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NSY PORTSMOUTH
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LETTER AND COMMENTS FROM UNIVERSITY OF NEW HAMPSHIRE AND NEW
HAMPSHIRE FISH AND GAME REGION III REGARDING OFFSHORE ECOLOGICAL RISK
ASSESSMENT NSY PORTSMOUTH ME
10/16/1995
NAVFAC NORTHERN

Oct/16/1995



DEPARTMENT OF THE NAVY

NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
10 INDUSTRIAL HIGHWAY
MAIL STOP, #82
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IN REPLY REFER TO

5090
Code 1823/JMC

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

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

Subj: OFFSHORE ECOLOGICAL RISK ASSESSMENT, PORTSMOUTH NAVAL SHIPYARD, KITTERY, ME

Dear Ms. Cassidy and Ms. Beardsley:

From the beginning, the University of New Hampshire (UNH) has been a valuable contributor to the offshore investigation and ecological risk assessment (ERA). Their knowledge of the Piscataqua River and the Great Bay Estuary has made their contributions as part of the team of investigators led by Navy Command, Control and Ocean Surveillance Center (NCCOSC) invaluable. Since completion of field work and feeder reports prepared by various UNH and other investigators, finalizing the ERA report has been primarily the responsibility of NCCOSC. To ensure UNH's expertise and involvement is continued through finalization of the ERA we have extended their involvement in the review process. See enclosure (1) for comments received from UNH on the ERA report. UNH is also involved in developing the offshore monitoring workplan and its implementation in an effort to maintain their expertise in the offshore work.

Enclosure (2) contains comments received from New Hampshire Fish and Game that had been faxed earlier. If you have any questions, please call me at (610) 595-0567 extension 117.

Sincerely,

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

- Encl: (1) University of New Hampshire fax of October 16, 1995
(2) New Hampshire Fish and Game ltr of August 17, 1995

Copy to: w/encl:

NOAA (K. Finkelstein)

EPA (P. Tyler)

USFWS (K. Munney)

Maine Department of Marine Resources (D. Card)

New Hampshire Fish and Game (J. Nelson)

PNS (Code 121.10, F. Endyke, ~~w/o~~)

Brown and Root Environmental (M. Perry, w/o)

UNH (F. Short w/o)

NCCOSC (B. Johnston, w/o)

TO: Lt. Jim Conroy
Northern Division

FROM: Dr. Frederick T. Short
JEL/UNH

DATE: 16 October 1995

RE: Draft ERA Review

Clearly, this ERA represents a huge effort and necessitates the organizing and synthesizing of a tremendous volume of data. Additionally, the work was done under a considerable time constraint. Under the circumstances, Bob Johnston was able to gather and present the efforts of many scientists, and his work is appreciated. However, there are still some real problems with this document that must be corrected before the final version comes out. I know that this will only add to Bob's workload, but nevertheless these changes are important for the overall accuracy and credibility of the final Ecological Risk Assessment for the Portsmouth Naval Shipyard. I appreciated the opportunity to review the document again at this stage, although I, too, was working under a time constraint and my comments are not presented in manuscript form. I will be happy to discuss my comments and those of my colleagues at UNH/JEL with you and Bob Johnston. Dr. David Burdick's comments follow mine; unlike myself, he made comments on the manuscript document, and his marked-up copy is being forwarded to you.

General comments

The draft ERA often gives COC levels elsewhere in the estuary first, drawing the focus away from the Shipyard. Or when presenting Shipyard levels saves the worst news for the end of the paragraph, often preceded by "additionally" or some other prefix that downplays the results.

This report is always pointing in another direction besides the Shipyard, to the degree that it loses credibility. Clearly there are other potential sources of contamination in the estuary, but the purpose of the ERA is to identify potential sources from the Shipyard.

The draft ERA does not acknowledge that although we are talking about past practices, there may be ongoing contamination of the estuary from Shipyard sources.

Statements that "no ecological damage" was found in relation to SWMUs are inappropriate since not specific surveys of ecological damage was made.

The document does not present a balanced view of all the data available from our studies. Generally, the draft ERA takes a negative attitude toward data that tends to implicate the Shipyard in the contribution of COCs to the estuary and often that data tends to receive a very brief description.

The Risk Characterization is not clearly presented. It is difficult to understand how risk was determined and to get a real feeling for the levels of ecological risk involved. Diagrams showing the Risk Characterization methods should be included and the actual implementation of this process laid out in the text.

In the concluding sections of the report, far too much emphasis is put on Phase I data; Phase II data is not adequately included. The extensive quotations from the Phase I report are not appropriate or sufficient.

There is an erosion of information through repeated presentation, often in such a way that possibilities become certainties as the text progresses. For instance, the causes of the absence of eelgrass in Clark Cove are stated to be "unknown" at the beginning of the volume, but by Sections 7 and 8, the lack of eelgrass is being attributed to physical disturbance. In fact, we do not know why there is no eelgrass in Clark Cove.

The choice of avian receptors should be changed.

DDT should be considered as a Contaminant of Concern.

Seeps are dismissed as sources of COCs to the estuary without foundation and are not included in the Risk Calculation.

Reference to "highest levels" instead of to patterns of high levels is made throughout the text. This practice is misleading and can result in dismissal of high levels around the Shipyard.

There are many spelling, language, and grammar errors, especially agreement of subject and verb, throughout. Use of many acronyms without definition.

The way the report is currently written, it takes a great deal of effort and detective work to figure out what is being said. There is no summary that is easily accessible and readable that details the findings of ecological risk and the relation of that risk to the Shipyard in terms of proximity or patterns of distribution.

Specific comments on the Navy ERA:

1-1 Section 1.2 Line 4 remove "ecological"; the stressor is not ecological in nature

1-1 Section 1.2 Line 6 "area" should read "areas"

1-1 Section 1.2 Line 8 "stressor exposure levels" should read "levels of exposure to stressors"

Line 9 "release of key contaminants of concern" should read "release of contaminants". At this point, no contaminants, let alone "key" contaminants, had been identified as being of concern.

1-1 Section 1.2 3rd paragraph Line 3 "identify key contaminants" should read "identify contaminants of concern". The purpose of the study was to find all contaminants, not to determine "key" contaminants.

1-2 Include DDT in the list of contaminants of concern at the top of page 1-2. What is needed is a map of DDT levels around the Shipyard and Portsmouth Harbor (see Fig. 4-1, page 4-25) and a clear statement that DDT has not been associated with SWMUs and is not a problem originating from Seavey Island.

1-2 Section 1.3 Remove "zinc" and "nickel" and refer to Zn and Ni and do the same for PAHs, PCBs, and DDT, i.e., name fully at first mention, and then use initials.

1-2 Section 1.3 First paragraph "the island" should be "Seavey Island" and "DRMO" should be spelled out, since these are first mentions

1-2 Section 1.3 "*Sediments were identified as proximal sources of...*" should read "*Sediments were identified as a site of contaminant accumulation providing secondary exposure to estuarine biota.*"

1-2 Section 1.3 Paragraph Line 3 replace "indigenous blue mussels" with "indigenous blue mussels and eelgrass"

1-2 Section 1.3 Second paragraph Line 6 "potential bioaccumulation of PAHs" should read "bioaccumulation of PAHs" Did lobster and flounder bioaccumulate PAHs?

1-2 Section 1.3 Paragraph 2 line 9 "produce the types" should be "produce some of the types". Only some of the ecological effects were shown in the Pb experiments

1-2 Section 1.3 Second paragraph Last sentence This is not a true statement. Water-borne exposure is important but so is sediment exposure, which is probably the cause of the anomalies in benthic community structure in Clark Cove, for instance. Leave this sentence out -- everything in the estuary is water-borne or direct sediment exposure, and the sentence just doesn't say anything important.

1-2 Section 1.3 After paragraph 3, add a new paragraph which discusses the other contaminants of concern besides Pb. I suggest:

"Although Pb as a major contaminant of concern was directly linked in the ERA to Shipyard sources, other contaminants of concern were identified in the estuary near the Shipyard, have potential sources on the Shipyard, and constitute potential risk to estuarine biota and ecosystems. The exposure of estuarine biological receptors to other divalent metals including Hg, Cu, Zn, and Ni is likely similar to Pb and related to the varying concentrations of these metals in sediments and other sources around the Shipyard. These and other contaminants of concern (Cr, Ag, As, Cd, as well as PAHs, PCBs, and DDT) were found in elevated concentrations from biota sampled near the Shipyard and may contribute to the ecological stress observed in the vicinity of the Shipyard."

1-3 Section 1.3 Last paragraph line 1 "indicates heavy metals released" should read "indicates heavy metals, and perhaps organic contaminants"

Line 3 "catastrophic exposure and effects, and the rapid" should read "catastrophic exposure and effects, the large volume of clear-water tidal flushing in the lower estuary, and the rapid"

Line 5 "low-level chronic exposure" should be "chronic exposure" You have not defended Pb or other levels as being "low" in the document

2-5 Section 2.3 Paragraph 3 Description of Section 4.0 should be a separate paragraph. This section is a main thrust of the entire study and deserves its own paragraph. The last sentence should read, "Taken together with Section 3.0, Section 4.0..."

Figure 2-1 has poor labels. Hard to distinguish what is being labelled, particularly Seavey Island and Spruce Creek. Should include Pierces Island.

Figure 2-4 is unreadable

3-2 Section 3.2.1 Paragraph 2 "The nature of the hazardous materials..." should read "The hazardous materials..."

3-3 Section 3.2.1 Paragraph 1 Line 4 from the bottom Here, you have converted from cubic yards (in the Table) to cubic meters in the text. Text should read "less than" (or the real number) since a cubic meter is larger than a cubic yard. Is the JILF is still a recreational area?

3-3 Section 3.2.1 Paragraph 2 Line 1 "the landfill would serve" should be "landfill might serve"

Line 2 "and would prevent" should be "and could prevent" The use of "would" here is a very odd construction and implies a kind of certainty that we don't really have. All the "would" statements in this paragraph need rewriting. Since at least some seeps are lower salinity than the estuary, some fresh water is moving through the JILF, creating a contaminant transport pathway. The text should reflect these facts.

3-4 Line 1 "seepage samples" should be called "seep samples" throughout the study.

3-4 Line 6 Levels above trace levels of inorganic contaminants have been found in the seep samples. See Cullen and Arimoto "Trace level inorganic analysis of marine and estuarine samples"

3-4 First full paragraph Last line ER-L has not yet been defined in the ERA document. Define the ER-L here.

Missing page 3-5 which contains section 3.2.1.3 and 3.2.1.4, i.e., SMWUs #5 and 26

3-6 Section 3.2.1.5 Wasn't tidal fluctuation observed in the tank?

3-6 Section 3.2.2 Paragraph 2 Line 7 Were microbial contaminants measure in seep water, as this implies? If not, remove "seep" and write a new sentence that outlines seep sampling.

3-6 Section 3.2.2 Paragraph 3 "Measurements of impacts on" should be "Assessment of impacts or stressors on ... were made by measuring the abundance of ..."

3-7 Section 3.2.3 Line 4 "were targeted because ...signals" should be "were targeted because these are also the sites of contaminant accumulation."

3-7 Section 3.2.3 Paragraph 2 Line 3 "one upstream and one downstream" should read "one adjacent to Pierce Island and one in a side channel of Little Harbor". Also, until now you have called it "Pierces Island" with an "s"

3-7 Paragraph 2 Last sentence add "or both" to the end of the sentence

3-7 Section 3.2.3 Third paragraph Line 8 "with stations visited by" should be "with some stations from"

4-1 Title "Selection" should be changed to "Determination" or "Identification" Selection sounds arbitrary.

4-1 Section 4.1.1 Paragraph 2 Last sentence Delete "pertinent". What would it mean here? - sounds as if there was a screen for pertinence.

4-2 Section 4.1.2.1 Second paragraph It is incorrect to refer to the Piscataqua River and upper estuary stations as "reference stations." Stations in the York River were the reference stations.

4-4 Section 4.1.2.1 Is the Hg data based (in Fig. 4-1) on Phase 1 data only? The detection limit resolution problem should have been cleared up in Phase 2 and then Phase 2 data should be used here instead. See Short and Hoover 1995. Consider the incorrectness of using only Phase I data for COCs

4-4 Section 4.1.2.2 Line 3 Explain "HQ" acronym
Line 4 Do not put references in parentheses when used as part of the sentence (same problem throughout)

4-5 Section 4.1.2.2 under Areas of Concern, the "Jamaica Island" listing should be "Jamaica Cove"

4-5 The heading "Sediment Exposure" should be all caps, with a space below it, to put it at the same level as WATER COLUMN SCREENING LEVELS

Paragraph 2 line 2 "organic data" should be "organic contaminants" Organic data for sediments means something completely different

Line 4 Spell out "Washington"

4-5 Paragraph headed "Metals" Begin with Seavey Island information, then go on to reference stations

4-5 Last paragraph line 2 WA-CL not previously defined

4-5 Last paragraph Line???? The correct microgram symbol should be used here and throughout

4-5 through 4-6 My response to the Hg detection problem is that the inadequate analytical method creates a data gap which cannot be resolved without further study, unless there is sufficient Phase 2 data to address the issue. If the data collected cannot resolve the issue, then this needs to be clearly stated as an area needing work. Should be included in data gap table.

4-5 Top of page. Give the station numbers for Areas of Concern and Reference Areas. "Reference Areas" should be labeled "Non-Shipyard Stations," as none of those listed are true reference areas.

4-5 Paragraph headed "Metals." line 2 Do not refer to Piscataqua River stations or Spruce Creek stations as "reference areas"

4-6 Paragraph headed "Organic Compounds." line 1 Figure 4-5 is not the screen for organic compounds -- maybe Figure 4-3?

Line 4 Reference stations are in Figure 4-4, not 4-6.

4-6 First paragraph under "Organic Compounds." last line Need a figure on pesticide concentrations.

4-6 Second paragraph under "Organic Compounds." Add "... near the Shipyard." to the end of the first sentence in the paragraph. At the end of the paragraph, add "near the Dry Docks," to the last sentence.

4-7 Line 1 and Line 3 Again, incorrect to refer to Piscataqua River stations as "reference stations"

4-7 First full paragraph Line 2 Again, incorrect to use "reference station"

4-7 First full paragraph It would be far better to start this paragraph with the following sentence: "Pesticide ER-M levels were exceeded for DDT in samples from numerous stations around Seavey Island, but none of the stations away from Seavey Island (Appendix III.D)." Your sentence gives the impression that Seavey Island has the same levels as elsewhere in the estuary, which is simply not backed by the data.

4-7 First full paragraph Obfuscation to state "at least one pesticide compound was elevated above ER-M levels" when there are three pesticides (ACHLOR, DDT and DDD) and many instances in Appendix III.D.2 of values exceeding the ER-M at stations around the Shipyard -- and none away from the Shipyard. The sentence should read, "The pesticides ACHLOR, DDT, DDD, and DDE exceeded ER-L toxicity thresholds at almost all of the stations near the Shipyard. Additionally, the only instances of these pesticide compounds (ACHLOR, DDT, and DDD) exceeding ER-M levels, mostly in sediment core samples, were from stations

around Seavey Island.”

* Screen for pesticides using pore water toxicity units does not seem to be sensitive or useful screen although this can't be determined from Appendix III D.4, since the toxicity levels are not given.

4-7 Last paragraph Line 6 “An” should be ? Ag, As? Zn?

4-8 First paragraph First of all, must be clear from the start that you are talking about seep water. Sentence 2 should read, “Two seep sampling stations (S2 and 1008)...

The sentence 7 lines from the bottom of the first paragraph mixes Phase I (S2 and S3) results with Phase II (1001 through 1008) results, and the filtering problem only applies to S2 and S3 samples. The 1001 through 1008 samples were collected through a filtration system (but not a 0.4 μ filter) and these results were confirmed by the subsequent seep sampling of Cullen and Arimoto (1995).

The final sentence of the paragraph should be part of paragraph 2, since it is talking about water column, rather than seep, data.

4-8 Next to last paragraph and following The study area should be referred to consistently as the Piscataqua and Great Bay Estuary. Also, further into this section, you talk about “Great Bay Estuary stations,” as if there were other stations. Should say “stations sampled for the ERA.”

4-9 Must include a new paragraph, one which discusses the levels of contaminants in mussels from around the Shipyard (% stations exceeding screening for various contaminants).

4-10 Section 4.1.3 Some of the SWMUs have as yet undetermined ecological damage. It is inappropriate to say “No ecological damage was observed,” especially when there is a potential pathway to the estuary. In these cases, ecological damage should be characterized as “unknown.” This should also be changed in Appendix V (and the sources of information for Appendix V should be presented).

4-10 First paragraph Only detects high values relative to high-end Seavey Island values. What if the whole island is elevated enough to affect off-shore levels? eg., DDT?

4-10 Second paragraph line 5. What is “\$\$\$ ecological damage”?

4-10 Paragraph 4 line 2 “Yard was elevated” should be “Yard is elevated” since these chemicals exist in the present and it is misleading to use the past tense

4-10 Paragraph 4 Line 6 After “porous fill at the site (McLaren/Hart 1992).” should add a sentence saying, “Additionally, continuing shoreline erosion is a potential migratory pathway of contamination to the

estuary."

Line 7 "NiCd" should be Ni, Cd

4-11 Paragraph 1 Line 2 "JILF" should be "Seavey Island" since Seavey Island has been established as the background for comparison

4-11 Paragraph 2 The characterization of conditions at SMWU #10 is not consistent with previous reports of this site. This whole paragraph needs to be rewritten. When use of the battery acid tank was stopped, tidal fluctuation was noted in the tank, which indicates a direct pathway of Pb and sulfuric acid to the estuary. How long this went on is unknown.

4-11 Paragraph 4 Line 1 "of ANTH" should be "of the PAH compounds (ANTH,...)"

4-12 Second full paragraph "#3" should be "#23" Additionally, SMWU #23 is very close to the pile-supported pier construction adjacent to Dry Dock #3, and estuarine water surges close to that SMWU location

4-12 Third full paragraph "were background detected above at" should be "were detected at levels above background"

4-12 Fifth full paragraph Line 1 Identify PHEN and PYRENE as PAHs. This paragraph does not make clear that the second burial vault was never found and that its condition is unknown. Rewrite to include these facts.

4-13 First section "With a change over to CERCLA..." should read "When the Shipyard was designated Superfund (CERCLA) site in 199__, radionuclides became an important focus."

4-13 Section 1.3 Heading: spell out Contaminants of Concern

Section 1.3 Rewrite first sentence. As it stands, it is unclear that COCs were identified based on the results of the IRA. Here you suddenly introduce the idea of "estuarine risk," although you did not clearly identify risk prior to this.

I question whether a chemical has to be a COPC and be found at a SMWU to be a Contaminant of Concern. If it's a COPC and higher in concentration near the Shipyard, it should become a COC, eg., pesticides

4-14 Wrong avian species See comments for 4-42.

4-16 Section 4.2.2 Line 6 "Contaminants may have entered..." should be "Contaminants may enter..." later in the same sentence "...or may have been released..." should be "...or may be released..."

4-16 Paragraph starting "The geochemical behavior..." Eighth line from the bottom: "particular-bound" should be "particle-bound" or "particulate-bound"

Must include this idea: "Bioturbation may bring buried contaminants back to the surface."

4-17 Section 4.3.1.1 line 4 "tertatogenic" should be "teratogenic"

4-21 DDT should be included in the Ecological Effects Associated with COCs

4-23 Section 4.4 Conceptual Model This section is often written in the past tense in such a way that all transport on contaminants seems to have happened in the past. Rewrite so that "were dispersed", etc., are in the present tense, i.e., "...are being dispersed..."

4-22 Bulleted section What does the second bulleted phrase mean? Must be made clearer

4-22 Last sentence of paragraph beginning "Direct measurement..." If we are reporting on the "...nature and range of ecological effects..." then contaminant concentration in tissue should be included as part of endpoint assessment (see also Table 4-4, p. 4-49)

4-23. Second paragraph Line 2 "Fig. coc2" needs correct figure reference

4-23 Second paragraph "and tide water infiltration" should be added after "via groundwater routes," as evidenced at JILF and SMWU #10.

4-23 Paragraph 3 Do not say "and to some extent, the relative magnitude of transport." The magnitude idea was removed from the present model.

4-23 Paragraph 3 The conceptual model, as summarized here, says absolutely nothing about the Shipyard, the subject of this entire study. As I've said before, there must be some accountability of the Shipyard, or at least the possibility of such, built into this model. Add in front of "1)": "#) the Shipyard is the potential source of metals (name them), PAHs, PCBs, and DDT that were disposed of in SMWUs on Seavey Island."

4-23 Paragraph 4 Inconsistent with Figure 4-19, which does not show "Clark Cove, and the greater estuary proper." Cannot equate Seavey Island with Clark Cove alone. The model depicted in Figure 4-19 represents the movement of contaminants from Seavey Island to the two sub-systems of the estuary and the input of other sources to these same two systems.

4-24 First paragraph "...removing them from contact with ecological systems." should be "...from contact with ecological systems, except where bioturbation moves particles back to the surface sediments."

4-24 First full paragraph Leave out the sentence that begins "A major source of uncertainty..." Other sources of COCs do not create uncertainty in the models, but are rather a problem of data interpretation.

4-25 Figure 4-1 The map of metal contaminants in blue mussels from Phase II should also be presented, especially since the Hg data from Phase I had a problem of high detections limits.

4-28 Figure 4-4. "Reference Areas" should be "Non-Shipyard Areas" After "for" add "sediments from"

4-29 Figure 4-5 Omit "Sediment HQs" After "for" add "sediments from"

4-30 Figure 4-6. "Reference Areas" should be "Non-Shipyard Areas" After "for" add "sediments from"

4-31 Figure 4-7. After "for" add "sediments from"

4-32 Figure 4-8. "reference" should be "non-shipyard" After "for" add "sediments from"

Add new figures for hazard quotients for DDTs.

4-33 Figure 4-9. Both screens identify COPCs for surface water. The box for mussel residues should be deleted and the arrow redirected to the surface water box.

4-34. Figure 4-10. Add "Based on Phase I and II data."

4-35 Regarding Figure 4-11, there should be a comparable figure showing the distribution of Hazard Quotient Screen results for sediments.

Figures 4-12 through 4-18. Arrows indicating exposure points are not consistent or clear. Point to every exposure point, or use a different kind of arrow.

4-36 Figure 4-12. Flounder should not be included -- it's a benthic species generally not considered to feed in the pelagic food chain. And surface water is also a Proximal Source and needs a label and an arrow from Exposure Points.

4-37 Figure 4-13. Add arrows from exposure points to prey species and surface water boxes (proximal sources). Add to legend "(see Figure 4-14 for eelgrass exposure pathways."

4-38 Figure 4-14. To the two Eelgrass boxes, add "Roots" to the top box and "Leaves" to the bottom box

Figures 4-15 and 4-13 Why include *Ruppia* response in non-seagrass exposure pathway diagrams?

4-41 Figure 4-17. Black ducks don't eat algae, and eat only eelgrass seeds. Canada geese would be a better herbivorous waterfowl candidate. Abundance of fucoids are not a measurement endpoint, because waterfowl don't eat them.

4-42 Figure 4-18. Most demersal fish do not feed from the surface water; remove "demersal" from this box. Cormorants don't eat mussels! Either move arrow to come from Pelagic finfish or replace Cormorant with Sea Gulls. Remove the grey arrow from Measurement Endpoints to the pelagic-to-osprey arrow, because there is no measurement endpoint in this case.

4-43 Figure 4-19. Put an oval around Seavey Island, like the one around "Other sources." At present, it looks like it all comes from Clark Cove, which is incorrect. That will allow the arrows to come from all of Seavey Island. Add "PCBs, DDT" to the Stressor list under Seavey Island and replace "Metals" with "Cr, Ni" in the Stressor list under Other Sources to agree with the text.

4-44 Figure 4-20. Drop Fucoids; they are not eaten by water fowl. Replace black ducks with Canada geese. Replace cormorants with sea gulls. Run an arrow from the sediment to mussels and label it "Suspended Sediments" Replace "Benthos" with "Invertebrates"

4-45 through 4-46 Table 4-1. Do not refer to "Ref" in the heading -- again, these are not reference stations. Reference stations are defined on 3-7: 2 in York, 1 at the Isles of Shoals. Say "GB stations", etc. State whether this is Phase I or Phases I and II data. Under NOTES (P. 4-46) "see p. 4-3" should be "see p. 4-2" and "see p. 4-4" should be "see p. 4-3" Should give a key under NOTES to the 3 grey tones.

4-47. Table 4-2. "Sullivan Point" should be "Sullivan Point" Add DDT under Sullivan Point and probably for Clark Cove and elsewhere, as per Phase II data. Add figure showing DDT concentrations at stations in Portsmouth Harbor like Figure 4-1 that shows DDT is not a problem connected to the Shipyard.

4-48 Table 4-3 Legend and heading should read "Estuarine Receptors of Concern" Flounder should be under the Epibenthic category. Revise species per comments on figures on exposure pathways; eelgrass is a receptor of pelagic, or water column, habitat.

4-49 Table 4-4 Remove flounder and mussels from pelagic category along with flounder and mussel measure endpoints. Put flounder in the epibenthic category. Tab lobster over to measurement endpoints column. Add "tissue concentrations" to "Eelgrass abundance and morphometrics" and to "Mussel abundance and condition" and to "Lobster abundance and condition" and to *Spartina* spp.

4-50 Table 4-5 COC residues in blue mussel, Temperature, Salinity, Nutrient concentration, and Current structure are NOT "Exposure Measure(s)" and should not be listed under Surface Water. Geotechnical characteristics are not a sediment exposure measure. Under Biota, add Lobster and Salt marsh.

Text of Chapter 5 is unbalanced with too much lobster and flounder. Add text and figures for mussels, eelgrass, and salt marsh from the appropriate reports.

5-4 First line 200 pounds per day really?

5-4 Second full paragraph Next to last sentence This brings up a question about the model: where is the rest of the introduced lead removed to, if not in sedimentation or flushing to the Atlantic Ocean? See Table 5-2.

5-4 Last paragraph Line 2 "Fig. 5-2" should be "Fig. 5-3"

5-6 Top paragraph Models are inherently less accurate because of the difficulty of fully representing physical processes over such a large scale with mathematical constructs, not because "...they are themselves dependent on the field measurements" although this is a small factor in the model inaccuracy.

5-6 Section 5.5 Exposure Scenarios

Paragraph 1 of this section is not adequate. Greatly oversimplifies some very important processes and dismisses other scenarios with unfounded assumptions such as "it is expected that water-column exposure would be short term and probably restricted to local sources." There is no justification for the claim of short term exposure. The modelling exercise just completed suggested that material would move around in the water column for quite a while. As far as "restricted to localized sources" goes, we know from the field data and as implied by the modelling, some portion of the contaminants are spread throughout the estuary. It may be convenient to severely limit the scenarios, but I'm not convinced it provides a useful or appropriate representation of estuarine conditions. For example, blue mussels at the DRMO may be continually exposed to elevated Pb concentrations from groundwater transport, or run-off, or dust, and in fact the elevated concentrations in mussel tissue suggest that the exposure is not short term.

5-6 Second full paragraph I don't believe we measured receptor exposure to phytoplankton. On the other hand, I think what you mean to say here (in the first line, for instance) is "benthic exposure scenario"; this would also be true in line three for "epibenthic and water column exposure scenarios". Eelgrass leaves and algae should be included in line 4 as part of the water column exposure scenario.

5-7 Second full paragraph Line 7 Rewrite for clarity

5-8 First three paragraphs "u" should be " μ ". This is actually a problem throughout much of the report

5-12 Formulae "u" should be " μ "

5-12 Formula as presented is not correct. An evaluation of the equations as given produces Metals = Unfiltered. It's unclear exactly what operation was done to the data.

5-12 5.4.2.3 First paragraph "under a drain running landward" should be "subsurface flow emanating from the ground below a pipe draining JILF. Station 1008 was across the street from the storm drain that drains the backside of Jamaica Island."

5-12 Last paragraph This paragraph dismisses the Pb and Hg data from the April 1993 seep sampling because of one contaminated blank sample. This could be considered an outlier and dropped, since the fall 1993 sampling confirmed the range of concentrations seen in the spring. Rewrite.

5-13 Last paragraph Very hard to follow. Rewrite.

5-14 First full paragraph This paragraph should summarize the areas with high exposure for all COCs, and not just rank them in terms of which areas had highest exposures. "Jamaica Island area" is not the correct designation -- should be "Jamaica Cove"

5-14 Second full paragraph Not appropriate to say the "highest Pb accumulation occurred in the mussels from Pepperrell Cove" since they do not appear (Fig. 5-6) to be significantly different. Since the deployed mussels probably were significantly different from the indigenous mussels, it appears that the deployment may not have been long enough for sufficient exposure.

5-14 Section 5.4.2.4 First paragraph This paragraph dismisses sampling the seeps and dismisses sampling the mussels to find out about the seeps, when neither one has been sufficiently studied to draw such conclusions. In the previous section, it's stated that there is no valid Pb or Hg data from the seeps due to contamination and instrument errors. If this is the case, nothing can be concluded about the seeps without further study.

5-15 One blank sample of 3 was contaminated.

5-15 First full paragraph Discussion of fresh water organisms doesn't make sense. Additionally, we can't leave out Pb and Hg data from the discussion of seeps. Both likely have higher correlations (seep to mussels) than some of the other metals. Compare seep blank data from both studies (spring and fall 1993).

5-16 Last paragraph Several of the conclusions here are unfounded. The whole paragraph has a split: it

calls for more study of seeps while sounding dismissive of any seep findings. We didn't measure all of the seeps, so concluding that elevated mussel metal levels are not seep related because the mussels are not near a measured seep is incorrect (eg. mussel station 163 was near a flowing seep which was not sampled in the April 1993 or any other seep sampling). Therefore, we cannot conclude that organisms living near the seeps have been adequately compared to seeps. We simply don't know how limited seep water influence is without a comprehensive seep water study and we cannot say "seeps are not contributing significant quantities of metals to the waters of the Piscataqua". For example, there is a large seep entering Clark Cove from the JILF that has not been sampled. Also, we have no measures of seep flow rates, which it is implied here that we do. Therefore the input of COCs to the estuary from seeps cannot be dismissed

5-18 First full paragraph Again, listing the highest concentrations is not useful or representative of the results of the study.

5-18 Section 5.4.5.1 First paragraph The York Harbor samples were collected to be the reference population for Portsmouth Harbor sampling in Phase I (see 3-7). If this was not deemed appropriate at some later date, that should be stated here.

5-24 Section headed "Lobsters" Second full paragraph Last two sentences More likely, the adult lobsters have had less exposure to PAHs due to their high degree of mobility. In the last sentence, juvenile lobsters may have more direct contact with sources of PAH contamination because they live in sediment burrows and they may actually have longer term exposure because they have stayed in a given area longer than adults. Add this sentence at the end of the paragraph: "Juvenile lobsters in residence around the Sipyard had higher levels of PAHs than juveniles from the Isles of Shoals and than larger lobsters from Portsmouth Harbor."

5-23 Section 5.4.5.3 Must consistently create paragraphs that deal with one COC. Otherwise, this is very difficult to follow, with six different lobster endpoints and several sampling locations.

5-25 Throughout the page "u" should be " μ ", continuing onto page 5-26

5-25 Last paragraph This paragraph is very confusing. I don't think all of it is correct: sentence 2 and the data in Figure 5-29 contradicts the statements in the first sentence.

5-28 and 5-29 Discuss Hg in juvenile lobsters as a finding, since it was higher than sub-legal adult even though it may not have been statistically significant

5-29 and 5-30 Section 5.4.6 More extensive summary is needed to present the significant findings resulting from mussel studies. Figures should be reproduced from Short and Hoven 1995.

5-30 through 5-32 Section 5.4.7 More extensive summary is needed here, as well, to present the

significant findings of these studies relative to results from other biota. This section is supposed to cover Exposure Point Concentrations, and none are given. Also, figures and/or tables should be presented.

5-33 Last paragraph Very unclear. Doesn't appear to reflect the stressor response found for Clark Cove.

Figure 5-7 Why present this?

Figure 5-8 It's not that they're non-seep stations; it's that seep samples were not collected at those sites. "concentrations measured at seep" should be "concentrations measured in mussels at seep"

Figure 5-9 "concentrations measured at seep" should be "concentrations measured in mussels at seep"

6-1 Section 6.0 Define "effects concentrations"

6-1 Concerns about receptors raised in Chapter 4 still apply, and impact the choices of "effects concentrations" presented in Table 6-1.

6-3 DDT does exceed sediment screening levels at five of the seven stations where toxicity was observed (9,16,17,18,23). This should be included.

6-3 Section 6.2.2.1 Line 4 "exposure of sperm, and" should be "exposure of sperm to water samples, and"

6-5 Section 6.2.3 Widgeon grass is not a species representative of local biota, nor is the eastern purple sea urchin. They are stand-ins because of lack of information on local biota. This must be made clear throughout Chapter 6. The limits of extrapolating results from these species to effects on species actually found in the Great Bay Estuary must be discussed in Section 6.2, page 6-2.

6-10 Section 6.2.3.2.1 Give results for Shipyard first! This should be done throughout.

6-10 Section 6.2.3.2.1 Second paragraph From the presentation, it looks as if Pepperrell Cove isn't a good reference site. If it's true that Pepperrell Cove has such high values, it should be explained.

6-10 Section 6.2.3.2.1 Second paragraph Explain SEM and AVS briefly

6-16 Last paragraph It is not appropriate to characterize ranges in contaminant concentration as "occasionally" associated with adverse ecological effects when by definition they may occur up to 50% of the time. And "frequently" should be changed to a term that more clearly implies over 50% of the time.

7-1 Besides all the technical introductory stuff, an understandable and readable introduction to the kinds of

risks looked for and found is needed.

7-2 Section 7.1 The section doesn't include effects found on sea urchins, mussel growth, toxicity to amphipods, salt marsh stress. Where are they?

7-2 Section 7.2 First paragraph Fifth line from the bottom "...it may be related to contaminant exposure, but most likely is due to..." should be "...it may be related to contaminant exposure, but other factors..." Also, the only current "significant level(s) of disturbance" is the marina operation. The other items should be deleted. The next to the last sentence in this paragraph should read: "... it may be related to contaminant exposure, but other factors including sediment type, water clarity, and marina operations could also be contributing to the fact that no eelgrass exists in most of Clark Cove."

7-3 First full paragraph. Here is a typical example of the writing that makes this report so difficult to follow. The one real result, and the reason for the paragraph, is several sentences down, and is prefaced by "Additionally,..." as if it were an afterthought. Then two sentences are presented in a way that appears to minimize the finding of an adverse ecological effect. A reader who did not know the result already -- that 17% of the benthic anomaly is attributable to COCs -- would, I believe, not be able to figure out this result by reading the paragraph. Put it up front.

7-4 First full paragraph Should begin with: "Elevated levels of COCs found in lobster indicate a chronic pollution problem around the Shipyard."

7-3 through 7-7 Difficult to understand at best. No overall clear explanation of what is being done here. What is a mussel critical level? What are you trying to show?

It seems as if predicted water column concentrations are calculated from mussel tissue levels, but then these projected levels are not compared to water quality criteria to determine if, in the absence of dilution by the estuary, these water column concentrations would be of high risk. Since predicted water column concentrations are closer to seep levels that were found, doesn't that suggest seeps may be an important source of COCs?

7-6 Middle of the page What is "FCV"? Not defined above.

7-7 Paragraph beginning "The the critical values estimated..." Use % sign consistently throughout

7-7 through 7-8 Section titled "Eelgrass"

This section does not adequately characterize bioaccumulation of COCs by eelgrass. Discusses only root uptake. Bioaccumulation by eelgrass leaves needs to be discussed.

7-8 Eighth line from the bottom "...with eelgrass bed sampling stations (Short and Hoven 1995)." should be the end of a paragraph. As a beginning to the next paragraph, state that "Eelgrass can bioaccumulate

metals through its leaves from the water column and through its roots from the sediment. "...causing metals to become more biologically available to the biota." should be "...causing a change in bioavailability of metals within the sediment."

An additional paragraph is needed describing the pattern of bioaccumulation in eelgrass tissue around Seavey Island with particular reference to the SMWUs and seeps. Include figures 4 and 9 from Short 1995.

7-8 Section 7.4

Toxicity is not defined.

The first sentence should read "Toxicity in amphipod exposure test was not observed in field sediments from any of the stations that were considered to be missing eelgrass (...), but benthic organism stress and toxicity to sea urchin sex cells was present at several of these stations.

"*Zostera*" should be "*Zostera*"

Line 5 "Toxicity was..." should be "Toxicity to ? was..." Is this *Ruppia*?

Next sentence "However, contamination levels..." should be removed since this was a result of inadequate experimental design in the study of Naciri et al. 1994.

Next sentence "Physiological stress..." should read "Physiological stress on eelgrass shoot growth was observed on shoots that were transplanted near seep locations in Clark Cove and Jamaica Cove sediments..."

Last paragraph of section. Include the following sentence in the paragraph: "Toxicity to sea urchin sex cells was observed at several stations in Clark Cove where benthic anomalies, salt marsh stress, and eelgrass absence were also identified."

7-9 Section 7.5 First paragraph Line 7 Remove the sentence that starts, "This assumption would be invalid..." The assumption is valid, but the reasoning is incorrect. There may well be significant sources of these COCs, as there is for Pb (for instance), but the large flushing and mixing effects are the reason that surface water concentrations are low. This should be made clear.

The conceptual model does not predict (or should not predict) that exposure would be short-term, because for example, a continuous source of contaminant could create continuous exposure, resulting in an isolated exposure that, with adequate flushing, would show no apparent water column concentration.

7-9 Second paragraph Use the % sign consistently throughout. Give the Cu and Ni percentages for Clark Cove -- these should come first, as they were the highest and major finding and did exceed WQC.

7-9 Third paragraph Use the % sign consistently

7-10 Section 7.6 First paragraph I do not understand why risk is not calculated for seep data, since seeps may increase the exposure to local biota, (eg. mussels) and can result in elevated concentrations of COCs in

the water column, as shown by Cullen and Arimoto. Explain.

7-11 There does not seem to be any Table 7-4 or 7-5

As mentioned earlier, black ducks do not feed on eelgrass leaves, *Spartina* leaves, or fucoid seaweeds. Cormorants do not eat mussels and rarely, if ever, eat flounder, and osprey rarely eat flounder. Alternate avian receptors were recommended earlier.

7-11 Section 7.7 This section seems out of place in a presentation of Risk Characterization. In addition, ecological considerations are not really presented here, as predicted by the title. What is presented seems unduly negative, as if the only alternatives for a risk manager are "destructive remediation" or "residual contamination"

7-12 Using the excerpt from Munns et al. 1994 as the only major section that discusses the magnitude of risk, the spatial extent of risk, and recovery potential seems very inappropriate. This was part of the Phase I report and certainly more is now known about the character of risk to the estuary.

7-15 Section 7.9 First paragraph I don't understand why the "other indications of stress" are not considered to be risk. Why are they considered "subtle effects"? This seems to me to be an arbitrary separation of some risks from others. The selection of Pb or other factors may not have been the correct chemical stressors to explain these responses, rather than indicating the other indicators of stress are not important.

7-15 Second paragraph We are not just interested in "appreciable risk" which is a judgement for the risk manager to make. Also, this paragraph neglects the effects of seeps, which I do not believe were credibly dismissed above.

Third and fourth paragraphs The most important finding (ie., most significant finding of risk) presented in each of these paragraphs is talked about in the last sentence, where it should be presented in the first. Additionally, these paragraphs switch between presenting results of probabilities and as percents, which is confusing to a reader/reviewer. Use percents only.

7-15 through 7-16 Last paragraph of Section 7.9 Again, what is "appreciable level of risk"? This should be presented more clearly/quantitatively, and should be included in the summary paragraph, above. The remainder of this paragraph is a reprint of a earlier paragraph. In the summary, some clearer statement of the results and their meaning is needed.

A final paragraph would be useful, summarizing the true risk findings and their implications.

Figure 7.1. Nowhere does this state that the plant in question is eelgrass. "root+rhizome biomass suggested" should be "eelgrass rhizome length based on"

Figure 7.2 Legend should read "PAH accumulation factors..."

Figure 7.3. Legend should read "Observed water column concentrations of Pb for Clark Cove (CC), Back Channel (BC), and Portsmouth Harbor (PH) and two comparable predicted TPb concentration (*explain two predicted results*) calculated from mussel tissue concentrations of Pb." Source of mussels at S is not identified and the relationship between stations and points is not clear. Additionally, this legend should say, "These results illustrate the degree to which mussels can take up Pb from the water column despite the lack of any measurable concentration in the water column." Include seep water levels.

Figure 7.4. The legend doesn't adequately explain this figure. It appears that the risk of mussels from the Back Channel is extremely high, as is risk from elsewhere in the estuary. It would be useful to also present the probability distribution of non-Shipyard stations and to give the point or designation for Mussel Watch high. Sea urchin effects seem to be a rather inappropriate measure of risk for this study. A different measure of critical value should be considered.

Figure 7-5. Legend should explain what PHEN is and what group of chemicals it represents. As with Figure 7-4, a plot of non-Shipyard stations would be informative. Are the Portsmouth Harbor stations (n=129) the same as "All stations n=129" from Figure 7-4?

Figure 7-6 Should be "...eelgrass root+rhizome tissue and associated sediment..."

Figure 7-7 Need to give the data source for this figure. Are these actually surface water Pb concentrations? and, is the difference between Great Bay Estuary and the Upper Estuary just the result of flushing and dilution? Perhaps include the plot for non-Shipyard Portsmouth Harbor data. The importance needs to be stated.

Figure 7-8. This plot indicates a high degree of risk, and is not discussed in Chapter 7. What about Clark Cove seep data? or does "Jamaica Island" really mean "JILF"? If so, it should say so.

Figure 7-9. *Ruppia* leaf EC20 looks to be an inappropriate measure for this study. This figure legend should explain the importance of the findings; the text should indicate that a large part of the risk probability for Clark Cove indicates risk at the ER-L level.

Figure 7-10. Again, explain the importance of the findings. Include non-Shipyard probability distribution.

Figure 7-11. Spell out PHEN and give importance of results. Again, *Neanthes* benchmark doesn't seem useful. Show probability distribution for non-Shipyard.

8-1 Section 8.0. First paragraph. This paragraph sets up a false dichotomy. As stated here, the entire study is undercut by the statement "The contaminant-receptor approach does not adequately address the ecological

significance of potential risk..." But the contaminant-receptor approach is exactly the one used in the ERA. The paragraph goes on to say that "holistic approach" will show ecological risk to be "readily apparent" implying that a system must be as degraded as New Bedford Harbor in order to have ecological risk. The logic falls apart because the premises are false. The ecological risk to be reported here is, by definition, based on the studies done for the ERA. Pulling in another basis for establishing risk, a non-quantitative one at that, is unscientific and undercutting of the entire study and all the work done.

8-1. Section 3.1. The Synthesis of the Ecological Study is based predominantly on the Phase I study as summarized in Johnston et al. 1994d. The entire section should be a more comprehensive assessment based on all Phase I and Phase II findings.

"Ecological Resources" section title is not appropriate as the section does not present a description of ecological resources.

8-2. Winter flounder abundance and distribution (first full paragraph) is not an appropriate measure of the health of the pelagic community. Or drop the phytoplankton and call this "Fish Community". If this is a holistic approach, the current condition of low fisheries catch of flounder in the GBE should be a main topic of this discussion.

8-3 First paragraph Line 8 "Piscataqua Reference 2" should be "Piscataqua Station 2"

Line 11 Rewrite to state "Grizzle found that beyond factors that naturally contribute to infaunal species variance (grain size, eelgrass presence, amounting to 55%), metals and PCBs accounted for 13% and 3%, respectively, of the..."

8-3 Second paragraph Line 3 "estuarine mesocosm could" should read "estuarine mesocosms or in field experiments could"

8-4 Last paragraph Short and Hoven describe elevated tissue concentration of metals found around Seavey Island, indicating areas of concern and hot spots of COC. This should certainly be included in the Synthesis of the Estuarine Study.

8-5. Eelgrass Communities. Below the quote, the next paragraph should be begin, "Eelgrass tissue concentrations showed elevated metal concentrations at site around Seavey Island, indicating potential sources of COCs."

Third paragraph. Line 4 no justification for "most likely caused by disturbance" should say "is a further indication of the ecological impact from an as yet unknown cause and the potential effect of Clark Cove sediment Pb concentrations is being investigated as a disturbance factor."

8-5 Salt marsh Communities The lack of evidence for large-scale disturbances most likely resulted from the lack of large scale sampling.

Second sentence The link to contaminant exposure is the most important finding and should be presented in the first sentence. "Ecological differences" should be "Ecological stresses"

8-6 Paragraph starting "More research..." Line 4 "Methods are also needed to structurally stabilize and..." should be "Methods are needed to improve the health of *Spartina* populations to prevent erosion..."

8-6 Water Quality Did Cullen and Arimoto find sources, as stated at the end of the first paragraph? The Water Quality section should include findings from eelgrass leaves,

8-11 First paragraph First sentence The entire study focussed on depositional areas, so one can conclude that all of the areas studies experience ecological stress

Last paragraph How can the study "not, with the data currently available, be (show specific COCs can be) attributed to specific origins" and at the same time "...identify and eliminate sources of current contaminant migration from the Shipyard and identify if there are areas that require remediation"?

8-13 Section 8.4 presents a lot of information that makes it sound like these other sources are far greater than any Shipyard sources, although no good evidence to support that is presented and comparable data for Shipyard loadings have not been determined. The Jones report has not been reviewed by the UNH project management.

8-14 through 8-15 Section 8.5 In general this is a poor way to end the report; regurgitating a quote that has already largely been included above does not seem useful.

Some of the real limitations of this project that should be included in a "Limitations of the Assessment" are:

- 1) the lack of adequate information and studies on COC effects on appropriate receptors for this estuary
- 2) the lack of connection between requirements for determining ecological risk and the indicator receptors necessary to demonstrate that risk
- 3) inadequate sampling of the links between potential Shipyard sources and the estuarine environment

Figure 8-1. Lack of eelgrass in Clark Cove is not included.

Dr. David Burdick's comments on the Draft ERA 10/16/95

General remarks: The greater and greater reliance on Phase I data and results as we move through Chapters 6 - 8 is clear from the size and length of the quotations, and evaporation of results and findings of the Phase II studies. Ignorance of large bodies of data undermine the risk characterization in Chapter 8 and makes the reader, or risk manager (the user) begin to question the process and the meager discussion of real risks in Sections 8.2 and 8.3.

Many typographic errors are corrected only in the text.

Chapter 1

1-1 Section 1-2 Last line "to identify links to sources of hazardous waste release from the Shipyard." Cumbersome and awkward. Change release (noun) to released (verb) or rewrite.

1-2 Section 1-2 Line 2 Why isn't DDT included in this list? The omission is very obvious.

1-2 Section 1.2 Line 15 Include "anomalies in salt marshes and in benthic community structure in Clark Cove and..."

1-3 Section 1-3 Line 1 Laboratory studies can show physiological, behavioral or toxicologic effects; they cannot show "ecological effect." Correct appropriately.

Chapter 2

2-1 Section 2.1. Line 14 What is RCRA? as yet, this is undefined.

Line 17 and 19 Replace "these" with "SWMUs"

Line 18 Cite the study

Line 21 This paragraph discusses the "purpose of this document" and section 2.2 on page 2-2 lists the "objectives of this document." Either define the difference clearly in the text, combine these paragraphs, or rewrite this paragraph, using suggestions annotated directly on the text.

2-2 Section 2.2 Scope 3. Replace "adverse effects" with "adverse effects and anomalies" since many effects could not be categorized as adverse (eg. benthic community structure, saltmarsh differences, etc.)

2-6 Section 2.3 Line 14 Make the statement specific for this report, as indicated in the text.

2-10 Figure 2-4. The figure is too busy. Make it into two figures.

2-11. Table 2.1 Correct citations.

Chapter 3

3-1 Section 3.1 Line 10-13 Not all industrial water has always been collected, pretreated, and sent to Kately. Industrial wastes were discharged directly into the river at many sites and the text should reflect this. Also, the current scheme should include a date, such as "...since 19__".

3-4 Line "only trace levels of inorganic contaminants in the seep samples." Is this true? What is a "trace level"? 10^{-15} , 10^{-9} , 10^{-3} ? Define "trace" in the text and check against the levels actually found.

3-9 Section 3.3.3 First sentence is OK. Second sentence: "Low marsh habitats occur in relatively protected marine and estuarine areas with fine-grained (muddy) sediments from mid tide to neap high tide elevations. It is characterized by short and tall forms of the salt marsh cord grass, *Spartina alterniflora*. The typical high marsh habitat is found landward of low marsh habitats, from neap high tide to the spring high tide line, and is characterized by the salt marsh plants *Spartina patens*, *Distichlis spicata*, and *Juncus gerardii*. Underlying sediments in all but the seaward edge of low marshes are peat, which is created by undecomposed roots and rhizomes mixed with fine-grained sediments. Salt marshes provide habitat for estuarine species, including juvenile fish and minnows, birds, terrestrial animals, and invertebrates (Short 1992)."

3-10 Section 3.3.3 Lines 10-16 The sediments are likely the primary route of exposure and the paragraph should be rewritten to reflect this; in up front.

3-10 Section 3.3.4 Lines 14-19 Same comment as above.

3-14 Section 3.4.2 Line 12 Animals are exposed through ingestion of food as well.

3-15 Section 3.4.3 Line 4 Add "also nest in salt marsh"

Line 7 What are "feed prey items"?

Line 16 lethality = death; do not be obscure

3-14 to 3-15 Sections are not in order.

3-21 Table 3-1. DDT in JILF?

Chapter 4

4-1 Section 4.1.1 Line 27 "proved" should be "provided"

4-2 Section 4.1.2.1 Line 22 Define "elevation in contaminant residues" i.e. elevated relative to stations away from the Shipyard? York Harbor?

4-5 Section 4.1.2.2 Line 36 Define WA-CL

4-6 Section 4.1.2.2 Line 11 Define WA-CL
Line 33 Make references to cleanup levels consistent

4-10 Section 4.1.3 Line 26 Replace "of" with "have"

Line 27 No comparison of "what was found there" to "what would be expected if ecological damage had occurred." There is no record of such an assessment, so this conclusion cannot be made.

Include sections with discussions of DDTs and organotins!

4-40 Figure 4-16. Amend as directed on text.

4-48: Table 4-3 Delete "Terrestrial"

4-49 Table 4-4. Abundance of an organism may not be as meaningful as occurrence of that organism. Define the difference between this table and Table 8-1, which seems much more complete. Move eelgrass to the epibenthic community section in Table 4-4? Re-do Table 4-4 using Table 8-1.

4-50 Table 4-5 Shouldn't "microbial concentration" be "microbial abundance"? Under "Biota" include "COC residues in *Spartina* spp. leaf" tissue

Chapter 5

5-6 Section 5.3 Lines 2-6 Sentence is not understandable

Line 11 Bioturbation of bedded sediments is another exposure route.

Lines 12-20 No wetland receptors are discussed, though measurements were made in salt marshes. There are no species representative of salt marshes, so include some or delete wetland habitats and identify them as a data gap for risk assessment.

5-9 Section 5.4.2.2 Delete paragraph 2 and cite Johnston et al. 1993 for analytical methods, if appropriate.

5-10 Again, delete methods paragraph

5-11. Section 5.4.2.2. Lines 27-29 Statistical grouping procedures unclear because three different collection/duplicate strategies were used (spring seeps, fall seeps, mussels).

Line 29-38. No statistical tests of these field duplicates is appropriate. The values for each station may be averaged, but cannot be considered replicates or repeated measures. Concentration means may be compared to water quality criteria and correlated with mussel metal levels. In fall 1993, see 1 samples were collected from the same locations on 3 different days. These samples may be considered replicates and analyzed using repeated measures ANOVA. The results of the fall sampling need to be compared to the spring results.

5-12 Section 5.4.2.3 Line 2-5 Sentence implies 100% was surface flow. Change as corrected in text.

Lines 7-16 Begin with the most important elevations of contaminants: Cr, Ni, Zn, Hg, Pb

5-13 Section 5.4.2.3 Line 1 Replace "detected" with "elevated" or rewrite.

Paragraph 4. Poorly written; rewrite for clarity and to state points. Don't wander. Compare fall and spring contaminant levels to see if spring sampling was really inadequate as you have stated earlier! Also a comparison would show that the one elevated blank value did not influence the high Pb levels found at station 1008 (7152).

5-14 Paragraph 2 Rewrite. I don't think anyone cares whether JI had higher exposure to Zn than Clark Cove habitats. We do need to know if these contaminants are at chronically high levels.

Paragraph 3 What were the Cr results?

5-14 Section 5.4.2.3 Results section. No reporting of indigenous or deployed mussel levels or comparisons of contaminants levels. Last paragraph of page 5-13 should be expanded to include these results. Also, figures should be used to illustrate points (only Pb and Cu are shown).

5-14 Section 5.4.2.4 Line 12 What is a chemical signal and how would it be recognized?
Replace "dominant" with "dominate"

5-14 Section 5.4.2.4 Paragraph 2 This paragraph has nothing to do with this section (i.e.

Significance of Findings).

5-15 Discussion of WQC values is very confusing. Why are fresh water organisms mentioned? What about Pb and Hg? What is this signal? What is the significance of the findings? Say, "Chronic levels of Cu, Ni, Zn, and probably Pb and Hg are coming from the seeps and impacting the marine ecosystem."

5-15 Last paragraph This paragraph has nothing to do with this section.

5-16 Line 5 Probably not appropriate to call Portsmouth Harbor levels "reference levels"

Line 13 replace "may be" with "are"

Lines 14-21 Show data with figures. Currently, only Pb and Cu are shown. The "very high concentrations of Hg" are not shown.

5-16 Last paragraph Sentence 2 Such a sweeping statement followed by three qualifiers suggests this should be rewritten.

5-18 First full paragraph Line 6 Replace "determined in " with "estimated from ", since no actual pore water samples were collected. This is probably a data gap and some pore water samples should be collected to verify the calculations (Appendices III C and VI D).

5-26 Line 6 What were the significant differences? Shouldn't all of these be shown using figures?

5-26 Line 19 Data in Figure 5-34 indicate transformation must be done prior to analysis to reduce error heterogeneity. Also check 5-29 for error variance (ANOVA assumptions) and transform and reanalyze statistically, if indicated.

5-30 Section 5.4.7 Line 4 "of passive and active uptake through..."

Line 9 "saltmarsh cord grass and salt hay..."

Line 27 "between rhizome development..."

5-33 Line 13 What is the "Clark Cove treatment"? Sentence is very confusing.

Define 306 as the Isles of Shoals.

Figures 5-26, 5-27, and 5-29 through 33 Where are the error bars? Show them. Also Figures 5-36, 5-45 and 5-47.

5-37 and 5-38 Figures 5-1 and 5-2 are missing.

Chapter 6

6-1 Line 2 Define CoCs. Heretofore COCs? Make consistent throughout the document. Second sentence is wordy.

Paragraph 2 is wordy and technical. confusing sections are underlined in the text.

6-10. Section 6.2.3.2.1 Line 21 Add ..."available, except in oxidized microsites."

6-13 Section 6.2.3.2.5.1 Line 13 Was this difference significant?

Line 19 Explain better

6-17 Section 6.4 Lines 14-17 Include mention of amphipod toxicity in CC sediments as a possible example of synergistic impacts from multiple contaminants (Fig. 6-17). Include the uncertainty introduced by using non-endemic or uncommon species.

Chapter 7

7-2 Section 7.1 No mention of salt marsh effects observed.

7-3 Section 7.2 Line 4-20 The interpretation of Grizzle (1995) is cloudy. Rewrite for clarity and to show your main point (that there was found a contaminant effect on diversity or species richness of the benthos).

7-4 Section 7.3 Lines 7-9 Confusing paragraph. Rewrite for clarity. What may we conclude about Pb in juvenile lobsters? What about Hg?

7-6 Last paragraph. What would you find if seep water concentrations were used in the calculations?

7-8 Section 7.4 Confusing paragraph. Rewrite for clarity. Toxicity to what?

7-11 Section 7.6 Trophic relationships stated in this paragraph do not exist.

7-12 Paragraph 2 Why focus on the negative? Why is there no mention of constructive remediation?

7-13 Line 1 Insert: "On the other hand, ecologists are poorly equipped to observe ecological

problems caused by contaminants." Also, salt marshes should be mentioned; most marsh area was destroyed during waste disposal activities and the remaining marshes exhibit signs of stress. Why have all the Phase II results been omitted from this section?

7-15 Section 7.9 Include salt-marsh effects from Burdick (1994).

Lines 16-18 Why do you use % chance of risks for Sullivan Point and Jamaica Island Cove and WQC for Clark Cove? Be consistent! How is a reader supposed to compare Clark Cove and the Jamaica Island Cove results?

Line 19-25 What is being discussed here? Water? Sediment?

Lines 26-30 Since no pore water levels were measure, verification of estimates should be identified as a data gap. Water column concentrations were 1 to 2 orders of magnitude lower than predicted by actual mussel residues, thus estimates of pore water concentrations may be low as well.

Lines 31-33 At specific sites the chances were much higher. This should be stated.

7-16 This list should be summarized (it is unreadable) and the section needs a conclusion.

Chapter 8

8-1 First, before the contaminant-receptor approach is discarded, what did the approach conclude?

8-6 Line 15 The best way to stabilize a marsh is to keep it health. Structural solutions impede the processes that keep it healthy and lead to degradation of the marsh (and to the erosion of peat).

Line 16 "...on monitoring changes in the ..."

8-11 Section 8.2 Line 1 "The occurrences of ecological stress were found in depositional areas rather than in the water column of the lower estuary."

Lines 12-18 Rewrite for logic and clarity.

8-12 Section 8.3 Last paragraph Figure 5.8 shows mussels collected from beds on Seavey Island are over thirty times greater than FDA action levels. Use all Phase I and Phase II data for these discussions. Also see Figure 7-4 for FDA levels compared to risk. Clearly the following paragraph on p. 8-13 is rubbish.

8-14 and 8-15. Rewrite the last two pages, using new lessons from Phase II.

8-24 Table 8-1. Changes marked in text.

8-25 Add: Abundance, morphology impacted

Delete: "structurally" and insert "Develop methods to enhance marsh health and prevent erosion of salt marsh substrates."

Chapter 9 References

General comments: Proper citations are essential for this document. There are many citations not found in the references, many ambiguous citations (eg., Johnston et al. 1994 without the suffix a,b,c, or d so it could be any of four choices), and many references not cited in the text. Citations in the text but not found in the references are labeled NOT IN REF in the text. Ambiguous citations are questioned in the text. All references found in the text are checked and labeled with the Chapter in which they first appear in Chapter 9. References without checks should be searched for in the text, tables, and figures of the document using a word processor. References not found in the text using this procedure should be omitted. Cite the entire journal. Do not abbreviate. Make citations with "et al." consistent -- either italicize throughout or change them to plain text.

Specific comments: There are two Chadwick et al. 1993 references. Use the entire 3 names for each or distinguish using each Chadwick's first initials.

Appendix V. What were the methods and standards used to assess ecological damage at these sites? See comment 4-10; Section 4.1.3.

Appendix VI. C. 2. Columns are not of sufficient width to display the largest numbers. Reformat VI-18 to VI-28.

VI B. Prob seem too low for Pb at Sullivan Point and Hg at Clark Cove.



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James J. DiStefano
Executive Director

August 17, 1995

Fran Endyke
Portsmouth Naval Shipyard
Code 121, 10 Bldg 44
Portsmouth, NH 03804

Dear Fran,

We have reviewed the draft PNSY Estuarine Ecological Risk Assessment report.

There are numerous typos, grammatic and syntactic errors which we have outlined in our copy of the report. We probably did not catch all of them so we suggest a thorough reading of the text. Also page numbers are incorrect for various sections figures and tables. We will give you the copy at our next meeting or when we are in the area.

Specific comments are as follows:

P. 4-12 Re: Boiler blowdown waste water. The text states that heat is the only potential contaminant expected in boiler blowdown. In fact, many NPDES boiler related permits acknowledge the presence of high pH for boiler blowdown and place pH limits on such effluents. Also, boiler water may have additives such as hydrazine or trisodium phosphate that may be in measurable quantities. As for the addition of heated water, the statement would be better supported if the volume of boiler blowdown was mentioned and the point of release into the water column explained.

Same page as above. Re: dioxin. Any use of herbicides on PNSY might have been a source of dioxins if the phenoxy herbicide 2,4,5,T was used. Disposal of unused herbicides (in addition to their application) should also be reviewed.

P. 4-13. Re: radionuclides. The significance of Co-60 as a "yardstick" isotope that serves as a general index of PNSY radionuclide presence should be explained.

P. 4-15 and elsewhere. Re: The term benthic community, infaunal benthic community and epibenthic community. In some discussions the term benthic community denotes only the infauna whereas epibenthic covers animals that are on the

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infauna whereas epibenthic covers animals that are on the bottom. Unfortunately this becomes somewhat jumbled in other sections where benthic community is used to cover both infauna and epifauna. We would prefer the latter approach throughout the report i.e. the benthic community is inclusive of both infauna and epifauna.

P. 5-19-20. Throughout the discussion of lobsters the terms juvenile, sublegal adults and adults are used. This implies some discrimination as to individual lobster sexual maturity or, some arbitrary size classification for sexually mature lobsters. Which was used? If size, what then was the size at which lobsters were judged sexually mature? Was the size the same for both sexes?

P. 6-5 and beyond. Re: Arbacia punctulata as "representative of local biota". Certainly Arbacia bioassay is a valuable assessment tool for determination of effluent toxicity. Because the Arbacia test is so standardized and popular it is understandable that it would be one performed to support the overall assessment of PNSY CoCs. However, it should not be characterized as being representative of local biota in the same sense Mytilus, Ampelisca and Ruppia are. Arbacia is not indigenous to our waters. While the tests on Arbacia may be useful there is little value in taking these results and trying to apply them to population modeling.

In general, the report needs to ferret out inconsistencies, eliminate ambiguities and generally bring concordance as to the key findings of the various studies.

Finally, Table 8-1 attempts to set out results and includes a further study 'wish list'. It probably would be appropriate to rank those in regard to their relative value to PNSYS overall objectives.

If you have any questions, please give me a call.

Sincerely,


John I. Nelson
Chief of Marine Division

JIN/kmn