UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

March 13, 1996

Mr. Philip Otis
U.S. Department of the Navy
Northern Division - NAVFAC
10 Industrial Highway
Code 1811/PO - Mail Stop 82
Lester, PA 19113-2090

Re: EPA Preliminary Comments on the Draft Feasibility Study (FS) Report, Site 09-Allen Harbor Landfill, January 1996, Former Naval Construction Battalion Center, Davisville, RI

Dear Mr. Otis:

Please find attached the Environmental Protection Agency's (EPA)preliminary comments on the above referenced document. I have also attached to this letter comments on the RI/FS from Ken Finkelstein, NOAA. Additional EPA comments on the ARARs will be forthcoming.

The FS was very biased toward Alternative 2. EPA does not agree with the implied preferred alternative, Alternative 2 (soil cap). EPA finds that this alternative does not comply with ARARs and therefore cannot be the preferred alternative.

EPA proposes a Contingency Alternative that would be based on all the components of Alternative 4. If during the remedy design phase the Navy wishes to petition EPA and RIDEM to omit construction of the vertical barrier component of the remedy, the Navy would have to provide justification that the vertical barriers are not necessary to prevent the future re-contamination of the intertidal ecological zone.

I look forward to working with you and the RIDEM to produce a draft-final FS and to work out the details on the contingency alternative. Please contact me to set up a meeting to discuss the Navy's responses to these comments at (617) 573-5736.

Sincerely,

Christine A.P. Williams
Remedial Project Manager
Federal Facilities Superfund Section

Attachments

cc: Richard Gottlieb, RIDEM
Walter Davis, NCBC
Tim Prior, USF&WL
Ken Finkelstein, NOAA
Andy Beliveau, EPA
Bill Brandon, EPA
M. Peter Holmes, EPA
Jayne Michaud, EPA
Scot Gnewuch, ADL
Jim Shultz, EA

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Admin.
National Ocean Service
Office of Ocean Resource Conservation and Assessment
Hazardous Materials Response and Assessment Division
c/o EPA Waste Management Division (HEE-6)
J.F. Kennedy Federal Building
Boston, MA 02203
23 February 1996

Ms. Christine Williams
U.S. EPA Waste Management Division
J.F. Kennedy Federal Building
Boston, MA 02203

Dear Christine:

Enclosed are technical reviews for two documents sent to me by the U.S. Navy: 1. the Draft Final, NCBC Allen Harbor Landfill, Phase III Remedial Investigation and 2. the Draft NCBC Allen Harbor Landfill, Feasibility Study Report, both Prepared by EA Engineering, January 1996. I was in the middle of reviewing the Phase III RI when I received your comment letter, dated 15 February 1996, addressing this document . I was under the impression I had much more time to review the Phase III RI; hence, I cut back my review of the RI and spent more time with the FS. Nevertheless, the following comments refer to both the RI and FS as they are closely related.

The following issues will be emphasized:

- Is the intertidal environment adversely stressed; are concentrations leaving the landfill of import?
- Which pathway is the source of contamination to the intertidal environment in front of the landfill—surface flow, groundwater, or tidal action?
- Which remedy would be most appropriate?

The Phase III investigation collected groundwater from 21 wells analyzing samples for VOCs. High concentrations of VOCs were observed in groundwater beneath the landfill. Concentrations exceeded 10,000 μg/l for several including trichloroethene, 1,1,2,2-tetrachloroethane, acetone, vinyl chloride, and 1,2-dichloroethene. Although concentrations of several VOCs were high, their volatility, coupled with their relatively low toxicity and attenuation upon discharge to surface waters, make these substances a secondary concern. For the protection of natural resources and habitats in Allen Harbor, the previous phases of the RI that investigated PCBs, pesticides, SVOCs, and trace elements provided more pertinent information and data.

Bioassessment studies were conducted during each of the three Phases of the RI and found significant toxicity associated with landfill sediment and leachate. Toxicity was observed in sediment bioassays in areas contaminated by landfill discharges as well as areas associated with the Spink Neck outfall. Toxicity observed at stations clearly associated with the landfill was significant, but not severe. Coarse grain-size could have also contributed to increased mortality in amphipod sediment bioassays. No toxicity was observed in sediment bioassays conducted during Phase III investigations. Bioassays conducted to determine the toxicity of groundwater leachate found significant effects.

These findings indicate that toxic effects may be occurring in the intertidal zone near the face of the landfill. The FS statement that seep waters pose limited risks to aquatic resources is unfounded. A suite of bioassays was conducted on leachate and significant effects were observed with sea urchins (larval development), red algae (*Champia* reproduction), and coot clam (larval development). This provides a weight of evidence that indicates the potential toxicity of groundwater leachate. The level of toxicity upon discharge and entrainment to the intertidal sediments is less clear. The attenuation and dilution of contamination upon discharge to the intertidal zone may mitigate toxic effects to some extent, but data suggest that localized biological effects are still occurring and would likely continue without some level of source control.

There is no evidence to indicate that surface runoff is the cause of intertidal sediment contamination at the face of the landfill, as the Navy contends. Surface runoff investigations were not conducted at the landfill; this conclusion appears viable for only the area proximal to the Spink Neck outfall. The contaminants observed in landfill leachate (e.g., lead, copper, nickel, zinc, total PAHs) are consistent with those observed in intertidal sediments. Contaminated intertidal sediments generally appear downgradient of contaminated seeps, suggesting that leachate is the cause of sediment contamination. The FS appears to lay the foundation that runoff from the Spink Neck outfall is a more important source than the landfill. Given the degree of contamination observed in sediments proximal to both sources, this is not an unreasonable supposition. As reported, however, the burden of evidence indicates that localized areas of the intertidal zone have been contaminated by landfill discharges and biological effects are occurring. There is no evidence to indicate that the contaminated seeps will stop discharging without source control. Although the areas with biological effects are localized, they are occurring in ecologically valuable intertidal wetlands.

Tidal action may contribute to the liberation of contamination from the landfill, but there does not appear to be any direct evidence or data collected as part of the RI investigations to support this. The Phase III RI reported that groundwater measurements in the unconfined shallow fill zone were largely unaffected by tides (Section 3.7.5), but also reported that groundwater and harbor water mix and move back and forth in this layer near the shore (Section 3.7.6.5). Salinity measurements of groundwater were reported to be in Appendix I, but I was unable to find them (Appendix I consisted of 3 pages). This should be corrected. These data indicate that tides do not have a large affect on groundwater flow, but this does not mean tidal effects are minimal. It appears that a substantial amount of saltwater intrusion occurs in the fill material in areas of the landfill closest to the shore, indicating that the estuarine system can be in direct contact with source contamination.

Overall, groundwater investigations indicate that groundwater in contact with contaminated soils associated with fill material eventually discharges to the intertidal zone in the form of seeps. Saltwater intrusion also indicate that the groundwater is influenced by the estuarine system and not just by surface water infiltration (i.e., precipitation). In these cases, a soil cap would not likely decrease the amount of leachate generated by the landfill or prevent its discharge at the landfill face. An impermeable cap would likely decrease the amount of leachate discharged by the landfill by preventing the infiltration of precipitation but would not prevent the intrusion of seawater into the fill material. It would also not prevent regional groundwater flow upgradient of the landfill from flowing through the fill material and discharging as seeps to the intertidal zone. A combination of an impermeable cap and barrier walls isolating the landfill from the intertidal zone would be necessary to completely isolate contamination from the intertidal zone. Remedial Alternative 4 provides for both an impermeable cap and barrier to prevent groundwater discharge to the intertidal zone.

Given that uncontrolled landfill discharges have resulted in only localized areas of biological effects, an impermeable cap (Alternative 3) may provide sufficient protection to the intertidal zone, although it is unlikely that it will completely eliminate groundwater seeps. A reasonable alternative to Alternative 4 may be to cap the landfill (Alternative 3) and put in place a monitoring program to determine if contaminated seeps have decreased to a level where the intertidal zone can recover. If not, further remediation in the form of a barrier wall can then be conducted (assuming that placement of an impermeable cap does not preclude the future placement of a barrier wall).

Source control would likely allow contaminated areas of the intertidal zone to recover naturally. As reported, contamination in the intertidal area is not severe and biological effects are localized.

Alternatives 2, 3, and 4 include the creation of wetlands along the entire site shore connecting the southern and northern wetlands. The creation of viable wetland areas would likely increase the habitat value of the intertidal zone near the face of the landfill. Since wetlands tend to be depositional areas for fine-grained sediments, they may also act as a sink for burying residual contamination during the remedial and post-remedial phases. The source control remedy at the landfill should be considered in the wetland design to make sure the hydrological regime is sufficient to support wetland development.

One specific question concerns the discussion of HQs on page 25 of the FS. HQs are calculated using toxicity reference values, usually a no effects level. They are not calculated using reference data as shown. Perhaps the discussion of Prudence Coggeshall Cove reference data refers in some way to the TOC-normalization. This should be clarified.

Please let me know if you have any questions.

Sincerely,

Kenneth Finkelstein, Ph.D.

cc: Tim Prior (USF&WS)

Allen Harbor Landfill (Sit 9) Draft Feasibility Study (dat d January 1996) Comments

GENERAL COMMENTS

1. EPA has recently made substantive comments on the Allen Harbor Phase III Draft Final RI report - which supports this FS - which have not yet been addressed. The magnitude of the problem represented by migration of contaminants from the landfill via ground water to the environment surrounding the landfill represents the major area of contention. Particularly, the approach used in the RI for modeling fate and transport of metals (e.g. arsenic), the distribution of ground water discharge to the harbor, and the resulting impact to sediment concentrations in the harbor (current and future) are the primary issues. (See EPA comments on Draft Final Phase III RI - Site 09; General Comments 1 through 5 and numerous specific comments). These issues require resolution prior to finalization of this FS.

2. The original purpose of this feasibility study was to provide a detailed assessment regarding the feasibility of capping alternatives, in addition to the no action alternative. This report contains only cursory information with no details. The information contained in this document, although pertinent, provides no greater detail than any of the previously written FSs on this site. The information that should be provided includes (but is not necessarily limited to):

Hydrological impacts resulting from each alternative

Quantification of contaminant mass leaving the site for each alternative

Expected risks based on quantified mass of contaminant discharging from the site (may be done qualitatively and by comparison to conservative screening values)

Preliminary engineering calculations regarding slope stabilities, soil volumes required for the caps, expected required leaching rates of cap materials, etc.

Greater detail regarding the feasibility of generating new wetlands including the elevations (relative to sea level) required for the wetlands, expected storm impacts, types of vegetation expected, soil types required, etc.

A quantitative comparison of the three alternatives to one another (perhaps a table summarizing the risks, long- and short-term effectiveness, reduction in toxicity, costs associated with each alternative, and a qualitative summary of the remaining criteria).

Details on the long-term monitoring plan, such as, the specific existing wells and sediment locations and associated analytical parameters, the locations of new intertidal groundwater sampling and associated analytical parameters, the specifics on the shell fish monitoring, etc.

3. The region does not agree with the implied preferred alternative, Alternative 2 (soil cap). EPA finds that this alternative does not comply with ARARs and therefore cannot be the preferred alternative. Additional comments on the ARARs will be forthcoming.

4. EPA proposes a Contingency Alternative that would be based on all the components of Alternative 4. If during the remedy design phase the Navy wishes to petition EPA and RIDEM to omit construction of the vertical barrier component of the remedy, the Navy would have to provide justification that the vertical barriers are not necessary to prevent the future re-contamination of the intertidal ecological zone.

5. The document presented here follows the normal feasibility study format with the exception that is does not discuss each alternative separately using only the merits or faults of that alternative. If one alternative has the same problem as another then that problem should be discussed in both places.

6. The entire report is biased toward the selection of Alternative 2 - Soil Cap. The report continually provides all the positive aspects of this alternative but none of the negative aspects. On the other hand, the discussions for Alternatives 3 and 4 point out the negative aspects, and continually discuss rationale that supports not selecting these alternatives, even though the rationale provided has not yet sufficiently been proved. The purpose of an FS is to gather all information known about the site, and evaluate the advantages and disadvantages of each remedial alternative. Then, based on the evaluation, a preferred alternative is selected. This FS should be written in the same manner.

7. The conclusions of the ecological risk assessments summarized in this feasibility study are premature at best, and in many instances incorrect. Although the various phases of the ecological risk assessments (i.e., Phase I and Phase II) had conclusions within them, they were never agreed upon by the EPA. (That was the primary reason for conducting additional phases.) Therefore, to state conclusions in this FS regarding ecological risks that were never agreed upon is incorrect, and these statements should be qualified as such in the report. This pertains to references to ecological risks discussed in the Executive Summary, Section 1.4.3, 1.4.4, and any additional references throughout the report.

8. The justification for creating additional wetlands is not clear as presented in this report. If the soil cap will prevent further erosion of the landfill, and leachate is not a significant contributor to the harbor, as the Navy contends throughout the report (although it is not supported by data), why is the creation of wetlands considered as part of the remedial alternatives? If the wetlands are being created to compensate for previous contamination, that is, compensation for natural resource damages, that should be presented in this context.

9. The scopes of the cap integrity, ground water and wetland monitoring plans should be detailed in the FS due to the impacts on eventual costs.

10. The document does not discuss the effects of flushing that would occur if Alternative 2 were used as a remedy. A soil cap would be permeable and would allow the shallow surface water to flush the through the waste, therefore, there would be risks to account for in the discharge of groundwater.

11. The document does not discuss the possibility of more rapid biodegradation when an anaerobic system is created under an impermeable cap. The biodegradation of chlorinated solvents is enhanced by anaerobic conditions.

12. The text has a number of extraneous comments that are added but not explained. The issue of design difficulties that is thrown out in several places may have impacts on the cost of an alternative. These design difficulties need to be discussed and explained so that the reader can evaluate whether they impact the viability of a specific alternative. Comments about how visually pleasing one alternative over another to the boating public should not be mentioned unless there have been public comments that indicate this is a viable concern.

13. Several references are made about removal of hot spot materials. These references should be removed as they have no bearing on the feasibility of the chosen alternatives.

14. <u>Fate/Transport Modeling Approach for Redox-controlled metals</u>: It does not appear that the Navy has adequately modeled the contribution of metals, specifically redox-controlled metals (e.g. arsenic), in ground water to intertidal sediments (of primary concern is the concentration of arsenic). Although current data do not strongly suggest that ground water contamination is causing a problem <u>presently</u>, it is unclear what the <u>cumulative impact</u> of continued discharge of contaminated ground water to the harbor sediments will be over time.

a) More importantly, the modeling approach used for fate and transport in the RI is not sufficiently sophisticated to answer this question, as highlighted in the RI comments, due to the relationship of metals mobilization to VOC biodegradation which is not considered by the model. Although the modeling approach considered biodegradation of VOCs by using a half-life approach, the associated phenomena with respect to metals were not considered. Specifically, arsenic, a primary risk driver for near shore sediment risk, is prone to mobilization and hence enhanced transport via ground water in conjunction with changing redox conditions. Biodegradation of VOCs has been demonstrated to produce these conditions. Further, the reducing geochemical environment generally associated with many landfills - irrespective of VOC contamination - has been demonstrated in other sites to facilitate mobilization and concentration of arsenic in response to changing redox conditions.

b) Source Term Approach: In this context, the source term approach employed by the Navy to model retardation of chemicals in ground water is not appropriate for arsenic, as well as other metals which exhibit pronounced influence by redox condition on environmental fate. Simply put, the "source term" of the arsenic need not be derived from disposal of a given quantity of arsenic-containing waste into the landfill. Rather, arsenic is a widely disseminated, naturally occurring element which makes up some of the minerals within the bedrock units as well as the unconsolidated aquifer materials derived from them. As reduced leachate/contaminated ground water flows through such aquifer materials, arsenic may be liberated at various locations along the ground water flow path, where geochemical conditions are appropriate. Thus, although disposal of arsenic-containing wastes may contribute to the arsenic "source term", this represents only a portion of the total arsenic available to the system.

15. The general issue of fate and transport of redox-controlled metals such as arsenic is not well understood. The problem is acknowledged, yet the actual fate and transport mechanisms, and monitoring methods are less clear. As such, the problems with the existing fate and transport modeling may be extremely difficult, if not impossible to correct with respect to the arsenic issue. It is therefore suggested that a presumptive remedy approach be used for ground water containment. Consensus exists that capping (i.e. impermeable cap) will provide substantial immediate benefits. Other remedial components necessary for ground water containment, such as vertical barriers (i.e. sheetpile walls, slurry walls), hydraulic containment (e.g. pumping controls), etc. should therefore also be approached via the presumptive remedy approach.

16. Perform Modeling to simulate effects of FS alternatives: A major deficiency of this FS is the lack of modeling to support

changes to the ground water system which would accompany all of the proposed alternatives (with the exception of the "No Action" Scenario). The potential effects of capping and other remedial measures on ground water flow system include, but are not limited to the following:

- Ground Water Mound reduction
- Potential for/Consequences of reduction in lateral/vertical extent of fresh water lens (i.e. fresh-saline interface)
- leachate reduction due to reduced infiltration
- tidal influence on reconfigured ground water system

Primarily, the Navy has not modeled the effects of the capping alternatives on the site hydrology. Although it is apparent that there would be a reduction of the amount of waste in the saturated zone and therefore a likely reduction of the amount of leachate discharged to the intertidal zone if an impermeable cap is placed on the site, this has not been demonstrated. Further, there is an important horizontal component to the groundwater flow system that should not be overlooked. It appears that the groundwater will continue to flow from the north-west to southeast through the landfill, albeit through a smaller thickness of saturated waste. Nonetheless, with an impermeable cap the tidal flushing through the landfill's toe may be increased as the ground water mound in layer 1 is flattened substantially, thus potentially increasing leachate exchange to the intertidal zone. Reduction in the ground water mound following capping would also be expected to alter the position of the saline/fresh water interface, which may produce unexpected consequences. This interface may in part control the location of ground water discharge to the harbor floor (The potential effects of the fresh/saline interface have not yet been addressed for the current ground water conditions as modeled in the RI/FS).

This modeling, though required to support the FS, will also be needed to identify the appropriate locations for long-term monitoring (LTM). The degree of uncertainty inherent in the modeling process indicates that LTM will be required to monitor the effectiveness of the remedy which is selected.

17. <u>Additional remedial components</u>: Modeling is also required to evaluate additional remedial components which include, but are not limited to:

- vertical barriers
- hydraulic controls
- artificial wetlands

The potential for ground water contamination to degrade created wetlands is yet unclear. Until it can be clearly demonstrated, i.e. through LTM, that ground water is not problematic, construction of artificial wetlands should not proceed. It makes no sense to propose this concept until the ground water issue is resolved. Further, if ground water is problematic, additional remedial components may be required. This concept should be given preliminary consideration at once.

18. Performance Monitoring: Optimum locations for long-term monitoring of sediment/ground water quality will need to be selected and monitored. The FS should acknowledge clearly the reality of the necessity for LTM, as well as providing a general outline of the anticipated LTM program. The LTM program should be devised in such a way as to enable resolution, after a sufficient time period, of the following questions:

a) remedy effective ? (Need to establish criteria)
b) wetlands creation permissible ?
c) additional remedial components needed ?

Clear criteria for establishing success/failure, based on the results of the LTM, will also need to be addressed at this juncture (i.e. FS phase).

SPECIFIC COMMENTS

19. Page ES-1, third paragraph and Chapter 1, page 3; the Navy states that "the landfill was closed in 1974 and a 2-foot soil cap placed over the fill materials" yet the Navy makes no mention of how the effectiveness of the proposed soil cap will be better than the one the Navy already placed on the site. Since the previous soil cap failed to prevent contamination from entering the harbor, how can the Navy be certain that a new soil cap will not fail?

20. Page ES-2, first paragraph; an historical discussion should be provided regarding past FSs written for this site. The discussion should summarize each of the previous reports, what was contained within them, and why each was written. As the report currently is written, only 4 alternatives are provided and no rationale is presented as to why other alternatives were reviewed. People involved during the entire process understand why we are starting with only four (relatively detailed) alternatives, but a first time reader may not. Please clarify.

21. Page ES-2, first bullet; while the statements are factual, the paragraph is misleading. The total carcinogenic risk for future recreational users of the site (soil exposures plus showering exposures) is actually 9×10^{-3} (above the risk range) and the non-cancer risks were above 1, HI = 5 for the RME. Modify the paragraph to include all exposure pathways.

22. Page ES-2; In the last paragraph on this page, the meaning of the term "deep ground water" is not clear. A definition

should be added.

23. Pg. ES-3, ¶ 1 and 3; The potential impact of "seeps" remains unresolved. The seep samples were collected from dug holes. While EPA agrees that these samples may not represent the true condition of the sediment pore water, this data was used in the RAPS reports and toxic effects were found on the ecological receptors.

24. Page ES-3, second paragraph; the RAPS Phase I ERA did indeed determine "significant mortality was associated with material collected the north middle and south faces of the landfill", although sediment grain size may have been a complicating factor. The RAPS Phase 1 ERA did also conclude that "Allen Harbor interstitial water was substantially more toxic to sea urchin fertilization , growth, and survival than was" the reference station. The Navy is not providing all the appropriate information in this para-phrasing of the document. The ecological risk section should either be removed or all positive and negative information should be included. This paragraph should, at the very least, indicate that overall there was an impact noted in the harbor, but an exact cause could not be determined and so therefore Phase II was initiated.

25. Page ES-3, second and fourth paragraph; the Navy should indicate that the "relatively low levels of constituents of concern in sediment" are above benchmark criteria rather than stating that they were lower than other stations in Narragansett Bay or in the Narrow River.

26. Page ES-3, third paragraph; the RAPS Phase II ERA did conclude what the Navy states, however, not as is implied. The runoff sources alluded to are the Spink Neck storm drain rather than the erosion of the 1974 landfill "cap".

27. Page ES-3, 4th paragraph; while again the Navy's statements are factual, all information was not presented so the tone of the paragraph was not entirely correct, the RAPS Phase III conclusions also included the fact that "Allen Harbor sediments have the substantial potential to impact the four biological endpoints". Please modify the paragraph so the reader has all the facts with which to make their own determination.

28. ES-3 , 5th paragraph; the Phase III Marine & Terrestrial ERAs were issued in draft-final form after this FS. Please modify the para-phrasing of the conclusions of the marine ERA to indicate that "the vitality of pelagic, epibenthic and infaunal communities located in habitats proximal to the Allen Harbor landfill to the north and south may be at moderate risk...Hence it is concluded that indigenous biological communities in the immediate vicinity of the southern portion of the landfill are at risk primarily due to landfill-related stressors..." The

Terrestrial ERA has also concluded that there are ecological risks in the Allen Harbor watershed, "...those analytes that appear to be of primary concern because of relatively high HQs, involvement of several ROCs, or both are: DDT, cadmium, total Aroclor and zinc..HI analysis for Allen Harbor watershed indicates very high risk due to total metals exposure for Hawk, heron, shrew, and mink, and total pesticide/PCB exposure for hawk, heron, and shrew all other HIs are judged significant (greater than 10.0) with the exception of heron and tern for PAHs."

29. Page ES-4, top of page, last sentence; while the draft ERA made such a conclusion, once additional data evaluation was performed, the draft final ERA has concluded that,"...In the Allen Harbor watershed, the number of COCs was large (43) and double/triple digit HQs were common....although the risks were not reflected in the benthic communities the elevated HQs, particularly for pesticides, represent potential chemical risk to aquatic receptors in the Hall Creek and Allen Harbor watersheds." Please update the FS to include the most recent ERA information.

30. Page ES-4, third paragraph, last sentence; EPA cannot agree with the Navy's statement that groundwater is "...no of risk to offsite receptors." The groundwater, subsurface soils and leachate near MW-09-05S contains the same PAHs that are sediment COCs (e.g.; anthracene & fluroanthene) and the ERA has concluded that there is an ecological risk due to exposure to PAHs in sediment. Also the modeled value of the discharge from the landfill to the sediments of trichlorethylene could be as high as 17 times the criteria. An effect is most likely happening, since at this high value the TCE could be mobilizing the metals in this area which would then become bioavailable.

31. Page ES-4, third paragraph; the statement "Ground water has been identified as a minor migration pathway" may be premature. Many comments on the Phase III RI were provided to the Navy regarding this issue that may change the results of that study. In addition, the results, as they were presented in the Phase III RI indicated that as much as 15.4 percent and 13.5 percent of chromium and lead, respectively, in the harbor sediments may be present as a result of ground water discharge to the harbor, which may possibly not be "minor."

32. Pg. ES-5, Baseline Remedial Actions; It may be appropriate to note that the content of these various baseline remedial actions will need to be the subject of future detailed discussion. For example, the long term monitoring component is critical to any remedy selected (with the exception of the "No Action" scenario), and hence will require the establishment of the location, type, and frequency of any monitoring actions during the design phase.

33. Pg. ES-6; Alternative 2 ; It is unclear how a soil cap will "reduce infiltration into the source area". Given the fact that the area is currently covered with an irregular soil cover, is it implied that the updated soil cap will have certain permeability values ? Again, this alternative is based on the premature conclusion that the RI data do not suggest sufficient risk from site ground water contamination, which is not appropriate in an FS, particularly since EPA does not concur with this analysis.

34. Page ES-7: The most recent ERA does indicate that there is some ECO risk at the southern and northern coastlines of the landfill. Please reevaluate this conclusion using new data. At this point the decay of a wall or sheet piling is not analyzed and it is unknown how long they may last or need to last.

35. Chapter 1, Page 5, Section 1.2.3.2, first paragraph; the term "artificially elevated exposure concentration data" may not be appropriate. It is possible that the water collected from these seeps may not actually contain ground water that was discharging to the harbor. However, regardless of where the water came from, the concentrations detected represent possible sediment/water concentrations that are available for exposure and they are not artificially elevated. Artificially elevated implies that the detected concentrations are higher as a result of some type of problem with sampling. This statement should be clarified.

36. Chapter 1, page 6: The statement in the second line of this page "sources within was Allen Harbor including Allen Harbor" does not make sense.

37. Page 1-6, ¶ 1; indicate in the test the composition and mesh size of the "Whatman 4 filter" .

38. Page 1-6, ¶ 3; define "shallow" and "deep".

39. Page 1-9, ¶ 3; "very" should be "vary".

40. Page. 1-9; text does not mention the presence of a second peat layer beneath the harbor.

41. Page 1-10; as presented, there is very little difference between the average hydraulic conductivities for the various layers, which presumably refer to horizontal K values. Given this fact, how were vertical K values assigned to the model ? How do the vertical gradients measured at the site compare with the horizontal gradients measured at the site ? A brief paragraph is needed which provides the approach used to model the vertical component of ground water flow, including the uncertainties inherent in this approach. It should also be stated that the hydrogeology beneath the harbor is not constrained by data and is thus subject to some uncertainty.

42. Chapter 1, Page 10, fourth, fifth, and sixth paragraphs; what is the rationale for stating the water within each of the aquifers is nonpotable? This rationale should be included along with the statement.

43. Page 1-11; Section 1.4.1.1; EPA does not concur with the statement that VOCs were not identified as "elongate plumes", but were rather identified in "isolated areas". This language is misleading in that it downplays unmistakable concentration gradients of VOCs in deep and intermediate ground water leading from the central source area (near MW-7) eastward to the harbor, a relatively short distance which is consistent with the ground water flow gradients. The harbor's edge also represents the end of the area of data coverage. All alternatives should require that deep ground water samples are collected beneath the harbor via a barge-mounted rig for use in the design and implementation of the long term monitoring plan.

44. Chapter 1, page 11, last paragraph; the Navy should point out that the fact that any VOC contamination was found in the deep core sediment sampling location supports the groundwater model that indicates the upwelling of groundwater within the intertidal zone.

45. Table 1-2; the Phase I Marine Ecological Risk Assessment data should not be eliminated from presentation in this table. Rather, a note should be provided that explains these data may be elevated because of sampling methodology.

46. Chapter 1, page 12: Units for the number 0.03 in the second paragraph are needed.

47. Chapter 1, page 12, 5th paragraph, last 2 sentences; since this FS is for the Allen Harbor Landfill, not for the non-Navy site of Spink Neck, remove the last 2 sentences.

48. Chapter 1, page 13: In the second paragraph, concentrations are expressed in ng/g. Units elsewhere in the report are expressed as mg/kg. It is appropriate to use consistent units in the report, please correct the units.

49. Chapter 1, page 15 second paragraph; the blanket statement that the "groundwater in the area of MW2S discharges to freshwater areas west of the site," may be correct when there is a ground water mound at the site, however during the dry season last year the groundwater mound seemed to have disappeared. Please clarify.

50. Chapter 1, Page 16, Section 1.4.1.5, in general; the conclusion that the majority of contamination in the nearshore sediments is a result of overland runoff is possibly somewhat premature since all comments on the Phase III RI modeling have

not yet been addressed. In addition, even if overland runoff is a likely source for much of the contamination, other transport pathways should be discussed. In particular, a discussion should be included on the potential enhanced mobilization of metals within the ground water as a result of the reducing conditions in the landfill.

51. Chapter 1, Page 16, last partial paragraph; The Navy has stated that "ground water is not a plausible VOC transport mechanism." The transport of contaminants in ground water is certainly plausible. VOC in deep cores do indeed indicate that groundwater is upwelling into the intertidal sediments. Additionally if there is a new release of unknown barrel wastes groundwater will be the first mode of transport to the harbor. All of the sources of waste may not have been released at this point. See previous comment on FS page 11, Chapter 1.

52. Chapter 1, Page 19, second paragraph; the question regarding whether correct Kd values for metals were used remains. The Kd for metals is highly dependent on site conditions and it has not yet been established that the Navy considered these conditions when selecting the Kd values. In addition, the full reference for the citation Baes, et al. (1984) is not presented in the reference section.

53. Chapter 1, page 19: In the first line of the next to last paragraph, phenanthrene appears twice.

54. Chapter 1, page 25, 3rd paragraph, last sentence; Hazard Indices and Hazard Quotients are defined as site concentration over recognized bench mark criteria not site concentration over reference concentration. This comment has been made on the draft ERA and the draft final ERA corrected the use of HI and HQ. Please use the updated information in the FS.

55. Chapter 1, page 26, section 1.4.5. para 2, 2nd & 3rd sentences; recommended revision:
"Risks associated with exposures to chemicals of concern in soil, groundwater, surface water, sediments, and shellfish" pathways were assessed for relevant exposure routes as listed below."

56. Chapter 1, page 30, section 1.5; Add a bullet to reflect that the RI results also support the conclusion that consumption of shellfish and groundwater ingestion would pose an unacceptable human health risk.

57. Chapter 2, page 5; add a bullet for leachate and the necessary text throughout the document.

58. Chapter 2, page 5, section 2.3, 2nd paragraph; add a sentence to explain why the site is not considered a viable source of drinking water, such as the expected saltwater

intrusion during low groundwater table or the federal classification of the groundwater.

59. Chapter 2, page 6, section 2.4; EPA guidance does state a preference for the containment of groundwater. The guidance indicates a preference for containment of the source with site specific actions for the management of contaminated groundwater that has migrated away from the site. The guidance also states that the Presumptive Remedy for a landfill may also include the collecting and treating of contaminated groundwater and leachate to contain the contaminant plume and prevent further migration from source area and the controlling and treating of landfill gas. Please include this information in the FS.

60. Chapter 2, Page 6, Section 4; the Navy is comparing the ambient water quality criteria (AWQC) to ground water concentrations, however, AWQCs are not developed for ground water but rather for surface water. This should be explained in the text.

61. Table 2-5; prior to the presentation of this table, the Navy claims that discharge of shallow ground water to sediments does not result in elevated sediment risks. Yet a remedial action objective for shallow ground water is to "reduce or eliminate off-site migration of concentrations of chemicals of concern above state and federal marine chronic AWQC for shallow ground water discharging to marine receptors." This appears inconsistent.

62. Chapter 2, page 7, first paragraph, last sentence; would the "subsurface source area erosion " be the leachate generation? Please clarify.

63. Chapter 2, Page 8, second paragraph; this paragraph notes that polycyclic aromatic hydrocarbons (PAHs) in shallow ground water have been identified as risks to marine ecological receptors, but later chapters minimize the importance of groundwater in causing risks to marine life. The purpose of the FS is not to evaluate risks or their importance but to utilize what risks were determined to be elevated at the site in the risk assessments and develop feasible alternatives to mitigate those risks.

64. Chapter 2, page 11, first paragraph, last sentence; the land surrounding the landfill is mostly urban with available public drinking water supplies both on the base and off base that could be tied into to provide recreational users of the capped landfill drinking water. Please re-evaluate this statement.

65. Chapter 2, page 12; the effectiveness of the soil cap could be reduced by establishing vegetation. It is stated that large trees would not be established because uprooting by wind may

damage the cap. However, there are no provisions for removing trees before they grow large. The establishment of trees and shrubs in poorly permeable soils may actually increase the potential for infiltration by the introduction of roots and soil-dwelling organisms that tend to increase porosity and permeability. Increased infiltration in wooded areas may counterbalance increased losses to evapotranspiration.

66. Chapter 2, page 26, section 2.7.7: provide a discussion of how storm surges would affect the remedial action for intertidal sediment. This possibility was not addressed.

67. Chapter 2, Page 26, last paragraph; the statement that biotic and abiotic processes can degrade polychlorinated biphenyls (PCBs) and PAHs is misleading. While true conceptually, no data has been presented that indicates that any significant degradation of PCBs and the heavier PAHs is occurring.

68. Chapter 2, Page 31, second paragraph; low redox potential does not necessarily mean low metal mobility, although this may generally be the case.

69. Chapter 3, page 2, last para., lines 4-6; a risk qualitative assessment (including comparison to conservative screening values) will be needed to determine if dredged sediments from Allen Harbor will pose a human health or ecological risk if the sediments are used to construct the soil cap.

70. Chapter 3, page 7; how will the permeable soil cap prevent the source material from contaminating more groundwater? The soil cap is porous and with deep rooted vegetation will be even more porous. The water may run off do to the grading but much of the rain will be absorbed into the soil before it runs off. This action will cause flushing and allow for more contaminants to reach shallow ground water and eventually the harbor. This alternative will also inhibit anaerobic biodegradation which is a good destruction mechanism for chlorinated solvents.

71. Chapter 3, Page 8, 3.2.3.4: What are the design difficulties that mentioned? Engineering/design difficulties for alternatives 3 & 4 should be fully developed rather than left as generalized statements.

72. Chapter 3, Page 3-10, 3.2.4.4: What are the design difficulties? This alternative may provide the most anaerobic degradation for chlorinated volatiles because the will be less flushing. This alternative will have to allow for a gas venting system to be designed and implemented. If venting is implemented then there will have to be some type of initial ambient air monitoring study to determine if the vents are allowing hazardous gas to exit the landfill.

73. Chapter 4, Page 4, second sentence; it is unclear how the no action alternative will meet location-specific applicable or relevant and appropriate requirements (ARARs). If no action is taken, then contaminants will continue to migrate to the adjacent wetlands.

74. Chapter 4, Page 6, Section 4.4.1.3; it is unclear why the contaminated shoreline sediments would be removed and then possibly placed "beneath constructed shoreline wetlands." In addition, no discussion is provided regarding the feasibility of temporarily removing shellfish to another location, or to cages, and then returning them to newly created wetlands.

75. Chapter 4, page 16, paragraph 2; what data suggests that the "more weathered and less contaminated landfill face soil" will be that part left exposed to the environment if the cap is terminated above M.S.L.? According to the previous section 4.5.1.2, 22,000 CY of soil and fill will be removed from the landfill face when the face is pulled back 5 feet and graded. The fill left to be exposed will be the fill that had been covered by land filing activities and not exposed to the daily tidal influence that the existing face has been exposed to and therefore not "weathered" and the fill will likely be more contaminated than the existing surface of the landfill face.

76. Chapter 4, page 17, second paragraph; provide the calculations that support the statement that "COC transport....will be reduced." Provide the calculations that support the statement that COC in shallow ground water are anticipated to meet marine AWQC once the cap construction activities are complete.

77. Chapter 4, page 17, third paragraph; provide more explanation of why the Navy feels that the incorporation of synthetic materials into an engineered construction effort is uncertain.

78. Chapter 4, Page 4-18, In this alternative the shallow groundwater will still be flushing through the waste and discharging to the stream or harbor and the tides will continue to flush the landfill face twice daily. The Navy will have eliminated the rainwater infiltration. What is the resulting reduction in leachate generation? What is the volume of water infiltration? How does the Navy know that with or without the cap the infiltration is low ? Where is that data? Compare the groundwater flux with the infiltration of ground water. The same would be true for Alternative 2, but that is not mentioned in the discussion of alternative two. Alternative 3 eliminates infiltration thus slowing down the upper groundwater flow. A multimedia cap may allow for more chance for anaerobic biodegradation of the chlorinated solvents since there will be less oxygen and low flow of ground water. More VOC may be

destroyed. The fate of the contaminants for each of the alternatives should be discussed rather than comparing alternatives at this point.

79. Chapter 4, Section 4.5.2.6; "If source area treatment is needed in the future due to ineffectiveness of the containment system" is stated as a negative for having a RCRA cap. The same could be said for the Alternative 2. If this were to happen then the cap would have to be opened and the source waste removed. The hot spot sources should be fully investigated and known before a cap can be constructed. This feasibility study is based on the assumption that all those sources are remediated or known. The RCRA cap is actually a better alternative for containing a hot spot than Alternative 2 that will allow for some infiltration through the hotspot into the shallow groundwater. The Navy should not be thinking about hypothetical negatives at this point in this document.

80. Chapter 4, page 21, section 4.6.1.2; this description is the only one to discuss the pine trees along Sanford Road. These trees may have to be removed no matter which cap is place on the site due to their proximity to the waste. They would also be a detriment to the cap integrity since they readily shed branches in wind storms that could puncture the cap creating infiltration pathways.

81. Chapter 4, Page 4-25, 4.6.2.3: The chlorinated volatiles may start to biodegrade before they reach the sheet iron wall. When they reach that wall the iron put into solution anaerobically may actually act as a catalyst in the destruction of the chlorinated solvents. The barrier life may be long enough to allow for the ground water to remediate it self, and at the same time prevent more contaminants from reaching Allen Harbor.

82. The discussion of forming a habitat for birds and indigenous animals by having a soil cap is out of place in this discussion. The soil cap may allow deep rooted plants to grow, but these deep roots and animal boroughs may also be another conduit for infiltration. If the deep rooted plants were to topple during a storm then they would leave deep holes in the soil cap. Having no deep rooted plants and only grasses may be just as pleasing as scrubs and trees. The scenic value of the final remedy is not a criterion for choosing the final remedy, unless public comments are received during the public comment show that the general public is vehemently opposed to a field. The mowed grassland would also be a viable habitat for other species and therefore should be included as a plus for the multimedia cap.

83. Chapter 5, page 2, second & third paragraphs; the deep-rooted vegetation allowable on the soil cap cannot be the tall tress that is included now in the "natural aesthetics of the harbor".

84. Chapter 5, Page 5-4, 5.4: This document does not discuss the advantages of a closed system. The biodegradation of the waste would stop completely with no water infiltration, but we know that there is groundwater flow across the site that may not be influenced what so ever by infiltration. The closed system may be the perfect bioreactor.

85. Chapter 5, page 4, third paragraph; indicate that Alternative 3 and 2 have the same amount of short-term risk.

86. Chapter 5, page 6, 5.7; the added protection of a multimedia cap is not much more expensive than a soil cap, it would be more protective of human health and the environment and would comply with ARARs.