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DRAFT

September 3, 1987

Mr. Frank Ciavattieri
New Bedford Harbor Project Manager
U.S. Environmental Protection Agency
Region I
JFK Federal Building
Boston, Massachusetts 02203

Subject: Transmittal of Draft Technical Memorandum
Target Levels for PCBs in Ambient Air During the
Pilot Dredging and Disposal Study

Dear Mr. Ciavattieri:

Enclosed is the draft technical memorandum on E.C. Jordan Co.'s development of target levels for PCBs in ambient air during the pilot dredging and disposal study. The approach to developing target levels has been discussed with Kevin Garrahan and Sara Levinson. Further discussions will be required before target levels can be finalized.

We are transmitting the memorandum now to obtain thoughts and comments from all reviewers and would appreciate comments in any form by September 14, 1987. Following review of the comments, we may want to schedule a meeting to finalize target level development prior to the public meetings later in September.

Please ask reviewers to call directly Beth Ryan of E.C. Jordan Co. (617-245-6606) with any questions.

Very truly yours,

EBASCO SERVICES, INC.

Siegfried L. Stockinger, P.E.
New Bedford Harbor Project Manager

SLS:das

cc: A. Ikalainen
E. Ryan
FILE

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EBASCO SERVICES INCORPORATED

TECHNICAL MEMORANDUM

TARGET LEVELS FOR PCBs IN AMBIENT AIR DURING THE PILOT DREDGING AND DISPOSAL STUDY ACUSHNET RIVER ESTUARY ABOVE COGGESHALL STREET BRIDGE

NEW BEDFORD HARBOR
MASSACHUSETTS
SEPTEMBER 1987

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NOTICE

The information in this document has been funded by the United States Environmental Protection Agency (USEPA) under REM III Contract No. 68-01-7250 to Ebasco Services, Inc. (Ebasco). This document is a draft and has not been formally released by either Ebasco or the USEPA. As a draft, this document should not be cited or quoted, and is being circulated only for comment.

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1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), as part of the Feasibility Study for the New Bedford Harbor Superfund Site, will be conducting a pilot scale dredging operation in the upper estuary of the Acushnet River. The purpose of this Pilot Study is to determine the feasibility of dredging and disposal alternatives for the Superfund Site. The nature of the Pilot Study, in particular the removal and storage of PCB contaminated sediments in a shoreline disposal facility, raises a public health concern over the potential volatilization of PCBs during the dredging and disposal operations. In response to this concern, EPA and USACE have identified the need to develop a monitoring program for purposes of collecting "adequate information to insure that public health and the environment are protected during and after the Pilot Study". This memo discusses the public health risks relating to the potential volatilization of PCBs during the dredging operations. Specifically, this memo provides carcinogenic and noncarcinogenic risk estimates associated with various ambient PCB concentrations and assess the PCB air criteria values that have been developed for the protection of public health. This information can be used to establish "acceptable air concentrations" of PCBs to be used in the Pilot Study monitoring program.

Based on current information, the Pilot Study dredging and disposal operations are planned for the area in and adjacent to a small cove located north of the Coggeshall Street Bridge on the New Bedford side of the Acushnet River. Approximately 25,000 cubic yards of contaminated sediments (100-400 ppm PCB) are expected to be removed by hydraulic dredges and pumped through a pipeline to a confined disposal facility (CDF). The contaminated dredge material is to be placed in a 4.5-acre CDF and in a 5-acre contained aquatic disposal site (CAD). In both sites, the contaminated material will be capped by a layer of uncontaminated sediment. Dredging operations are expected to continue for approximately two months. (Draft Pilot Study Plan for New Bedford, New England Division Corps of Engineers.) The proposed dredging operations involve dredging beneath the water surface in the estuary, conveyance of dredged material to the disposal sites through pipeline, and disposal under water within the CDF. Because these activities will occur under water, the potential for the volatilization of PCBs is through the water column in the CDF.

2.0 EXPOSURE AND INCREMENTAL RISK LEVELS

Demographic information reviewed indicates that approximately 2,500 people reside within a half-mile radius of the proposed CDF location (1985 Census Information). Volatilization and transport of the PCBs from the dredging and CDF area to residential areas may result in exposure to these compounds and present a risk to public health if concentrations of PCBs reach a level considered to be unacceptable. To assist EPA in establishing "acceptable" ambient PCB concentrations during dredging operations, the ambient PCB concentrations corresponding to a 10-4, 10-5, 10-6, and 10-7 incremental carcinogenic risk level are presented below and are used later in this memo to develop "target concentrations".

To ensure that target concentrations provide an "adequate" level of protection to the exposed population, the exposure assumptions used to estimate risk are based on exposure by a child. Children are considered to be more susceptible to contaminant exposure than adults due to their immature immune system and lower body weight. Therefore, PCB concentrations considered to be protective of children should be also protective of adults. Because volatilized PCBs are expected to be the source of air contamination, it is assumed that exposure to PCBs occurs in the vapor phase. Based on this assumption, a respiratory adsorption factor of 100 percent is used to calculate incurred body dose levels. The other exposure assumptions used to develop PCB concentrations are continuous exposure by a 10 kg child, respiring at a rate of 10 m3/day over a two month exposure period (anticipated duration of dredging).

Using the above exposure assumptions, the concentrations of PCBs associated with incremental carcinogenic risks between 10-4 and 10-7 are presented below:

10-4 RISK	9.7 ug/m3	=	9,700 ng/m3
10-5 RISK	0.97 ug/m3	=	970 ng/m3
10-6 RISK	0.097 ug/m3	=	97 ng/m3
10-7 RISK	0.0097 ug/m3	=	9.7 ng/m3

Therefore, if a 10-5 incremental risk level is considered appropriate for the monitoring program, a two month average ambient PCB concentration of 0.97 ug/m3 (970 ng/m3) will be acceptable. These risk estimates and concentrations assume that exposure to PCBs occur only during the Pilot Study operation and that background exposure is insignificant. Background levels of PCBs in this area have not yet been determined. Once this information is available, the above risk estimates may need to be refined to account for the background risks.

3.0 DEVELOPMENT OF TARGET LEVELS

Due to the inherent variability in air monitoring data and the non-continuous dredging and disposal, a range of PCB concentrations in the air can be expected. Therefore, setting one target concentration may not be practical for the Pilot Study Project, as this approach will not provide the necessary flexibility in attaining acceptable air concentrations or insights into the risks associated with expected short-term exposures to levels greater than the target concentrations. There are no acute (1 day) standards or criteria developed for PCBs that could provide an upper bound acceptable concentration. However, a 10-day Health Advisory (HA), has been developed by the EPA for the protection against the noncarcinogenic effects of PCBs. Exposure to potentially elevated levels of PCBs are expected to be limited to and occur over a two month duration. Therefore, it is appropriate to assess the noncarcinogenic effects associated with exposure to these compounds in addition to the carcinogenic risks. The 10-day HA can be used to develop an upper bound target concentration for short-term exposure. This concentration would represent the level of PCBs in the air which should not be exceeded on a "short-term" basis.

The 10-day HA (0.01 mg/kg-day) can be expressed in terms of an ambient PCB concentration. This concentration is backcalculated using the same exposure assumptions as the carcinogenic risk estimates (10 kg child, 10 m3/day respiration rate, and continuous exposure to ambient concentrations of PCBs). The PCB concentration calculated below represents the level of PCBs in the air which would be protective against the noncarcinogenic effects of PCB.

0.01 mg/kg-day = PCB concentration (mg/kg) x 10 m3/day x

24 hrs/day x 100% absorption

x 1/10 kg body weight

PCB concentration = 0.01 mg/m3 or 10 ug/m3

Thus, for a short-term exposure duration, 10 ug/m3 (10,000 ng/m3) represents an acceptable concentration of PCBs in the air. However, as stated, the 10-day HA is protective only against the noncarcinogenic effects of PCBs. To ensure that this concentration does not present an unacceptable cancer risk, the carcinogenic risk was calculated based on the assumed exposure duration of 10 days. An incremental risk estimate of 1.7 x 10-5 is associated with a 10-day exposure of 0.01 mg/m3. This cancer risk falls within the target range of 10-4 to 10-7. Therefore, PCB concentrations up to 0.01 mg/m3 can occur as long

as this concentration is not maintained for more than a 10-day period.

The carcinogenic and noncarcinogenic risk estimates developed above (for two month and 10-day exposure durations) provide a basis from which to establish target concentrations. Based on the previous calculations, an average concentration of 0.01 mg/m3 (10 ug/m3) should not be exceeded for any 10-day period within the duration of the dredging operations. In addition, the average (over the duration of the Pilot Study) measured ambient PCB concentration must not exceed the target concentration calculated based on incremental carcinogenic risks. Thus, if a 10-5 incremental risk level is established, the average measured concentration over the two month dredging operation should not exceed 0.97 ug/m3.

In the absence of acute (1-day) standards or criteria values, the above target levels are used to establish a maximum daily concentration of PCBs. Since no 10-day period can exceed, on the average 10 ug/m3, no 1-day period can exceed 100 ug/m3. A value of 100 ug/m3 also corresponds to the 10-day criteria value (10 ug/m3) with a safety factor of 10 applied. Therefore, it is suggested that the 100 ug/m3 be used as the 1-day allowable PCB concentration.

Massachusetts DEQE Acceptable Ambient Level for PCBs

Currently, no federal or state regulations exist to regulate the concentrations of PCBs in ambient air. The Massachusetts Department of Environmental Quality Engineering (DEQE) is in the process of finalizing an Acceptable Ambient Level (AAL) for PCBs. The DEQE considers the AAL to be "enforceable guidelines" although AALs have not been formally established or promulgated as standards. The concentration of PCBs currently being peer reviewed for the AAL is 0.0081 ug/m3 (8.1 ng/m3). This value corresponds to a 10-5 incremental carcinogenic risk based on a lifetime exposure for a 70 kg adult. These exposure conditions differ from those expected to occur under dredging operations (2 month exposure duration for a 10 kg child). Since risk is a function of both exposure and concentration, the shorter the exposure duration, the "greater" the exposure concentration can be to achieve the same level of risk. Thus, the AAL may be overly conservative for purposes of the Pilot Study.

To determine the applicability of the AAL to the Pilot Study, Jordan calculated the incremental carcinogenic risks associated with exposure to 0.0081 ug/m3. The risk estimate based on a two month continual exposure for a 10 kg child was calculated to be 1.24 x 10-7. This risk level falls within the target range of 10-4 to 10-7. If an incremental risk level of 10-7 is considered to be appropriate for the Pilot Study, then the AAL value will be sufficient. However, if an incremental risk level of 10-4 to 10-6 is considered, the AAL may be conservative.

4.0 SUMMARY

The following summarizes Jordans development of health based target concentrations.

- The Pilot Study dredging operations is expected to occur over a two month duration.
- Background levels of PCBs in this area have not yet been determined, and, therefore, background risks are not incorporated into these risk estimates.
- The target concentration will be determined by the incremental risk (10-4 to 10-7) chosen for the monitoring study.
- The average ambient PCB concentration measured during the entire dredging operation must be equal to or less than the target concentration to attain the target risk level (10-4 to 10-7).
- Within the constraints above, no 10-day average PCB concentration can exceed 10 ug/m3.
- It is recommended that no daily PCB concentration exceed 100 ug/m3.
- The AAL derived by the Massachusetts DEQE (8.1 ng/m^3) will provide adequate protection, but may be conservative if a target risk level of less than 10-7 is desired.

To ensure that acceptable air concentrations are maintained during the Pilot Study project requires that an effective air monitoring program be instituted. The target concentrations presented above provide appropriate health based guidelines which can be used to develop an air monitoring program. Additional considerations to be addressed in developing an effective air monitoring program include technical issues relating to the frequency and duration of air sampling, the placement of air monitoring devices around the source area, and the determination of background levels of PCBs in the New Bedford Harbor area.