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

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NSB NEW LONDON
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07 OCT 1998

Ms. Kymberlee Keckler
Remedial Project Manager
U.S. Environmental Protection Agency
J.F.K. Federal Building (HBT)
Boston, MA 02203-2211

Dear Ms. Keckler:

SUBJ: RESPONSES TO USEPA LETTER OF SEPTEMBER 16, 1998 REGARDING EPA REVIEW OF THE NAVY'S AUGUST 11, 1998 RESPONSE TO COMMENT LETTER ON THE DRAFT REMEDIAL INVESTIGATION REPORT FOR THE LOWER SUBASE, NAVAL SUBMARINE BASE NEW LONDON, GROTON, CT

Please find attached the Navy's responses to the comments in your September 16, 1998 letter. As we have discussed, the Draft Final Remedial Investigation report will be submitted by October 16, 1998.

If you have any other questions or comments please do not hesitate to contact me at (610) 595-0567 ext. 162.

Sincerely,

Mark Evans
By direction of the
Commanding Officer

Copy to: Mr. Mark Lewis, CTDEP
Mr. Jeff Sullivan, NSB-NLON
Mr. Corey Rich, TetraTech NUS - Pittsburgh

RESOLUTION OF RESPONSES TO COMMENTS
USEPA's SEPTEMBER 16, 1998 LETTER
REGARDING EPA REVIEW OF THE NAVY'S AUGUST 11, 1998 RESPONSE TO COMMENT LETTER ON THE DRAFT LOWER SUBASE REMEDIAL INVESTIGATION REPORT

October 5, 1998

1 Resolution of General Comment No. 2

Comment: Data collected from various storm sewer systems identifies elevated concentrations of inorganics and polycyclic aromatic hydrocarbons (PAHs). These systems represent a continuing source of contaminants and migration is evident through the chemical analyses of sediments collected from downgradient areas. All storm sewer systems should be removed of residual sediments and the National Pollution Discharge and Elimination System (NPDES) permits should be reviewed to ensure that contaminants of concern from various source areas are included as analytes in these drains. The storm sewer system could be acting as a conduit for contaminant migration or as accumulation areas for site related soil contamination. The results of the annual storm sampling events from the various storm sewers resulted in low pH, high suspended solids, some elevated fecal coliform, elevated inorganics and PAHs, and some level of mortality to aquatic organisms used in the toxicity testing. The sediment removal in these systems and continued annual monitoring of these systems for physico-chemical, chemical and biological parameters is critical to decreasing the contaminant loadings and future transport of contaminants to the Thames River.

Response: The storm water that is sampled and analyzed as part of the NPDES permit is not analyzed for PAHs. The water is only analyzed for Oil and Grease by Method 413.1. This method is applicable for determining concentrations of relatively non-volatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, and greases. Petroleum fuels from gasoline through No. 2. fuel oils are completely or partially lost in the solvent removal operation of this method. Therefore, the existing data is not sufficient to determine if PAHs are present in the storm water.

The pH of the storm water is consistent with the pH of rainfall as measured at NSB-NLON and the Northeast Region in general. NSB-NLON collected two rainfall samples, one in 1996 and one in 1997, as part of the NPDES sampling and had the samples analyzed for pH by a certified laboratory. The pH of the samples were 6.81 and 4.01, respectively. The pH of the storm water sampled at the Lower Subase has been as low as 4.32, but this pH is within the range of pH for rainfall. Therefore, it is likely that the low pH of the storm water is the result of acid rain.

The quality of the storm water discharged from NSB-NLON will continue to be monitored by the Navy as required by the NPDES permit. Appropriate actions will be taken to maintain compliance with the permit.

The Navy will evaluate the need to clean and repair the storm sewer system as a remedial alternative to prevent contaminant migration. Remedial alternatives will be evaluated during the Feasibility Study for the Lower Subase. Additional sampling and analysis of the storm sewers will be completed as part of the proposed Monitoring Program after the appropriate remedial alternatives are completed.

Additional Comment: Historic NPDES data will be collected and summarized by NSB-NLON personnel. A meeting between CTDEP and NSB-NLON personnel to discuss storm water issues will hopefully assist in resolving some of the concerns raised in the EPA comment. Also it was discussed at the August 27 meeting that storm water issues should be integrated into the monitoring plan for Lower Subase.

Additional Response: Agree. A meeting between NSB-NLON personnel and the CTDEP will take place to resolve NPDES data and storm water issues. The meeting time and date will be determined by the parties involved with the NPDES permit.

The Navy will integrate storm water into the tiered monitoring plan for the Lower Subase. The details of the plan will be discussed and resolved during its preparation.

2 Resolution of General Comment No. 3

Comment: EPA's comments on the Draft *Work Plan and Sampling Analysis Plan for Lower Subase Remedial Investigation, Naval Submarine Base New London* reiterated the need to conduct sediment and surface water sampling and a tiered approach to biotic sampling. Therefore, sediment toxicity testing should have been performed for Zone 4 sediments since concentrations of benzo(a)pyrene, antimony, and lead were relatively high at Pier 33 in Zone 5.

Response: Disagree. The Final *Work Plan and Sampling Analysis Plan for Lower Subase Remedial Investigation, Naval Submarine Base New London* proposed additional sediment toxicity testing if warranted by the results of the Lower Subase screening-level ERA. No toxicity testing was included in the Sampling and Analysis Plan. It is unclear from the comment whether the sentence "sediment toxicity testing *should have been* performed" should read "...*should be* performed."

Sediment toxicity testing was performed in Zones 4 and 5 as part of the Phase II RI ERA and other historical studies. Survival of *Ampelisca abdita* and *Leptocheirus plumulosus* in Zone 4 Phase II RI toxicity tests was not significantly different than in reference sediments, suggesting that the sediments were not toxic to benthic organisms despite exceedances of guidelines by some contaminants. Although some significant mortality was observed for Zone 5 sediments in SEAWOLF EIS toxicity tests using *Macoma*, no significant toxicity was observed in Zone 5 SEAWOLF EIS toxicity tests using *Nereis*, SEAWOLF EIS toxicity tests using *Ampelisca*, and Phase II RI toxicity tests using *Ampelisca* and *Leptocheirus*. Moreover, the SEAWOLF EIS authors point out that toxicity to *Macoma* was significant only if an outlier is included in the data set.

Additional Comment: The Work Plan and Sampling Analysis Plan for Lower Subase Remedial Investigation, §1.4 contains the following statements. "The chemistry results of Thames River sediment samples may indicate potential risks to benthic invertebrates from sediment contaminants. If the Lower Subase is shown to be the source of elevated chemical concentrations in the Thames river sediment near the Lower Subase, additional ecological investigations may be conducted to more fully characterize potential risks. Several factors will be taken into account when determining if potential risks are high enough to warrant additional studies. These include, but are not limited to, magnitude of exceedances of guideline values (*e.g.*, ER-Ms), bioavailability (*e.g.*, AVS/SEM ratios), frequency of detection, location of exceedances, and whether elevated contaminants are capable of bioaccumulating. The sediment chemistry represents the first tier in the ecological risk assessment for the Thames River. If the factors listed above indicate significant potential risks, an additional tier of study will be performed." This section of the Work Plan also states that the objective of the sediment samples is to fill data gaps and provide sufficient data for the ecological risk assessment for the Thames River adjacent to Zones 1 through 7.

The EPA comments on the Draft RI indicated that there appears to be data gaps. It was decided at the August 27 meeting that a table would be developed that summarizes all of the existing sediment chemistry and toxicity test data for the zones of the Thames River. After this summary table is presented to EPA, the existence of data gaps and the need for additional chemical analysis or toxicity testing will be evaluated.

Additional Response: A table, with a format similar to the one presented in the ecological risk assessment for Portsmouth Naval Shipyard, will be prepared and included in the draft final RI report. The table will help to summarize the existing data, the results of the ecological risk assessment, and the conclusions that can be made from the data and assessment.

As originally stated in the Work Plan, several factors will be taken into account collectively to determine if potential risks are high enough to warrant additional studies. These include, but are not limited to, magnitude of exceedances of guideline values (*e.g.*, ER-Ms), bioavailability (*e.g.*, AVS/SEM ratios), frequency of detection, location of exceedances, and whether elevated contaminants are capable of bioaccumulating.

The Navy and EPA will work together to determine if additional sampling or analyses are required.

3 Resolution of General Comment No. 4

Comment: EPA is concerned about the results of the toxicity tests from sediments collected nears Piers 17 (Zone 7) and 33 (Zone 5). Also, elevated level of boron was detected in two blue mussel samples in Zone 4. However, the current concentrations of contaminants in the sediments surrounding Pier 17 are unknown and a data gap since the sediments have been disturbed by dredging activities that occurred in 1996. Since these sediments were toxic before they were disturbed, the sediments in this area should be resampled and reanalyzed.

Response: Disagree. Three sediment samples were collected in Zone 7 as part of the Lower Subase RI in September of 1997 (i.e., post-dredging). Overall, contaminant concentrations in the three sediment samples were not elevated; no ER-Ms were exceeded. As a result, it does not appear that significant re-suspension and subsequent deposition of potentially toxic sediments has occurred in Zone 7 as a result of the dredging. It should also be noted that no significant mortality was observed in pre-dredge Pier 17 Phase II RI toxicity tests using *Leptocheirus* and Pier 17 EA toxicity tests with *Ampelisca*.

It is agreed that additional sediment chemistry analysis could be conducted to better characterize the nature and extent of contamination in sediments surrounding Pier 17 in Zone 7 since the site was recently dredged. However, it is unclear whether additional Pier 17 sediment chemistry data would be a necessary component for the decision-making process. The Pier 15/17 EA benthic surveys indicated that Pier 17 benthos appeared to be disturbed but Pier 15 sediments contained relatively high species diversity and abundance. Therefore, if the newly exposed sediments around Pier 17 are toxic, they would comprise only a portion of Zone 7 and an even smaller area of the Lower Subase as a whole. The likelihood, thus, of extensive, ecosystem-level effects on sediment biota would be diminished.

Additional Comment: The Work Plan and Sampling Analysis Plan for Lower Subase Remedial Investigation, §1.4 contains the following statements. "The chemistry results of Thames River sediment samples may indicate potential risks to benthic invertebrates from sediment contaminants. If the Lower Subase is shown to be the source of elevated chemical concentrations in the Thames river sediment near the Lower Subase, additional ecological investigations may be conducted to more fully characterize potential risks. Several factors will be taken into account when determining if potential risks are high enough to warrant additional studies. These include, but are not limited to, magnitude of exceedances of guideline values (*e.g.*, ER-Ms), bioavailability (*e.g.*, AVS/SEM ratios), frequency of detection, location of exceedances, and whether elevated contaminants are capable of bioaccumulating. The sediment chemistry represents the first tier in the ecological risk assessment for the Thames River. If the factors listed above indicate significant potential risks, an additional tier of study will be performed." This section of the Work Plan also states that the objective of the sediment samples is to fill data gaps and provide sufficient data for the ecological risk assessment for the Thames River adjacent to Zones 1 through 7.

The EPA comments on the Draft RI indicated that there appears to be data gaps. It was decided at the August 27 meeting that a table would be developed that summarizes all of the existing sediment chemistry and toxicity test data for the zones of the Thames River. After this summary table is presented to EPA, the existence of data gaps and the need for additional chemical analysis or toxicity testing will be evaluated.

Additional Response: A table, with a format similar to the one presented in the ecological risk assessment for Portsmouth Naval Shipyard, will be prepared and included in the draft final RI report. The table will help to summarize the existing data, the results of the ecological risk assessment, and the conclusions that can be made from the data and assessment.

As originally stated in the Work Plan, several factors will be taken into account collectively to determine if potential risks are high enough to warrant additional studies. These include, but are not limited to, magnitude of exceedances of guideline values (*e.g.*, ER-Ms), bioavailability (*e.g.*, AVS/SEM ratios), frequency of detection, location of exceedances, and whether elevated contaminants are capable of bioaccumulating.

The Navy and EPA will work together to determine if additional sampling or analyses are required.

4 Resolution of General Comment No. 7

Comment: As discussed in Appendix F of the 1997 Work Plan for the supplemental sampling performed for this RI, the sample size for lead was intended to be optimized during sampling. Zones 4, 7, and possibly 3 were identified in the Work Plan as areas where additional sampling was needed to establish an adequate mean lead concentration for use in the adult lead and IEUBK models. The Navy already agreed to explain the procedures used to determine sampling adequacy in the RI. Also, if it were necessary to remove hot spots from the data sets to determine sampling adequacy, this should be discussed as well.

Response: The calculations that were completed to determine optimal sample size for lead are summarized in Appendix F of the Final Lower Subase RI Work Plan (September, 1997). Zones 3, 4, and 7 were identified as Zones that may require additional sampling beyond the sampling program proposed in the Work Plan to establish an adequate mean lead concentration.

A summary of the preliminary lead analytical results from the Lower Subase RI was submitted to the USEPA for review and comment on October 27, 1997. The USEPA provided written comments on the data on November 12, 1997. All of USEPA's comments were resolved during a conference call on November 19, 1997. It was agreed that the sample set size for each zone was adequate and no further sampling was necessary.

Removal of "hot spots" from the zone-specific data sets to determine more representative mean lead concentrations was also discussed during the conference call. Data sets which are skewed because of one high outlier may require an extremely large number of samples if the formal DQO process is followed to determine sample set size. Removal of "hot spots" from the data set can be used to show that the remaining samples provide an adequate mean and sample set size. Other qualifiers such as number of samples per area and frequency of detections can be used to help qualify the results of the DQO process.

The approach discussed above is also appropriate to evaluate future risks to human receptors after a remedial effort such as "hot spot" removal is completed. The resulting risks from this approach will be less conservative, but more representative of future conditions.

For the Baseline Human Health Risk Assessment completed for the Lower Subase RI, all lead data was used to determine risks. This approach resulted in the development of conservative risks for each zone. An evaluation of risks for future conditions (i.e., with "hot spots" removed) was not completed in this RI. It is believed that future scenarios should be evaluated and included in a Feasibility Study (FS).

Text will be included in Section 3 that discusses the approach used in the Work Plan to determine sample size adequacy and the results of the November 19, 1998 conference call. In addition, text will be included in Section 3.4, Human Health Risk Assessment Procedures, that explains why zone-specific risk assessments with "hot spots" removed were not completed in this RI. The text will also indicate that this type of assessment will be completed in the FS for the Lower Subase.

Additional Comment: Adding text to Section 3 that describes the approach discussed in Appendix F and discusses the hot spot issue will be sufficient.

Additional Response: Agree. The text will be included in the draft final RI report.

5 Resolution of General Comment No. 8

Comment: The RI does not currently discuss the approach outlined in Appendix F of the Work Plan, nor does it detail the results. It appears that an adequate sample numbers have been collected for Zones 3 and 4. If the hot spot of 189,000 mg/kg of lead is removed from the sampling data set for Zone 7, the data on soil lead concentrations from this Zone appears to be adequate to determine an acceptable mean, as well. However, no discussion is presented on Zone 7 hot spots in the text. Discussion of the method used to determine adequacy of sampling for soil lead concentrations should be added to the RI.

Response: Please refer to the Response to General Comment No. 7.

Additional Comment: Adding text to Section 3 that describes the approach discussed in Appendix F and discusses the hot spot issue will be sufficient.

Additional Response: Agree. The text will be included in the draft final RI report.

6 Resolution of General Comment No. 9

Comment: EPA - both nationally and regionally - will be developing new supplemental risk assessment guidance for dermal risk assessment in the next few months. This guidance will identify dermal absorption factors for twelve contaminants. As a result, the contribution to overall risk from the dermal exposure route may be quantified for these twelve contaminants. I have attached a copy of the recommended dermal absorption factors from soil for the twelve contaminants and their associated references in Attachment B to this letter. The RI must be revised in light of the new guidance. Additionally, for screening purposes EPA recommends that you quantify the dermal contribution to human health risk from semivolatile organic compounds and inorganics (*see also* Attachment B).

Response: The human health risk assessment for the Lower Subase RI was completed following the approved Work Plan and the current EPA Region I guidance. The new guidance referred to by the USEPA is not yet available to the public and may be revised before it is issued. Therefore, it would be premature to revise the entire risk assessment if the methodology is not finalized.

In addition, because the new dermal guidance is not yet available to the public and the information provided in Attachment B is not complete, the procedure for quantifying the dermal contribution to human health risk from semivolatile organic compounds and inorganics for screening purposes is unclear.

Further discussions between the Navy and Base Partnering Team are required.

Additional Comment: As stated in the August 31, 1998 e-mail from EPA, the HHRA must be revised to quantify the additional contaminants for dermal absorption.

Additional Response: Agree. The Navy will revise the HHRA to quantify the additional contaminants for dermal absorption. The USEPA was contacted on September 16, 1998 in order to resolve outstanding issues regarding the assessment. The USEPA provided follow-up information on September 22, 1998. The HHRA will be updated and included in the draft final RI report.

7 Resolution of Specific Comment No. 7 (p. 3-32, §3.4.1.1)

Comment: The text states that shallow soils were defined as soil from depths of 0 to 4 feet bgs or from 0 to 5 feet bgs depending on the site. Soil samples from the shallow soils were used as surface soils in the risk assessment. The Work Plan for this RI (Brown and Root, September 1997), defines surface soils at soil samples from depths of 0 to 2 feet bgs. The use of soils from depths greater than 2 feet to represent surface soils requires justification. (If pavement is a consideration, this should be discussed in the text.) Unless justification can be provided for using soil samples collected from depths of up to 4 or 5 feet bgs, the soil data set will need to be revised to comply with the Work Plan.

Response: Agree. The work plan erroneously defined surface soils as soil samples collected from depths of 0 to 2 feet bgs. This definition is not consistent with other documents submitted for NSB-NLON sites, including the Phase II Remedial Investigation Report, which defined shallow (surface) soils as 0 to 4 feet bgs or 0 to 5 feet bgs, depending on the zone. It was the Navy's intention that the approach to human health risk assessment for this RI be consistent with the approach used in the Phase II RI.

Additional Comment: The original comment noted an inconsistency in the definition of "shallow soils." The response acknowledges an error in the presentation, and, presumably, it will be corrected. As it now stands, the definition of "shallow" is 0 to 4 feet or 0 to 5 feet bgs, depending upon the zone. Because this definition is not fixed throughout the document, care should be taken to note the depth of the "shallow soils" for each zone. When first introduced (see, e.g., p. 2-3, §2.2.1), it should be noted that the definition of "shallow" is zone-specific. The original text in §2.2.1 gives only one definition. Also, the rationale for redefining "shallow" on a zone-by-zone basis should be given in §2.2.1.

Additional Response: Agree. The definitions of shallow and deep soils are zone-specific. The report will be revised so that these definitions are used correctly and consistently throughout the draft final RI report.

8 Resolution of Specific Comment No. 14 (p. 4-12, §4.4.1.1)

Comment: The text here defines "shallow" soil as 0 to 4 ft bgs. "Shallow" was previously defined (page 2-3, §2.2.1) as 0 to 5 ft bgs. Please correct. We note that there are some samples (*e.g.*, Zone 3, LS3SB0030201 from 4-7 ft bgs; Zone 5, LS5SB0050201 from 4-5.5 ft bgs) for which this cutoff depth may change their classification. Please explain why shallow is not consistently 0-5 ft bgs.

Response: The text in Section 2 will be changed to indicate that the definition for shallow soil is specific for each site based on the samples collected.

Additional Comment: See Comment 7 above.

Additional Response: Agree. The definitions of shallow and deep soils are zone-specific. The report will be revised so that these definitions are used correctly and consistently throughout the draft final RI report.

9 Resolution of Specific Comment No. 15 (p. 4-20, §4.5.1)

Comment: The text states that "metals are not typically considered to be mobile contaminants in the environment." While it is true that metals are relatively immobile in comparison to many other contaminants, this statement conflicts with important conclusions of the RI. At the end of the same paragraph, for example, the text notes, "Metals were ... detected in groundwater at Zone 1, which indicates that migration of metals has occurred." Later (page 4-31, §4.7.2) it is stated that "... mobile inorganics from Zone 1 may have migrated to the Thames River." The contradictory statement that metals are not considered to be mobile should be replaced with site specific and inorganic specific statements. This comment applies, in concept, to all of the other zone chapters in the RI (*i.e.*, §§ 5.5.1, 6.5.1, 7.5.1, 8.5.1, 9.5.1, and 10.5.1).

Response: The text in each site-specific fate and transport section will be augmented with available site-specific and chemical-specific fate and transport information.

Additional Comment: See General Comment 6 above.

Additional Response: No further information is provided by the USEPA regarding General Comment 6. As stated in the Navy's original response, the text in each site-specific fate and transport section will be augmented with available site-specific and chemical-specific fate and transport information.

10 Resolution of Specific Comment No. 16 (p. 4-21, §4.5.2)

Comment: The text states that "lead does not appear to be migrating with groundwater to adjacent zones on the Thames River." This statement is ambiguous. Does this refer to impact on groundwater in adjacent Zones (*e.g.*, Zone 2 to the south and Zone 7 to the north)? Or, does it refer to impact on the river itself, adjacent to Zone 1 and/or abutting Zones to the north and south? The contours of lead concentration, as drawn, do not suggest significant transport to the north and/or south. However, the contours imply transport (albeit potentially quite slow) downgradient toward the river to the west. The wording should be clarified. Also, it should be noted in this context that the contour plots of lead (Drawings 13 and 14) are constrained by virtually no data in the area adjacent to Zone 1 on the north, and by very little data to the south. Conclusions concerning transport are tenuous, and should be presented with appropriate circumspection.

Response: The text referred to in the comment will be modified as follows: "...adjacent zones or the Thames River." Text will also be added to this section to clarify the uncertainty with the data set and conclusions made from it.

Additional Comment: The original comment noted ambiguity in wording with respect to lead migration to adjacent zones and/or to the river. The proposed revision clarifies the intent of the statement. The comment also noted the difficulty of drawing meaningful conclusions regarding transport from the data shown in Drawings 13 and 14, and the response states that the conclusions will be appropriately qualified. This discussion of the data should caution against over interpretation of contour plots based on sparse data and the adoption of an interpolation scheme.

Additional Response: Agree. The text will be revised appropriately.

11 Resolution of Specific Comment No. 17 (p. 4-22, §4.5.3)

Comment: Drawing 15 shows the distribution of dissolved oxygen (DO) in shallow groundwater. In Zone 1, the highest DO was measured at monitoring well FOMW14, and consistently high values were obtained at several nearby wells. This area of high measured DO correlates with an area of high TPH, low Eh, high Fe^{++}, and high methane. The high DO conflicts with the other data, which are indicative of a reducing environment. Although the text (page 4-22, first bullet) acknowledges clearly that the DO data are suspect, the data deserve further discussion. In particular, the text suggests that there may have been a problem with the field instrument used to obtain the DO measurements. However, a faulty instrument would result in either sporadic anomalous data, or uniformly bad values (*e.g.*, all measurements consistently in the same high range). In the present case, the highest DO reading is surrounded by five other high values, falling off with distance from FOMW14. The pattern is remarkably systematic, as indicated by the concentric contours shown on Drawing 15. Please provide a more thorough discussion of the DO data in this area and possible reasons that the data, while "suspect," fall into the pattern observed. The DO data should be treated consistently for all zones (*i.e.*, §§ 5.5.3, 6.5.3, 7.5.3, 8.5.3, 9.5.3 and 10.5.3).

Response: A YSI multi-parameter meter was used to measure DO and other water quality parameters (i.e., REDOX potential, specific conductivity, pH, etc.) during the field investigation. For Zone 1, water

quality measurements were taken during sampling of monitoring wells on 3 different days. Measurements were taken at 13MW1, 13MW3, FOMW14, FOMW15, FOMW16 on November 10, 1997; 13MW19, 13MW20, and 13MW21 on November 11, 1997; and 13MW8, 13MW9, 13MW18, FOMW13 on November 12, 1998.

Because the data was collected on different days, it is possible that the variation in the Zone 1 data shown on Drawing 15 is related to a faulty DO probe or improper calibration of the DO probe. For example, the DO probe was not able to be calibrated on November 12, 1998 due to short in the probe. No valid DO readings were able to be obtained at wells 13MW8, 13MW9, 13MW18, FOMW13 on that day.

The information provided above will be incorporated into the first bullet on p. 4-22. Additional information regarding the quality/uncertainty of the DO data will also be incorporated into Sections 5 through 10.

Additional Comment: The original comment requested additional discussion of the dissolved oxygen data and its interpretation. The information provided puts the data into perspective. The response is adequate.

Additional Response: Agree. The text will be revised appropriately.

12 Resolution of Specific Comment No. 18 (p. 4-32, §4.7.4)

Comment: The first bullet states that "the nature and extent of organic and inorganic contamination at the site is well defined." For this and other Zones (*i.e.*, §§ 5.5.4, 6.5.4, 7.5.4, 8.5.4, 9.5.4, and 10.5.4) that are occupied to a significant extent by buildings that preclude exploration, it is an overstatement that the nature and extent of contamination is well defined, particularly with regard to groundwater. Please qualify. For example, the nature and extent of organic and inorganic contamination within this zone is defined to the extent practical considering infrastructure limitations.

Response: Agree. The first bulleted item in Sections 4.7.4, 5.7.4, 6.7.4, 7.7.4, 8.7.4, 9.7.4, and 10.7.4 will be revised as follows:

> "The nature and extent of organic and inorganic contamination in the soil is well defined to the extent practical considering infrastructure limitations."

Additional Comment: The comment suggested that the claim that contamination is "well defined" is overstated. The proposed change is adequate.

Additional Response: Agree. The text will be revised appropriately.

13 Resolution of Specific Comment No. 20 (p. 5-14, §5.5.1)

Comment: The text again states that "lead is not typically considered to be a mobile contaminant in the environment," yet it is also stated (page 5-13, §5.4.2.2) that "the impact of the lead contamination ... may be decreasing with time," and that (page 5-14, §5.5.1) "migration of lead has occurred." The statement concerning the mobility of lead should be modified for internal consistency; *e.g.*, it could state that, while lead is relatively immobile, there is evidence for lead transport at the site. (*See also* comment for page 4-20, §4.5.1.)

Response: The text will be revised as suggested. Also, please refer to the Response to Specific Comment No. 15.

Additional Comment: The original comment noted an apparent contradiction in statements concerning lead transport. The proposed revision is adequate to improve the internal consistency of the text.

However, the larger, technical issue demonstrating a clear understanding of lead mobility under site-specific conditions and its implications remains. See General Comment 6 above.

Additional Response: No further information is provided by the USEPA regarding General Comment 6. As stated in the Navy's original response, the text in each site-specific fate and transport section will be augmented with available site-specific and chemical-specific fate and transport information for lead.

14 Resolution of Specific Comment No. 21 (p. 5-16, §5.5.3)

Comment: The first bullet notes that DO measurements were highly variable, and that the high value at 13MW17 is near saturation. It is stated that the DO data are thus "inconclusive." The second bullet notes that the redox potential (Eh) data show both aerobic and anaerobic regions, and that the high Eh measured at 13MW17 "confirms" the high DO measured there. There appears to be a contradiction here, in that there is a caution with regard to the DO measurement at 13MW17, yet it is then stated that the high DO and Eh are consistent. In contrast, in 13MW11, the DO is somewhat elevated (3.71 mg/L), while the Eh is very low (-105.1 mV). The DO and Eh data for 13MW11 seem to be contradictory. The DO data should not be accepted and used selectively where they support an argument, and dismissed where they are contradictory. An effort to quantify the uncertainty in the DO measurements would be beneficial. For example, if the DO data are good to plus or minus 5 mg/L, then the DO measurement at 13MW17 stands as "high," while that at 13MW11 might fall into the "low" range (*e.g.*, less than 1 mg/L, as per Table 3-6, page 3-97), consistent with the Eh data. The text should be consistent.

Response: Agree. The text should be consistent. Similar information regarding the uncertainty of the DO data, as discussed in the Response to Specific Comment No. 17, will be provided in the first bullet on p. 5-16. The second bullet will be revised for consistency.

The YSI meter used to measure water quality parameters has an accuracy for DO of ±0.2 mg/L and REDOX potential of ±20 mV. Therefore, the example argument provided in the comment, albeit a useful approach, can not be used to justify the DO measurements.

Additional Comment: The original comment requested more discussion of the DO data and consistency in its use. The proposed added text addresses the concern adequately. It should be noted that the measurement uncertainty for DO using the YSI meter of plus or minus 0.2 mg/L is precision rather than accuracy. That is, under controlled conditions, the probe may give DO readings whose standard deviation is of that order, but the uncertainty of the field measurement relative to the true DO content of the groundwater may be larger.

Additional Response: The text will be revised appropriately.

15 Resolution of Specific Comment No. 23 (p. 6-2, §5.5.3)

Comment: The text notes that storm water discharge from Zone 3 (as well as other locations described elsewhere) is neither sampled nor analyzed. The Existing Data Summary Report (Brown & Root, 1997) recommended that "the amount of lead entering the Thames River be quantified." Why was the storm water transport pathway to the river neglected?

Response: A summary and evaluation of the existing analytical results from the NPDES permit sampling were provided in the RI. Lead is one of the parameters on the analytical list for these samples; therefore, the data, which is from several outfalls along the Lower Subase, provides a general indication of the amount of lead entering the Thames River. Only one storm sewer in Zone 3 discharges to the Thames River and it is not sampled under the permit. Therefore, it is agreed that the amount of lead entering the Thames River from this outfall has not been quantified. Additional sampling and analysis of the storm sewers will be considered by the Navy. Please refer to the Responses to General Comment No. 2 and Specific Comment No. 19.

Additional Comment: It was agreed at the August 28, 1998 meeting that the storm drain information will be integrated into the fate and transport discussion with in the in the RI and will be integrated into the FS. The role of the storm drains in the transport of contaminants to the river remains a major issue with respect to site characterization and understanding pathways. The Navy states here that additional work will be "considered."

There is a data gap, there are chemical analysis data for only 5 storm sewer outfalls. There are no storm sewer analytical data for Zone 3.

There remain some major issues here to be resolved between the Navy and the regulators. See evaluation of the response to general comment 2.

Additional Response: For clarification, the meeting to resolve comments on the draft Lower Subase RI took place on August 27, 1998, not August 28, 1998 as stated in the USEPA's additional comment above.

The sampling requirements of the NPDES permit will be resolved between the Navy and the CTDEP.

Readily available information for the storm sewers of the Lower Subase (i.e., invert elevations) will be incorporated in the draft final RI report. This information will be evaluated within the report to determine if the storm sewers are viable transport pathways for groundwater.

The Navy will complete additional investigation of the storm sewers as part of the NPDES permit process or, the FS and the proposed tiered monitoring program.

16 Resolution of Specific Comment No. 24 (p. 6-12,§6.4.1.2)

Comment: The text states (first paragraph, page 6-12) that several metals exceeded background levels in one sample. It also states that "concentrations of metals in the Zone 3 soils were generally similar to concentrations detected within all zones of the Lower Subase." Does this imply that all of the deeper soils on the base have metals concentrations that exceed background? One might conclude that there is widespread contamination that should be addressed, or that background concentrations should be re-evaluated. The discussion should be made more precise. For example, what is meant by "generally similar?"

Response: Agree. The text in this paragraph is not meant to infer that the concentrations of metals detected in "deep" soil at the Lower Subase consistently exceed background concentrations. In most of the seven zones, "slight" exceedances of background concentrations were evident in one or two deep soil sample locations. These exceedances appear to be randomly scattered and are typically within the same order of magnitude (generally similar) between zones for a given contaminant. In a few instances, such as lead hot spots in Zone 3 and general metals hot spots in Zone 7, the background levels are exceeded by several orders of magnitude and the contamination will have to be addressed.

The last sentence in the first paragraph on p. 6-12 will be revised as follows: "With the exception of lead, maximum concentrations of metals in Zone 3 were generally randomly scattered, but within the same order of magnitude as concentrations detected in most of the other zones within the Lower Subase. Typically, the concentrations of these metals were either slightly above or slightly below background levels."

Additional Comment: The original comment requested clarification of statements concerning lead levels relative to background. The proposed revision is a clearer statement. It would be improved further if a more quantitative statement could be made regarding metals near background. If the background data are sufficient to determine both a mean and a standard deviation for each metal in background, then a more definitive statement could be made regarding metals detected in the present RI relative to background. For example, rather than stating that a certain compound is "slightly above background,"

one could state that it is within one standard deviation of the mean of the background data set. Or, if there is reason to believe that the background data should not be described in terms of a particular statistical distribution (*e.g.*, normal, log-normal, *etc.*), at least the range of the background data set could be considered. In that case, for example, an analysis could be described as above the mean, but within the range, of the background data set.

Additional Response: Approved background concentrations of inorganics in soil are provided in Table 1-4. The background concentrations were taken from the *Background Concentrations of Inorganics in Soil* report that was prepared by Atlantic in April 1995. The approved background concentrations are typically the maximum concentrations detected in all samples. Therefore, it is not possible to provide the quantitative statements requested by the USEPA. As an alternative, the text will be updated to indicate whether the background concentration is exceeded by a certain factor (e.g., 2 times) or order of magnitude (e.g. 3 orders of magnitude), depending on the magnitude of exceedance.

18 Resolution of Specific Comment No. 26 (p.6-15, §6.4.2.2)

Comment: The text notes that "... many dissolved metals results were slightly higher than respective total metals results." This suggests a problem with the analyses and demands further discussion.

Response: Upon further review of the data, two of three sample pairs analyzed during the Lower Subase RI in 1997 had filtered results that were typically higher than total results. With the exception of barium and zinc analyses on two of the three sample pairs, the differences were minor and would typically be considered to be within the reporting accuracy of the particular analytical test. There appears to be an insufficient number of instances where the differences were large enough to question the validity of the data. It should be noted that for at least one of the questioned sample pairs, the laboratory ran different dilutions for the dissolved versus total metals samples and this could be the reason for the difference in the analytical results. The section of text in question will be revised for clarity.

Additional Comment: The original comment requested discussion of results in which dissolved fractions were higher than total. The discussion offered in the response clarifies the matter, and should be included in the text, as is stated.

Additional Response: Agree. The appropriate text will be incorporated into the report.

19 Resolution of Specific Comment No. 27 (p. 6-16, §6.5.1)

Comment: The text makes the rather general statement that "...under acidic soil conditions, lead may be solubilized and transported...." The geochemical conditions that determine lead solubility should be defined quantitatively, and those conditions should be assessed at the site. This comparison will be essential to evaluating the mobility of lead at the site. The evaluation should include, for example, discussion of the phases that may control lead solubility at the site.

Response: Please see the Response to General Comment No. 6.

Additional Comment: See evaluation of the response to General Comments.

Additional Response: No further information is provided by the USEPA regarding lead contaminant fate and transport in their evaluation of the Responses to General Comments. As stated in the Navy's original response, the text in each site-specific fate and transport section will be augmented with available site-specific and chemical-specific fate and transport information for lead.

20 Resolution of Specific Comment No. 28 (p. 6-17, §6.5.2)

Comment: The text makes statements regarding cross-contamination by TPH in deep soils based on the contours shown in Drawing 9. While it appears that it is possible that sources in one area can lead to contamination of the other, conclusions such as those suggested are highly speculative, given the density of data. The impression of a gradient from the high TPH in 13MW12 toward the south into Zone 4 may be entirely an artifact of the geostatistical contouring algorithm. The contours to the south are constrained by only one datum from GS-11L. Such speculation should be appropriately qualified.

Response: The text will be qualified as suggested.

Additional Comment: The original comment expressed reservations about drawing conclusions concerning "cross-contamination" from one Zone to another, and cautioned against over interpretation of contour plots based on sparse data and interpolation schemes that can yield a convincing picture, but in reality are poorly constrained. The response states that the text will be qualified appropriately. It would be useful, too, if the text were to further elucidate the processes that are inferred to be operating here. In particular, what is the conceptual model that emerges from consideration of these data? If "cross-contamination" has occurred, was it by spreading on the ground surface before the hydrocarbons seeped into the soil, transport by groundwater through fluctuations in the water table, or some other mechanism? What appears to be consistent with the data?

Additional Response: Agree. Site-specific information will be used to determine the processes and mechanisms affecting contaminant fate and transport for each zone.

21 Resolution of Specific Comment No. 29 (p. 6-17, §6.5.2)

Comment: The text states that lead appears to have migrated from Zone 3 to Zone 2, to contaminate deep soil in the adjacent area of Zone 2. This conclusion apparently is based on the gradient in lead concentration in deep soil between, for example, 2-EXBE-ALBACORE-04 (6060 mg/kg) and 13TB11 (404 mg/kg). What mechanism is envisioned for transport in the subsurface soil? Is the following statement regarding lead in groundwater meant to imply that transport has occurred via groundwater during periods of higher water table? Please clarify. Appropriate caution should be exercised in drawing broad conclusions that are strongly conditioned by the sparse data to the north (Zone 2).

The text also states that "concentrations of total and dissolved lead are comparable in groundwater...," and the conclusion is drawn that the lead is present in dissolved form. However, it is noted that this statement is based on a single hit of lead at an *estimated* concentration of 10.5 ppb, and that the total lead analysis (unfiltered) for the same sample is 9.7 ppb. Thus, these data, and the inferences drawn from them, are questionable. The conclusions regarding transport of lead in groundwater should be appropriately qualified.

Response: The text will be qualified as suggested.

Additional Comment: The original comment was similar to that discussed in 28 (above), but here in the context of lead rather than TPH. The response agrees to revise the text as requested to qualify the conclusions appropriately. The revised text should state clearly the basis of the conclusion that lead has migrated from Zone 3 to Zone 2 (i.e., is this inference drawn from the change in lead concentration from 2-EXBE-ALBACORE-04 to 13TB11)? If some transport mechanism is envisioned that is consistent with the setting and what is observed, it should be discussed.

Additional Response: Agree. Please see the additional response to Specific Comment No. 28.

22 Resolution of Specific Comment No. 30 (p. 6-19, §6.5.3)

Comment: The third bullet on page 6-19 states that high sulfate indicates that sulfate reduction is not occurring. However, the analyte list does not include sulfide. Please explain how conclusions regarding

sulfate reduction can be drawn in the absence of sulfide data. Methane is present, yet the absence of sulfate reduction is inconsistent with methanogenesis. The conclusions regarding sulfate reduction should be re-evaluated.

Response: The methodology used to evaluate sulfate data is presented in Section 3.3.4 and Table 3-6. This methodology was taken from recently published literature on natural attenuation.

It is agreed that inclusion of sulfide on the analyte list would verify that sulfate reduction is occurring. However, this parameter was not included in the parameter list for this baseline evaluation of natural attenuation. The parameter list for the Lower Subase RI was included in the USEPA approved final Work Plan (Brown & Root Environmental, September 1997). If natural attenuation is chosen as the preferred remedial alternative for this or any of the zones, additional, more comprehensive sampling and analysis will be completed to verify the progress of natural attenuation.

It is also agreed that sulfate reduction generally occurs before methanogenesis, but the biodegradation process is dependent upon site-specific conditions and contaminants. Therefore, the process may proceed differently than studies completed at other sites.

The third bullet on p. 6-19 will be revised as follows:

> "High concentrations of sulfate (i.e., > 20 mg/L) were detected in two of three groundwater samples collected. Sulfate was not detected in the third sample. These results indicate that sulfate reduction may be occurring in limited portions of Zone 3."

Additional Comment: The comment raised questions regarding the interpretation of data relevant to biodegradation of the hydrocarbons. The proposed revision is an improvement, in that it acknowledges that sulfate reduction cannot be ruled out based on the available data. It would be clearer yet to expand upon this further by stating, for example, that in the absence of sulfide data, the results are ambiguous. The reply states that sulfide was not on the analyte list, but that the analyte list will be revisited in the event that monitored natural attenuation is considered further as a remedial alternative for any of the zones. Such a review of the analyte list for any future sampling that bears on natural attenuation is encouraged.

Additional Response: Agree. The revisions to the text proposed in the original response will be incorporated into the text of the draft final RI. The ambiguity/uncertainty of the data set will also be dealt with in the revised text and conclusions.

23 Resolution of Specific Comment No. 31 (p. 6-19, §6.5.3)

Comment: The summary paragraph regarding natural attenuation (NA) makes the rather strong statement that conditions are "... favorable for natural attenuation..." and that "... these remedial alternatives are practical..." This overstates the implications of the NA parameters, which are somewhat equivocal; *e.g.*, redox conditions are variable, nitrate data are inconclusive, divalent iron data are scarce (one hit among three samples), and reduced sulfur species were not measured. If **monitored** natural attenuation is to be considered as a remedial alternative, it will require a more thorough and focused study of NA parameters. The text should be modified to reflect the open questions regarding the conditions favoring natural attenuation. This comment applies to the evaluation of natural attenuation capacity for every zone (*e.g.*, §§ 5.5.3, 6.5.3, 7.5.3, 8.5.3, 9.5.3, and 10.5.3).

Response: The recommendations made in this paragraph were regarding further evaluation of natural attenuation as a remedial alternative for this zone. Further evaluation of remedial alternatives will be completed during the Feasibility Study. If natural attenuation is chosen as the preferred remedial alternative for this or any of the zones, additional, more comprehensive sampling and analysis will be completed to verify the progress of natural attenuation. The summary paragraph will be revised to

discuss the limitations of the data set and the conclusions that can be made from them. Similar revisions will be made to Sections 4, 5, and 7 through 10.

Additional Comment: The comment noted that the case for the efficacy of natural attenuation in this setting was somewhat overstated. The response states that the text will be revised to acknowledge limitations and qualify the conclusions. This is a satisfactory response. It is recommended that the revised text state clearly that *some* indicators of biodegradation are encouraging, but that, within the scope of this investigation, others are ambiguous. These results do indicate value in further evaluation, and that conclusion should be stated. However, the data in hand do not provide support for the conclusion that monitored natural attenuation (MNA) is a "practical" remedial alternative. This has not been established at this time.

Additional Response: Agree. The ambiguity/uncertainty of the data set will be dealt with in the revised text and conclusions.

24 Resolution of Specific Comment No. 32 (p. 6-26, §6.7.1)

Comment: The summary notes that lead was detected in groundwater beneath Building 31 at 392 ppb, and then states that the maximum concentration detected was 10.5 ppb. These statements should be clarified to eliminate the apparent contradiction. The 392 ppb is a total (unfiltered) value, while the 10.5 ppb is for a filtered sample.

Response: Disagree. The final two sentences of Section 6.7.1 describe the differences in concentrations of lead detected in groundwater beneath Building 31 and the surrounding area. There is no contradiction with the information.

The last two sentences will be revised for clarity to indicate that the lead concentration of 392 ug/L is from an unfiltered sample from a temporary well and the lead concentration of 10.5 ug/L is from a filtered sample from a permanent well.

Additional Comment: It is suggested that the revised text also note that the data from the temporary well are regarded as "screening" data, and note that these data are not shown on the figures.

Additional Response: Agree. The appropriate changes will be made to the text.

25 Resolution of Specific Comment No. 33 (p. 6-26, §6.7.2)

Comment: The contaminant fate and transport summary repeats many of the same broad conclusions discussed in the detailed comments above, including those related to lead transport and natural attenuation of petroleum hydrocarbons and SVOCs. Many of these conclusions are weakly supported, at best. The summary should be modified such that it does not overstate the results.

Response: Agree. The information provided in Section 6.7.2 will be qualified. The summary will be modified so that it does not overstate the results. Modifications made to the text of previous sections regarding lead transport and natural attenuation will be incorporated into this paragraph.

Additional Comment: The comment requested that broad conclusions regarding fate and transport be appropriately qualified where the data and analysis are only suggestive, rather than strongly supporting. The response states that the text will be modified as requested. The response is adequate.

Additional Response: Agree. The appropriate changes will be made to the text.

26 Resolution of Specific Comment No. 49 (Appendix I.6)

Comment: This appendix provides the human health risk tables for Zone 2. A print out of the Zone 2 run of the IEUBK model is provided. The default drinking water concentration (4 mg/L) was used instead of the exposure concentrations for lead in groundwater. Because lead is a COC in groundwater (8.6 mg/L), the more conservative value should be used.

Response: As stated in p. 5-21, §5.6.2, "Future potential residents are not assumed to come into contact with groundwater at the site because saline conditions that exist near the Thames River would preclude domestic use of groundwater." Therefore it is inappropriate to use the concentration of lead in Zone 2 groundwater in the IEUBK model since Zone 2 groundwater can not be readily used as drinking water.

Additional Comment: As stated in the August 31, 1998 e-mail from EPA, the IEUBK model can be run using the default (4 mg/l) concentration for lead in groundwater considering that the area is served by public water and the groundwater is brackish.

Resolution: Agree. No further action is necessary.