RETURN TO 1998 ROD AR INDEX

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administratio
NATIONAL OCEAN SERVICE
OFFICE OF OCEANOGRAPHY AND MARINE ASSESSMENT
OCEAN ASSESSMENTS DIVISION
HAZARDOUS MATERIALS RESPONSE BRANCH
c/o U.S. Environmental Protection Agency
Waste Management Division - HEE-6
J.F. Kennedy Federal Building
Boston, MA 02203
30 October 1990

SDMS DocID 63847

Ms. Mary Sanderson
U.S. EPA Waste Management Division
J.F. Kennedy Federal Office Building
Boston, MA 02203

New Bedford
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Dear Ms. Sanderson:

Thank you for the opportunity to review and comment on the Draft Final Feasibility Study (FS) for the Estuary and Lower Harbor/Bay, New Bedford Harbor Superfund site. Specific comments pertaining to the remedial measures under consideration were given in a letter from NOAA dated 4 June 1990. In letters dated 10 and 14 May 1990, NOAA addressed the Target Cleanup Levels (TCL) for sediment and water, the Risk Assessment Summary, and the 2.0 mg/kg (ppm) FDA limit that result in fishery closures and restrictions. This letter provides general comments on the FS and discusses the "new" proposal of a 50 ppm, or greater, sediment TCL in the Estuary and Lower (Inner) Harbor/Bay as evaluated in Volume III of the FS. Following that discussion NOAA offers, for EPA consideration, specific recommendations for further remedial measures in the Upper Buzzards Bay geographical area (also defined as the Outer Harbor). The recommended remedial actions are designed to achieve, to the greatest extent practicable, a sound level of protection for the natural resources in Upper Buzzards Bay. Over time, this level of protection will provide the necessary foundation for future natural resource restoration projects in and around the area. The recommended actions are based on, and consistent with, the alternatives analyzed in the FS. Finally, NOAA believes that the recommended actions are reasonable and that they respect the practical limitations of remediation at this site.

NOAA has been authorized to state that the trustee for the Commonwealth of Massachusetts concurs with NOAA that a major goal at the New Bedford Harbor site is to reduce the levels of PCBs in the harvestable biota to concentrations that will allow the fisheries to reopen as soon as practicable, and the technical justification expressed by NOAA herein warrants the identified remedial enhancements at the site.

A. GENERAL COMMENTS ON THE FEASIBILITY STUDY

General Model Review

The 50 ppm TCL is based almost solely on the TEMPEST hydrodynamic, FLESCOTT sediment-contaminant transport, and WASTOX food chain models. While acknowledging the sophistication of these models NOAA has some questions about their results. Figure 2-8 in Volume III of the FS shows that there is no appreciable difference in water column PCB concentrations in any of the three areas (Estuary, Lower Harbor, or Upper Buzzards Bay) after 10 years by reducing sediment concentrations to 10 or 50 ppm. "Remediation to a 50 ppm TCL in the estuary and lower harbor is estimated to result in similar reductions in flounder PCB concentrations as was estimated for the 10 ppm TCL" (from Battelle modeling report, 1990). Similarly, Upper Buzzards Bay lobster show little difference in PCB concentration based on a 10 or 50 ppm sediment remediation. In fact, the 10 ppm TCL results in a lobster concentration virtually no different than the no action alternative. In short, the conclusion that a five-fold decrease of PCBs in the sediment results in no appreciable benefit to the water column or biota raises some concern about the interpretation of the model's results.

The AWQC Standard

Figures 2-7 and 2-8 of Volume III use the AWQC of 30 ng/l (ppt) as the critical level to meet. The Draft FS (April 1990), released earlier this year, made it clear that the AWQC for PCBs is not protective of natural resources or of human health. The AWQC is based on the "old" FDA limit of 5 ppm in the biota. It would be better to use the bioaccumulation model to calculate a protective PCB concentration, using the human health endpoint (not the FDA level). With this in mind, the 50 ppm sediment TCL, as shown in Figure 2-8 (Summary of Modeled Water Column PCB Concentrations in Response to 10 ppm and 50 ppm Sediment Cleanup), may not be protective of the Estuary and Lower Harbor/Bay water column.

Potential Biota and Human Health Impacts With a 50 ppm TCL

The FDA limit is based, in part, on interstate commerce considerations, i.e., from the averaging of consumption from a nationwide distribution, rather than local consumption rates. "Therefore, the FDA limit may not be the most appropriate TCL (biota) for this site" (excerpt taken from Draft FS, Section 4.3.1.2, page 4-18). Based on a consumption model, the endangerment assessment concluded that PCB concentrations in edible tissue as low as 0.02 ppm (range between 0.2 and 0.02 ppm) posed a substantial threat of causing cancer in humans (summarized in Table 4-5). Thereby, the 0.2 to 0.02 ppm range would be more protective of frequent consumers, rather than the FDA level. NOAA therefore recommends:

1. that the proposed biota TCL for the New Bedford site, relative to the FDA limit and the Human Health Residual Tissue Levels, be discussed further in Section 4.3.1.2;
2. that the human cancer risk level (i.e., 0.2 to 0.02 ppm) be used and;
3. that this range of values, rather than the FDA limit, be used in all analyses of the effectiveness of the sediment TCL of 50 ppm of the sediments .

If a 50 ppm sediment TCL is used, it is clear that it will be an indefinite period of time before the lower biota TCL will be reached for most of the commercial and recreational fisheries. The discussion of the tissue levels that would remain 10 years after the clean-up of the sediments to 10 ppm presented in Section 7.4.3 (page 7-59) of the FS indicates that the projected concentrations in the edible tissue of flounder in the lower harbor would still be near 0.7 ppm, while the tomales of lobster would have PCB levels close to 2 ppm. The concentrations in the estuarine species would be higher. Similar results are found when using the 50 ppm sediment TCL. In addition, the rate of decrease in the concentrations was projected to be slow after an immediate decrease in the first years after removal. As a result, it is logical to predict (although the FS does not) that it would be many more years, probably decades, before the more protective concentrations would be reached in the resident biota. As noted above, this may mean that the fisheries in those areas will continue to remain closed for substantially longer than the 10-year span discussed in the FS.

Long Term Implications

Without further discussion and justification, the 50 (or 500, see alternative SW-7) ppm TCL discussed in Volume III of the FS may set a potentially dangerous precedent. Although 1 ppm is stated as protective of the natural resources (deferred at this time due to technical feasibility considerations), few will remember that number or the 10 ppm value proposed in the Draft FS. Instead the 50 ppm sediment TCL may be incorrectly applied and used as an improper benchmark at other sites in the future.

B. SPECIFIC RECOMMENDATIONS FOR FURTHER REMEDIAL MEASURES IN UPPER BUZZARDS BAY GEOGRAPHICAL AREA

Herein NOAA offers for EPA's consideration a general remedial action plan that NOAA believes will result in more protection for the environment of Upper Buzzards Bay and which will hasten the recovery of injured natural resources in the area. The justification for such an action is given with direct benefits to resources quantified. The remedial actions recommended are substantially based on information presented in the FS.

Transport of PCBs from the Estuary and Lower Harbor

Based on the transport model which relies on real time data from the Coggeshall Street Bridge, the estimated flux from the Lower Harbor, inside the Hurricane Barrier, to Upper Buzzards Bay is approximately 98 kg/yr at present, decreasing to about 70 kg/yr after 10 years under the no-action alternative. With clean up to concentrations in the sediments of 50 ppm of PCBs inside the Hurricane Barrier, the transport appears to reduce to about 75 kg/yr immediately and to about 40 kg/yr after 10 years. These latter figures were estimated from the data presented because NOAA did not find these exact figures stated in the reports.

At present, Upper Buzzards Bay is estimated to contain about 4500 kg of PCBs and the estimated rate of loss from the area is low. The estimated present inputs from the Lower Harbor/Estuary (north of the Hurricane Barrier) constitute about 2% of the mass of PCBs presently in-place in Upper Buzzards Bay per year. If no action were taken in the areas inside the Hurricane Barrier, the cumulative inputs from those areas may slow the recovery in Upper Buzzards Bay. The model indicates, for example, that with no clean up, the mass of PCBs in Upper Buzzards Bay will decrease only by about 6% after 10 years.

However, even with clean up in the inner areas, the rate of decrease of PCBs in sediments of Upper Buzzards Bay is still estimated to be slow. The projected diminution of transport through the Hurricane Barrier if the estuary and Lower Harbor are cleaned up would help the Upper Buzzards Bay area recover, but to a limited extent. In addition, with or without remediation in the Estuary and Lower Harbor, the amount of PCBs exiting the Hurricane Barrier is projected to decrease. Similarly, the bio-uptake modeling indicates the changes taking place north of the Hurricane Barrier would have little impact on the levels of PCBs in biota in Upper Buzzards Bay.

Overall, the conclusion that can be drawn from this discussion is that migration of PCBs from inside the Hurricane Barrier out to Upper Buzzards Bay is projected to be limited compared to the contamination that is already deposited in the Upper Buzzards Bay area. Thus, while clean up in areas north of the Hurricane Barrier is encouraged, it will not have a significant effect on the concentrations of PCBs in either the sediments or biota in Upper Buzzards Bay.

Importance of the More Highly Contaminated Areas in Upper Buzzards Bay

At least two areas of high concentrations of PCBs (>10 ppm), "hot spots", exist in Upper Buzzards Bay area, one near the Hurricane Barrier and one near the outfall off Fort Rodman. The PCBs are likely from the CDE facility and the sewage outfall, respectively. Estimating the possible influence these areas have on the local biota was difficult in part because NOAA did not have access to the original data. This limited the accuracy of NOAA's

estimation because NOAA had difficulty determining the size of the "hot spots". Note, the reports that were reviewed had somewhat the same problem in that the hydrodynamic transport model and the biological uptake model both used different values for the average concentrations in Upper Buzzards Bay - 1 and 2 ppm, respectively. In part this resulted from different areas used for the averaging, but that did not seem to account for the whole difference. NOAA did not find a discussion associated with either model that described how the averages were obtained. The presentation appeared to indicate that the data were not area-weighted. This point is not academic: the biological uptake is strongly driven by the concentration of PCBs in the sediments that are input to the model. It was noted in the reports that the model systematically underestimated the concentrations of PCBs in the biota of the Upper Buzzards Bay area.

The effect of the "hot spot" areas on the biota in Upper Buzzards Bay is simplest to discuss in terms of the relative importance of those areas as contributors to the overall contamination of the biota. This contribution is in turn a function of the relative concentrations of the two "hot spots" compared to the mean levels in the area, the size of the areas, and how the exposure is assumed to occur. The latter factor has basically three parts: the release of PCBs to the water column, uptake by sessile organisms residing in the contaminated areas, and uptake by mobile organisms that reside and/or feed in the "hot spot" areas for a period of time. For any of the exposure scenarios, the effect of the "hot spot" areas on the populations in Upper Buzzards Bay would be dependent primarily on the fraction of whole area constituted by the contaminated zones and by the average PCB concentration compared to the surrounding areas.

To make these estimates, it was necessary for NOAA to make some rough measurements from the charts that were available of Upper Buzzards Bay. Based on these measurements, NOAA estimated that the area near the Hurricane Barrier that was substantially contaminated constituted about 6% of the area north of a line between Ricketson and Wilber Points and south of the Hurricane Barrier (Area 3 of the biological uptake model and most of Areas 5 and 6 of the hydrodynamic model). NOAA also estimated that the average concentration in that area was 50 ppm total PCBs (reflecting the values of 51 ppm and 83 ppm found in the area). The spot near the outfall is estimated to constitute approximately 2% of the whole area, and to have an average concentration of 20 ppm (possibly too low).

Based on these values and assuming that the concentrations in the biota can be directly related to the sediment concentrations (the biological uptake model is substantially more sophisticated than this), the relative contributions of these areas was estimated for different average levels of PCB in the whole area (see Attachment 1 for specific explanation of methodology):

Average Concentration in Upper Buzzards Bay	Estimated Percent Increase of PCBs in Biota Contributed by Bay "Hot Spot"Areas
1 ppm	330%
3 ppm	105%
5 ppm	60%

For example if the average PCB concentration in the area outlined above is 3 ppm then the two "hot spots" are doubling the biota concentration, or it can be calculated that 50% of the PCBs in the biota are from these two "hot spots".

In summary, these data indicate that anywhere from approximately one-third to three-quarters of the PCBs in the biota in the Upper Buzzards Bay area could be the result of the PCBs of the "hot spot" areas. The data also indicate that reducing the concentrations at the "hot spots" could result in a dramatic reduction in the levels in the biota. In fact, this 50% reduction of PCBs in the biota could occur in less than 6 months, based on an optimistic biota purge rate (Duke, et al., 1970; Lowe, et al., 1972; Hansen, et al., 1976; Goerke and Ernst, 1977; Clark, et al, 1986; Pruell, et al., 1986). This positive result is also reinforced by the fact that the biota favors the outfall area. Obviously, the results above depend on the assumptions NOAA made regarding the sizes of the "hot spot" areas and the average PCB concentration and assumes a strong relationship between the concentrations in the sediments and in the biota.

At this point it is not clear how these data and estimates could be incorporated into the feasibility planning study, primarily because the reports are unclear regarding to what extent the two "hot spot" areas were incorporated in the modeling and hence have been addressed in terms of the 10-year recovery estimates. That is, the present modeling may have ignored the high concentrations, however, the results of the model indicate what would happen if the "hot spots" were cleaned up. Alternatively, the model may have incorporated at least some of the high-concentration values and thus could be re-run to demonstrate via the model what impact the clean up of the Upper Buzzards Bay "hot spots" would have on levels of PCBs in the biota. The reports did note that the area near the outfall was excluded from the modeling and therefore the former scenario seems most likely. If that is true then the output from the model could be interpreted as substantiating the conclusion that cleaning up the two "hot spot" areas would lead to a decrease in the PCB levels in the biota of Upper Buzzards Bay by 50% or more.

Target Clean Up Levels

Discussions of target clean up levels and the feasibility of reaching various levels brings up a number of issues, many of which have not been adequately answered. Because PCBs exhibit mostly chronic toxicity to aquatic biota, one of the major goals at the New Bedford site is reducing the levels of PCBs in the harvestable biota to concentrations that will allow the fishery to reopen.

Most of the reports refer the concentrations in the harvestable species to the FDA "tolerance" level, currently set at 2 ppm wet weight. As noted in previous comments, this level is far above concentrations considered protective of human health. The Draft FS puts that value between 0.2 and 0.02 ppm (Table 4.5). Concentrations in Upper Buzzards Bay are orders of magnitude higher than this level. Achieving the more conservative 0.02 ppm concentration is not technologically feasible at present, but these values indicate that strong measures are warranted if the fisheries are to be fully reopened in the relative near future.

Again, based on limited data, a review of the distribution of PCBs in the sediments of Upper Buzzards Bay indicate that the exposure concentrations could be reduced by as much as 50% by isolating the PCBs in the two "hot spots". Because the average PCB concentration in the geographical area of concern is approximately 3 ppm, NOAA recommends that EPA attempt to remediate these two "hot spots" to the 3 ppm level. Acknowledging the difficulties in actually achieving specific clean-up levels, a range between 1 and 10 ppm would be understandable. With remediation of these two "hot spots" to 3 ppm, the average PCB concentration for this geographical area will likely be much below 3 ppm as the present 3 ppm average includes the two "hot spots". If this estimate is correct and remediation to 3 ppm is achieved, most edible tissue should be reduced to near the 0.2-ppm level.

Capping versus Dredging

Remedial measures are recommended for the areas discussed above. The two feasible alternatives for such remediation appear to be capping and/or dredging. However, both have drawbacks. For example, a cap in Upper Buzzards Bay may be subject to disturbance from storm waves, particularly in shallow water, resulting in its erosion. It may also be difficult to cap near the outfall without affecting its operation. On the other hand, dredging may not be feasible for many of the same reasons that are of concern in the inner harbor areas; primarily, costs and lack of areas to place the contaminated sediments. In addition, dredging may result in resuspension of the PCBs, particularly if a bucket dredge is used. Capping may be a possible alternative if done in a manner that would address the erosion problem, for example by placing enough material in areas subject to strong storm waves to withstand one or more major storms, backed by a monitoring program and a commitment to add capping material if and when the cap is eroded. NOAA would like to continue to work with EPA on developing the safest and most cost efficient remedy.

The Corps of Engineers (Mark Otis) has developed some conceptual approaches and approximate costs concerning the remediation of the two "hot spot" areas outlined above. It is uncertain whether the 3 ppm target level can be reached but a sediment level below (probably well below) 10 ppm appears certain. Specifications and cost breakdowns are given in Attachment 2. Costs for additional sediment sampling and PCB analysis to better define the remediation area are not included.

1. Area Opposite Cornell-Dublier Facility.

Although either dredging or capping can be achieved, NOAA recommends the dredging option due to its lower cost and the ability to dismiss the erosion problem associated with capping in this relatively shallow environment. Approximately 31 acres would be remediated requiring the removal of 50,000 cubic yards of sediment by a small cutterhead dredge. Additional disposal facilities are not required. The estimated cost is $2,3000,000.

2. New Bedford Outfall.

A decision in this area is more difficult and depends upon the City of New Bedford's plan to upgrade and/or extend the outfall in addition to the City's decision to, or not to, independently dredge some of this area. Nevertheless, NOAA could support a capping alternative here as dredging would necessitate the use of a large mechanical dredge resulting in excess material removed. Dredging would require an additional disposal facility costing an estimated $10,000,000+. Capping could be completed at a cost of approximately $2,800,000 by utilizing a hopper dredge to obtain 450,000 cubic yards of capping material from areas adjacent to the harbors entrance channel. However, some environmental impact review may be necessary before these sediments could be excavated.

C. SUMMARY

NOAA believes that a 50 ppm sediment TCL is not protective of natural resources. Neither the hydrodynamic or food chain model, when closely evaluated, indicate that such resources will be protected or restored by this level. In fact, the FS points out that 1 ppm is the protective level. NOAA understands that a site-wide remediation to the 1 ppm level may not be technically feasible. However, reasonable remedial actions in Upper Buzzards Bay are possible and such actions would result in significant protection and restoration of the local natural resources. Therefore, NOAA requests that EPA consider further remediation steps in the Upper Buzzards Bay area as outlined in this letter, i.e., dredging in the area opposite the Cornell-Dubelier facility and capping at the New Bedford outfall. Specific justifications for such an action is given in Section B of this letter. A 3 ppm sediment TCL is recommended.

I am available to answer any questions you may have, or to work along side you and your staff on the remedial actions recommended herein.

Sincerely,

Kenneth Finkelstein, Ph.D
NOAA Coastal Resource Coordinator

REFERENCES

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Pruell, R.J., J.L. Lake, W.R. Davis, and J.G. Quinn. 1986. Uptake and depuration of organic contaminants by blue mussels (*Mytilus edulis*) exposed to environmentally contaminated sediment. Mar. Biol. 91:497-507.

ATTACHMENT 1

Methodology to Determine Net Benefit of Recommended Remediation

The primary assumption used in theses calculations is that the concentrations of PCBs in the organisms in Upper Buzzards Bay would be directly related to the concentrations in the sediments. This relationship is also assumed to be directly dependent upon the percent of time the organisms spends in the areas of differing concentrations, i.e., an organisms spending all of its time in an area with 10 ppm PCBs would have roughly twice the concentration of PCB of the same type of organisms exposed all of the time to 5 ppm PCBs. Note that this does not mean that all organisms in a particular area will have the same PCB content, since the relative uptake among species is a function of numerous factors besides the sediment concentrations.

A figure of Upper Buzzards Bay was available and showed some rough PCB contours. This was used to estimate the area and PCB concentration (see below) of the two "hot spots". Specifically, some rough estimates of the total area (in relative measure, i.e., square centimeters of the figure) bounded by the shoreline, the Hurricane Barrier, and Ricketson and Wilbur Points (Area 2 of the biological model) were calculated. Next the size of the "hot spots" near the Hurricane Barrier and near the outfall was estimated; subsequently, the percentage of the total area each comprised was calculated, i.e., the area near that Hurricane Barrier was estimated to be about 6% of the total area, while the spot near the outfall was estimated to be about 2% of the total area.

The next step assumed that the mobile organisms, specifically the lobster and flounder, migrate randomly throughout the Upper Buzzards Bay area, therefore spending 6% of their time near (performing similar activities compared to the other areas) the Hurricane Barrier, 2% near the outfall, and 92% in other areas of the Upper Buzzards Bay. Conversely, for sessile organisms, the applicable assumption would be that 6% of the population resides near the Hurricane Barrier and 2% near the outfall.

Finally, the 6% "hot spot" near the Hurricane Barrier was characterized by an average concentration of 50 ppm PCBs (based on measured concentrations ranging from 10 ppm to over 80 ppm PCBs) and that the 2% area near the outfall had an average concentrations of 20 ppm. The estimated "hot spot" PCB levels were compared to three different concentrations for the average level in the "non-hot spot" areas of Upper Buzzards Bay: 1 ppm, 3 ppm, and 5 ppm. The hydrodynamic transport model and the biological uptake model used 1 and 2 ppm for the average concentrations in Upper Buzzards Bay, respectively. However, the modeling completed by Battelle may have ignored the two areas of high PCB concentrations which is the focus of this letter. Therefore, 3 ppm may be a more realistic average concentration for the Upper Buzzards Bay area.

Based on the values and assumptions laid out above, the calculations consisted of a simple proportioning of the exposure:

Exposure concentration with the hot spots = (concentration in area near Hurricane Barrier)(fraction of total area in hot spot near Hurricane Barrier) + (concentration in area near the outfall)(fraction of total area in hot spot near the outfall) + (concentration in non-hot spots)(fraction of total area not in hot spots)

Exposure concentration without hot spots = concentration in non-hot-spot areas

Relative concentration = Exposure concentration with hot spots/exposure concentration without hot spots.

For example:

Case 1: "Background" concentration is 1 ppm.

Exposure with hot spots = (50)(0.06) + (20)(0.02) + (1)(0.92) = 4.32

Exposure without hot spots = 1 ppm

Relative concentration = 4.32/1= 4.32 or 432%
or 332% increase from "hot spots"

Case 2: "Background" concentration is 3 ppm.

Exposure with hot spots = (50)(0.06) + (20)(0.02) + (3)(0.92) = 6.16

Exposure without hot spots = 3 ppm

Relative concentration = 6.16/3= 2.05 or 205%
or 105% increase from "hot spots"

Case 3: Background concentration is 5 ppm

Exposure with hot spots = (50)(0.06) + (20)(0.02) + (5)(0.92) = 8.0

Exposure without hot spots = 5 ppm

Relative concentration = 8/5 = 1.6 or 160%
or 60% increase from "hot spots"

ATTACHMENT 2

Specifications and costs for recommended remediation in Upper Buzzards Bay

1. Area Opposite Cornell-Dublier Facility. Dredging Option.

Two sites immediately south of the Hurricane Barrier have PCB levels above 10 ppm (Area adjacent have levels between 1 and 10 ppm). Total area = 1,330,000 sq. feet; if 1 foot depth removed = 50,000 cu. yards (cy). Water treatment costs are based on information provided in WES report on Pilot Study Evaluation of Carbon and UV/Hydrogen Peroxide Treatment. The other cost data are taken from Report 11 of the Engineering Feasibility Study - a 10% increase was added to these cost figures.

A. Dredging option 1 (preferred alternative). The sites would be dredged using a small cutterhead dredge. The dredged material would be pumped into a scow/barge (3,000 cu. yards capacity) which would then be towed to the upper harbor and emptied (pumped out) into an existing CDF in the upper harbor. The production rate is approximately 400 cy per day (8 hrs per day removing 50 cy per hour) and 137 days (26 days per month) are required to complete the dredging.

Dredging = $75,000/month x 5.3 months	=	$397,500
Scows (2) = $20,000/month x 5.3 months	=	$106,000
Tugboat = $30,000/month x 5.3 months	=	$159,000
Scow pumpout operation = $100,000/month	=	$530,000
Water treatment = 168,180,000/1000 gal x $4.40 = assumes 5% solids content		$739,992
Subtotal		$1,932,492
20% contingency		$386,000
Total		**$2,318,990**

B. Dredging option 2. The sites also would be dredged using a small cutterhead dredge. A temporary CDF would be constructed on the Standard Times Field to initially dewater the sediments. Final disposal of the sediments would be in an existing CDF in the upper harbor.

CDF construction:

Dikes: 22,500 cy of material at $7/cy	=	$157,500
Liner: 40,000 square yards (sy) at $2.25/sy	=	$ 90,000
Removal of contaminated sediment, 60,000 cy x $20/cy	=	$1,200,000
Removal of clean material, 22,500 cy x $10/cy	=	$225,000
Subtotal	=	$1,672,500

Dredging and water treatment:

Dredging = $75,000/month x 5.3 months	=	$397,500
Water treatment = 168,180,000/1000 gal x $9.64 = assumes 5% solids content		$1,628,250
Subtotal	=	$2,018,750
Total	=	$3,691,250
20% contingency		$738,250
Total		**$4,429,500**

2. New Bedford Outfall Area - Capping Option

The area specified for remediation is that area enclosed by the 10 ppm contour. PCBs outside this area are between 1 and 10 ppm. An area 4,212,000 square feet would be capped by a 3 foot cap thereby requiring 12,636,000 cubic feet or 468,000 cy.

A. Capping option 1 (preferred alternative). Assume a hopper dredge is used to dredge capping material from areas adjacent to the navigation channel. This material would be placed on the contaminated area. The production rate (24 hour operation) of the dredge and capping procedure is 8,000 cy/day, thus 58 days would be needed. Some type of environmental study of the dredged area may be necessary; this cost is not included.

58 days x $40,000/day	=	$2,320,000
20% contingency	=	464,000
Total		**$2,784,000**

B. Capping option 2. The capping material would come from an upland source. This source may be difficult to locate. The production rate is 1000 cy/day; thus 22 months would be necessary.

Deliver material; 468,000 cy x $7/cy	=	$3,276,000
Load material; 468,000 cy x $5/cy	=	$2,340,000
Scow (1) = $5,000/month x 22 months	=	$110,000
Tugboat = $30,000/month x 22 months	=	$660,000
Subtotal		$6,386,000
20% contingency		$1,277,200
Total		**$7,663,200**

3. Clarks Cove Outfall Area, Recreational Areas (beaches), Commercial Facilities (marinas, etc.)

The State of Massachusetts requested that EPA consider these areas for further remediation. The following is information provided by the Corps of Engineers for your consideration.

A. Clarks Cove outfall area. Assume a 1,000 x 1,000 foot area will be remediated by using a small cutterhead dredge. Material would be pumped into scows/barges and offloaded into an existing CDF in the upper harbor. 37,000 cy would be dredged with a production rate of 400 cy/day resulting in 4 months of work.

Dredging = $75,000/month x 4 months	=	$300,000
Scows (2) = $20,000/month x 4 months	=	$ 80,000
Tugboat = $30,000/month x 4 months	=	$120,000
Scow pumpout operation = $100,000/month	=	$400,000
Water treatment = 124,451,880/1000 gal x $4.40 = assumes 5% solids content		$547,588
Subtotal		$1,447,588
20% contingency		$281,518
Total		**$1,729,100**

B. Recreational areas (beaches). The Corps does not believe that dredging is feasible due to the rough sea conditions in those areas. Capping may be possible, however. Sand should be obtained from an upland source, trucked to the site and hydraulically placed. The typical beach area is about 600 square feet and would require a 3 foot cap; 6,700 cy is thereby needed.

Deliver material; 67,000 cy x $7/cy	=	$46,900
Place material; 67,000 cy at $10/cy	=	$67,000
Subtotal		$113,900
20% contingency		$22,780
Total		**$136,680**

C. Commercial facilities (marinas, etc). Dredging of all areas subject to vessel traffic would result in the removal of a considerable amount of material and would likely require the construction of additional CDFs at considerable expense. General costs shown below:

Dredging of a 100 x 100 foot area results in removal of 370 cy
Dredging costs are $9/cy