

The risks for current exposure at the Nautilus museum by occasional visitors and site employees were all well below acceptable risk benchmarks established by EPA. However, high concentrations of TCE and manganese in groundwater contributed to risks via the dermal contact exposure pathway for the construction worker.

It is unclear whether sufficient data exist to evaluate remedial alternatives in a Feasibility Study. Additional interpretive discussion and diagrams should be presented to assess whether it is possible to proceed without further characterization.

Chapter 14: Lower Base

EPA agrees with the recommendations to perform additional site characterization on the extent of lead, TPH, and semivolatile organic compounds in soil. Based on data collected to date, dermal contact with manganese in groundwater by a construction worker in zone 3 (under RME exposure conditions) is the only scenario that significantly exceeded an EPA benchmark (HI = 47). Also, extremely high levels of lead in soils from zone 4 (10,600 mg/kg) grossly exceeded

EPA's residential cleanup value of 400 mg/kg. All cancer risk estimates for the construction worker, future resident, and full-time employee via incidental ingestion of soil and dermal contact with groundwater exceed 1E-4.

Since the likelihood of exposure to ecological receptors at the Lower Subase is low, an ecological risk assessment was not performed. However, because of the high level of contamination found in soils at certain sites, further actions include focusing on remedial options to prevent future migration of contaminants to the Thames River.

Chapter 15: Over Bank Disposal Area - Northeast

The recommendation for no further action at the OBDANE Site appears consistent with the risk information presented. No significant exceedences of EPA's risk benchmarks were noted for either the construction worker or the trespasser scenario via incidental ingestion of soil and dermal contact with groundwater. It appears that a sufficient number of samples were collected from each medium and a complete sample analysis was conducted.

OBDANE provides a good habitat to ecological receptors. Surface and subsurface soils were examined and the COCs, according to the risk assessment, could be the source of potential risk to terrestrial receptors. No further action has been recommended for this site based on the size of the site and the conservative nature of the risk assessment.

Chapter 17: Thames River

Based on the risk summary in Table 17-10, significant excess cancer risks (3.9E-3) are attributed to the ingestion of shellfish (oysters and clams) harvested from the Thames River. These risks are almost entirely owing to arsenic and the RI suggests that these risks may be overstated based on an ATSDR study that noted that arsenic in aquatic tissues may not be carcinogenic. Arsenic was also identified as a major contributor to the projected hazard index (18 to 20). The RI also notes that typical levels of arsenic in fish and seafood are comparable to concentrations observed in the Thames River samples.

Recommendations for the Thames River appear to be directed at locating a source of PAHs in sediments around the Lower Subase. Additionally, efforts are targeted toward studying the larger watershed to investigate relationships between sediment and shellfish concentrations, particularly for metals.

It is unclear to me why the comments provided to you in my letter dated December 22, 1994 regarding the oyster, mussel, sediment, and water column data were not addressed. Accordingly, I am hereby incorporating those comments by reference.

Sediments in the vicinity of Piers 15 and 17 have been dredged and the data provided in the Phase II RI is obsolete. The Thames River ecological risk assessment indicates potential risk to the

benthic community at sediment locations adjacent to the DRMO and Piers 15 and 17. Consequently, recommendations have been made to focus on shellfish impacts adjacent to the Lower Subase. Unless additional chemical analyses indicate higher contaminant concentrations, remedial action is not warranted in the Thames River.

I appreciate the extra time that you allowed EPA to take to thoroughly review the RI and look forward to working with you on future investigations at these sites. Please do not hesitate to contact me at (617) 573-5777 should you have any questions or wish to arrange a meeting.

Sincerely,

Kymberlee Keckler, Remedial Project Manager
Federal Facilities Superfund Section

Attachment

cc: Mark Lewis, CTDEP, Hartford, CT
Andy Stackpole, NSBNL, Groton, CT
Joan Miles, USEPA, Boston, MA
Patti Lynne Tyler, USEPA, Boston, MA
Sarah Levinson, USEPA, Boston, MA
Dale Weiss, TRC, Lowell, MA
Ken Finkelstein, NOAA, Boston, MA
Matthew Cochran, Brown & Root, Pittsburgh, PA

ATTACHMENT A

Page	Comment
p. 3-96	The equation, BAF = (Y_L/foc)(Koc/.66), used for the earthworm is incorrect. Calculating BAFs using this equation and variables found in site specific tables does not yield the values reported. The equation, BAF = Y_L/ 0.66foc (Menzie, 1992), however, does yield such values. If cleanup levels are needed for soils, derivation of these levels should incorporate site specific BAFs or literature-based values in place of calculated ones because of the uncertainties involved. In this same section, the following clarification is required and should be included in the text: Small Mammal Body Burden = small mammal dosage mg/Kg/d * shrew transfer factor.
p. 3-98	The units for "F" should be in mg/d, not mg/Kg.
p. 3-103, last sentence	This sentence implies that the BAFs for DDT and its metabolites were site-specific. Although soil invertebrate BAF calculations used site-specific foc values, the BAF was not determined from the ratio of earthworm tissue data to soil concentration (*e.g.*, Area A Downstream Watercourses).
p. 3-157	The aquatic surface water benchmarks for DDT, DDD, and DDE are not correct. The value should be 1E-3 ug/L (CTAWQC). Please correct the value and review the COC list. The WQC for chromium is listed as "not available." The FAWQC chronic value is 11 ug/L for Cr^{+6} and 210 ug/L on the basis of 100 mg/L hardness. Please correct the table and confirm the source of the benchmark value used for Area A wetlands. The mammal endpoint NOAEL value for aluminum of 50 mg/Kg/d is not found in Opresko, 1994. The aquatic endpoint for selenium is listed as N/A. According to FAQWC 1991, selenium has a chronic value of 5.0 ug/L. The sediment endpoint for arsenic is 57 mg/Kg. The Ontario Ministry of the Environment lists LEL and SEL values of 6 and 57 mg/Kg, respectively. Please correct and compare to the LEL value.

p. 5-18	The text states that no filtered groundwater samples were collected at the site. This contradicts the data presented in Table 5-6.
p. 5-37	Table 5-7 is not consistent with the text in Section 5.4. Please revise accordingly.
p. 6-141	The units for pesticides are ug/Kg, not mg/Kg.
p. 7-8, ¶2	This paragraph states that the cadmium concentration was 12.6 ug/L. Table 7-9 on page 7-65 states a concentration of 126 ug/L at location 2WSW2. Table 7-10 lists ranges of detected concentrations identifying neither of these concentrations. In Appendix I.3 (page 1a) the maximum cadmium concentration is shown as 6.66E-2 mg/L. Cadmium is not carried through the risk assessment because the value in Appendix I.3 is low and below background. Please correct these tables and calculate an HQ for cadmium if necessary.
p. 7-18, ¶2	Please discuss the elevated PAH concentrations at location 2WSD9 and their exceedances of benchmark values. While this may not be critical to the Area A wetlands, it indicates that the Weapons Center may represent a continuing source of PAH contamination.
p. 7-22	The second paragraph explains that the presence of *Phragmites* indicates that risk to vegetation is overestimated. *Phragmites* is an opportunistic species, tolerant of disturbed conditions. The presence of this species is *not* evidence for lack of risk and the discussion should therefore be modified.
p. 7-28	The recommendations are not consistent with the risk characterization. The risk numbers indicate a substantial risk to receptors and the fourth bullet restates this point. The uncertainty discussion indicates that the bioavailibility of soil contaminants to terrestrial receptors is questionable partly because of the lack of soil TOC data. Although sediment TOC data was used, this does not necessarily lead to an overestimation. As indicated in the general comments and stated in the general uncertainties discussion in Section 3, risk estimation to terrestrial vegetation and vertebrates may be overestimated. However, overestimation of risk to aquatic biota is not as clear. For example, site specific benchmarks were calculated for organic contaminants and yet numerous exceedances were observed for average sediment concentrations. The calculation of aquatic risk is questionable. Before making any recommendation, further discussion on the specific uncertainty factors should be presented. Potential ecological risk to sediment biota is still unclear and we should resolve this matter soon.

p. 8-17, ¶3	This paragraph does not discuss the cadmium and lead found at location 2WCSD5 in Drainage Area 3 at 29.5 and 204 mg/Kg, respectively. In Appendix I.4, page 1c, the cadmium concentration is listed but not included on the COC list. The lead concentration listed in the Appendix is 123 mg/Kg. Please modify as appropriate.
p. 8-25	Cadmium should be added to the paragraph (*see* above).
p. 8-26	The bioavailability assumptions associated with SQBV development and sediment contaminant concentrations detected at discharge points in the drainage swales and in the Area A Wetlands indicate that the first bullet should be amended. The fourth bullet in this section discusses the likelihood of ecological receptors inhabiting the site. Please add a discussion of the possibilities of contaminant transport through the drainage swale and possible receptor exposure in Area A Wetlands and modify the recommendations as appropriate.
p. 9-21, ¶¶2&3	Change DDE in the second paragraph to DDT. Change the stream number to 2 in the third paragraph.
p. 9-30	EPA's IEUBK model (residential exposure) is only appropriate for average concentrations as input (*see page* 1-18 of EPA's *Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children*). Please delete the information concerning the model runs using maximum concentrations.
p. 9-43, ¶2	How does the data suggest nutrient loading impacts?
p. 9-46, ¶3	Does the test chemistry report the occurrence of low dissolved oxygen? If so, please incorporate this information into this discussion.
p. 9-52	The benchmark for cadmium is not conservative. According to the text of *Ecotoxicology of Metals in Invertebrates*, cadmium NOECs range from 10 to 100 ppm and are species-specific. The TV of 50 ppm should therefore be used with caution. The statement regarding the lack of risk to soil invertebrates should be delayed until we resolve whether to use 1000 mg/L as a threshold for DDT and its metabolites. Please explain why EPA's question about the validity of this qualitative soil invertebrate survey owing to the lack of control locations remains unresolved.

p. 9-53	The text concludes that no adverse impacts to soil invertebrates exist. The results of the toxicity test indicate that approximately half of the chambers had a mortality exceeding 30%. The dose-response could be owing to bioavailability and the potential impact from water could limit the confidence of the conclusions.
p. 9-54	The raccoon diet was based on concentrations of contaminants detected in frog tissue. As discussed in EPA's letter dated May 27, 1994, frogs were collected from the Area A Wetlands and the Upper Pond Area. No frogs were collected from either the OBDA or Lower Pond areas where elevated contaminants have been known to occur. Consequently, risk to the raccoon should be reevaluated.
p. 9-57, ¶2	This paragraph incorrectly states that the source of frogs was Area A Downstream and OBDA.
p. 9-62, ¶1	It is not clear whether the soil invertebrate toxicity test results support the conclusion of no risk. The test results demonstrate that approximately half of the samples have a mortality rate exceeding 30%. The soil invertebrate survey is questionable because there is no reference location. Consequently, EPA recommends that this statement be either removed or modified to consider this information.
p. 10-24	In contrast to what the text states at the end of Section 10.8, a reference dose value of 4E-2 mg/kg/day is presented in Chapter 3 for naphthalene, such that exposure to this chemical can be quantitatively evaluated.
p. 10-26	This section explains that the Rubble Fill Area does not provide a suitable habitat for ecological receptors and therefore the risk is overestimated. According to Figure 10-4, the highest concentrations of arsenic and PAHs have been detected outside the 25' by 60' area. The extent of contamination is unknown. Please modify the text to address these points.
p. 10-27, 2nd bullet	Either remove or modify the last sentence (*see* above).
p. 10-61, last column	The heading should read Barred Owl, not Red Tailed Hawk.
	Arsenic and chrysene were not included as COCs for soil invertebrates. Arsenic at 150 mg/Kg and chrysene at 29 mg/Kg appear elevated. Explain why these contaminants were eliminated.
p. 11-18	Discuss the likelihood of significant concentrations of contaminants being transported to the Thames River. In addition, please address the

	concentrations of contaminants in sediments and surface water found near the DRMO.
p. 11-29, ¶1	Owing to the shallow water table, the DRMO cap will have a minimal effect on the leaching of contaminants to the groundwater. The RI Report is misleading in this statement.
p. 12-31, ¶5	It is unclear whether additional site investigations at the Torpedo Shops are recommended. One of the recommendations is to "reevaluate" the Phase I and Phase II data. Were not these data fully evaluated within the context and scope of the Phase II RI?
p. 13-10, ¶1	Please reference a diagram showing the groundwater contamination to support the theory that the high VOC content is because of an off-site source.
p. 13-14, ¶5	This section should discuss the transport parameters and mechanisms that affect DNAPLs and the dissolved VOC plume likely emanating from the site. There is no discussion of vertical flow as it relates to plume movement.
p. 13-38, ¶4	Insufficient data have been presented to establish the nature and extent of groundwater contamination. There may not be sufficient data to develop and evaluate remedial alternatives in a Feasibility Study.
p. 15-18	Before concluding that no further action is necessary, the extent of contamination should be delineated. Why was lead elevated at location SS3? What is the likelihood that disposal also took place in a more southerly location?
p. 17-2, ¶3	Sampling location, T3SW13, does not exist. Please correct.
p. 17-3, ¶1	Change "Thomas River" to "Thames River."
Table 17-4	The detection limits for acenaphthene, acenaphthylene, dibenzo(a,h)anthracene, fluorene, DDT, DDD, and DDE exceed the ER-M value. Discuss how this will affect the results of the assessment in the uncertainty section.
p. 17-35	Discuss the evaluation of caged mussel tissue concentrations and that they are likely to be injurious. Inclusion of data, if available, regarding the equilibrium time frame for bioaccumulation is also appropriate. As requested by NOAA, a discussion on the acceptability of a 28-day

deployment should be incorporated and used to expand the bioaccumulation discussion in the second paragraph on page 17-28. EPA recognizes, however, that the likelihood of site versus non-site contamination must be considered in light of the need for future study.

The statement made on this page with respect to mercury is not consistent with that made on page 17-12. EPA recommends that potential mercury exposure be handled within the Goss Cove feasibility study.

p. 17-36

It is premature to state that minimal risk posed to ecological receptors associated with the Thames River. The paragraph on this page begins by identifying two locations of continued concern (EC-SDTR04, associated with the Lower Subase, and EC-T3SD4, associated with the DRMO). Further evaluation of PAHs along the Lower Subase is recommended because they could be problematic. EPA therefore concurs with the recommendations for further study and looks forward to reviewing the forthcoming work plan. The recommendation for further study and discussion on the nature and extent of PAHs in the immediate vicinity of the Lower Subase should also address some of the concerns expressed by Dr. Ken Finkelstein of NOAA.

Additionally, toxicity tests performed in 1994 for Piers 15 and 17 (Lower Subase), indicated no reduction in survival to *Ampelisca abdita*. However, this species demonstrated a significant decrease in survival when compared with the control in tests performed in support of the RI.

p. 17-86

Site related locations exceed background concentrations of zinc and also NOAA ER-L values. The SEM/AVS calculations indicate that zinc is a likely candidate for toxicological impacts. Therefore, zinc should have been retained as a COC.

The maximum concentration of cadmium is 0.61 mg/Kg (below ER/L values), and would not be included in the COC list (Tables 17.5 and 17.6).

Appendix I.1

CBU Drum Storage Area - Earthworm Tissue Concentration. The tissue concentration for vanadium was calculated using a BAF of 9.25. This is not consistent with the proposed methodology stating that if specific BAFs for metals cannot be located in the literature, a default of one will be used. If a BAF of one is used, the tissue concentration decreases from 344 mg/Kg to 28 mg/Kg. This is significant because vanadium is reported as contributing to the majority of risk to the shrew at this site. The RI should be revised accordingly.

Appendix I.1 *CBU Drum Storage Area - Exposure tables.* The exposure calculation tables for maximum concentrations for the short-tailed shrew and the red-tailed hawk are mislabeled. The maximum tables are missing from the appendix and should be included in the next revision of the RI.

Appendix I.2 *Area A Landfill.* The assessment of risk from the maximum copper concentration is not correct. In Appendix I.2 the maximum value is listed as 794 mg/Kg, and the maximum value identified in Table 6-4 and Figure 6-6 is 871 mg/Kg. As a result, copper has been calculated to present an HQ risk factor of 27 and 4.2 to terrestrial invertebrates, for the maximum and mean concentration, respectively. This is also applicable to the lead concentrations used even though the HQ values are lower and may not exceed 10.

Appendix I.3 *Area A Wetland - Maximum Sediment Exposure Point Concentration.* The HQ values for both DDD and DDT appear to be incorrect. A value of 3.4E-2 is calculated for DDT using the formula from Section 3 for the calculation of site specific SQBVs, the foc of 0.028, K_{ow} of $1.55 * 10^6$, and AWQC value of 1E-6. Please check these specific compounds and calculate new HQs.

The maximum vanadium concentration is 203 mg/Kg at location T7-B, according to Table 7-11. This would approximately double the concentration on page 1e, Appendix I.3. In addition, there is no HQ calculated for this contaminant. Vanadium is noted as calculated on a site-specific basis based on EqP and foc (*see* Table 3-17). Please clarify how this calculation is possible for a metal.

Appendix I.3 *Area A Wetland - p. 1a.* This table documents the maximum surface water concentrations, benchmark values, and HQs. Assuming the units are in mg/L, the benchmark for copper is off by a factor of one thousand. Table 3-17 states a copper value of 4.8E-3 ug/L (based on 50 mg/L hardness), but this table reports 4.8E-3 mg/L. The lead and cadmium values in Table 3-17 are 1.3E-3 and 6.6E-4 ug/L, respectively. This table lists benchmark values for lead and cadmium of 1.9E-3 and 8.59E-4 mg/L, respectively. Hardness specific values aside, the values in this table are off by a factor of approximately one thousand. Please identify the appropriate units, the derivation of benchmark values, and correct risk estimates.

Appendix I.5 *Area A Downstream Watercourses/OBDA - Table 9-23.* The Appendix lists a DDD concentration of 3E-3 mg/Kg. Table 9-23 reports a maximum concentration of 300 mg/Kg. The DDE and DDT maximum concentrations in the Appendix should be changed to those detected at

3SD3 of 15 ppm and 37 ppm, respectively. As a result, DDD would be included as a COC and the HQs would change. Additionally, change the dieldrin concentration to 0.0335 mg/Kg found at location 3SD6.

Appendix I.11

Thames River - pp. 1a-1zz. EPA recommends that these tables provide footnotes citing benchmark sources for individual contaminants where necessary. For example, aluminum and manganese ER-L guidelines are not available, but are provided by the state of Washington.

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