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September 1991

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# Superfund Record of Decision:

## Sullivan's Ledge, MA

50272-101

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15. Supplementary Notes

16. Abstract (Limit: 200 words)


The Sullivan's Ledge site consists of a 12-acre former quarry site/disposal area and 14.5 acres of downgradient wetlands areas in New Bedford, Bristol County, Massachusetts. Land use in the area is predominantly municipal. The downgradient portion of the site, which is the focus of this Record of Decision (ROD), includes two wetlands areas: a 13-acre wooded wetland called Middle Marsh bordering the Unnamed Stream and a 1.5-acre wetland area 400 feet upstream from Middle Marsh called the "adjacent wetlands". In addition, the site includes portions of golf course fairways, and associated floodplains and watershed areas. The entire site lies within the 25- and 100-year floodplains of a tributary of the Unnamed Stream to the south and the Apponagansett Swamp to the north. Prior to 1930, 12 acres of the site were used as a granite quarry. From the 1930's to 1970's, the City of New Bedford acquired the property and used the quarry pits and nearby areas were used for disposal of hazardous materials including electrical transformers and capacitors, fuel oil, volatile liquids, and other industrial wastes. From 1988 to 1990, several EPA investigations identified contamination by PCBs and PAHs in surface and subsurface sediment, soil, and biota; and VOCs and inorganics in ground water.

(See Attached Page)


17. Document Analysis a. Descriptors

Record of Decision - Sullivan's Ledge, MA
First Remedial Action - Final
Contaminated Media: soil, sediment, sw
Key Contaminants: VOCs (toluene), other organics (PAHs, PCBs, pesticides, phenols), metals (lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

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Sullivan's Ledge, MA
First Remedial Action - Final


Abstract (Continued)

Contamination has resulted in part from contaminated sediment migrating from the disposal area via the Unnamed Stream and deposition in Middle Marsh during stream flooding. A 1989 ROD for the first Operable Unit (OU1) addressed source control of the disposal area and the Unnamed Stream. This ROD addresses the Middle Marsh as OU2. The primary contaminants of concern affecting the soil, sediment, and surface water are VOCs including toluene; other organics including PAHs, PCBs, pesticides, and phenols; and metals including lead.

The selected remedial action for this site includes excavating and dewatering approximately 5,200 cubic yards of contaminated sediment and soil from portions of Middle Marsh and the adjacent wetlands; solidifying/stabilizing the excavated materials as needed to comply with RCRA LDR rules; treating water extracted from excavated materials using carbon adsorption, followed by onsite discharge to the Unnamed Stream; onsite disposal of the excavated materials beneath the cap that will be constructed over portions of the disposal area as part of OU1; restoring affected wetlands; conducting long-term environmental monitoring; and implementing institutional controls to prevent future residential use of Middle Marsh and the adjacent wetlands. If the disposal area in OU1 has already been capped when materials from OU2 are excavated and ready for disposal, a contingency remedy will be implemented. This contingency remedy includes treating the excavated soil/sediment using solvent extraction, and treating the extracted oil containing PCBs and other organic chemicals offsite using incineration; treating residual water using carbon adsorption; disposing of the treated sediment/soil at Middle Marsh; restoring affected wetlands; conducting long-term environmental monitoring; and implementing institutional controls to prevent future residential use of Middle Marsh and the adjacent wetlands. The estimated present worth cost for this remedial action is $2,800,000, which includes a present worth O&M cost of $164,000. The estimated present worth cost for the contingent remedy is $7,780,000, which includes a present worth O&M cost of $164,000.

PERFORMANCE STANDARDS OR GOALS: Soil, sediment, and surface water clean-up goals are based on an excess lifetime cancer risk of $10^{-4}$ to $10^{-6}$ and an HI=1. The sediment/soil clean-up level for aquatic areas in Middle Marsh is the interim mean sediment quality criterion of 20 ug of total PCBs per gram of carbon (ug/Gc). This will result in interstitial water concentrations equal to or lower than the PCB ambient water quality criteria of 0.014 ug/l. The sediment/soil clean-up level for non-aquatic areas in Middle Marsh and for the adjacent wetland is total PCBs 15 mg/kg. This will protect mammals from chronic adverse effects from wetland/terrestial exposure to contaminated sediment/soil.

Declaration of Record of Decision
Remedial Alternative Selection

## Site Name and Location

Sullivan's Ledge Superfund Site
Middle Marsh Operable Unit
New Bedford, Massachusetts

## Statement of Purpose

This Decision Document presents the selected remedial action for the Sullivan's Ledge - Middle Marsh Operable Unit developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Contingency Plan (NCP); 40 CFR Part 300, 55 Federal Register 8666 (March 8, 1990).

The Commonwealth of Massachusetts has concurred with the selected remedy and the contingency remedy.

## Statement of Basis

This decision is based on the Administrative Record which was developed in accordance with Section 113(k) of CERCLA and which is available for public review at the information repositories located in the New Bedford Free Public Library, New Bedford, Massachusetts, and at 90 Canal Street, Boston, Massachusetts. The attached index identifies the items which comprise the administrative record upon which the selection of the remedial action is based.

## Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to the environment.

## Description of the Selected Remedy

The selected remedial action for the Sullivan's Ledge Site - Middle Marsh Operable Unit consists of the following source control components:

1. Site preparation;

2. Excavation of contaminated sediments and soils from portions of Middle March and the adjacent wetlands;

3. Dewatering of the excavated materials;

4. Disposal of the materials beneath the cap that will be constructed over portions of the Disposal Area of the Sullivan's Ledge site;

5. Restoration of the affected wetlands;

6. Institutional controls to prevent future residential use of Middle Marsh and the Adjacent Wetland; and

7. Long-term environmental monitoring.

Because implementation of the selected remedy is dependent upon the Sullivan's Ledge Disposal Area being available for disposal of Middle Marsh sediments and soils, a contingency remedy has also been selected consisting of the following components:

1. Site preparation;

2. Excavation of contaminated sediments and soils from portions of Middle March and the Adjacent Wetland;

3. Treatment of the excavated sediments by solvent extraction; and Treatment of the concentrated oil extract by off-site incineration;

4. Disposal of treated sediment/soils at Middle Marsh;

5. Restoration of the affected wetlands;

6. Institutional controls to prevent future residential use of the restrict access to Middle Marsh and the Adjacent Wetland; and

7. Long-term environmental monitoring.

EPA has determined that if additional design activities necessary to implement the selected remedy for the Middle Marsh Operable Unit are not completed in time to integrate the design elements for the Middle Marsh Operable Unit into the Remedial Design (which is to be submitted and approved under schedules approved according to the Consent Decree for the First Operable Unit), then the contingency remedy shall be implemented.

Declaration

The selected remedy and contingency remedies are protective of human health and the environment. The remedies satisfy the statutory preference for treatment that permanently and significantly reduces the volume, toxicity and mobility of the hazardous substances, pollutants and contaminants as a principal element. The selected remedy and contingent remedies also utilize permanent solutions and alternative treatment technologies to the maximum extent practicable, and are cost-effective. The selected remedy and contingency remedies attain federal and state requirements that are applicable or relevant and appropriate (ARARs).

Sept. 27 1991
DATE

Julie Belaga
Julie Belaga
Regional Administrator
EPA-Region I

# REGION I

# RECORD OF DECISION SUMMARY

SULLIVAN'S LEDGE SUPERFUND SITE
MIDDLE MARSH OPERABLE UNIT

SEPTEMBER 27, 1991

SULLIVAN'S LEDGE - MIDDLE MARSH OPERABLE UNIT

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ROD DECISION SUMMARY
SEPTEMBER 27, 1991

## I. SITE NAME, LOCATION AND DESCRIPTION

The Sullivan's Ledge Site ("the Site") consists of two operable units: the First Operable Unit which was the subject of a Record of Decision issued on June 29, 1989 (the "1989 ROD"); and the Middle Marsh Operable Unit, which is the subject of this ROD. Figure 1 shows the rough boundaries of the Sullivan's Ledge Site and the Middle Marsh Operable Unit. The First Operable Unit includes all areas within the Sullivan's Ledge Site, except for those areas in the Middle Marsh Operable Unit.

The Sullivan's Ledge Middle Marsh Operable Unit, the second operable unit of the Sullivan's Ledge Superfund Site, is located within the New Bedford Municipal Golf Course north of Hathaway Road in New Bedford, Bristol County, in southeastern Massachusetts. The Middle Marsh Operable Unit is bounded on the south by the southern banks of the tributary of an unnamed stream (the "Unnamed Stream"), on the north by the Apponagansett Swamp and on the east and west by fairways of the New Bedford Municipal Golf Course (see Figure 1). This operable unit excludes the Unnamed Stream, which travels from culverts under Hathaway Road, continues northward across the golf course in a well-defined channel, bisects Middle Marsh and eventually drains into the golf course water hazards.

The study area for this operable unit includes a 13-acre wooded wetland called Middle Marsh, a 1.5 acre wetland area bordering the Unnamed Stream 400 feet upstream of Middle Marsh (the "Adjacent Wetland"), and portions of the golf course fairways and associated floodplains and watershed areas. All wetlands in the study area are classified as bordering vegetated wetlands under the Massachusetts Wetland Protection Regulations, 314 CMR 10.00. Based on hydrologic sampling and quantitative hydrologic and hydraulic studies, the entirety of Middle Marsh and large areas of the golf course lie within the 25 and 100 year floodplains (see Figure 2).

The primary focus of this ROD is Middle Marsh, because sedimentary contamination migrates from the Sullivan's Ledge Disposal Area via the Unnamed Stream and is deposited in Middle Marsh during periods of stream flooding. Middle Marsh is predominantly a freshwater wetland consisting of palustrine broad-leaved deciduous forested wetland. Based on the results of the wetland delineation, additional wetland areas identified in Middle Marsh include emergent wetlands, scrub-shrub wetlands and forested upland areas (see Figure 3).

A more complete description of the Site can be found in the "Final Remedial Investigation Report - Additional Studies of Middle Marsh" (Metcalf and Eddy, 1991a) in Chapters 1 and 2 of Volume I.

## II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

### A. Land Use and Response History

The United States Environmental Protection Agency (EPA) conducted an air monitoring program of the Greater New Bedford Area in 1982 and installed groundwater monitoring wells around the Sullivan's Ledge Site in 1983. Based, in part, on the results of these studies, the Sullivan's Ledge Site was included on the National Priorities List in September 1984.

The twelve-acre Sullivan's Ledge Disposal Area (located in the area of the First Operable Unit) is a former granite quarry. Four granite quarry pits with estimated depths up to 150 feet have been identified from historical literature and field investigations. After quarrying operations ceased, the land was acquired by the City of New Bedford. Between the 1930s and the 1970s, the quarry pits and nearby areas were used for disposal of hazardous materials including electrical transformers and capacitors, fuel oil, volatile liquids and other industrial waste.

The Sullivan's Ledge Superfund Site, including the Disposal Area and downgradient areas, was the subject of Phase I (Ebasco, 1987) and Phase II (Ebasco, 1989a) remedial investigations, and a feasibility study (Ebasco, 1989b) which was completed in January 1989. These field investigations revealed high concentrations of polychlorinated biphenyls (PCBs) and polyaromatic hydrocarbons (PAHs) in surface and subsurface sediment/soils. In addition, the sampling results indicated the presence of volatile organic compounds (VOCs) and inorganics in groundwater sampled from the network of wells installed in the study area. Based on the results of the two RIs, EPA concluded that the sources of contamination within the Sullivan's Ledge study area are the wastes disposed of in the former quarry pits, contaminated soils in the 12-acre Disposal Area, and sediments that wash off the Disposal Area. In particular, the remedial investigations revealed that PCBs and other contaminants have migrated from the Disposal Area to the Unnamed Stream and the Middle Marsh Operable Unit.

U.S. EPA Region I issued a Proposed Plan for the Site on February 6, 1989. On June 29, 1989, EPA Region I issued a Record of Decision (ROD) for the First Operable Unit, outlining remedial action for the Disposal Area and nearby areas including the Unnamed Stream. The remedial action selected in the ROD consists of source control and management of migration components. As described in the June 29, 1989 ROD, the remedy for the First Operable Unit includes the following components:

1. Fencing and site preparation;
2. Excavation and on-site solidification/stabilization of contaminated soils in the unsaturated zone at the Disposal Area. Excavation and on-site solidification (if necessary) of contaminated soils in the unsaturated zone in areas immediately east and north of the Disposal Area. All excavated and/or solidified soils shall be disposed on the Disposal Area under the cap;

3. Excavation/dredging, dewatering, solidification/stabilization (if necessary) and on-site disposal of contaminated sediments from the Unnamed Stream up to and including the two golf course water hazards;
4. Construction of an impermeable cap over approximately 11 acres of the Disposal Area;
5. Temporary diversion and lining of a portion of the Unnamed Stream;
6. Construction and operation of passive and active groundwater collection, extraction, treatment and discharge systems;
7. Implementation of a wetlands restoration and maintenance program;
8. Long-term monitoring; and
9. Institutional controls.

In its 1989 Proposed Plan, EPA presented three possible options for addressing contamination found in Middle Marsh. These options included a No-Action alternative, which called for no cleanup activities to occur within Middle Marsh, and two alternatives which called for excavating sediments that contained PCBs at concentrations that may cause long-term impacts to aquatic organisms. The two action alternatives differed in the amount of sediment/soils that would be excavated, resulting in different residual levels of PCBs in the area. In the 1989 Proposed Plan, EPA sought comments on the various cleanup alternatives for Middle Marsh, and initially proposed the No-Action alternative, stating that removal of the contaminated sediments in all areas of Middle Marsh which exceeded the interim sediment quality criteria might cause more harm to the environment than would leaving the contaminated sediments in place. Because Middle Marsh is located within a heavily used golf course and because of the high ecological value of the wetlands, EPA was especially interested in comments on the three remedial alternatives considered for Middle Marsh.

After further consideration, EPA concluded in June 1989 that additional studies of Middle Marsh and the Adjacent Wetland would be necessary to: (1) determine with greater accuracy the nature and extent of contamination in the area; (2) compare the potential environmental impacts of conducting cleanup activities to the impacts of site contamination; and (3) further identify any potential risk to human health and the environment posed by the contamination. Thus, the study and remediation of Middle Marsh and the Adjacent Wetland was separated into a second operable unit, called the Middle Marsh Operable Unit. The "Remedial Investigation - Additional Studies of Middle Marsh" (Metcalf and Eddy, 1991a) was completed in April 1991 and the "Feasibility Study of Middle Marsh" (Metcalf and Eddy, 1991b) was completed in May 1991. EPA issued a Proposed Plan for the Middle Marsh Operable Unit on May 29, 1991. A sixty-three day comment period to accept comments from the public on the proposed remedial alternatives followed.

A more detailed description of the site history can be found in the "Phase I Remedial Investigation Report; June 1987" in Chapter 1 of Volume I and the "Remedial Investigation - Additional Studies of

Middle Marsh" in Chapter 1 of Volume I.

## B. Enforcement History

In September 1984, EPA issued the owner of the Site, the City of New Bedford, an Administrative Order under Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) requiring the City to secure the former disposal area by installing a perimeter fence and posting signs warning against unauthorized trespassing.

Between November 1988 and May 1990, EPA notified 23 parties who either owned or operated the Site, generated wastes that were shipped to the Site, arranged for the disposal of wastes at the Site, or transported wastes to the Site that they were potentially liable for response costs incurred with respect to the Site. On April 6, 1990, EPA began negotiations with the potentially responsible parties (PRPs) for performance of the remedial design and remedial action at the First Operable Unit.

Fourteen PRPs formed a steering committee and substantial negotiations took place. In September 1990, EPA, the Commonwealth of Massachusetts, and fourteen PRPs reached a settlement with respect to the First Operable Unit. This settlement was approved by the United States District Court in April, 1991. Under the terms of the settlement, the 14 companies agreed to: (1) construct the remedy called for in the 1989 ROD; (2) perform operation and maintenance for thirty years after completion of construction of the remedy for the First Operable Unit; (3) pay a portion of EPA's and the Commonwealth's past costs of conducting studies at the Site; and (4) pay a portion of EPA's and the Commonwealth's costs of overseeing the design and construction of work to be performed at the First Operable Unit. Design of the cleanup plan for these portions of the Site, including the Disposal Area, is currently underway.

Several PRPs have been active in the remedy selection process for the Middle Marsh Operable Unit. Technical comments presented by PRPs during the public comment period were summarized in writing, and the summary and written responses were included in the Administrative Record.

# III. COMMUNITY PARTICIPATION

The Sullivan's Ledge Site was originally included as part of the New Bedford Harbor site, known as the Greater New Bedford Superfund site. The level of community concern about the Greater New Bedford site was quite high during the fall of 1984, when an open house was held by EPA to explain cleanup options for PCB "hot spots," and a public hearing was held to obtain comments from citizens and local agencies and organizations. About that same time, the EPA and the Massachusetts Department of Public Health announced the start of a three-year health study in the greater New Bedford area that included testing individuals to determine the level of PCBs in their bloodstream. EPA provided funding for the study.

Other public meetings were held to discuss findings or information about the New Bedford sites in January and October of 1985. At the October 1985 meeting, EPA announced the decision to separate the Sullivan's Ledge Site from the Greater New Bedford Superfund site and to include the Sullivan's Ledge Site on the National Priorities List (NPL). The decision to create a separate site was based on the following considerations:

1. The severity of the problem and the environmental complexity of the Sullivan's Ledge Site.

2. Environmental diversity between harbor areas (aquatic) and the Sullivan's Ledge Site (primarily wetlands and uplands).

3. Difference in the range of contaminants found.

4. Possible differences in potentially responsible parties (PRPs) at the sites.

5. Degree to which separate management would facilitate activities at the sites.

In September 1986, EPA issued a community relations plan which outlined a program to address community concerns and to keep citizens informed about activities during remedial activities. On July 20, 1988, EPA held an informational meeting to present the results of the Phase II Remedial Investigation and to answer questions from the public.

An administrative record for the First Operable Unit was prepared and made available to the public on February 6, 1989. On that same date, EPA held an informational meeting to discuss the cleanup alternatives presented in the Sullivan's Ledge Feasibility Study (Ebasco, 1989b) and to present the EPA's Proposed Plan. From February 6 to March 27, 1989, the Agency held a forty-nine day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan for the First Operable Unit and on other documents available to the public. On February 21, 1989, the Agency held a public hearing to accept oral comments. A transcript of this hearing, a summary of written comments, and the comments and EPA's response to comments were attached to the 1989 ROD.

Community concern about and involvement with to the Middle Marsh Operable Unit has been moderate. EPA has kept the community and other interested parties apprised of site activities through informational meetings, fact sheets, press releases and public meetings.

On May 29, 1991, EPA held an informational meeting in New Bedford to describe the results of the Middle Marsh Remedial Investigation

(Metcalf and Eddy, 1991a), the cleanup alternatives presented in the Feasibility Study (Metcalf and Eddy, 1991b) and to present the Agency's Proposed Plan. Also during this meeting, the Agency answered questions from the public.

On May 30, 1991, EPA made the administrative record available for public review at EPA's offices in Boston and at the New Bedford Free Public Library. EPA published a notice and brief analysis of the Proposed Plan in the New Bedford Standard Times on May 24, 1991 and made the plan available to the public at the New Bedford Free Public Library. In the proposed plan, EPA specifically sought comments on the following: (1) site cleanup plans; (2) the impacts of site cleanup activities on the wetlands and floodplains found at the Site; and (3) possible use of a treatability variance to comply with RCRA land disposal restrictions for each of the alternatives for which a variance is required.

From May 30, 1991 to July 31, 1991, the Agency held a sixty-three day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public. On June 26, 1991, the Agency held a public hearing to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting and the comments and the Agency's response to comments are included in the attached responsiveness summary.

## IV. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

In summary, the selected remedy for the Middle Marsh Operable Unit consists of the following components:

1. Site preparation;
2. Excavation of contaminated sediment/soils from portions of Middle Marsh and the Adjacent Wetland;
3. Dewatering of the excavated materials;
4. Disposal of the materials beneath the cap that will be constructed over portions of the Disposal Area of the Sullivan's Ledge Site;
5. Restoration of the affected wetlands;
6. Institutional controls to prevent future residential use of and to restrict access to Middle Marsh and the Adjacent Wetland; and
7. Long-term environmental monitoring.

Because implementation of the preferred alternative is dependent upon the Sullivan's Ledge Disposal Area being available for disposal of Middle Marsh sediment/soils, a contingency remedy has also been selected consisting of the following components:

1. Site preparation;
2. Excavation of contaminated sediment/soils from portions of Middle Marsh and the Adjacent Wetland;
3. Treatment of the excavated sediment/soils by solvent extraction;
4. Disposal of the treated sediment/soils at Middle Marsh;
5. Restoration of the affected wetlands;

6. Institutional controls to prevent future residential use of and restrict access to Middle Marsh and the Adjacent Wetland; and
7. Long-term environmental monitoring.

The contingency remedy would be implemented if EPA determines, after consultation with the Massachusetts Department of Environmental Protection (MADEP), that design activities necessary to implement the selected remedy for Middle Marsh are not completed in time to integrate the design elements for the Middle Marsh Operable Unit into the remedial design for the First Operable Unit, so that the Disposal Area could not be used for the containment of excavated sediment/soils from Middle Marsh and the Adjacent Wetland without delaying the implementation of the First Operable Unit.

The remedial action for the Middle Marsh Operable Unit, as described in this ROD, addresses the principal threats to the environment posed by exposure of biota to contaminated sediment/soils in Middle Marsh and the Adjacent Wetland. This remedy, in conjunction with the selected remedy for the First Operable Unit, addresses all principal threats to human health and the environment posed by the sources of contamination at the Sullivan's Ledge Site including contaminated soils at the Disposal Area, PCB-contaminated sediments that have migrated to the Unnamed Stream and wetland areas, and wastes disposed of in the former quarry pits.

## V. SUMMARY OF SITE CHARACTERISTICS

The significant findings of the Remedial Investigation are summarized below.

### A. General

Field investigations were conducted in the Middle Marsh Operable Unit's study area in 1988, 1989 and 1990. The results of the investigations revealed high concentrations of polychlorinated biphenyls (PCBs) in surface soils, subsurface soils, sediments and biota. Based on the results of the field investigations, EPA has determined that erosion of soils from the Disposal Area into the Unnamed Stream and wetland areas is the most significant pathway for movement of PCBs. Airborne transport is of little consequence at the Site.

The primary manner of distribution of PCBs in the environment is adsorption to soils, so that the distribution of PCBs in the golf course area mirrors that of sediment deposition along and from the stream. In areas of frequent flooding and deposition in Middle Marsh, PCB concentrations were generally in the range of 10 to 30 mg/kg. PCB concentrations in the sediment/soil generally diminished to levels of approximately 2 mg/kg at depths of one foot and deeper. Several heavy metals including lead and zinc were detected, and the pattern of their distribution in Middle Marsh is similar to that of the PCBs in the surface sediment/soils. Volatile and semivolatile organic compounds were generally within the range of background concentrations, but were higher in Middle Marsh than in the Adjacent Wetland.

Volatiles and semivolatiles were found in the pore and surface water samples from Middle Marsh and the Adjacent Wetland at levels near detection limits. Similarly, many of the heavy metals were near detection limits and were below ambient water quality criteria. However, PCBs (Aroclor 1254) were detected in filtered pore and surface water samples at levels above 0.014 $\mu g/l$, the PCB ambient water quality criterion for protection of uses of aquatic life, specifically the consumption of aquatic life by wildlife.

PCBs were found in the tissues of almost all animals sampled in Middle Marsh during field studies. In particular, PCBs were detected in tissue samples of aquatic insects, earthworms, frogs and small animals, including mice and voles.

B. <u>Wetland and Habitat Delineation</u>

A preliminary wetland delineation included a review of the U.S. Geological Survey Topographical Map, the U.S. Department of Agriculture Soil Conservation Service Soil Survey of Bristol County, Massachusetts, and the National Wetland Inventory.

The U.S. Geological Survey map indicates that Middle Marsh is wooded swamp or marsh. Five unnamed ponds are indicated in the area surrounding Middle Marsh, and the Unnamed Stream is indicated flowing through the center of Middle Marsh. Review of Soil Conservation Service soil surveys indicated the widespread presence of hydric soils in the vicinity of Middle Marsh and the golf course.

The National Wetlands Inventory indicates Middle Marsh is Palustrine Forested Broad-Leaved Deciduous Wetland. The Middle Marsh forested wetland is characterized by woody vegetation that is 6 meters tall or taller, with red maple as the dominant tree. In addition, five areas of Palustrine Open Water are indicated to the north and southwest of Middle Marsh.

EPA concluded that Middle Marsh was composed mainly of palustrine forested deciduous wetland, with nearby palustrine open water in three to five locations. Using the information from the literature review as a basis, field investigations were conducted in December 1989 and May 1990 to delineate wetland boundaries, and to characterize further all wetlands at the Site. Figure 3 depicts the wetland/upland borders, as well as distinct habitat types identified within and next to Middle Marsh. As indicated in Figure 3, the following wetland classes were delineated and characterized within Middle Marsh: (1) three areas of palustrine emergent persistent wetlands dominated by the common reed "phragmites australis"; (2) persistent emergent wetlands with a mix of emergent, non-phragmites plant species, located in the northern section of Middle Marsh; (3) palustrine scrub-shrub broad-leaved deciduous/emergent wetland, located in the north central section of Middle Marsh and characterized by woody vegetation and erect rooted herbaceous hydrophtes.

In contrast to the largely forested Middle Marsh, the Adjacent Wetland consists of palustrine emergent and scrub-shrub wetland, including a large area of phragmites wetland directly next to the Unnamed Stream.

C. **Flora and Fauna Investigations**

EPA undertook an investigation of the flora (plants) and fauna (animals) at the Middle Marsh Operable Unit. As part of this investigation, EPA consulted with the Massachusetts Division of Fisheries and Wildlife, Natural Heritage & Endangered Species Program to determine the potential occurrence and distribution of any threatened or endangered species including state listed "Species of Special Concern." EPA also conducted direct observations and recording of all wetlands flora and fauna encountered at the Middle Marsh Operable Unit.

According to the Massachusetts Natural Heritage & Endangered Species Program, two state-listed "Species of Special Concern", the spotted turtle (*Clemmys guttata)* and the mystic valley amphipod (*Crangonyx aberrans*), may occur on-site. The occurrence of both species has been documented in the Apponagansett Swamp, which is contiguous to the Site.

The spotted turtle is typically found in small, shallow water bodies, frequently basking along the water's edge. It is omnivorous, consuming insects, other invertebrates, and aquatic plants underwater. Breeding occurs from March to May. Spotted turtles hibernate during the winter on the muddy bottoms of small ponds, and may become dormant for the late part of the summer. During the May 1990 field investigation, spotted turtles were observed in Middle Marsh in the northern part of the scrub-shrub wetland area about 500 feet from the Unnamed Stream.

The Mystic Valley Amphipod is primarily a nocturnal species occurring in lowland aquatic habitats, especially in red maple swamps. They feed on detritus surrounding the roots of plants, and breed in the spring or early summer. This species was not observed on-site, although EPA has determined that Middle Marsh may be suitable habitat for the Mystic Valley Amphipod. As described in Section X.B.1.d., prior to initiation of remedial activities, further investigations will be performed to identify areas of Middle Marsh where the Mystic Valley Amphipods may inhabit.

Flora and fauna observed at Middle Marsh and the immediate vicinity are listed in Table 2-2 and Table 2-3 of the RI (Metcalf and Eddy, 1991a), respectively. In particular, animals observed at Middle Marsh and the immediate vicinity include red-tailed hawk, american robin, raccoon, deer mouse, green frog and crayfish.

D. <u>Wetland Functional Analysis and Habitat Evaluation</u>

An analysis of wetland functions and values was conducted for Middle Marsh and the Adjacent Wetland using the U.S. Army Corps of Engineers Wetland Evaluation Technique Volume II (WET II). WET II assesses functions and values by characterizing a wetland in terms of its physical, chemical and biological processes and attributes. The results of the WET II evaluation of Middle Marsh are listed below:

1. Infiltration from Middle Marsh is not critical to groundwater supplies in the area. Recharge may be somewhat inhibited in Middle Marsh because the wetland is underlain by glacial till which is composed largely of silty sand and may be somewhat impervious;

2. Middle Marsh is moderately effective in terms of floodwater alteration as the area is relatively large, water is not artificially removed, and the underlying soils do not have an exceptionally slow infiltration rate;

3. Vegetated areas of Middle Marsh outside the stream channel are highly effective for stabilizing sediment since vegetation is dense in most areas and there is good water/vegetation interspersion throughout the wetlands;

4. Middle Marsh is rated low for sediment/toxicant retention because during average flow conditions in which the Unnamed Stream does not flood into Middle Marsh, most of the flow and associated sediments never leave the Unnamed Stream, passing directly into the golf course ponds/hazards. Chemical data and direct observations indicate, however, that during wet weather that causes flooding of the Unnamed Stream, deposition of sediments and removal of toxicants does occur in Middle Marsh;

5. Middle Marsh generally has a limited effectiveness and a moderate opportunity to remove and transform nutrients;

6. Middle Marsh is highly effective in providing breeding, migration and wintering habitat for wildlife. Table 1 lists animal species typically associated with wetland cover types identified at Middle Marsh;

7. Middle Marsh does not provide an abundance of ideal aquatic habitat in that *permanent* open water within Middle Marsh is limited to its main tributary and nearby permanently flooded areas. These areas support aquatic life such as aquatic invertebrates, tadpoles, mollusks, and crayfish;

8. Middle Marsh is highly significant in terms of Uniqueness/Heritage because a species of special concern, the spotted turtle, is known to inhabit Middle Marsh. In addition, although not observed, the mystic valley amphipod may occur on-

site.

Adjacent Wetland

Due to its general topography and subsurface geology, the Adjacent Wetland is likely ineffective for groundwater recharge and discharge. The Adjacent Wetland does not function effectively for flood attenuation because of its small size and relatively steep slopes. With dense vegetation abutting the stream bank, this area could provide reduction of sediments and toxicants, and removal and transformation of nutrients, as well as stabilization of sediments despite rapid overbank stream flow velocities. Due to the area's relatively small size, homogeneous cover type, and absence of characteristics such as tree cavities for protective cover and seed or nut producing tree or plants, the area does not have exceptional habitat value, but could support various species of birds and nocturnal mammals.

E. Surficial Sediment/Soils

Surficial sediment/soils were sampled to define more clearly the horizontal extent of contamination as well as to investigate the relationships between contaminant concentrations, elevation, frequency of flooding, soil description and vegetation cover type. Tables of detected contaminants in surficial sediment/soils are presented in Appendix E-1 of the "Remedial Investigation - Additional Studies of Middle Marsh" and are summarized in Table 2 of this ROD. Contaminant patterns in surficial sediment/soils for PCBs, volatiles, semivolatiles and metals are summarized below.

1. **Polychlorinated Biphenyls**

PCB Aroclor 1254 was the only Aroclor detected in the study area. This is consistent with the results of previous studies. Figure 4 shows the individual and contoured PCB concentrations above 5 mg/kg in Middle Marsh, assuming that the stream influences the distribution of sediment equally on both sides of the stream. Individual and contoured PCB concentrations at surficial stations in the Adjacent Wetland and golf course areas are depicted in Figure 5.

Twenty-seven of the thirty stations sampled in Middle Marsh during the current investigation had PCB contamination in surficial sediment/soils. As illustrated by Figure 4, the highest PCB concentrations in Middle Marsh were found near the Unnamed Stream and in the most upstream areas. In general, sediment/soil concentrations appear to be correlated with elevation and the frequency of flooding, especially in areas near the stream that flood at an interval of 3 months or more (see Figure 2). An additional trend indicates decreasing concentrations with distance from the stream despite an insignificant change in elevation. The highest PCB concentrations were found near the Unnamed Stream, confirming that the Unnamed Stream is the source of contamination.

PCB sampling results from the current investigation are consistent with samples collected in Middle Marsh as part of the 1989 RI and with samples collected by EPA. To the north of the Unnamed Stream, concentrations at stations ME15 (13 mg/kg), ME29 (5.6 mg/kg), ME17 (24 mg/kg), ME2 (5.8 mg/kg) and ME30 (4.1 mg/kg) decrease with distance from the Unnamed Stream within an elevation range of less than one foot. Similarly, concentrations decrease with distance in forested wetland to the south of the Unnamed Stream, as seen at stations ME14 (19 mg/kg), ME16 (5.7 mg/kg) and ME23 (0 mg/kg). Stations ME1 (20 mg/kg), ME10 (20 mg/kg), ME14 (19 mg/kg), ME15 (13 mg/kg), and ME17 (24 mg/kg) had among the most elevated concentrations in the survey and are all located relatively close to the Unnamed Stream in the upgradient areas of Middle Marsh.

However, levels of PCBs at areas previously identified as "hot spots" were not consistent with previous investigations. In the Phase II RI (Ebasco, 1989a), station MM-5 marked a "hot spot" of 60 mg/kg PCBs. In the RI (Metcalf and Eddy, 1991a), in the same area at station ME1, the concentration was 20 mg/kg PCBs. Conversely, EPA found concentrations of 3.9, 1.8 and 3.0 mg/kg in the same area (ERT8). Similar variability was found when comparing other stations located close together. ME11 and MM-20 were located in dense forested wetland in the same area and had concentrations of 12 and 28 mg/kg PCBs, respectively. ME27 and MM-25 were both located next to the tributary in the southwest portion of the wetland, but had concentrations of 2.2 and 10 mg/kg, respectively. EPA believes that this variability is likely due to slight differences in topography, hydrology or soil type. In addition, flooding events of varying intensity between the sampling rounds may have deposited and redistributed sediments.

The highest concentrations of PCBs in the Middle Marsh study area were encountered in the Adjacent Wetland (see Figure 5), upstream from Middle Marsh. Aroclor 1254 was detected at every station sampled in the Adjacent Wetland. Stations SL56, ME38, ME35 and ME34 which were directly next to the Unnamed Stream (from upstream to downstream) had PCB concentrations of 34, 32, 22 and 16 mg/kg, respectively. Another station next to the stream (ME31), but further downstream, had a concentration of 3.4 mg/kg PCBs.. Concentrations at other stations decreased with increasing elevation and distance from the stream.

Surficial soils were sampled at nine locations on the golf course. PCBs were detected at eight of the nine stations. Concentrations ranged from undetected to 10 mg/kg PCBs. In the vicinity of the ponds/water hazards to the north of Middle Marsh, concentrations did not exceed 1.1 mg/kg PCBs (ME41). In the golf course area east of the Unnamed Stream (Stations SL63 to SL65), PCB concentrations ranged from 0.42 to 3.3 mg/kg. Three additional stations were sampled near a golf course tee area next to the Adjacent Wetland and the Unnamed Stream. PCB concentrations in this area were 1.4 mg/kg (SL50), 10.0 mg/kg (SL51), and 0.94 mg/kg (SL52). Station SL51 was located closest to the Unnamed Stream.

2. Volatile Organics

Thirteen surficial sediment/soil samples were analyzed for volatile organics. In general, data indicate that volatiles were found at low levels at ten stations in Middle Marsh. Volatiles found included acetone (0.019-0.190 mg/kg), 2-butanone (0.004-0.030 mg/kg) and methylene chloride (0.009-0.110 mg/kg). Chloroform, toluene, and xylene were found at levels near detection limits. These compounds were found at one or more of the following stations: ME1, ME2, ME4, ME15, ME17, ME23 and/or ME29 which are widely distributed in Middle Marsh but are all within the 3 month floodplain (See Figure 2). No distinct patterns or relationship to patterns of PCB contamination were observed in Middle Marsh. Volatiles were virtually undetected in the Adjacent Wetland/golf course areas.

3. Semivolatile Organics

Semivolatile organics were found in surficial sediment/soil samples at all of the 25 stations sampled in Middle Marsh and at 18 of the 23 stations sampled in the Adjacent Wetland and the golf course. Semivolatile organics detected included: polyaromatic hydrocarbons (PAH), phenols, furans, phthalates, 1,4-dichlorobenzene, and benzoic acid. Concentrations of individual compounds ranged from 0.040 to 7.0 mg/kg. Eight PAHs, including phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene were widely distributed. Concentrations of these eight PAHs ranged from 0.040 to 2.1 mg/kg in Middle Marsh, and from 0.055 to 0.140 mg/kg in the Adjacent Wetland. The levels in Middle Marsh exceeded site-specific background concentrations, whereas concentrations in the Adjacent Wetland fell within the range of site-specific background concentrations[1].

Similar to volatile organics, semivolatiles concentrations did not exhibit a strong pattern of distribution, but were detected at greater frequency at several stations near the Unnamed Stream.

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[1] Concentrations of these PAHs at background stations ME8 and ME20 ranged from undetected to 0.200 mg/kg. In comparison, concentrations of many of these semivolatile compounds at the Ebasco background stations ranged from 0.093 to 0.99 mg/kg.

### 4. Metals

Metals analysis was performed on samples from 34 surficial stations in Middle Marsh and the Adjacent Wetland. The concentration and frequencies of detection of aluminum, calcium, sodium, potassium and barium in surficial soils were generally consistent with site-specific background levels. However, manganese (22.3-1870 mg/kg) and iron (2360-167,000 mg/kg) were widely distributed in Middle Marsh and the Adjacent Wetland, and exceeded site-specific background levels. Iron appears to be related to disposal practices at the Site, as evidenced by comparison to background levels elsewhere on the Middle Marsh Operable Unit (2490 to 12,100 mg/kg) and by the dark orange color of the sediments in the Unnamed Stream downstream of the Disposal Area.

A number of heavy metals were detected in Middle Marsh at levels above background. Chromium, copper, lead, vanadium and zinc were elevated above site-specific background levels in Middle Marsh. There was no pattern in the distribution of chromium and copper. In contrast, lead, vanadium, and zinc were present in a pattern very similar to that of PCBs, with highest concentrations occurring at stations ME29, ME17 and ME2 to the north of the Unnamed Stream and ME16 to the south. These stations are all located in semi-permanently flooded areas of Middle Marsh in a palustrine emergent wetland area that drains into the Unnamed Stream.

Several metals, including lead and zinc, were also found in the Adjacent Wetland, but concentrations were much lower than those in Middle Marsh and were generally within site-specific background levels. Metals were virtually undetected in samples taken from the golf course.

## F. Subsurface Sediment/Soils

Core sampling was conducted at 14 stations in Middle Marsh and the Adjacent Wetland to determine the vertical extent of contamination. Tables of detected contaminant concentrations in subsurface sediment/soil are presented in Appendix E-2 of the "Remedial Investigation - Additional Studies of Middle Marsh". The sections below describe contamination patterns in subsurface sediment/soils for PCBs, volatiles, semivolatiles and metals.

### 1. Polychlorinated Biphenyls

Core sampling revealed a consistent pattern of decreasing PCB contamination with depth. At about half the stations, concentrations diminished to below 2 mg/kg or undetected in the 12-18 and 18-24 inch fractions. At stations ME1, ME14 and ME15, PCB levels were more consistent with surface concentrations (8.6, 6.6, and 12 mg/kg, respectively) in the 18-24 inch core fraction.

At station ME38 (SL38), which is located directly next to the Unnamed Stream in the Adjacent Wetland, a concentration of 97 mg/kg was found in the 6-12 inch core fraction. This was the highest PCB concentration found downstream of Hathaway Road.

**2. Volatile Organics**

Most volatiles were found at levels near detection limits in subsurface samples of various depths. Volatiles were detected at nine of the ten core sampling stations in Middle Marsh. The volatiles found at three or more stations included acetone (undetected-0.480 mg/kg), methylene chloride (undetected-0.160 mg/kg), and 2-butanone (undetected-0.077 mg/kg). Chloroform, carbon disulfide, xylene, benzene, and toluene were detected less frequently in core samples at low concentrations near detection limits.

**3. Semivolatile Organics**

In general, there was no clear pattern of semivolatile contamination with depth. PAHs were found at varying depths in Middle Marsh with individual concentrations ranging from 0.069 mg/kg to 3.8 mg/kg. Concentrations decreased with increasing depth at some stations, while other stations showed the opposite pattern. Bis(2-ethylhexyl)phthalate was found at all ten stations at concentrations ranging from 0.064 mg/kg to 5.9 mg/kg. Other phthalates were detected at few stations and at concentrations near detection limits. 4-methyl phenol and benzoic acid were found at station ME17 at concentrations of 1.1 mg/kg and 1.6 mg/kg, respectively.

**4. Metals**

Metals concentrations in subsurface core fractions were generally in the same range as the surface and there was no clear trend of changing concentration with depth. At station ME15, aluminum, barium, iron, and zinc increased with depth. In contrast, zinc decreased with depth at ME23. Lead concentrations decreased with depth as observed at stations ME15 and ME23.

**G. <u>Pore Water</u>**

Pore water samples were collected (when present) at the core sediment/soil sampling stations for comparison with ambient water quality criteria. Tables of detected contaminants in the pore water are presented in Appendix E-3 of the "Remedial Investigation - Additional Studies of Middle Marsh". PCBs, volatiles, semivolatiles and metals analyses were conducted on pore water samples and the results are summarized below.

**1. Polychlorinated Biphenyls**

Aroclor 1254 was found in the pore water in both filtered and unfiltered samples. In filtered samples, dissolved PCB concentrations ranged from undetected (at a detection limit of 0.05 µg/l) to 4.4 µg/l in the samples collected in May, 1990 and from undetected (at a detection limit of 0.02 µg/l) to 10 µg/l in the samples collected in September, 1990. In unfiltered samples, dissolved and particulate-associated PCB concentrations ranged from 1.8 µg/l to 29 µg/l in the samples collected in September 1990.

**2. Volatile Organics**

Concentrations of volatiles in unfiltered pore water samples were detected infrequently and were found at levels near detection limits. Methylene chloride, acetone, carbon tetrachloride, toluene, and carbon disulfide were found at levels near detection limits at stations throughout the wetland with no apparent distribution pattern.

**3. Semivolatile Organics**

Semivolatiles were found at concentrations near detection limits in unfiltered pore water samples. There were very few detectable concentrations and no discernable pattern. Bis(2-ethylhexyl)-phthalate was most common, but was found at low levels (0.014 µg/l - 0.230 µg/l). Benzoic acid was detected at station ME29 at a concentration of 0.004 µg/l, and pentachlorophenol was detected at a concentration of 0.006 µg/l at station ME14.

**4. Metals**

Unfiltered pore water samples contained barium, lead, aluminum, calcium, iron, magnesium, manganese, potassium, and sodium. Lead concentrations ranged from 21.7 to 1140 µg/l, with the highest concentrations found at stations ME3, ME4, and ME14. These three stations were located along the Unnamed Stream bank and flood more frequently than the other three pore water sampling stations (ME11, ME23, and ME29). Arsenic and nickel were found infrequently and at low concentrations. Chromium was detected at stations ME4 and ME14 at 76 µg/l and 65.7 µg/l, respectively. Vanadium and zinc were found at five stations with highest concentrations at ME3, ME4, and ME14 (45 µg/l, 81.9 µg/l, 133 µg/l, and 175 µg/l, 625 µg/l, 566 µg/l, respectively).

Filtered (dissolved) metals samples had markedly diminished concentrations of iron, lead, and zinc as compared to the unfiltered samples. Whereas iron and zinc values were approximately halved, lead values ranged from undetected, at a detection limit of 2 µg/l, to 5.2 µg/l.

**H. <u>Surface Water</u>**

Surface water samples were collected when present at the sediment/soil sampling stations to examine the horizontal extent of contamination. Tables of detected contaminants in the surface water are presented in Appendix E-4 of the "Remedial Investigation - Additional Studies of Middle Marsh" and are summarized in Table 3 of this ROD. PCBs, volatiles, semivolatiles and metals analyses were conducted on surface water samples and the results are summarized below.

**1. Polychlorinated Biphenyls**

Aroclor 1254 was detected in the surface water, but at substantially lower concentrations than in pore water. In filtered samples, dissolved PCB concentrations ranged from undetected to 0.19 μg/l in the samples collected in May, 1990, and from undetected to 0.077 μg/l in the samples collected in September, 1990. In unfiltered samples, concentrations ranged from 0.98 to 2.0 μg/l in the samples collected in September, 1990.

**2. Volatile Organics**

Acetone and carbon tetrachloride were generally undetected in unfiltered surface water but were found at levels near detection limits at two stations. No other volatiles were detected in any of the surface water samples.

**3. Semivolatile Organics**

Semivolatiles were undetected in nearly every surface water sample. Benzoic acid and bis(2-ethylhexyl)phthalate were each found at one station (ME3 and ME23, respectively) near detection limits.

**4. Metals**

Surface water samples generally had lower metals concentrations than the pore water. Zinc was found in unfiltered samples from four stations (ME3, ME11, ME23 and ME29) and lead from three stations (ME3, ME23, and ME24). The highest concentrations of zinc and lead were found at ME23 and ME3. ME3 is located next to the stream and is subject to frequent flooding. Similar to the pore water, lead and zinc values ranged from undetected to values at the detection limits in filtered surface water samples.

## I. <u>Biota</u>

EPA Environmental Response Team conducted a food chain study in Middle Marsh which included biological and chemical sampling conducted in June and September of 1989.

The study consisted of collection of sediment/soil, surface water, and biota samples. Sediment/soil and water samples are discussed in detail in Section 2.4 of the RI (Metcalf and Eddy, 1991a). Biota sampling consisted of benthic invertebrates, small mammals, amphibians, earthworms, and plants. Figure 6 illustrates biota sampling stations and the types of samples collected at each station. All samples in this study were analyzed for pesticides and PCBs. Aroclor 1254 was the only contaminant found in the tissue data. Table 4 summarizes the animal and plant tissue data collected at ten stations in Middle Marsh. All animal species exhibited bioaccumulation of PCBs.

Aroclor 1254, the principal contaminant of Middle Marsh, was found in samples of small mammals, benthic invertebrates, earthworms, and frogs. A total of seven green frogs (*Rana clamitans melanota*) were sampled in Middle Marsh. PCBs were present in all specimens with concentrations ranging from 0.19 to 0.73 milligrams per kilogram (mg/kg). Two short-tail shrews (*Blarina brevicauda*) caught at Station 4 had PCB concentrations of 0.38 and 0.98 mg/kg. Concentrations in meadow vole (*Microtus pennsylvanicus*) at the east bank station had PCB concentrations of 0.36, 0.88, and 1.6 mg/kg. Concentrations in deer mice (*Peromyscus maniculatus*) at the east and west bank stations ranged from undetected to 1.0 mg/kg PCBs. Concentrations in white-footed mice (*P. leucopus*) which were found only at the west bank station were 0.68, 0.68 and 0.84 mg/kg PCBs.

Concentrations of PCBs in earthworms ranged from undetected at the reference station (Station 4) to 2.3 and 1.8 mg/kg at the east bank and west bank, respectively. The concentrations of PCBs detected in earthworms indicate a likely exposure pathway for predators including the shrew, frogs, american robin, woodcock and other bird species.

Aroclor 1254 levels were found to be below the method detection limit (MDL) of 100.0 µg/kg in all plant tissues sampled and in benthic invertebrates from five of the seven sites sampled. PCBs were detected, however, in benthos at Stations 2 and 3 at concentrations of 0.35 and 0.4 mg/kg, respectively.

These data from tissues of common food species indicate potential endangerment to lower and upper level consumers. In particular, PCB tissue values in green frog, shrews, meadow voles, deer mice and white footed mice, as described above, exceed 0.64 mg/kg PCBs, a level in diet which was shown to cause death and reproductive failure in mink.

A complete discussion of site characteristics can be found in the "Remedial Investigation - Additional Studies of Middle Marsh" in Chapters 2 and 3 of Volume I.

## VI. SUMMARY OF SITE RISKS

A Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment were performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Middle Marsh Operable Unit.

The human health risk assessment and the ecological risk assessment followed a four step process: 1) contaminant identification, which identified those hazardous substances which, given the specifics of the Middle Marsh Operable Unit, were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances, and 4) risk characterization, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Middle Marsh Operable Unit, including carcinogenic and non-carcinogenic risks. The results of the public health risk assessment for the Middle Marsh Operable Unit are discussed below followed by the conclusions of the ecological risk assessment.

### A. Human Health Risk Assessment

Forty-four contaminants of concern, listed in Table 5, were selected for evaluation in the human health risk assessment. These contaminants constitute a representative subset of more than eighty contaminants identified at the Site during the Remedial Investigation. The forty-four contaminants of concern were selected to represent potential site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment. A summary of the health effects of each of the contaminants of concern can be found in the "Final Remedial Investigation - Additional Studies of Middle Marsh," in Section 5.3 of Volume I.

Potential human health effects associated with exposure to the contaminants of concern were estimated quantitatively through the development of several hypotheses concerning exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the Site. The following is a brief summary of the exposure pathways evaluated.

Under current and expected future land use conditions, the HHRA assumed that the Middle Marsh and golf course areas are frequented by golfers and maintenance workers, who may contact contaminated surficial sediment/soils and surface water during activities such as golfing and landscaping. The study used adult exposure to evaluate a reasonable worst case, since at this operable unit adult exposure over thirty years will be more significant than exposure to older children over a much shorter period (e.g., ten years or less).

Under current land use conditions at the Middle Marsh area, the HHRA evaluated risks associated with dermal contact and incidental ingestion of sediment/soils, and dermal contact with surface water for an adult who may be exposed 28 days per year for 30 years. Under future land use conditions, EPA took into consideration the possibility that Middle Marsh may dry up in part or in whole, and accordingly evaluated dermal contact and incidental ingestion of sediment/soils in Middle Marsh for an adult who may be exposed 56 days per year for 30 years. For the Adjacent Wetland and golf course areas under both current and future land use conditions, EPA assumed an adult exposure of 56 days a year for 30 years for dermal contact and incidental ingestion of sediment/soils. EPA based its assessment of future human health exposure parameters on the assumption that Middle Marsh and the Adjacent Wetland would continue to be used for a golf course or other recreation, and not for residences (e.g. housing developments).[2] This assumption is based on the stated intention of the City of New Bedford to change the zoning of the New Bedford Municipal Golf Course from residential to recreation/conservation, and the fact that because the Middle Marsh study area is primarily in a wetland, future development of Middle Marsh and the Adjacent Wetland is not likely.

A more thorough description of the exposure pathways evaluated can be found in the "Remedial Investigation - Additional Studies of Middle Marsh," in Section 5.4 of Volume I.

For each pathway evaluated, an average and a reasonable maximum exposure estimate was generated, corresponding to exposure to the average and the maximum concentration of contaminants detected in each medium.

The HHRA calculated the excess lifetime cancer risks for each exposure pathway by multiplying the exposure level with a chemical-specific cancer potency factor. Cancer potency factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is very unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g. $1 \times 10^{-6}$ for 1/1,000,000) and indicate (using this example), that an individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of site-related exposure as defined by the compound at the stated concentration. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

The hazard quotient was also calculated for each pathway as EPA's measure of the potential for non-carcinogenic health effects. The hazard quotient is calculated by dividing the exposure level by the reference dose (RfD) or other suitable benchmark for non-carcinogenic health effects. Reference doses have been developed by EPA to protect sensitive individuals over the course of a lifetime and they reflect a

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2 If EPA had assumed that the future use would be residential, EPA would have calculated the human health risk based on a higher frequency of exposure, resulting in lower cleanup levels than those established in Section X of this ROD.

daily exposure level that is likely to be without an appreciable risk of an adverse health effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The hazard quotient is often expressed as a single value (e.g. 0.3) indicating the ratio of the stated exposure as defined to the reference dose value (in this example, the exposure as characterized is approximately one third of an acceptable exposure level for the given compound). The hazard quotient is only considered additive for compounds that have the same or similar toxic endpoints (for example: the hazard quotient for a compound known to produce liver damage should not be added to a second whose toxic endpoint is kidney damage). The resulting sum is referred to as the hazard index.

Table 6 depicts the carcinogenic and non-carcinogenic risk summary for the contaminants of concern in sediment/soils and surface water in Middle Marsh and the golf course/wetland area evaluated to reflect present exposure pathways corresponding to the average and the reasonable maximum exposure scenarios. Table 7 depicts the carcinogenic and non-carcinogenic risk summary for the contaminants of concern in sediment/soils in Middle Marsh evaluated to reflect potential future exposure pathways corresponding to the average and the reasonable maximum exposure scenarios[3].

As indicated in Tables 6 and 7, total excess lifetime carcinogenic risks associated with present and potential future exposure to the contaminants of concern in Middle Marsh and the golf course/wetland areas fall within EPA's acceptable risk range of $10^{-4}$ to $10^{-6}$, for both the average and the reasonable maximum exposure scenarios. In addition, total non-carcinogenic risks associated with present and potential future exposure to the contaminants of concern in Middle Marsh and the golf course/wetland areas are less than one for both the average and the reasonable maximum exposure scenarios, indicating that the potential for adverse effects is unlikely. Therefore, EPA has determined that, based on the exposure assumptions described above, human exposure to contaminants in Middle Marsh and the golf course/wetland area through current and future pathways would not result in significant increases in carcinogenic risk, and that there are no significant risks to human health posed by exposure to noncarcinogenic contaminants.

B. <u>Ecological Risk Assessment</u>

1. Hazard Assessment

The following contaminants of concern were selected for

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[3]Total risks associated with potential future use of the golf course/wetland areas are not included in Table 7, because they are the same as the total risks associated with present use of the golf course/wetland areas shown in Table 6.

evaluation in the ecological risk assessment: chromium, copper, iron, lead, manganese, vanadium, zinc, PAHs and PCBs. These contaminants constitute a representative subset of the more than eighty contaminants identified at the Middle Marsh Operable Unit during the Remedial Investigation. The nine contaminants of concern were selected to represent potential site-related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment. A discussion of the health effects of each of the contaminants of concern can be found in the "Final Remedial Investigation - Additional Studies of Middle Marsh" in Section 4.1 of Volume I and is summarized below:

a. Polychlorinated Biphenyls

As described in Section V. above, PCB sediment/soil concentrations in Middle Marsh and the Adjacent Wetland are substantially above background concentrations and exceed site-specific interim sediment quality criteria. PCB concentrations in filtered pore water, and unfiltered pore and surface water exceed the acute toxicity ambient water quality criterion of 2.0 micrograms per liter (ug/l) for the protection of aquatic organisms. PCB concentrations in filtered and unfiltered pore and surface water exceed the ambient water quality criterion of 0.014 ug/l for the protection of wildlife.

To support an ecological exposure assessment, a literature search was conducted to obtain toxicological data such as dose-response relationships. Table 4-1 of the RI (Metcalf and Eddy, 1991a) lists toxicity data for PCBs (Aroclor 1254) for some species of birds and mammals. Table 4-2 of the RI (Metcalf and Eddy, 1991a) lists data concerning the lethal and sublethal effects of PCBs on wildlife species.

As indicated from the literature study, laboratory animals exposed to dietary PCBs showed increased evidence of cancer; reproductive impairment; pathological changes such as lesions on the liver, stomach, and skin; and immunological impairment. Relatively low levels of PCBs in the diet of a variety of wildlife species have been shown to cause reproductive impairment, behavioral changes and mortality in sensitive species. Table 4-2 of the RI (Metcalf and Eddy, 1991a) indicates that reproductive failure in bird species occurs at dietary levels of PCBs between 5 and 10 ppm (Heinz et al., 1984; Peakall et al., 1972; Tori and Peterle, 1983). Fleming et al. (1983) reported that 0.64 ppm of PCBs in the diet of mink caused reproductive failure and 1.0 ppm caused death. Platonow and Karstad (1973) reported that dietary concentrations of 3.57 ppm of PCBs caused death for all mink in 105 days and that 0.64 ppm of PCBs caused death, extreme weakness and reproductive failure.

Site-specific studies found PCBs in the body tissues of aquatic invertebrates, earthworms, amphibians, and small mammals in Middle Marsh. These data from tissues of common food species indicate potential endangerment to lower and upper level consumers. In particular, PCB tissue values in green frog, shrews, meadow voles, deer mice and white footed mice, as described in Section V.I., exceed 0.64 mg/kg PCBs, a level in diet which was shown to cause death and reproductive failure in mink.

Since PCB-contaminated species serve as food for upper level consumers such as American robin and mink, there is a potential endangerment to wildlife from bioaccumulation of PCBs at this Site. Based on the toxicity of PCBs to wildlife, potential for bioaccumulation, and previous site-specific studies, EPA determined that PCBs, in the Middle Marsh Operable Unit, may present an imminent and substantial endangerment to the environment. Accordingly, an ecological exposure assessment was conducted for PCBs.

b. Metals

Several heavy metals were detected in sediment/soils in Middle Marsh and the Adjacent Wetland above background levels, including copper, chromium, iron, lead, vanadium, manganese and zinc. However, after comparison to sediment criteria set forth by Long and Morgan (1990), only lead and zinc were considered to have levels which could cause toxicity to some species in the wetland areas. Long and Morgan (1990) found that sediment lead concentrations of 35-110 mg/kg, and sediment zinc concentrations of 50-125 mg/kg, resulted in sublethal effects in aquatic biota. These concentrations are substantially below the maximum lead and zinc concentrations in Middle Marsh of 845 and 521 mg/kg, respectively. Iron could also pose a threat to aquatic biota through creation of a solid floc that adheres to sediments and smothers sediment benthic organisms.

Because contaminants in sediments partition into pore and surface water, the potential for exposure to contaminated sediments resulting in toxicity to biota can be related to the concentrations of contaminants in water. Therefore, to evaluate further the potential for biological impacts, surface water and pore water metals data were compared to ambient water quality criteria. This comparison revealed that dissolved (filtered) metals concentrations were near or below ambient water quality criteria for lead, zinc and other metals. This phenomenon may be due to the binding of metals to sediments as sulfides, resulting in low bioavailability for uptake by plants and animals. Due to the low water concentrations, heavy metals have not been evaluated as a hazard to site biota.

c. Polyaromatic Hydrocarbons

PAH levels in Middle Marsh exceeded site-specific background concentrations, whereas concentrations in the Adjacent Wetland fell within the range of site-specific background concentrations. In water samples, PAHs were found at levels near detection limits, indicating that exposures of wildlife to PAHs in pore water and surface water do not represent pathways of concern.

Measured sediment/soil levels were compared with interim sediment quality criteria established by EPA for fluoranthene, pyrene, benzo(a)pyrene and benzo(a)anthracene and were below the lowest site-specific sediment quality criteria. Based on these considerations, PAHs are not considered a hazard to wildlife in the study area.

## 2. Exposure Pathways

Detailed physical, chemical and biological information was collected and evaluated for Middle Marsh to identify aquatic and wetland/terrestrial exposure pathways critical to the transfer of PCBs in Middle Marsh and the Adjacent Wetland.

### a. Aquatic Exposure Pathways

In the aquatic environment, sediment-dwelling or benthic organisms are at the base of the food chain. These organisms are in intimate contact with the interstitial (pore) water of the sediments and many emerge in later life stages as aquatic insects. Further, in all aquatic organisms, contact with water through respiration is an important route of uptake. Thus, aquatic species accumulate PCBs through several pathways, including direct exposure to water and food chain bioaccumulation.

EPA evaluated areas within Middle Marsh to identify those areas which support an aquatic food chain and, thus, an aquatic exposure pathway. Based on field observations, EPA determined that the area west of the stream in the northwest portion of Middle Marsh, as delineated in Figure 7, was connected to the stream over most of the year, and that this area could be a feeding area for stream animals and could contribute plant and animal material to the stream on a continuing basis. The area was further identified as an aquatic area, based on the invertebrate surveys (which identified aquatic organisms in this area), the topography, and the fact that the area is permanently flooded. Therefore, this northwest portion of Middle Marsh could represent an area that supports a significant aquatic pathway for the biological transfer of contaminants.

### b. Wetland/Terrestrial Exposure Pathways

Wetland and terrestrial species, such as terrestrial insects, small mammals and birds, are not in intimate contact with surface water or pore water. For these species, direct sediment/soil contact and food chain exposure are predominant. In soil-dwelling organisms such as earthworms and mice, dermal contact may play a significant role. However, in upper level consumers, PCB uptake is due primarily to food chain (trophic) bioaccumulation.

Figure 8 depicts a food chain pathway model that was developed for the Middle Marsh Operable Unit to represent the trophic relationships between the species present in Middle Marsh. Site-specific tissue data, and literature information on the life histories and feeding habits of selected species, were used to select critical food chain pathways and target species for protection. The model was developed to: 1) evaluate the effects of contamination on environmental receptors, 2) determine ecological assessment endpoints for remediation, 3) evaluate the impacts of remediation on the wetland area, and 4) identifying appropriate mitigating measures.

Species included in the food chain pathway model for Middle Marsh were selected because they are integral parts of important transfer pathways. Selections were based on observed abundance at the Site, presence of suitable habitat for the species, and likelihood of exposure. Abundance of the species was judged by the number of sightings during sediment/soil and wetland studies and by trapping conducted by EPA. Habitat suitability was based on the U.S. Fish and Wildlife Service's Habitat Evaluation Procedure (HEP). Species with frequent or constant exposure to sediment/soil and water such as earthworms, insects and small mammals were included in the model. Conversely, species were excluded from the model if they were assumed to have little or no exposure to site contaminants or if they have been to shown to have very high tolerances to the contaminants.

Specifically, raccoon was included because its tracks were observed and its food species include small mammals, frogs, worms, and reptiles. Mink were included in the model because Middle Marsh provides the basic habitat requirements for mink, because of its known susceptibility to PCBs, and its position as a top level consumer in an area where site-specific data showed that many of the mink's food sources are contaminated with PCBs. Mink may also utilize aquatic food sources such as fish, crayfish, tadpoles, and mollusks when an aquatic feeding area is available, as well as small mammals and other terrestrial animals, such as mice and small birds during a substantial portion of the year. Minks are expected to use the Middle Marsh Operable Unit because they have historically occurred in the region and have been recently sighted in nearby areas including the Apponagansett Swamp and as road kills in neighboring Dartmouth, Massachusetts. Finally, mink tracks and the tracks of other small animals were recently observed and photographed in Middle Marsh near the Unnamed Stream.

Small mammals such as mice and shrews were included because they burrow in the soil and are frequent prey of reptiles and other small mammals such as raccoons and mink. In addition, the shrew is a voracious insectivore, feeding on terrestrial insects which are in intimate contact with the sediment/soil. Amphibians such as the green frog were included because of their abundance, site-specific data indicating PCB body burdens, and because they are frequent prey of reptiles and mammals.

American robin (*Turdus migratorius*) and American woodcock (*Philohela minor*) were included in the food chain pathway model because they are carnivorous and their principal food source is earthworms, which were found to carry body burdens of PCBs up to 2.3 mg/kg in Middle Marsh. Earthworms also play an important role in mobilizing PCBs into the food chain due to their contact with sediment, soil, and water. Insectivorous birds that feed on terrestrial insects such as beetles, pill bugs, and centipedes have also been included. Although the snapping turtle is a top level carnivore and was frequently observed in Middle Marsh, it is not a target species due to its high level of body fat and associated resistance to PCBs and other lipophilic contaminants. The spotted turtle is largely herbivorous and, based on site-specific plant tissue data indicating undetected PCB concentrations, has not been included. The Red-tailed hawk (*Buteo jamaicensis*) was observed on-site on a number of occasions, but was not included as a target species because its home range is 0.5-2.2 square miles. Middle Marsh comprises only about a maximum of 4 percent of the hawk's range, thus reducing the percent of its diet that would come from Middle Marsh.

3. Risk Assessment

A variety of methods were used to assess exposure of Middle Marsh wildlife species through both aquatic and wetland/terrestrial exposure pathways. For aquatic exposure pathways, the equilibrium partitioning method was used as a method of developing sediment quality criteria for aquatic portions of Middle Marsh. For wetland/terrestrial pathways, exposure of upper level consumers was evaluated by calculating potential dietary levels and comparison of those levels to the toxicity data. The ecological risk assessment for aquatic and wetland/terrestrial exposure pathways is discussed below:

a. Aquatic Exposure

Interim sediment quality criteria (SQC) were used to estimate the toxicity of the sediments and the biological impact of in-place contaminated sediments. SQC are intended to be protective of the presence and ecological functions of benthic invertebrates and other aquatic life. Sediment quality criteria are based on water quality criteria and are used to develop limits for contaminant concentrations in the interstitial (pore) water of sediments. These limits are established to protect benthic, epibenthic, and other aquatic invertebrate communities at the base of the aquatic food chain.

EPA has derived contaminant-specific criteria for sediments from ambient water quality criteria, through use of the partitioning coefficient. This allows back-calculation of sediment levels that, within certain probabilities, will not result in exceedance of water quality criteria in the pore water. The PCB sediment quality criteria were derived from the PCB ambient water quality criterion that was developed to safeguard against bioaccumulation that could result in chronic reproductive effects in upper level consumers, as represented by the mink (*Mustela vison)*, a species found to be particularly sensitive. In 1988, EPA published interim sediment quality criteria (including mean values and 95% confidence values) for 13 chemicals. The proposed low, mean, and upper value freshwater sediment quality criteria for PCBs were 3.87, 19.5, and 99.9 μg PCB/g carbon, respectively[4].

Comparison of the interim PCB sediment quality criteria with normalized PCB sediment data (unit of ug PCBs/g carbon) in the aquatic northwest area of Middle Marsh indicates that approximately 0.4 acres exceed the mean sediment quality criteria and 0.1 acres exceed the upper sediment quality criteria. Data from the biological tissue study for the Middle Marsh indicated that at the Middle Marsh Operable Unit, PCBs have accumulated in benthic organisms living in sediments where PCB-normalized concentrations exceed 200 ug PCBs/g carbon, a value two times the interim upper sediment quality criterion. Specifically, PCB concentrations of 0.35 and 0.40 mg/kg were found in benthic organisms collected from sediment samples with normalized PCB concentrations of 316 and 253 ug PCBs/g carbon, respectively.

In addition, PCBs (Aroclor 1254) were detected in filtered and unfiltered pore and surface water samples at levels above the ambient water quality criterion for PCBs of 0.014 μg/l.

Given the site-specific data indicating that bioaccumulation is occurring on-site, and due to the presence of aquatic

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[4]The low and upper values are based on the variability of the partitioning coefficient.

environments in portions of Middle Marsh with elevated PCB concentrations, EPA has determined that contaminated sediments in the northwest portion of Middle Marsh present an unacceptable risk to biota present at the Middle Marsh Operable Unit.

b. Wetland/Terrestrial Exposure

EPA's Ecological Risk Assessment used bioaccumulation and toxicity data presented earlier to conduct a wildlife exposure assessment for species indigenous to Middle Marsh, and to calculate potential levels of contaminants in sediment/soils which would be protective of the environment. For wetland/terrestrial pathways, EPA evaluated exposure of upper level consumers (such as the raccoon and mink) by calculating protective sediment levels, using lowest observed effect dietary levels, and site-specific bioaccumulation factors.

Site-specific tissue data were used to develop bioaccumulation factors for species such as small mammals, earthworms, and frogs. The bioaccumulation factors (BAFs) developed for these species were calculated as the ratio of PCBs in the tissue to the level in the sediment/soil, as follows:

$$\text{Sediment/soil} \times \text{BAF} = \text{Animal Tissue PCB Level}$$

which yields:

$$\text{BAF} = \frac{\text{Animal Tissue PCB Level}}{\text{Sediment/Soil PCB Level}}$$

This method accounts for all types of exposure including direct contact, inhalation, soil ingestion, and trophic magnification or food exposure. This method assumes that the organisms exposure level is directly proportional to the level in the sediment/soil. This information was used to back-calculate levels for sediment/soil that are protective of wildlife, by maintaining the food supply of targeted upper level consumers at or below lowest observed effects levels. BAFs based on site-specific data and literature values are summarized in Table 4-4 of the RI (Metcalf and Eddy, 1991a).

In the exposure assessment presented below, sediment/soil protective levels were back-calculated using the following relationship:

$$\text{Cmedia} = \frac{\text{LOEL}}{\text{BAF}}$$

where: Cmedia = concentration of PCBs in environmental media (e.g. sediment, soil, water) (mg/kg)

LOEL = dietary lowest observed effect level (mg/kg)

BAF = bioaccumulation factor from the media to the food species consumed (unitless)

**Carnivorous Birds.** Based on the abundance of earthworms in Middle Marsh and frequent sightings of the American robin, a sediment/soil protective level was calculated for American robin and other carnivorous birds (e.g. woodcock), based on a protective dietary level of 5 ppm PCBs and a BAF of 0.29 for earthworms. Assuming that earthworms comprise 75 percent of these species diet, and that Middle Marsh is 90 percent of their feeding range, a protective level of 25.5 mg/kg is indicated by the following equation:

$$\text{Sediment/Soil Protective Level} = \frac{5 \text{ ppm PCBs}}{(0.29)(0.75)(0.9)} = 25.5 \text{ mg/kg}$$

**Insectivorous Birds.** Insectivorous birds are exposed to PCBs through the terrestrial food pathway through consumption of terrestrial insects. A sediment/soil protective level was calculated for insectivorous birds using a BAF of 0.19. Assuming that terrestrial insects comprise 100 percent of the bird's diet, and that Middle Marsh is 90 percent of the feeding range, a sediment/soil protective level of 29.2 mg/kg is indicated by the following equation.

$$\text{Sediment/Soil Protective Level} = \frac{5 \text{ ppm PCBs}}{(0.19)(1.0)(0.9)} = 29.2 \text{ mg/kg PCBs}$$

**Carnivorous and Omnivorous Mammals.** Upper trophic level carnivorous and omnivorous mammals in Middle Marsh and the Adjacent Wetland include raccoon and mink. Mink prefer aquatic food sources to terrestrial food sources when both options are equally available (Linscombe et al., 1982). In Middle Marsh, aquatic food sources for mink include small fish, crustaceans, newts, mollusks, and tadpoles. Mink will also consume a significant number of frogs when available. However, during winter when the stream may be partially frozen and when frogs are hibernating, mink will feed largely on small mammals (Linscombe et al., 1982). Since reproductive impairment can occur in mink at low dietary levels in less than a year, the dietary level of 0.64 ppm PCBs was used as an acute exposure level and dietary exposure levels were calculated for the mink's winter (terrestrial) diet. In winter, mink will feed largely on small mammals. Accordingly, a sediment/soil protective level for wetland/terrestrial areas outside the aquatic areas is based on the site-specific BAF for small mammals as indicated by 0.64/0.07 = 9.14. Since Middle Marsh comprises 65 percent of the mink's home range of 20 acres, the protective level is adjusted accordingly to 15 mg/kg.

Raccoon, in comparison, are omnivorous, feed opportunistically and may consume a substantial amount of frogs and mice when readily available, as is the case in Middle Marsh. Accordingly, a sediment/soil protective level has been calculated to protect raccoon. A BAF of 0.22 for frogs, a BAF of 0.07 for mice and a protective dietary level of 1 ppm were used in the calculations. The raccoon has a home range of 18-36 acres. It was assumed that Middle Marsh comprises 50 percent of the raccoons feeding range and that 30 percent of their diet is composed of frogs and mice. A sediment/soil protective level of 45.9 mg/kg was calculated for protection of raccoon as indicated below.

$$\frac{1}{[(0.22)(0.5) + (0.07)\ (0.5)]\ [0.5][0.3]} = 45.9 \text{ mg/kg PCBs}$$

In summary, using the application of site-specific bioaccumulation factors to the food chain pathway model to PCB concentrations in Middle Marsh and the Adjacent Wetland reveals several areas, totalling approximately 1.9 acres where levels derived to protect mink are exceeded (see Figure 9). PCB concentrations at sampling locations ME22, ME38, and SL56 of 28, 32, and 34 mg/kg PCBs, respectively, exceed the calculated level which are protective of carnivorous birds. In addition, PCB concentrations at sampling locations ME38 of 32 mg/kg PCBs, and SL56 of 34 mg/kg PCBs exceed the calculated level which are protective of insectivorous birds.

In summary, EPA has determined that actual or threatened releases of hazardous substances from contaminated sediments in Middle Marsh and the Adjacent Wetland, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to biota present in the environment at the Middle Marsh Operable Unit.

## VII. DEVELOPMENT AND SCREENING OF ALTERNATIVES

### A. Statutory Requirements/Response Objectives

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: a requirement that EPA's remedial action, when complete, must comply with all federal and more stringent state environmental standards, requirements, criteria or limitations, unless a waiver is invoked; a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these Congressional mandates.

Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, remedial action objectives were developed to aid in the development and screening of alternatives. These remedial action objectives were developed to mitigate existing and future potential threats to the environment. These response objectives were:

- Reduce exposure of aquatic organisms to PCB-contaminated pore water and sediments either through direct contact or diet-related bioaccumulation;
- Reduce exposure of terrestrial and wetland species to PCB-contaminated sediment/soils through direct contact or diet-related bioaccumulation;
- Prevent or reduce releases of PCBs to the Unnamed Stream and the Apponagansett Swamp; and
- Mitigate the impacts of remediation on wetlands.

**B. Technology and Alternative Development and Screening**

CERCLA and the NCP set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives were developed for the Middle Marsh Operable Unit.

With respect to source control, the RI/FS developed a range of alternatives in which treatment that reduces the toxicity, mobility, or volume of the hazardous substances is a principal element. This range included an alternative that removes or destroys hazardous substances to the maximum extent feasible, eliminating or minimizing to the degree possible the need for long term management. This range also included alternatives that treat the principal threats posed by the Middle Marsh Operable Unit but vary in the degree of treatment employed and the quantities and character- istics of the treatment residuals and untreated waste that must be managed; alternative(s) that involve little or no treatment but provide protection through engineering or institutional controls; and a no action alternative.

As discussed in Chapter 7 of the Feasibility Study, the RI/FS identified, assessed and screened technologies based on implementability, effectiveness, and cost. These technologies were combined into source control (SC) alternatives. Chapter 8 of the Feasibility Study presented the remedial alternatives developed by combining the technologies identified in the previous screening process in the categories identified in Section 300.430(e) (3) of the NCP. The purpose of the initial screening was to narrow the number of potential remedial actions for further detailed analysis while preserving a range of options. Each alternative was then evaluated and screened in Chapter 9 of the Feasibility Study.

In summary, of the 13 source control remedial alternatives screened in Chapter 8 of the Feasibility Study, 7 were retained for detailed analysis. Table 8 identifies the 7 alternatives that were retained through the screening process, as well as those that were eliminated from further consideration.

## VIII. DESCRIPTION OF ALTERNATIVES

This Section provides a narrative summary of each alternative evaluated. A detailed tabular assessment of each alternative can be found in Table 9-19 of the Feasibility Study (Metcalf and Eddy, 1991b).

### Source Control (SC) Alternatives Analyzed

The source control alternatives analyzed for the Middle Marsh Operable Unit include the following:

**SC-1 - No Action**

**SC-2b - THE SELECTED REMEDY:** Site Preparation; Excavation; Dewatering; Disposal of Excavated Materials at the Sullivan's Ledge Disposal Area; Wetlands Restoration; Long-Term Environmental Monitoring; and Institutional Controls.

**SC-5 - THE CONTINGENCY ALTERNATIVE:** Site Preparation; Excavation; On-site Solvent Extraction; Disposal of Treated Sediment/Soils in Middle Marsh; Wetland Restoration; Long-Term Environmental Monitoring; and Institutional Controls.

**SC-6(a)** - Site Preparation; Excavation; On-Site Solidification/ Stabilization; Disposal of Treated Materials at the Sullivan's Ledge Disposal Area; Wetlands Restoration; Institutional Controls; and Long-Term Monitoring.

**SC-6(b)** - Site Preparation; Excavation; On-Site Solidification/ Stabilization; Disposal of Treated Materials at Landfill within the Golf Course; Wetlands Restoration; Institutional Controls; and Long-term Monitoring.

**SC-7(a)** - Site Preparation; Excavation; On-Site Incineration; Disposal of Ash at the Sullivan's Ledge Disposal Area; Wetlands Restoration; Institutional Controls; and Long-Term Monitoring.

**SC-7(c)** - Site Preparation; Excavation; On-Site Incineration; Off-Site Disposal of Ash; Wetlands Restoration; Institutional Controls; and Long-term Monitoring.

Alternatives 2(b), the selected remedy, and Alternative 5, the contingency remedy, are discussed in Section X of this ROD. All other alternatives outlined above are described below:

A. SC-1 No-Action.

This alternative was evaluated in detail in the FS to serve as a baseline for comparison with the other remedial alternatives under consideration. Under this alternative, no excavation or treatment of contaminated sediments/soil would occur. No restrictions on site use or access would be implemented. Because contaminants would remain in place, the area would be monitored annually to monitor contaminant concentrations over time and to trace the extent of possible contaminant migration. After five years, site conditions would be evaluated to determine whether cleanup activities would be required. A wetlands restoration program would not be implemented because, under this alternative, remedial activities would not be performed in wetland areas.

Estimated Time for Implementation: Not Applicable
Estimated Capital Cost: Not Applicable
Estimated Operation and Maintenance Cost (net present worth): $50,000
Estimated Total Cost (net present worth): $50,000

B. SC-2(b): THE SELECTED REMEDY: Site Preparation; Excavation; Dewatering; Disposal of Excavated Materials at the Sullivan's Ledge Disposal Area; Wetlands Restoration; Long-Term Environmental Monitoring; and Institutional Controls.

The selected remedy is described in detail in Section X of this ROD.

C. SC-5 - THE CONTINGENCY ALTERNATIVE: Site Preparation; Excavation; On-site Solvent Extraction; Disposal of Treated Sediment/Soils in Middle Marsh; Wetland Restoration; Long-Term Environmental Monitoring; and Institutional Controls.

The contingency remedy is described in detail in Section X of this ROD.

D. SC-6(a): Site Preparation; Excavation; On-Site Solidification/Stabilization; Disposal of Treated Materials at the Sullivan's Ledge Disposal Area; Wetlands Restoration; Institutional Controls; Long-Term Monitoring.

In this alternative, excavated material would be treated by solidification/stabilization to immobilize, or trap, the contaminants. To implement this component, a processing area would be set up at the site prior to excavation of the contaminated sediment/soils. Four areas would be excavated. Areas 1, 2, and 3 are located within Middle Marsh, and Area 4 is located southeast of Middle Marsh in the Adjacent Wetland (see Figure 9). The approximate surface areas of Areas 1, 2, 3 and 4 are approximately 0.4, 1.0, 0.1, and 0.4 acres, respectively. Of the total 1.9 acres to be remediated, 0.75 acres are forested wetland.

Initially, bulk debris would be screened out of the excavated materials. The excavated, screened soils would be placed in a mixing unit for solidification/stabilization. Solidification/stabilization involves mixing contaminated sediments/soil with a material such as quick lime, cement, flyash, or various polymers to chemically bind the contaminants into a solid material. The solidified material would be tested to ensure that the PCBs have been effectively trapped. The solidified materials would then be placed, along with the bulk debris, in the Sullivan's Ledge Disposal Area and covered with the cap that will be constructed as part of the site remedy for the First Operable Unit. If the sediment/soils are characteristic of RCRA hazardous waste (e.g. because of the presence of certain metals such as lead, barium and chromium), solidification/stabilization is expected to remove their hazardous characteristic, or in the alternative, to comply with a treatability variance for land disposal restrictions (LDRs) as provided in 40 C.F.R. 268.44. The alternative would comply with ARARs concerning wetlands (e.g. Section 404(b) of the Clean Water Act, Executive Order 11990, Protection of Wetlands, and Massachusetts Wetlands Protection Regulations). In particular, EPA has determined that, there are no practicable alternatives to excavation of the contaminated sediment/soils which would have a less adverse short-term impact to the aquatic ecosystem, but which would not also have significant adverse effects to the environment which will result if the contaminated sediment/soils are left in place.

Wetland restoration would be performed, as described in component d. of the selected remedy.

Estimated Time for Implementation: 6 Months
Estimated Capital Cost: $4,890,000
Estimated Operation and Maintenance Cost (net present worth): $164,000
Estimated Total Cost (net present worth): $5,050,000

**E.** <u>SC-6(b): Site Preparation; Excavation; On-Site Solidification/Stabilization; Disposal of Treated Materials at Landfill within the Golf Course; Wetlands Restoration; Institutional Controls; Long-term Monitoring.</u>

This alternative would include all staging, excavation, treatment and wetland restoration aspects of Alternative 6(a). However, under this alternative solidified sediments/soil would not be disposed of under the cap in the Sullivan's Ledge Disposal Area. Instead, a 1.6 acre disposal area, or landfill, would be constructed within the golf course in accordance with Massachusetts Solid Waste Landfill Regulations. The disposal area would be constructed in an area within the golf course so that wastes would be located above the 100 year flood-plain and be covered by a cap. The conceptual design for the cap is 0.5 feet of soil to be placed over the solidified materials, one and one-half feet of clay, one and one-half feet of soil to protect the clay, a one-foot drainage layer, and a 2 foot layer of soil that would be planted with grass to stabilize the cap.

For this alternative, the long-term environmental monitoring for the Middle Marsh study area required for all alternatives would be expanded to include groundwater and soil sampling in areas next to the golf course disposal area to ensure the long-term effectiveness of the landfill in preventing migration of PCBs. If the sediment/soils are characteristic of RCRA hazardous waste (e.g. because of the presence of certain metals such as lead), solidification/stabilization is expected to remove their hazardous characteristic, or in the alternative, to comply with an LDR treatability variance. For the reasons stated above with respect to alternative SC-6(a), this alternative complies with the wetlands ARARs.

Estimated Time for Implementation: 6 Months
Estimated Capital Cost: $5,420,000
Estimated Operation and Maintenance Cost (net present worth):
$650,000
Estimated Total Cost (net present worth): $6,070,000

**<u>F.</u>** **<u>SC-7(a): Site Preparation; Excavation; On-Site Incineration; Disposal of Ash at the Sullivan's Ledge Disposal Area; Wetlands Restoration; Institutional Controls; Long-Term Monitoring.</u>**

This alternative would include all staging, excavation, disposal and wetland restoration aspects of Alternative 6(a). However, under this alternative sediments/soil would be treated in a mobile incinerator that would be assembled in the staging area. Three different types of incinerators were evaluated in the FS: rotary kiln, circulating fluidized bed and infrared processing. The extremely high temperatures of these thermal destruction facilities may destroy 99.9999 percent of all the organic contaminants. Prior to implementation of a full-scale incinerator on-site, a test burn would be conducted on-site to demonstrate the effectiveness and efficiency of the unit in providing for the destruction of the contaminants specific to the Middle Marsh Operable Unit. Exhaust gases would be passed through air pollution devices before being released into the atmosphere. All incinerated residues would be tested to ensure that cleanup goals have been met. Following completion of the incineration program, the incinerator would be disassembled and removed from the Site.

TCLP tests would be performed to determine if the residues from the incinerator process are characteristic of hazardous waste due to the presence of metals. If such residues are determined to be hazardous, the residues would be treated by solidification/stabilization, to render the residues non-hazardous if possible, or in the alternative to comply with an LDR treatability variance. As with alternatives SC-6(a) and SC-6(b), this alternative complies with the wetlands ARARs. Treated sediment/soils, referred to as ash, would be disposed of in the Disposal Area of the Sullivan's Ledge Site and covered by the cap that will be constructed as part of the site remedy for the First Operable Unit. Wetland restoration would be performed, as described in component d. of the selected remedy.

Estimated Time for Implementation: 6.5 Months
Estimated Capital Cost: $9,660,000
Estimated Operation and Maintenance Cost (net present worth):
$164,000
Estimated Total Cost (net present worth): $9,820,000

F. SC-7(c): Site Preparation; Excavation; On-Site Incineration; Off-Site Disposal of Ash; Wetlands Restoration; Institutional Controls; and Long-term Monitoring.

This alternative is similar to Alternative 7(a) except that ash would be shipped off-site to a federally licensed hazardous waste landfill for disposal. As described in Alternative 7(a), prior to disposal of the ash off-site, TCLP tests would be performed to determine if the residues from the incinerator process are hazardous. If such residues are determined to be hazardous, the residues would be treated by solidification/stabilization, in order to attain the treatment level range established through an LDR treatability variance. This alternative complies with wetland ARARs, for the reasons stated with respect to alternative SC-6(a).

Estimated Time for Implementation: 6.5 Months
Estimated Capital Cost: $9,800,000
Estimated Operation and Maintenance Cost (net present worth):
$164,000
Estimated Total Cost (net present worth): $9,960,000

## IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

### A. Evaluation Criteria

Section 121(b)(1) of CERCLA presents several factors that at a minimum EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the National Contingency Plan articulates nine evaluation criteria to be used in assessing the individual remedial alternatives. These criteria and their definitions are as follows:

Threshold Criteria

The two threshold criteria described below must be met in order for the alternatives to be eligible for selection in accordance with the NCP.

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with Applicable or relevant and appropriate requirements (ARARS)** addresses whether or not a remedy will meet all of the ARARs of other Federal and State environmental laws and/or provide grounds for invoking a waiver.

Primary Balancing Criteria

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria.

3. **Long-term effectiveness and permanence** addresses the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

4. **Reduction of toxicity, mobility, or volume through treatment** addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the Site.

5. **Short term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

6. **Implementability** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to

implement a particular option.

7. **Cost** includes estimated capital and Operation Maintenance (O&M) costs, as well as present-worth costs.

<u>Modifying Criteria</u>

The modifying criteria are used on the final evaluation of remedial alternatives generally after EPA has received public comment on the RI/FS and Proposed Plan.

8. **State acceptance** addresses the State's position and key concerns related to the preferred alternative and other alternatives, and the State's comments on ARARs or the proposed use of waivers.

9. **Community acceptance** addresses the publics' general response to the alternatives described in the Proposed Plan and RI/FS report.

A detailed assessment of each alternative according to the nine criteria can be found in Chapter 9 of the "Feasibility Report of Middle Marsh".

Following the detailed analysis of each individual alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted. This comparative analysis can be found in Table 9-19 of the Feasibility Study (Metcalf and Eddy, 1991b).

In order to make a fair comparison of alternatives, EPA has compared the alternatives in two ways. The first analysis assumes that implementation of the remedy for the Middle Marsh Operable Unit can be coordinated with implementation of the First Operable Unit for the Site; that is that it would be possible to dispose of contaminated sediment/soils under the Disposal Area cap. The second analysis compares all alternatives <u>except</u> those that call for disposal under the Disposal Area cap.

**B. Summary of the Comparative Analysis of Alternatives (Selected Remedy)**

Assuming that the Middle Marsh Operable Unit can be coordinated with the First Operable Unit, a detailed analysis was performed on all alternatives [1, 2(b), 5, 6(a), 6(b), 7(a), 7(c)], using the nine evaluation criteria in order to select a site remedy. The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria. This analysis assumes that the Sullivan's Ledge Disposal Area will be available for use as the Disposal Area for excavated and dewatered sediment/soils.

**1. Overall Protection of Human Health and the Environment**

The No-Action alternative (SC-1) would be protective of human health based on current and projected site risks. Although the No-Action alternative would not cause construction-related impacts to wetlands because no excavation or construction activities would occur, this alternative would not be protective of the environment because no reduction in, or containment of, contaminant concentrations would occur. Under this alternative, biota that inhabit the Middle Marsh study area would continue to be exposed to PCBs at levels that result in adverse impacts to animals and aquatic organisms. As more fully discussed in Section XI.B. of the ROD, EPA has determined that for this site, disturbance of wetlands and floodplains is the only practicable alternative that would be protective of the biota while minimizing adverse impact on the terrestrial and aquatic ecosystem.

In contrast, all the treatment and/or removal alternatives [2(b), 5, 6(a), 6(b), 7(a), 7(c)] would be protective of the environment, as well as human health, by reducing contaminant levels to meet EPA cleanup goals and protective standards. Wetlands would be temporarily affected by excavation procedures, but a comprehensive wetland restoration program would be implemented for all alternatives (except the no action alternative). There may be potential short-term risks to site workers during excavation and treatment due to the possibility of exposure to PCBs. These risks, however, would be minimized by use of appropriate personal protective equipment.

Upon completion of implementation of alternatives 2(b), 5, 6(a), 6(b), 7(a) and 7(c), low level risks would remain due to low residual PCB concentrations. Low level risks remain, under all the containment/treatment alternatives from exposure to untreated PCB-contaminated sediment/soils that are below remediation levels (20 ug/gram carbon in aquatic areas and 15 ppm PCBs in all other areas). However, these residual levels are protective of human health and the environment.

**2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)**

All alternatives, except for the No-Action alternative, will comply with ARARs relating to wetlands, including Section 404(b) guidelines under the Clean Water Act, Executive Order 11990, and, the Massachusetts Wetlands Protection Regulations. As discussed in Section XI of the ROD, EPA has determined that temporary disturbance of wetlands and floodplains is the only practicable alternative that would be protective of biota while minimizing adverse impact on the wetland and aquatic ecosystem. All treatment or removal alternatives, if properly implemented, would comply with ARARs. However, compliance with wetland-related ARARs for these alternatives will depend upon the success of wetland restoration. Fill placed to support the access roads and the staging and treatment areas will cause only temporary impacts on wetlands and minor impacts on flood storage capacity and would not threaten homes or other property in the study area. The No Action alternative may not meet the requirements of the Wetlands Executive Order 11990 which requires EPA to minimize the degradation of wetlands and to preserve and enhance the beneficial uses of the wetlands.

In the event that sediment/soils with PCB concentrations greater than 50 ppm are excavated from the Middle Marsh Operable Unit, alternatives involving incineration [7(a) and 7(c)] will comply with TSCA incineration regulations. Similarly, alternatives 2(b) and 6(a), which call for disposal of sediment/soils under the cap at the Disposal Area will comply with chemical waste landfill requirements, at 40 CFR 761.75, with the exception of certain requirements which were waived in the June 29, 1989 ROD. Finally, oil from the solvent extraction unit (alternative 5) would be treated in an off-site incinerator and disposed of in compliance with TSCA.

EPA expects that the majority of the sediment/soils to be excavated at Middle Marsh do not constitute hazardous wastes, as defined under state and federal law, because the processes generating the contaminants are unknown, the level of heavy metals in the sediment/soils are relatively low, and most of the sediment/soils contain PCBs at concentrations lower than 50 ppm. However, because the wastes at the Site are similar to hazardous wastes, RCRA regulations are relevant and appropriate. Disposal of sediment/soils under the cap at the Disposal Area [alternatives 2(b) and 6(a)] will comply with relevant and appropriate RCRA requirements. Disposal of non-hazardous treated sediment/soils within the landfill to be constructed at the golf course [alternative 6(b)] will comply with Massachusetts Solid Waste Regulations. If it is determined that a portion of the contaminated sediment/soils are considered hazardous waste under federal law, then all action alternatives will comply with federal land disposal restrictions (LDRs) by solidifying/immobilizing the sediments/soils in accordance with a Treatability Variance under 40 C.F.R. 268.44. Immobilization will attain the treatment level ranges for treatability variances for lead, as set forth in EPA guidance.

The ash resulting from incineration alternative 7(c) would be transported and disposed of according to RCRA regulations.

All alternatives, except for the No Action alternative, will comply with the chemical-specific ARARs for surface water, including federal Ambient Water Quality Criteria. For alternatives 2(b), 5, 6(a), 6(b), 7(a) and 7(c), monitoring of effluent discharges to the stream or wetlands shall be performed to ensure that treated water discharges will meet surface water regulations. Likewise, for all remedial alternatives involving excavation or disposal [alternatives 2(b), 5, 6(a), 6(b), 7(a) and 7(c)], ambient air monitoring shall be performed to ensure that particulates do not exceed air quality emissions during remedial activities.

**3. Long-term Effectiveness and Permanence**

The No-Action alternative would not provide long-term effectiveness or permanence. Alternatives 7(a) and 7(c), would provide the highest degree of protection and permanence by incinerating and destroying site contaminants. Solvent extraction, alternative 5, would also be effective in the long-term in that PCBs recovered during the treatment process would be permanently removed from the Site and destroyed. Solidification/stabilization, alternatives 6(a) and 6(b), would provide long-term protection through treatment of the PCBs and containment of the solidified materials, although solidification/stabilization is less reliable in the long-term than the other treatment alternatives such as alternatives 5, 7(a) and 7(c)]. Solidification/stabilization with on-site disposal [alternatives 6(a) and 6(b)] would also require long-term maintenance of the landfill, whereas the solvent extraction and incineration equipment would be present at the Site only for the duration of the treatment program and would then be removed. Alternative 2(b) does not provide permanence through treatment; however, given the low levels of PCBs detected in sediments and soils at the Middle Marsh Operable Unit, alternative 2(b) would be only slightly less effective in the long-term than alternatives 6(a) and 6(b). Unless required by land disposal restrictions, it may not be necessary to solidify excavated Middle Marsh and Adjacent Wetland sediment/soils, because the levels of PCBs are relatively low, less than 50 ppm, and would be properly contained.

**4. Reduction of Toxicity, Mobility, or Volume Through Treatment**

The No-Action alternative would have no effect on the toxicity, mobility or volume of site contaminants.

Alternatives 7(a) and 7(c), incineration with on-site or off-site ash disposal, would provide the greatest reduction of toxicity, mobility and volume by destroying the contaminants. Alternative 5, solvent extraction, would also significantly reduce the toxicity, mobility and volume of site contaminants through treatment, and is preferred under CERCLA because it is an innovative technology. Alternatives 6(a) and 6(b), would solidify the excavated materials, thus reducing the mobility of the site contaminants. They would, however, increase the volume of site contaminants that would require disposal. Alternative 2(b), EPA's selected remedy, does not provide treatment that would reduce the toxicity and volume of site contaminants, but it would significantly reduce the mobility of the contaminants by placing the excavated sediment/soils under the RCRA cap at the Disposal Area. In comparison to Alternatives 6(a) and 6(b), Alternative 2(b) would not increase the volume of contaminated materials found at the Site.

## 5. Short-term Effectiveness

The No-Action alternative would pose no risk to human health or the environment beyond those already posed by site contaminants. Implementation of all other alternatives may result in a slight increase in PCB exposure to workers during remedial activities. Additionally, alternatives 7(a) and 7(c) may pose a short-term risk to public health, workers, and the environment due to air emissions. Alternative 5 may pose a potential risk to workers due to possible exposure to solvents. These short-term risks would be mitigated by requiring workers to wear protective clothing. Although PCBs are not volatile and inhalation of contaminants is not expected to be a problem, the breathing zone will be monitored and respirators worn if necessary. Dust is not expected to be a problem during excavation or transport of sediment/soils, however, water or other control measures will be kept available in case roadways or other areas become too dry.

Wildlife in the wetlands would also be exposed to short-term risks, due to disruption of habitat, during the limited time that site remediation and restoration would be required. However, engineering controls would be chosen and implemented to minimize downstream impacts resulting from excavation and other impacts on the wetlands, including the use of sandbags, earthen dikes, silt curtains and sedimentation basins. In addition, measures will be implemented to minimize impacts to wildlife.

All treatment or containment alternatives have implementation times of approximately six months, exclusive of the time for design, bidding and award of contracts. The

No Action alternative has no short-term effectiveness limitations, because it consists of remedial activities relating only to long-term environmental monitoring.

**6. Implementability**

The No-Action alternative would be easiest to implement as the remedial activities are limited, consisting mainly of long-term environmental monitoring. All of the remaining alternatives [2(b), 5, 6(a), 6(b), (7a), 7(c)] involve excavation of portions of the wetlands, sediment/soil processing, placement of processed materials and wetlands restoration. Of these alternatives, alternatives 5, 6(a), 6(b), 7(a), 7(c), would also require mobilization, demobilization and implementation of sediment/soil treatment units. Treatment units are expected to be equally available for solvent extraction, solidification/stabilization, and incineration. However, obtaining competitive bids on the solvent extraction unit may be difficult because there are fewer vendors and mobilization may require a greater lead time. Alternative 2(b) does not involve treatment; however, its implementability is dependent on the suitability of the dewatered and conditioned material for placement under the cap at the Disposal Area.

Of the action alternatives, capping without prior solidification/stabilization, solvent extraction or incineration would not require use of specialized treatment equipment with limited availability. The placement of excavated sediment/soils under the cap over the Disposal Area [Alternative 2(b)] would not significantly increase the volume of site contaminants to be disposed of under the cap, and Alternative 2(b) is therefore more implementable than Alternatives 6(a) and 6(b), which would increase material handling requirements due to the increase in volume of contaminants produced by solidification/stabilization.

It is anticipated that the incineration alternative 7(c) and solidification/stabilization alternative 6(b) with disposal on the golf course may be difficult to implement based on public accessibility, land acquisition, siting requirements and community opposition.

**7. Cost**

Alternatives 7(a) and 7(c), incineration, are the most expensive of all the alternatives, each with an estimated total cost of approximately $10,000,000. Solvent Extraction, Alternative 5 would be equally effective as Alternatives 7(a) and 7(c) in reducing contaminant concentrations to cleanup levels but at a lower total cost of approximately $7,800,000. The solidification/stabilization alternatives 6(a) and 6(b) are less expensive than the more permanent treatment alternatives [Alternatives 5, 7(a), and 7(c)].

The capping alternative, Alternative 2(b), is the least costly of the action alternatives. Of the containment alternatives [Alternatives 2(b), 6(a), 6(b)], Alternative 2(b) is the least costly to implement, at a total cost of approximately $2,800,000, compared to total costs in excess of $5,000,000 for the solidification/stabilization alternatives [Alternatives 6(a) and 6(b)]. The No-Action alternative would require the least amount of money to implement.

**8. State Acceptance**

Based on its review of the RI/FS and Proposed Plan, the Commonwealth of Massachusetts concurs with alternative 2(b) as the selected remedy. A copy of the declaration of concurrence is attached as Appendix C to this ROD.

**9. Community Acceptance**

Comments received from the community indicated a preference for the No Action alternative. In particular, a petition from golfers at the New Bedford Municipal Golf Course requested that the PCBs be left alone since there is no guarantee that the PCBs will be removed, and because the cost of remediation is high. The City of New Bedford opposed the preferred alternative, stating that it was not protective of the environment because the cleanup would have a more damaging impact on species at the Site than would the long-term effects of PCB contamination, and would cause redistribution of contaminants all over the Site. The City also stated that the selected remedy was not cost-effective and that a limited action consisting of institutional controls should be implemented.

**C. Summary of the Comparative Analysis of Alternatives (Contingency Remedy)**

This section compares and evaluates those alternatives that would not require use of the Sullivan's Ledge Disposal Area for placement of excavated materials. This analysis is based on EPA's assumption that the timing of the Disposal Area cap construction may prevent further use of the Disposal Area, and that another remedial alternative should be chosen for implementation if the Disposal Area should prove to be unusable. Therefore, all alternatives that would require use of the Sullivan's Ledge Disposal Area, which were evaluated in the previous section, have been removed from consideration.

The alternatives that are retained for evaluation in this section are:

- Alternative No. 1 -- No-Action;
- Alternative No. 5 -- THE CONTINGENCY REMEDY - On-site solvent extraction with off-site PCB treatment (EPA's contingency alternative);
- Alternative No.6 (b) -- On-site solidification/stabilization and on-site disposal;
- Alternative No.7(c) -- On-site incineration and off-site ash disposal.

A detailed analysis was performed on the alternatives using the nine evaluation criteria in order to select the contingency remedy. The following is a summary of the comparison of each with respect to the nine evaluation criteria.

**1. Overall Protection of Human Health and the Environment**

Alternative 1, No Action, would be protective of human health, but would not be protective of the environment. EPA has determined that for the Middle Marsh Operable Unit, disturbance of wetlands and floodplains is the only practicable alternative that would be protective of the biota while minimizing adverse impact on the terrestrial and aquatic ecosystem.

All the treatment and/or removal alternatives [5, 6(b), 7(c)] would be equally protective of human health and the environment by reducing contaminant levels to meet EPA cleanup goals and protective standards. There may be potential short-term risks to site workers during excavation and treatment due to the possibility of exposure to PCBs. These risks, however, would be minimized by use of appropriate personal protective equipment. Wetlands would be temporarily affected by excavation procedures, but a comprehensive wetland restoration program would be implemented.

Upon completion of implementation of alternatives 5, 6(b), and 7(c), low level risks would remain due to low residual PCB concentrations, although these levels would be protective of human health and the environment. Low level risks remain, under all the containment/treatment alternatives listed above, from untreated PCB-contaminated sediment/soils that are below remediation levels (20 ug/gram carbon in aquatic areas and 15 ppm PCBs in all other areas).

**2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)**

All alternatives, except for the No Action alternative, will comply with the chemical-specific ARAR for surface water, federal Ambient Water Quality Criteria. In addition, the No Action alternative may not meet the requirements of the Wetlands Executive Order 11990 which requires EPA to minimize the degradation of wetlands and to preserve and enhance the beneficial uses of the wetlands.

Alternatives 5, 6(b) and 7(c) would comply with ARARs, as described in Section IX.B.2. above.

**3. Long-term Effectiveness and Permanence**

The No-Action alternative (Alternative 1) would not provide an effective long-term solution to site contamination. Solvent extraction (Alternative 5) and incineration [Alternative 7(c)] would be equally effective in providing permanent solutions to site contamination because site contaminants would be destroyed. Solidification/stabilization with on-site disposal, Alternative 6(b), in a new landfill would provide long-term protectiveness, but would have a significant, permanent impact on the golf course where the landfill would be located. Solidification/stabilization with on-site disposal would also require long-term maintenance of the landfill, whereas the solvent extraction and incineration equipment would be present at the site only for the duration of the treatment program and would then be removed.

**4. Reduction of Toxicity, Mobility, or Volume Through Treatment**

The No-Action alternative would not affect the toxicity, mobility or volume of site contaminants. Alternative 6(b), solidification/stabilization, would significantly reduce the mobility of the contaminants by immobilization of the contaminants in a solid and placement of the solidified materials under an impermeable cap, but would significantly increase the volume of the materials that would be placed in the landfill located at the golf course. Incineration, alternative 7(c), would permanently reduce the toxicity, mobility and volume of site contaminants through treatment. Solvent extraction, alternative 5, would be equally effective. Solvent extraction is preferred under CERCLA, however, because it is an innovative technology. The development and use of innovative technologies are encouraged by the federal government to stimulate continuing improvements in hazardous waste treatment technologies.

**5. Short-term Effectiveness**

The No-Action alternative would pose no risk to human health or the environment beyond those already posed by site contaminants. Implementation of all other alternatives, [alternatives 5, 6(b) and 7(c)], may result in a slight increase in PCB exposure to workers during remedial activities. Additionally, alternative 7(c) may pose a short-term risk to public health, workers, and the environment due to air emissions during incineration. Alternative 5 may pose a potential risk to workers due to possible exposure to solvents. These short-term risks would be mitigated by requiring workers to wear protective clothing. Although PCBs are not volatile and inhalation of contaminants is not expected to be a problem, the breathing zone will be monitored and respirators worn if necessary. Dust is not expected to be a problem during excavation or transport of sediment/soils, however, water or other control measures will be kept available in case roadways or other areas become too dry.

Short-term risks may also be present for wildlife in the wetlands due to disruption of habitat during the limited time that site remediation and restoration would be required. However, engineering controls would be chosen and implemented to minimize downstream impacts resulting from excavation and other impacts on the wetlands, including the use of sandbags, earthen dikes, silt curtains and sedimentation basins. In addition, measures will be implemented to minimize impacts to wildlife.

All treatment or containment alternatives [alternatives 5, 6(b) and 7(c)] have implementation times of approximately six months, exclusive of the time required for design, bidding and award of contracts. The No Action alternative has no short-term effectiveness limitations, because it consists of remedial activities relating only to long-term environmental monitoring.

6. Implementability

The No-Action alternative would be easiest to implement as this alternative consists primarily of remedial activities relating to long-term environmental monitoring. Incineration [alternative 7(c)] and solvent extraction [alternative 5] would be implementable, although incineration may be more easily accomplished due to the larger number of transportable hazardous waste incinerators available in the country. Solidification/stabilization and on-site disposal would be implementable technically, but construction of the landfill would significantly impact operations of the golf course, which could affect implementability. In addition, alternative 6(b) would increase material handling requirements due to the increase in volume of contaminants produced by solidification/stabilization.

It is anticipated that the incineration alternative 7(c) and solidification/stabilization alternative 6(b) may be difficult to implement based on the need to construct a landfill in the golf course and because of issues relating to public accessibility, land acquisition, siting requirements and community opposition.

**7. Cost**

Alternative 7(c), on-site incineration, would be the most expensive of all the alternatives, with an estimated total cost of approximately $10,000,000. Solvent extraction [alternative 5] would be equally effective as alternative 7(c) in reducing contaminant concentrations to cleanup levels, but at a lower total cost of approximately $7,800,000. The solidification/stabilization alternative 6(b), at an estimated total cost of $6,070,000, would be less expensive than the more permanent treatment alternatives [Alternatives 5 and 7(c)], but would be the most expensive alternative to operate and maintain over the long term, with an estimated operation and maintenance total cost of $650,000. No-Action alternative would require the least amount of money to implement.

**8. State Acceptance**

Based on its review of the RI/FS and Proposed Plan, the Commonwealth of Massachusetts concurs with alternative 5 as the contingency remedy. A copy of the declaration of concurrence is attached as Appendix C to this ROD.

**9. Community Acceptance**

Comments received from the community indicated a preference for the No Action alternative. In particular, a petition from golfers at the New Bedford Municipal Golf Course requested that the PCBs be left alone since there is no guarantee that the PCBs will be removed, and because the cost of remediation is high. The City of New Bedford opposed the contingency alternative, stating that it was not protective of the environment because the cleanup would have a more damaging impact on species at the Site than would the long-term effects of PCB contamination, and would cause redistribution of contaminants all over the Site. The City stated that a limited action consisting of institutional controls should be implemented.

## X. THE SELECTED REMEDY

The selected and contingency remedies contain source control components which address the threat to biota posed by exposure to contaminated sediment/soils in Middle Marsh and the Adjacent Wetland.

A. Cleanup Levels

Cleanup levels have been established for total PCBs which were identified in the baseline risk assessment and were found to pose an unacceptable risk to the environment. Periodic assessments of the protection afforded by remedial actions will be made as the remedy is being implemented and at the completion of the remedial action. If the remedial action is not found to be protective, further action shall be required.

As described in Section VI. above, protective levels were developed to assess exposure of Middle Marsh species through both aquatic and wetland/terrestrial exposure pathways. Based on the ecological risk assessment, sediment/soil cleanup levels were established for the aquatic area delineated in Middle Marsh and for non-aquatic areas in Middle Marsh and the Adjacent Wetland as described below:

1. Sediment/Soil Cleanup Level for Aquatic Areas in Middle Marsh

The sediment/soil cleanup level for the aquatic area in Middle Marsh, as designated in Figure 7, is the interim mean sediment quality criterion (SQC) of 20 micrograms of total PCBs per gram of carbon (ug/Gc). As described in Section VI.B.3.a., this value has been derived by EPA's Criteria and Standards Division to be protective of the presence and ecological functions of benthic invertebrates. In addition, the PCB SQC was derived from the corresponding ambient water quality criterion developed to safeguard against bioaccumulation that could result in chronic reproductive effects in upper level consumers as represented by a species found to be particularly sensitive, the mink (Mustela vison).[5]

The mean sediment quality criterion (20 ug/Gc) was established as the cleanup level for aquatic areas in Middle Marsh because after remediation, the resulting

[5] As described in Section VI.B.3.a., site-specific tissue data indicates that accumulation of PCBs occurred in benthic organisms at sediment/soil concentrations greater than 200 micrograms of PCBs per gram of carbon (ug PCBs/ Gc), a value twice the upper sediment quality criterion.

PCB concentrations in sediment/soils represent levels which, with approximately 50% certainty, will result in interstitial water concentrations equal to or lower than the PCB ambient water quality criterion of 0.014 ug/l.

2. Sediment/Soil Cleanup Levels for Non-aquatic Areas in Middle Marsh and for the Adjacent Wetland

As described in Section VI.B.3.b., the application of site-specific bioaccumulation factors to the food chain pathway model in comparison to PCB sediment/soil concentrations in Middle Marsh and the Adjacent Wetland reveal several areas, approximately 1.5 acres in total, that exceed levels derived to protect carnivorous and omnivorous mammals, as represented by the mink. In addition, PCB concentrations at several locations in Middle Marsh and the Adjacent Wetland exceed levels derived to protect carnivorous birds.

For non-aquatic areas in Middle Marsh, as designated in Figure 7, and for the Adjacent Wetland, the sediment/soil cleanup level is 15 mg/kg total PCBs. A sediment/soil cleanup level of 15 mg/kg total PCBs has been established to protect carnivorous and omnivorous mammals from chronic adverse effects from wetland/terrestrial exposure to contaminated sediment/soils. Remediation of Middle Marsh and the Adjacent Wetland sediment/soils to the PCB cleanup level will also reduce the concentrations of PCBs to levels protective of carnivorous and insectivorous birds.

B. Description of Remedial Components

After evaluating all of the feasible alternatives, EPA is selecting a seven-component plan to address sediment/soil contamination at the Middle Marsh Operable Unit. Major components of the selected remedy and the contingency remedy are described below.

1. Selected Remedy

a. Site Preparation

Site preparation activities would be initiated with the construction of access roads necessary for the mobilization and use of excavation, treatment and disposal equipment. Roadway construction would be performed to minimize wetland impacts, in accordance with the conceptual design discussed in Sections 8.1.1 and 9.2.1.1 of the Feasibility Study (Metcalf and

Eddy, 1991b). Exact locations of the access roads shall be determined in Remedial Design. Performance standards of such road construction shall include, at a minimum, the following:
(1) To the extent necessary, a gravel roadway shall be constructed around the wetland to minimize impacts to areas not requiring remediation;
(2) To minimize fill placed in wetlands, narrow access roads would be constructed within areas requiring excavation;
(3) Slumping of fill shall be minimized by placement of fill on geotextile or geogrid mats;
(4) Measures such as signs, signals or temporary widening of Hathaway Road shall be implemented to mitigate traffic problems to and from Hathaway Road.

The site preparation includes the establishment of security and controlled access to the site, the connection of light and power utilities and the furnishing of sanitary facilities. A chain link fence will be constructed around the perimeter of the areas to be remediated and designated off-site areas. To the maximum extent feasible, the existing fences will be utilized. Warning signs will be posted at 100 foot intervals along the fences and at the entrance gates.

Site preparation work will also include provisions for controlling site drainage. In general, diversion ditches will be used to ensure proper drainage of stormwater away from contaminated areas. Erosion control in the form of silt fencing will be used to prevent uncontrolled movement of contaminated sediment/soils. Stormwater management and erosion control measures to be used during excavation/treatment activities are also considered part of the site preparation work.

Because these activities may include sediment/soil movement, an air monitoring program will be implemented during the performance of the site preparation work to determine risks to on-site workers, golfers and nearby residents. In addition, subsequent to site preparation work but prior to soil excavation activities, sediment/soil monitoring will be performed to further define contaminant levels in any area impacted by site preparation work.

This component of the remedy will utilize measures to limit potential air emissions from excavation activities, including the following methods: enclosure of the work areas; emission suppression techniques (e.g. foam, water spray); and containment of excavated sediment/soils.

Following the installation of erosion control structures, clearing and grubbing will be performed on the densely vegetated parts of the Middle Marsh Operable Unit of only those areas necessary for implementation and construction of the selected remedy. Cleared debris such as trees and shrubs will be disposed of on-site or off-site after initial processing (e.g. chipping). EPA anticipates that decontamination of such debris will not be required. In order to minimize the possibility of residual contamination of debris, special precautions will be taken during clearing and grubbing activities such as temporary covering of contaminated sediment/soils. Stumps and other contaminated materials shall be shredded and/or disposed of with the contaminated sediment/soil. Any rubble unearthed from fill material during site preparation work, or surface obstructions (e.g. cinder block, metal scrap) shall be decontaminated prior to off-site disposal in an approved facility. After areas have been cleared, grading will be performed to provide a level surface for the operational areas.

A concrete pad for stockpiling and dewatering will be constructed as the final step to prepare for construction of the sediment/soil treatment facility.

b. Excavation

Four areas within the New Bedford Municipal Golf Course property shall be excavated. Areas 1, 2, and 3 are located within Middle Marsh, whereas Area 4 is located southeast of Middle Marsh in the Adjacent Wetland (see Figure 9). The approximate surface areas of Areas 1, 2, 3 and 4 are 0.4, 1.0, 0.1, and 0.4 acres, respectively. Of the 1.9 acres to be remediated, approximately 0.75 acres are forested wetland.

Areas 1, 2, 3 and 4, as delineated in Figure 9, shall be excavated by conventional mechanical means to an initial depth of one and one-half feet to remove sediment/soils with PCBs in excess of the cleanup levels outlined in Section X.A. A total of approximately 5,200 cubic yards of contaminated sediment/soils shall be excavated. Additional sediment excavation shall be conducted as necessary to remove all contaminated sediment/soils with PCB concentrations exceeding sediment/soil cleanup levels.

A combination of conventional mechanical means shall be utilized including the following: crawler-mounted dragline; backhoe; front-end loader; bobcat; hand shovels; and other small lightweight excavators. However, due to the limited size of Area 3 (approximately 5,600 square feet), a dragline shall not be used for this area. Alternatively, although more labor intensive, a combination of light excavators such as bobcats and hand shovels shall be used to excavate Area 3 while minimizing tree removal and fill placement. Excavated material from Area 3 shall be removed by wheel barrows or by conveyor belts.

To implement this component, a processing area will be set up at the Middle Marsh Operable Unit prior to soil excavation. The processing area will be constructed so as to prevent, to the extent possible, any migration of the excavated soils.

As described in component a of the selected remedy, measures will be implemented to limit potential air emissions from excavation, treatment and ancillary activities. An air monitoring program shall be implemented during the performance of the on-site sediment/soil excavation and treatment components of the remedy to determine risks to on-site workers, golfers and nearby residents. Air sampling stations will be located at representative points throughout the golf course and at the perimeter of the work zone for the Middle Marsh Operable Unit. Samples will be analyzed, at a minimum, for PCBs in vapor phase and PCB particulates.

EPA anticipates that some amount of on-site wetland areas will be impacted by sediment/soil excavation. For those areas, steps will be taken as described in component d of the selected remedy, to minimize potential destruction or loss of wetlands or adverse impacts to organisms.

Upon completion of the initial excavation of on-site contaminated sediment/soils, samples will be collected and contaminant levels will be evaluated against the cleanup levels for sediment/soils (see Section X.A.1). Sediment samples will be analyzed, at a minimum, for PCBs and TOC. All samples will be evaluated to ensure that response objectives and performance standards are achieved. Based on the sampling results, additional excavation at one foot depth intervals will be performed in any area where sediment contaminant levels are greater than the respective sediment/soil cleanup level.

Appropriate pretreatment and materials handling (blending), such as feed size preparation and optimum sediment/soil feed criteria will be evaluated during remedial design for the excavation phase of the selected remedy.

Excavation activities shall be scheduled so that disturbances to Massachusetts species of special concern are minimized to the maximum extent practicable. EPA will evaluate the following factors in determining practicability: public access, weather conditions, stream flow, scheduling constraints.

This portion of the selected remedy will be implemented in a manner that mitigates any contaminant migration downstream. The method of isolating contaminated sediment/soils will be determined during design of the selected remedy, considering the need to mitigate wetland impacts.

Because the areas to be excavated are wetlands, excavation and associated activities will be performed to minimize adverse impacts to wetland areas. EPA has determined that, for this operable unit, there are no practicable alternatives to the site preparation and sediment/soil excavation components of the selected remedy, that would achieve site goals but would have less adverse impacts on the ecosystem. Therefore, sedimentation basins and/or silt curtains will be installed downstream to capture any particles that may become suspended during excavation activities. During excavation and dewatering of PCB-contaminated sediments, downstream monitoring of surface water will be conducted to ensure that transport is not occurring as a result of the excavation. Excavated areas shall be isolated by means of erosion (e.g. sandbags, haybales or earthen dikes) and sedimentation control devices (e.g. sedimentation basins), and diversion structures.

For wetlands areas affected by sediment/soil excavation, steps will be taken as described in component d of the selected remedy, to minimize potential destruction or loss of wetlands or adverse impacts to organisms.

c. Dewatering and Disposal

Because the excavated sediment/soils would contain liquids when excavated, a dewatering process (e.g.

filter presses) shall be used following excavation. Dewatering would reduce the moisture content of the excavated materials and facilitate their handling and transport. The dewatering system shall consist of mechanical (e.g. belt filter presses, recessed chamber filter presses, centrifuges) and/or chemical processes (e.g. quicklime addition) and would be designed based on results of bench-scale and chemical tests. In particular, Toxicity Characteristic Leaching Procedure (TCLP), PCBs and paint filter liquid tests would be performed to determine suitability for landfilling and to determine if the sediment/soils are characteristic of Resource Conservation and Recovery Act (RCRA) hazardous waste due to the presence of heavy metals. If solidification/stabilization is determined by EPA, in consultation with MADEP, to be necessary, then, bench-scale testing of the solidification/stabilization process using representative sediment/soil samples shall be performed to evaluate solidifying agents and mixtures, including the use of quicklime. Testing to determine appropriate and optimal use of hardening agents will consist of leachability tests. TCLP tests shall also be performed to determine whether certain sediment/soils will be RCRA characteristic waste after solidification/stabilization.

Sediment/soils which are determined to be RCRA hazardous waste would be subject to the land disposal restrictions (LDRs). If, upon evaluation of the results of the TCLP tests, sediment/soils are determined to be RCRA hazardous waste, then solidification/stabilization of these sediment/soils shall be performed, as necessary, to render the materials non-hazardous, or in the alternative to meet the treatability variance provided in the hazardous waste land disposal restrictions. Because existing and available data do not demonstrate that the full-scale operation of solidification/stabilization treatment technology can attain the LDR treatment standards consistently for all soil and debris wastes to be addressed by this action, this alternative will comply with the LDRs through a Treatability Variance for the wastes that cannot be treated to meet the standard.

Water extracted from the excavated materials shall be adequately stored and treated by carbon adsorption and additional treatment units, as necessary, to remove residual contaminants to protective levels. Treated effluent shall be discharged to the Unnamed Stream.

Following dewatering and solidification/stabilization, if necessary, the excavated materials would be transported to the Sullivan's Ledge Disposal Area, disposed of above the existing ground surface and outside the 100-year floodplain, and covered by the cap that will be constructed as part of the site cleanup for the First Operable Unit.

Activities relating to the treatment, disposal and transportation of these sediment/soils shall be performed while minimizing potential destruction or loss of wetlands or adverse impacts to organisms.

d. Wetlands Restoration

EPA has determined that, for this Site, there are no practicable alternatives to the selected remedy that would achieve site goals but would have less adverse impacts on the ecosystem. Unless sediment/soils with contaminants greater than the target levels are excavated, the contaminants in the sediment/soils would continue to pose unacceptable environmental risks.

Excavation, treatment and disposal of contaminated sediment/soils, and any ancillary activities will result in unavoidable impacts and disturbance to wetland resource areas. Such impacts may include the destruction of vegetation and the loss of certain plants and aquatic organisms. Impacts to the fauna and flora will be mitigated in accordance with Section 9.2.1.4. of the Feasibility Study (Metcalf and Eddy, 1991b) and the requirements discussed below.

During implementation of the remedy, steps will be taken to minimize the destruction, loss and degradation of wetlands, including the use of sedimentation basins or silt curtains to prevent downstream transport of contaminated sediment/soils. A wetland restoration program will be implemented upon completion of the remedial activities in wetland areas adversely impacted by remedial action and ancillary activities. In particular, the restoration program for the excavated portions of Middle Marsh and the Adjacent Wetland will be designed to mitigate any future impacts of such activities to those areas. Measures to be used will include adequate sloping of stream banks to prevent excessive sediment/soil erosion into the Unnamed Stream. All excavated areas would be backfilled, graded, stabilized and planted. The area would be restored to detail appropriate elevation contours and similar vegetation would be planted. Organic fill material would be distributed throughout the excavated areas to create grading, elevation and drainage approaching original patterns and to serve as substrate for replacement of vegetation.

A variety of mitigating measures shall be implemented during and after remedial action including protection of sensitive species, erosion control and turbidity control. Excavation, backfilling and other remedial activities shall be conducted such that the disturbance of the Spotted Turtle, a Massachusetts species of special concern known to occupy Middle Marsh is minimized. In addition, during remedial design, further investigations will be performed to identify areas where the Mystic Valley Amphipods may be inhabiting. Based on the results of such an investigation, measures shall be planned and implemented to minimize adverse impacts of remedial activities, including wetlands restoration, on the Mystic Valley Amphipods.

Upon completion of remedial action, any wetland areas impacted by dredging, excavation, treatment, disposal and/or associated activities performed in accordance with components a, b and c of the selected remedy, will be restored or enhanced, to the maximum extent feasible, to similar hydrological and botanical conditions existing prior to these activities.

The restoration program will be developed during design of the selected remedy to replace wetland functions and habitat areas. The Wetlands Restoration Plan will evaluate utilizing the spotted turtle and the mystic valley amphipod as biological indicators to measure the success of the restoration. In addition, this program will identify the factors which are key to a successful restoration of the altered wetlands. Factors will include, but not necessarily be limited to, replacing and regrading hydric soils, provisions for hydraulic control and provisions for vegetative reestablishment, including transplanting, seeding or some combination thereof. Quality assurance measures shall include; (1) detailed topographic and vegetative surveys to ensure replication of proper surface elevations and vegetation; (2) engagement of a wetland replication specialist; (3) establishment of work area limits for equipment to prevent inadvertent placement of fill; (4) production of a reproducible base map and a detailed planting scheme; (5) photographic documentation.

EPA, in consultation with MADEP, shall determine when restoration shall be performed. Consideration shall be given to breeding seasons of sensitive species, climatic conditions, and the time frame between excavation activities and possible stabilization/restoration activities.

The restoration program will include monitoring requirements to determine the success of the restoration. Periodic maintenance (i.e. planting) may also be necessary to ensure final restoration of the designated wetland areas.

e. Long-Term Environmental Monitoring

Long-term environmental monitoring, including sediment/soil monitoring shall be performed to determine the degree to which sediment/soils are mobilizing on- or off-site. Sediment/soils in the Unnamed Stream, the stream's tributary and nearby aquatic areas in the northwest portion of Middle Marsh shall be periodically sampled to determine if contaminants are migrating into these critical aquatic areas. Samples shall be analyzed, at a minimum, for TOC and PCBs.

Long-term monitoring of the wetlands shall be conducted to ensure the long-term effectiveness of the wetland restoration program.

All monitoring data and environmental conditions shall be formally reviewed and evaluated during the operation of the remedy to ensure that appropriate response objectives are achieved. Monitoring frequency and chemical parameters may be added or deleted based on review of monitoring data, and upon approval by EPA, in consultation with MADEP.

As required by law, EPA will review the Middle Marsh Operable Unit at least once every five years after the initiation of remedial action at the Middle Marsh Operable Unit if any hazardous substances, pollutants or contaminants remain at Middle Marsh or the Adjacent Wetland to assure that the remedial action continues to protect human health and the environment. EPA will also evaluate risk posed by the Middle Marsh Operable Unit at the completion of the remedial action (i.e., before the Site is proposed for deletion from the NPL). Future remedial action will be considered if the environmental monitoring program determines that unacceptable risks to human health and/or the environment are posed by exposure to site contaminants.

f. Institutional Controls

EPA's choice of the selected remedy is based in part on the assumption that the future land use of Middle Marsh and the Adjacent Wetland will be recreation and conservation. PCB cleanup levels for sediment/soils, as described in Section X.A. above, have been derived based on such future land uses. Therefore, institutional controls, such as zoning ordinances and/or deed restrictions, shall be implemented to ensure that future uses of Middle Marsh and the Adjacent Wetland are limited to its existing recreation and conservation purposes. Residential and non-recreational commercial uses of these areas will be prohibited.

The effectiveness of institutional controls shall be re-evaluated during the five year reviews described above. If, at the five year review, or at any time during or after completion of remedial action, EPA determines that additional or alternative institutional controls are necessary to protect human health, then such additional or alternative institutional controls will be implemented for a portion or all of the properties in the Middle Marsh Operable Unit, including the New Bedford Municipal Golf Course.

2. Contingency Remedy

EPA's selected remedy - excavation, dewatering, and disposal beneath the cap that will be constructed over portions of the Sullivan's Ledge Disposal Area - is dependent upon Middle Marsh excavations being conducted prior to capping of the Disposal Area. If the cap is constructed before the Middle Marsh excavations are conducted, the selected remedy could not be implemented.

Design of the Disposal Area cap is currently underway. In accordance with a legal agreement between EPA, the Commonwealth of Massachusetts and fourteen parties that have been determined to be potentially responsible for contamination at the Sullivan's Ledge First Operable Unit, this work is being conducted by the 14 Potentially Responsible Parties, under supervision of EPA, in consultation with MADEP.

Because it is not certain that the excavation of targeted sediment/soils in Middle Marsh and the Adjacent Wetland under the selected remedy can be implemented prior to the installation of the cap at the Sullivan's Ledge Disposal Area, EPA has selected a second alternative, a contingency alternative, to be implemented, if EPA, in consultation with MADEP, determines that the Disposal Area would not be available for placement of the excavated sediment/soils from Middle Marsh and the Adjacent Wetland. The contingency alternative is described below.

While a number of factors may affect the schedule for remedial construction at the First Operable Unit, CERCLA places a high value on the speedy cleanup of sites, especially principal threats, as found at the Disposal Area. Accordingly, it would be inconsistent with CERCLA to delay significantly the construction of the First Operable Unit in order to allow coordination of construction for the Middle Marsh Operable Unit.

Pre-design activities for the First Operable Unit are currently being conducted. EPA anticipates that based on preliminary time schedules, the remedial design for the First Operable Unit will be completed by March of 1994. EPA has determined that if additional design activities necessary to implement the selected remedy for the Middle Marsh Operable Unit are not completed in time to integrate the design elements for the Middle Marsh Operable Unit into the Remedial Design (which is to be submitted and approved under schedules approved according to the Consent Decree for the First Operable Unit), then the contingency remedy shall be implemented.

The contingency remedy would include all site preparation, excavation, wetlands restoration, long-term monitoring and institutional control activities of the selected remedy, as described in components a,b,d,e and f above. However, under the contingency remedy, excavated sediment/soils from Areas 1, 2, 3 and 4, as delineated in Figure 9, would be treated using a solvent extraction process.

The solvent extraction process generally involves the use of a solvent to remove PCBs and other organic chemicals from the sediment/soils. The first step in this process is to mix the contaminated sediment/soils with water and the solvent in order to extract the PCBs and other organic chemicals from the sediment/soils. Once the extraction is complete, the treated sediment/soils are removed from the mixture. Sediment/soils that do not meet EPA's target cleanup goals after an initial extraction will again be treated in the solvent extraction process until the target levels are attained. The liquid solvent/PCB/water mixture is then heated, separating the solvent/PCB-contaminated oils from the PCB-free water. The solvent is then separated in a stripping column and recycled for use in the system. The solvent extraction process will take place in a closed unit to prevent any contaminant air emissions.

The facilities will be designed and best management practices related to the storage and use of solvent, other chemical products and waste will be used, in accordance with state and federal regulations, including RCRA requirements and requirements for above-ground storage tanks. Extracted PCBs and other organic chemicals will be collected, stored and disposed of off-site by incineration in accordance with TSCA regulations at 40 CFR Part 761. Residual water from the process will be pumped into storage tanks for treatment by a portable carbon unit, and other treatment units necessary to achieve regulated discharge limits, located on-site.

Solvent extraction is an innovative treatment. Prior to implementation of the full-scale process at the Site, predesign treatability studies, including a bench-scale study will be conducted to determine the implementability of this technology on site-specific contaminants and on a full-scale level. The treatability study will yield information on optimum operational settings, percent reduction of organic compounds in sediment/soils and the volumes and types of residuals and byproducts produced by the operation of the treatment system. Results of the treatability studies will also be evaluated to determine appropriate material handling methods that will be implemented during remedial action. This evaluation will determine the extent to which sediment/soils will be blended prior to treatment, based on sediment/soil characteristics and/or contaminant levels, to ensure the optimal effectiveness of the solvent extraction process in reducing site contaminants to respective target levels.

Prior to full-scale implementation of the solvent extraction process on the Site, treatability tests, including TCLP tests, would be conducted to establish the optimum treatment design, and to verify that sediment/soil residues from the process are nonhazardous. If, after treatment, the sediment/soils are determined to be characteristic of RCRA hazardous waste, then these sediment/soils would be solidified to render the materials non-hazardous or in the alternative to meet the land disposal restriction treatability variance requirements.

Treated sediment/soils from the solvent extraction process would be mixed with fresh organic material and returned to the excavated area within Middle Marsh and the Adjacent Wetland. The addition of organic material to the treated sediment/soils would be necessary because the solvent would extract some of the natural organics present in the untreated sediment/soils and necessary for suitable wetland fill.

## XI. STATUTORY DETERMINATIONS

The selected remedy and contingency remedy selected for implementation at the Middle Marsh Operable Unit are consistent with CERCLA and, to the extent practicable, the NCP. The selected and contingency remedies are protective of human health and the environment, attain ARARs, and are cost-effective. The selected remedy does not, however, satisfy the statutory preference for treatment which permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element, based on the reasons discussed in Section XI.E below. The contingency remedy satisfies the statutory preference for treatment which permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element. Additionally, the selected remedy and the contingency remedy utilize alternate treatment technologies or resource recovery technologies to the maximum extent practicable.

### A. The Selected and Contingency Remedies are Protective of Human Health and the Environment

The selected and contingency remedies for the Middle Marsh Operable Unit will permanently reduce the risks posed to the environment by eliminating, reducing or controlling exposures to environmental receptors through containment (the selected remedy) or treatment (the contingency remedy), engineering controls, and institutional controls. Excavation of sediment/soils with PCBs exceeding cleanup levels, as required by the selected and contingency remedies, will permanently and significantly reduce the risks to biota associated with exposure to contaminated sediment/soils in Middle Marsh and the Adjacent Wetland, and will reduce subsequent bioaccumulation.

As discussed above in Section VI.B (Ecological Risk Assessment), the site-specific bioaccumulation data and toxicity data show that PCBs in the Middle Marsh Operable Unit present a substantial risk to wildlife in the environment. The data show that, unless the soils and sediments at the Middle Marsh Operable Unit are remediated in accordance with the selected cleanup levels, adverse effects on wildlife can be expected. EPA's evaluation of the protectiveness of the selected and contingency remedies also considered the effects of the temporary disruption of wetlands habitat that will occur as part of the remedy (primarily during the site preparation and excavation phases), and the fact that wetlands will be restored to the maximum extent practicable. EPA concluded that, on balance, the selected and contingency remedies will be protective of the environment in the long-term. EPA's evaluation of impacts to the wetlands is further discussed in Section XI.B.

As indicated in Tables 6 and 7, total excess lifetime carcinogenic risks evaluated to reflect present and potential future exposure for the contaminants of concern in Middle Marsh and the golf course/Adjacent Wetland areas corresponding to the average and the reasonable maximum exposure scenarios fall within EPA's acceptable risk range of $10^{-4}$ to $10^{-6}$. In addition, total non-carcinogenic risks evaluated to reflect present and potential future exposure for the contaminants of concern in Middle Marsh and the golf course/Adjacent Wetland areas corresponding to the average and the reasonable maximum exposure scenarios are less than one, indicating that the potential for adverse health effects are unlikely. Therefore, EPA has determined that, based on the exposure assumptions described above, human exposure to site contaminants in Middle Marsh and the golf course/Adjacent Wetland through the current and future pathways outlined in Section VI.A. would not result in significant increases in carcinogenic risk if contaminant levels were not remediated according to the selected and contingency remedies. EPA has further determined that there are no significant risks to human health posed by exposure to noncarcinogenic contaminants in Middle Marsh and the golf course/Adjacent Wetland. Excavation of sediment/soils with PCBs exceeding the cleanup levels, in accordance with the selected and contingency remedies will further reduce risks associated with potential future exposure to contaminants from direct contact with and ingestion of such sediment/soils.

Under the selected remedy, disposal of excavated materials under the impermeable cap to be constructed at the Sullivan's Ledge Disposal Area will provide a barrier against exposure to contaminated sediment/soils to both human and environmental receptors. Periodic site visits and maintenance will be performed to ensure the integrity of the cap, and its effectiveness in preventing exposure to contaminated sediment/soils. Similarly, institutional controls will be implemented to regulate land use of the Site, including activities which may compromise the integrity of the cap (part of the remedy selected for the First Operable Unit) and restrictions on residential development.

Under the contingency remedy, solvent extraction of PCBs from excavated sediment/soils, off-site incineration of the PCB-contaminated oil extract, disposal of treated sediment/soils in Middle Marsh and the Adjacent Wetland, and wetland restoration will mitigate risks to environmental receptors.

Finally, implementation of the selected and contingency remedies will not pose unacceptable short-term risks or cross-media impacts. Implementation of these remedies may result in a slight increase in PCB exposure to workers during remedial activities. In addition, implementation of the contingency remedy may pose a potential risk to workers due to possible exposure to solvents. However, any short-term risks will be mitigated by requiring workers to wear protective clothing. Although PCBs are not volatile and inhalation of contaminants is not expected to be a problem, the breathing zone will be monitored and respirators worn if necessary. Dust is not expected to be a problem during excavation or transport of sediment/soils, however, control measures such as water will be kept available in case roadways or other areas become too dry. For all remedial activities that may include sediment/soil movement, an air monitoring program will be implemented during the performance of the activities to determine risks to on-site workers, golfers and nearby residents. Measures will be utilized to limit potential air emissions from site preparation, excavation, treatment and disposal activities, including the following methods: enclosure of the work areas; emission suppression techniques (e.g. foam, water spray); and containment of excavated sediment/soils.

Short-term risks would also be present for wildlife in the wetlands during the limited time that site remediation and restoration would be required. However, engineering controls would be chosen and implemented to minimize downstream impacts resulting from excavation and other impacts on the wetlands, including the use of sandbags, earthen dikes, silt curtains and sedimentation basins.

Containment of the sediment/soils, as required by the selected remedy, would not result in cross-media impacts because disposal under an impermeable cap would minimize the transport of contaminants from sediment/soils to air and surface waters. In accordance with the contingency remedy, solvent extraction of sediment/soils and off-site incineration of the oil extract would be performed to mitigate cross-media impacts to the air by the use of air pollution devices on the incinerator and engineering controls (e.g. closed system) for the solvent extraction unit. Finally, as described in component d of the selected remedy, remedial activities associated with the selected and contingency remedies would be performed to mitigate impacts to the fauna and flora including the use of sedimentation basins or silt curtains to prevent the transport of contaminants to surface waters.

## B. The Selected Remedy and Contingency Remedy Attain ARARs

The selected and contingency remedies will attain all applicable or relevant and appropriate federal and state requirements that apply to the Middle Marsh Operable Unit. Environmental laws from which ARARs for the selected and contingency remedial actions are derived, and the specific ARARs include:

- Resource Conservation and Recovery Act (RCRA)
- Toxic Substances Control Act (TSCA)
- Clean Water Act (CWA)
- Executive Order 11988 (Floodplain Management)
- Executive Order 11990 (Protection of Wetlands)
- Clean Air Act (CAA)

State environmental regulations which are applicable or relevant and appropriate to the selected remedial action at the Site include:

- Hazardous Waste Regulations
- Wetlands Protection Regulations
- Certification for Dredging and Filling in Waters
- Air Quality Standards
- Air Pollution Control Regulations
- Surface Water Quality Standards
- Supplemental Requirements for Hazardous Waste Management Facilities

Tables 9, 10 and 11 provide a synopsis of the applicable or appropriate requirements and to be considered (TBCs) requirements for the selected remedy and for the contingency remedy, respectively. A brief narrative summary of the major ARARs and TBCs follows:

<u>Sediment/Soils</u>

<u>Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act</u>

The Commonwealth of Massachusetts has been authorized by EPA to administer and enforce RCRA programs in lieu of the federal authority. Compliance with Massachusetts RCRA regulations is discussed below. However, land disposal restrictions (LDRs) promulgated under the Hazardous and Solid Waste Amendments to RCRA (HSWA) and codified at 40 CFR Section 268, may be applicable under certain conditions.

The applicability of HSWA regulations as action-specific requirements for disposal depends on whether the wastes are hazardous, as defined under RCRA. In this case, the sediments/soils from certain areas may contain high levels of inorganics, including lead, such that these soils/sediments would be considered characteristic of hazardous waste.[6]. During predesign, TCLP tests shall be performed to determine if the sediment/soils are characteristic of RCRA waste. If, upon evaluation of the results of the TCLP tests, sediment/soils are determined to be RCRA hazardous waste, then solidification/stabilization of these sediment/soils shall be performed, to render the materials non-hazardous, or in the alternative to meet the treatability variance provided in the hazardous waste land disposal restrictions. EPA expects, however, that LDRs will not be applicable to those sediment/soils, because the Agency expects that after the sediment/soils are solidified, they will no longer exhibit any characteristics of hazardous wastes. If LDRs are applicable, the selected remedy and contingency remedy will comply with LDRs through the use of a treatability variance.

Massachusetts DEP Hazardous Waste Regulations

The applicability of Massachusetts Hazardous Waste Regulations depends on whether wastes at Middle Marsh Operable Unit are classified as hazardous waste under state law. If PCB concentrations in any soils/sediments to be excavated and disposed of are equal to or greater than 50 ppm, or if such soils/sediments exhibit the characteristics of hazardous waste due to the presence of metals, the Massachusetts Hazardous Waste Regulations will be applicable to those soils and sediments.

In the case of the sediments and soils to be excavated from the Middle Marsh Operable Unit during the selected remedy and the contingency remedy, EPA expects that the concentrations of PCBs will not, in most instances, exceed 50 ppm.[7] In addition, both the selected remedy and the contingency remedy call for solidification/stabilization of soils and sediments which are characteristic of hazardous waste due to the presence of metals. EPA expects that

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[6]The Agency has determined that none of the wastes in the sediment/soils at the Middle Marsh Operable Unit are listed hazardous wastes under RCRA because the specific processes creating the wastes are unknown.

[7] Even if PCB concentrations in these *media* do exceed 50 ppm, 310 CMR 30.501 provides that the Massachusetts hazardous waste regulations do not apply if the materials are handled and disposed of in accordance with the federal standards contained in the TSCA regulations, at 40 C.F.R. 761. As discussed below, the selected remedy and the contingency remedy comply with these standards.

following solidification/stabilization, such soils and sediments will no longer be characteristic of hazardous waste. For these reasons, EPA expects that the Massachusetts Hazardous Waste Regulations are not applicable to the disposal of soils and sediments at the Middle Marsh Operable Unit. However, since the soils and sediments may be similar to hazardous wastes, portions of these regulations are relevant and appropriate.

Implementation of the selected remedy and the contingency remedy will comply with the following provisions of the Massachusetts hazardous waste regulations at 310 CMR 30.00: General management standards for all facilities (310 CMR 30.510); Contingency plan, emergency procedures, preparedness, and prevention (310 CMR 30.520); Manifest system (310 CMR 30.530); and Use and management of containers (310 CMR 30.680).

Under the selected remedy, the soils and sediments to be excavated from Middle Marsh and the Adjacent Wetland will be disposed of under the cap at the Disposal Area. These activities at the Disposal Area will comply with relevant and appropriate portions of the following Massachusetts hazardous waste regulations: Closure and post-closure (310 CMR 30.580, 310 CMR 30.590); Landfills (310 CMR 30.620); Groundwater protection (310 CMR 30.660). As discussed in the 1989 ROD, the portion of the DEP landfill regulations requiring a double liner is not appropriate to the Disposal Area and will not be attained. Because of the impracticability of excavating the quarry pits, large volumes of wastes will be left in the quarry pits underneath the PCB-contaminated soils and sediments, and placement of a double liner over the wastes in the quarry pits would be ineffective in containing the wastes. Closure and post-closure requirements requiring, among other things, that the cap attain a certain low permeability standard and act to minimize migration of liquids through the landfill in the long term will be attained. As discussed in the 1989 ROD, relevant and appropriate requirements for leachate collection and groundwater monitoring will be achieved at the Disposal Area as part of the selected remedy for the First Operable Unit.

For the selected remedy, the placement of contaminated sediment/soils under a cap will occur outside the 100-year floodplain, in accordance with location standards in the Massachusetts Hazardous Waste Regulations. In addition, the substantive elements of the contingency plan, emergency procedures, preparedness and safety requirements will be satisfied.

<u>Toxic Substances Control Act</u>

To the extent that the soils and sediments to be excavated from the Middle Marsh Operable Unit contain PCB concentrations of greater than 50 ppm, the PCB Disposal Requirements promulgated under TSCA are applicable. As discussed in the 1989 ROD, disposal of PCB-contaminated soils and sediments under the cap at the Disposal Area will comply with the chemical waste landfill requirements of 40 C.F.R. § 761.75, with the exception of certain requirements[8] which were waived pursuant to 40 C.F.R. § 761.75(c)(4). Accordingly, the selected remedy will comply with PCB Disposal Requirements.

The PCB Disposal Requirements are also applicable to the contingency remedy because it involves disposal of liquids (oil extract) contaminated with PCBs in excess of 50 ppm. The PCB-contaminated extract produced from the solvent extraction treatment will be treated off-site in an incinerator meeting the standards of 40 C.F.R. § 761.69.

Both the selected remedy (for sediment/soils with PCBs greater than 50 ppm) and the contingency remedy require the construction of a storage area meeting the PCB storage requirements of 40 C.F.R. Section 761.65.

Floodplains and Wetlands ARARs

The regulations under Section 404 of the Clean Water Act (CWA) are applicable to the selected remedy, because construction of roads in the wetlands will involve a discharge of dredged or fill material. In addition, wetlands restoration will involve backfilling to the extent necessary to create grading, elevation and drainage approaching original patterns and to serve as substrate for replacement of vegetation. The Section 404 regulations are applicable to the contingency remedy for the same reasons, and also because the contingency remedy calls for the placement of treated soils and sediments (from which the PCBs have been extracted) back into Middle Marsh and the Adjacent Wetland.

Regulations promulgated under the Clean Water Act require that, before a project which involves a discharge of fill material into a wetland is undertaken, there must be an analysis of the impact of such a project on the aquatic environment, and a comparison to other practicable alternatives. 40 C.F.R. §230.10(a). In this case, EPA compared the selected remedy and contingency remedy to other

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[8] The requirements relating to low permeability clay conditions, use of a synthetic membrane liner, and distance from the high water table, 40 C.F.R. § 761.75(b)(1),(2) and (3), were waived in the 1989 ROD.

alternatives which did not involve a discharge of fill material to Middle Marsh and the Adjacent Wetland. EPA compared excavation (as called for in the selected and contingency remedies) to: (1) a "no action" remedy; (2) capping contaminated soils and sediments in Middle Marsh and the Adjacent Wetland; and (3) in-situ bioremediation.

EPA determined that none of the alternatives to excavation would be able to achieve the overall purpose of the project, which is to reduce risk to environmental receptors at the Site, without causing other significant adverse impacts to the environment. Specifically, a "no action" remedy would leave PCBs in place, and bioaccumulation which is known to occur at the Middle Marsh Operable unit would continue, causing adverse effects on higher trophic level species. Thus, although the habitat would remain intact, adverse environmental effects due to the presence of PCBs would continue. In-situ bioremediation would cause less temporary disturbance to the wetlands than excavation, but the technology has several major limitations: it is not proven for PCBs, it is not certain that the technology can attain cleanup goals, it may not be effective in dense organic soils, the organisms may metabolize sediment organics instead of PCBs, and there are few contractors available to perform the technology. In addition, bioremediation may not be less disruptive of the wetlands because of the need to rototill the soil during the aerobic phase of bioremediation. Finally, capping contaminants within the wetland would result in permanent loss of wetland habitat and loss of flood storage capacity. Accordingly, EPA has concluded that the only practicable alternative that will attain the project purpose of reducing risk to environmental receptors but does not also permanently destroy wetlands habitat is an alternative that provides for excavation of soils and sediments contaminated with PCBs above the cleanup level. Accordingly, EPA has determined that there are no other practicable alternatives which would have a less adverse impact on the aquatic ecosystem than the impacts of the selected remedy and the contingency remedy.

The selected and contingency remedies also satisfy the substantive requirements of 40 C.F.R. 230.10(b). Mitigation techniques such as silt curtains will be used so that the action will not cause or contribute to the violation of a state water quality standard; the action will not violate toxic effluent standards under the Clean Water Act; and the action will not jeopardize the continued existence or critical habitat of species listed in the Endangered Species Act. In addition, consistent with 40 C.F.R. § 230.10(c), the selected and contingency remedies will not cause or contribute to significant degradation of the waters of the United States: the action will reduce the risk to the environment caused by PCBs, and the discharge which is necessarily involved as part of the remedial action will not have a significant, long-term adverse effect on aquatic life and other wildlife, or on ecosystem diversity, productivity and stability.

The selected and contingency remedies will comply with the substantive requirements of 40 C.F.R. § 230.70 to minimize adverse impacts to the aquatic ecosystem, by creating sedimentation basins and by restoring the stream and wetlands, to the extent feasible.

In addition, the policies expressed in Executive Orders regarding wetlands and floodplains were taken into account in the selected and the contingency remedies. The remedies will include steps to minimize the destruction, loss, or degradation of wetlands in accordance with Executive Order 11990, and will include steps to reduce the risk of floodplain loss in accordance with Executive Order 11988.

DEP Wetlands Protection Regulations concerning dredging, filling, altering or polluting inland wetlands are applicable to the dredging of Middle Marsh and the adjacent wetland. The remedial actions will comply with the performance standards of the regulations regarding banks, vegetated wetlands, and lands under water, and a one-for-one replication of any hydraulic capacity which is lost as the result of this part of the remedial actions.

The selected and contingency remedies satisfy the substantive requirements for a variance from the Massachusetts wetlands regulation stating that a project which alters the habitat of a state-listed species of special concern cannot have any short or long term adverse effects on the habitat of the local population of that species. 310 CMR 10.58, 10.59. As a condition of the variance, it may be appropriate to use the Spotted Turtle and Mystic Valley Amphipod as biological indicators of habitat restoration. The wetland restoration program will evaluate methods for using these two state-listed species of special concern as biological indicators of habitat restoration.

Because Middle Marsh and the adjacent wetland are within the areal extent of contamination, they are considered part of the Site, and no permits will be necessary.

<u>Surface Water</u>

<u>Clean Water Act</u>

Certain regulations under the Clean Water Act are applicable to the discharge of treated waters to the surface waters of the Unnamed Stream, or any other designated surface water body. Under Section 121(e) of CERCLA, no permit is required under the NPDES program for these discharges, because the effluent from the treatment facilities (e.g. dewatering, solvent extraction) will be discharged directly into a surface water of the United States at a point considered part of the CERCLA site.

Massachusetts Surface Water Quality Standards

Massachusetts water quality standards for discharge to surface waters are applicable to discharges to the Unnamed Stream. The Unnamed Stream is classified as Class B, for the uses and protection of propagation of fish, aquatic life and wildlife, and for primary and secondary contact recreation. Massachusetts standards state that water shall be free from pollutants that exceed the recommended limits, that are in concentrations injurious or toxic to humans, or that exceed site-specific safe exposure levels determined by bioassay using sensitive species. At Sullivan's Ledge, these standards will be attained by using either ambient water quality standards or whole effluent toxicity limits. Bioassay tests may also be performed to determine site-specific safe exposure levels. Because the effluent from the treatment facilities and dewatering activities will be discharged directly into the Unnamed Stream at a point considered part of the Site, no permit is required.

Air

Standards for particulate matter under the Clean Air Act and DEP Air Pollution regulations are applicable and will be attained during construction phases.

Other Laws

The selected remedy and the contingency remedy will comply with certain other laws and regulations, although strictly speaking, they are not ARARs because they are not environmental laws or relate only to off-site activities. These laws include, but are not limited to: the Occupational Health and Safety Act, 29 U.S.C. 651 et seq.; Department of Transportation Hazardous Material Transportation Act regulations, 49 C.F.R. 171-179, 387; Massachusetts Requirements for Transporters of Hazardous Waste, 30 CMR 30.400; and Massachusetts Right to Know Requirements, 105 CMR 670.00, 310 CMR 33.00, and 454 CMR 21.00.

**C. The Selected and Contingency Remedies are Cost-Effective**

In the Agency's judgment, the selected and contingency remedies are cost effective, i.e., the remedies afford overall effectiveness proportional to their costs. In selecting these remedies, once EPA identified alternatives that are protective of human health and the environment and that attain, or, as appropriate, waive ARARs, EPA evaluated the overall effectiveness of each alternative by assessing the relevant three criteria--long term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short term effectiveness, in combination. The relationship of the overall effectiveness of the selected and contingency remedial alternatives was determined to be proportional to their costs.

1. Selected Remedy

The costs associated with the selected remedy are:
Estimated Capital Costs: $2,640,000
Estimated Operation and Maintenance Cost (net present worth): $164,000
Estimated Total Cost (net present worth): $2,800,000

Of the source control alternatives discussed in Section VIII., EPA has determined that the selected remedy (excavation, dewatering, disposal under an impermeable cap) may be only slightly less effective in the long-term as alternative 6(a) (solidification/stabilization, disposal at the Disposal Area) and alternative 6(b) (solidification/stabilization, disposal at golf course landfill) because under the selected remedy, the contaminants would be placed in a RCRA landfill that would include groundwater treatment and monitoring to ensure the effectiveness of the landfill. Although this selected remedy does not provide permanence through treatment, unless required by the land disposal restrictions, it may not be necessary to solidify or otherwise treat excavated Middle Marsh and Adjacent Wetland sediment/soils because the levels of PCBs are relatively low, less than 50 ppm, and would be properly contained under a RCRA engineered cap to be constructed as part of the First Operable Unit. While the selected remedy does not provide the same degree of permanence as alternatives requiring solvent extraction and/or incineration, for the Middle Marsh Operable Unit uncertainty associated with the long-term effectiveness of the selected remedy in containing relatively low levels of PCBs shall be minimized by engineering and institutional controls.

In comparison to all other containment/treatment alternatives, the selected remedy is the least costly, with a present worth cost of $2,800,000. In contrast, present worth costs of other alternatives requiring treatment include: solidification/disposal from $5.0 to $6.0 million; solvent extraction at $7.8 million; and on-site incineration from $9.8 to $10.0 million.

2. Contingency Remedy

The costs associated with the contingency remedy are:
Estimated Capital Costs: $7,620,000
Estimated Operation and Maintenance Cost (net present worth): $164,000
Estimated Total Cost (net present worth): $7,780,000

If the Disposal Area is unavailable for disposal of excavated materials, EPA has determined that solvent extraction, followed by off-site incineration of the PCB-contaminated oil extract (the contingency remedy), would be the most effective of the remaining source control alternatives in permanently and significantly reducing the toxicity, mobility and volume of hazardous substances and in reducing contaminant levels in sediment/soils to cleanup levels. A comparison of present worth costs for solvent extraction and on-site incineration indicates that the present worth costs for solvent extraction are lower than on-site incineration, $7.8 million versus $10.0 million, respectively.

While the solidification/containment alternative is cheaper than the contingency source control alternative (solvent extraction), the contingency alternative is significantly more effective in the long and short term, and is permanent. EPA has determined that there are some uncertainties associated with the long-term effectiveness of solidification/stabilization and on-site disposal in a landfill constructed in the golf course. In addition, this alternative would require construction of a new landfill in a golf course and would significantly restrict public access to golf facilities. As stated above, the selected source control alternative (solvent extraction/off-site incineration) is less expensive than the only other treatment alternative (on-site incineration) which provides an equivalent measure of long-term effectiveness. Thus, assuming the selected remedy would not be implementable, the selection of solvent extraction as the contingency source control alternative for sediment/soils is cost-effective; the costs are proportional to the overall effectiveness.

**D. The Selected Remedy and Contingency Remedy Utilize Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable**

The No Action alternative was eliminated from consideration because it would not be protective of the environment and would not attain ARARs, as described in Sections IX.B.1. and IX.B.2., respectively. Once the Agency identified those alternatives that attain or, as appropriate, waive ARARs and that are protective of human health and the environment, EPA identified which alternatives utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by identifying alternatives that provide the best balance of trade-offs in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost. The balancing test emphasized long-term effectiveness and permanence and the reduction of toxicity, mobility and volume through treatment; and considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance.

1. Selected Remedy

The selected remedy provides the best balance of trade-offs among the alternatives. The selected remedy would be protective of human health and the environment by reducing contaminant levels to meet cleanup levels. Given the low levels of PCBs detected in sediment/soils (less than 50 ppm) and the fact that the Sullivan's Ledge Disposal Area would be capped as part of the remedy for the First Operable Unit, EPA has determined that, for the Middle Marsh Operable Unit, treatment is impracticable. Excavation, dewatering and disposal of sediment/soils in the RCRA engineered landfill to be constructed at the Disposal Area provides the best balance of all alternatives considering short- and long-term effectiveness and cost. Of all the action alternatives, excavation and capping would be the most easily implementable as it would not require use of specialized units with sometimes limited availability. The placement of excavated sediment/soils under the cap to be constructed over the Disposal Area would not significantly increase the volume of contaminated materials as would solidification/stabilization alternatives but would significantly reduce the mobility of hazardous substances through engineering and institutional controls.

2. Contingency Remedy

Assuming the Sullivan's Ledge Disposal Area would not be available for disposal of excavated sediment/soils from Middle Marsh and the Adjacent Wetland, EPA has determined that the contingency remedy, excavation and solvent extraction, utilizes permanent solutions to the maximum extent practicable. Specifically, solvent extraction (contingency technology) meets the statutory preference for utilizing treatment technologies that significantly and permanently reduce the toxicity, volume or mobility of all hazardous substances. In addition, removal of the sediment/soil contaminants will reduce the source of sediment/soil contaminants, mitigating the possibility of PCBs migrating off-site.

Although solvent extraction is an innovative treatment, the results of treatability studies performed on various soils and sediments at other Superfund sites indicates that this technology will be effective in meeting cleanup levels for sediment/soils. This determination will be confirmed by site-specific treatability studies on solvent extraction. Solvent extraction has been selected over on-site incineration because it is an alternate treatment, as preferred by CERCLA, and is equally effective as incineration in attaining the protective cleanup levels of this remedy but at a lower estimated present worth cost ($7.8 million for solvent extraction; $10.0 million for incineration). Disadvantages associated with solidification/containment SC-6(b) include the uncertainty of the long-term effectiveness of the containment system located on the golf course for untreated wastes and the potential for future remedial costs and risks to the environment if the cap were to fail.

**E. The Selected Remedy for the Middle Marsh Operable Unit is Primarily a Containment Remedy, and Does Not Use Treatment as a Principal Element to Permanently and Significantly Reduce the Toxicity, Mobility or Volume of the Hazardous Substances; The Contingency Remedy Does Satisfy the Preference for Treatment Which Permanently and Significantly Reduces the Toxicity, Mobility or Volume of the Hazardous Substances as a Principal Element.**

The principal threats identified at the Sullivan's Ledge Site will be addressed through treatment by implementation of the remedial activities selected in the 1989 ROD. As described above, the remedial investigations at the Sullivan's Ledge Superfund Site, including the First Operable Unit and the Middle Marsh Operable Unit, revealed that high concentrations of PCBs and polyaromatic hydrocarbons (PAHs) were present in surface and subsurface sediment/soils. Based on the results of these remedial investigations, EPA concluded that the sources of contamination within the Sullivan's Ledge study area are: wastes disposed of in the former quarry pits, contaminated soils in the 12-acre Disposal Area, and sediments that wash off the Disposal Area.

EPA's 1989 ROD which outlined remedial action for the

Disposal Area and nearby areas, including the Unnamed Stream. The selected remedial action, as established in the ROD, includes source control components to address the principal threats at the Sullivan's Ledge Site. The components of the First Operable Unit remedy are:

- Fencing and site preparation;
- Excavation and on-site solidification/stabilization of contaminated soils in the unsaturated zone at the Disposal Area;
- Excavation and on-site solidification/stabilization (if necessary) of contaminated soils in the unsaturated zone in areas immediately east and north of the Disposal Area. All excavated and/or solidified soils shall be disposed on the Disposal Area under the cap;
- Excavation/dredging, dewatering, solidification/stabilization (if necessary) and on-site disposal of contaminated sediments from the Unnamed Stream up to and including the two golf course water hazards;
- Construction of an impermeable cap over approximately 11 acres of the Disposal Area;
- Implementation of a wetlands restoration and maintenance program;
- Long-term monitoring; and
- Institutional controls.

Thus, the principal threats at the Sullivan's Ledge Site are addressed through implementation of the remedy for the First Operable Unit. However, implementation of the Middle Marsh Operable Unit will be necessary to address remaining threats at the Site and to ensure a site-wide remedy that is protective of human health and the environment.

1. Selected Remedy

The selected remedy for the Middle Marsh Operable Unit is primarily a containment remedy, and does not satisfy the preference for treatment as a principal element. Given the low levels of PCBs detected in sediment/soils (less than 50 ppm) and the fact that the Sullivan's Ledge Disposal Area would be capped as part of the remedy for the First Operable Unit, EPA has determined that for the contaminated sediment/soils in Middle Marsh and the Adjacent Wetland, treatment is impracticable. This approach is consistent with the 1989 ROD, which specified that only unsaturated soils with PCB concentrations equal to or greater than 50 ppm will be treated (solidified) prior to disposal within the Disposal Area. Unsaturated soils in the First Operable Unit in areas outside the 12-acre Disposal Area with PCB concentrations equal to or greater than 10 ppm will be excavated, transported to and disposed of within the site's Disposal Area. In summary, the overall response at the Sullivan's Ledge Site is consistent with the NCP expectations to treat principal threats and contain low threat material.

2. Contingency Remedy

The contingency remedy satisfies that statutory preference for treatment as a principal element by specifying excavation and solvent extraction of contaminated sediment/soils equal to or above environmental risk-based target levels. In addition, the PCB-contaminated oil extract shall be treated off-site by incineration.

## XII. DOCUMENTATION OF NO SIGNIFICANT CHANGES

EPA presented a proposed plan for remediation of the Middle Marsh Operable Unit on May 24, 1991.

In summary, the preferred alternative, as described in the proposed plan, consisted of the following components:

1. Site preparation;
2. Excavation of contaminated sediment/soils from portions of Middle Marsh and the Adjacent Wetland;
3. Dewatering of the excavated materials;
4. Disposal of the materials beneath the cap that will be constructed over portions of the Disposal Area of the Sullivan's Ledge Site;
5. Restoration of the affected wetlands;
6. Institutional controls to prevent future residential use of and restrict access to Middle Marsh and the Adjacent Wetland; and
7. Long-term environmental monitoring.

Because implementation of the preferred alternative is dependent upon the Sullivan's Ledge Disposal Area being available for disposal of Middle Marsh sediments and soils, a contingency remedy was also described in the proposed plan consisting of the following components:

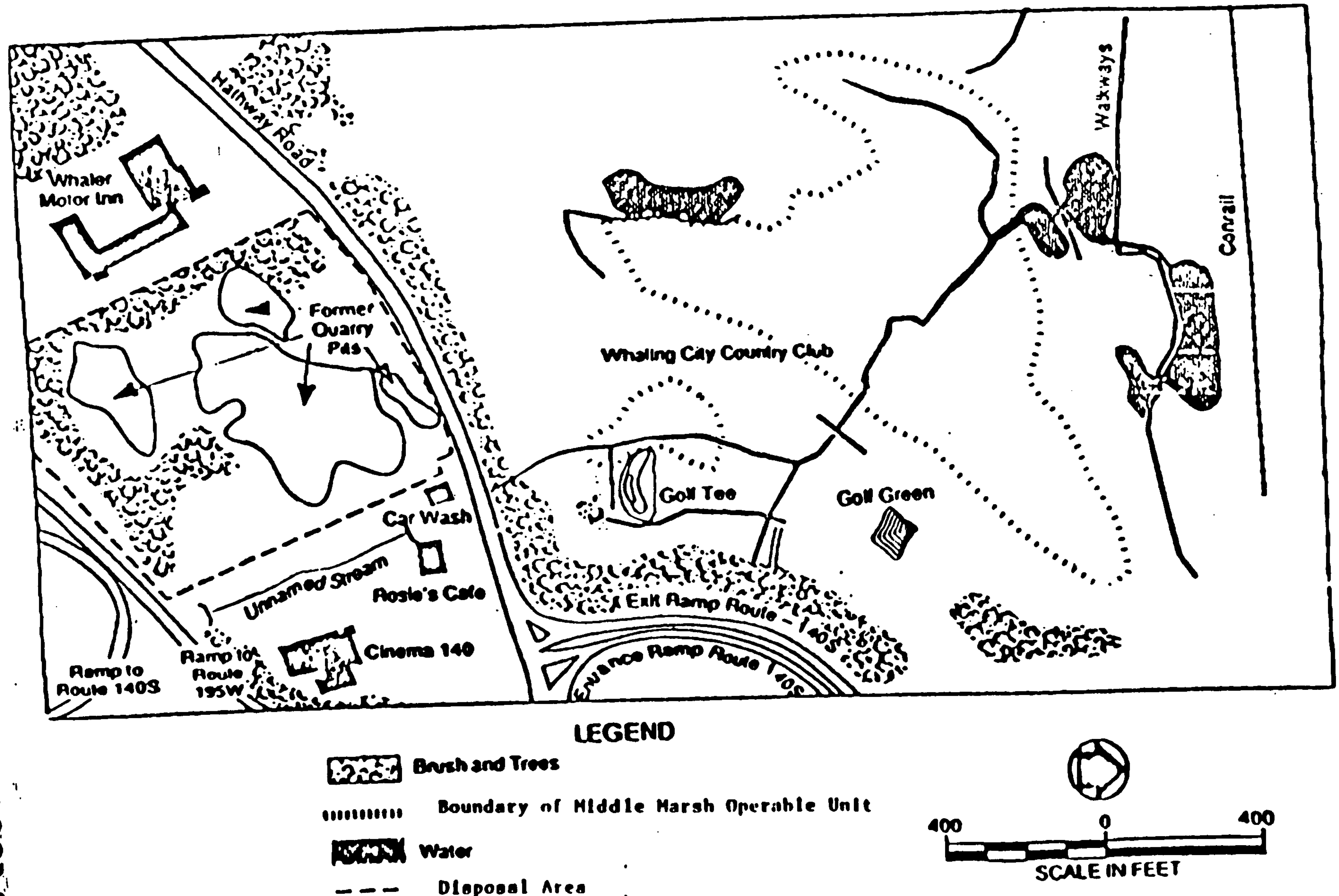
1. Site preparation;
2. Excavation of contaminated sediments and soils from portions of Middle Marsh and the Adjacent Wetland;
3. Treatment of the excavated sediments by solvent extraction;
4. Disposal of the treated sediments at Middle Marsh;
5. Restoration of the affected wetlands;
6. Institutional controls to prevent future residential use of and restrict access to Middle Marsh and the Adjacent Wetland; and
7. Long-term environmental monitoring.

As described in the proposed plan, the contingency remedy would be implemented if, based upon EPA's determination in consultation with MADEP, the timing of the Disposal Area cap construction to be implemented in accordance with the Consent Decree for the First Operable Unit would prevent further use of the Disposal Area for the containment of excavated sediments and soils from Middle Marsh and the Adjacent Wetland, as described in Section X.B.2.

Neither the selected remedy nor the contingency remedy contain significant changes from those proposed.

## XIII. STATE ROLE

The Commonwealth of Massachusetts/Department of Environmental Protection has reviewed the various alternatives and has indicated its support for the selected and the contingency remedies. The Commonwealth has also reviewed the Remedial Investigation, Risk Assessment and Feasibility Study to determine if the selected remedy and the contingency remedy is in compliance with applicable or relevant and appropriate State Environmental laws and regulations. The Commonwealth of Massachusetts concurs with the selected remedy and the contingency remedy for the Middle Marsh Operable Unit at the Sullivan's Ledge Superfund Site. A copy of the declaration of concurrence is attached as Appendix C.




MAP OF MIDDLE MARSH OPERABLE UNIT
Figure 1

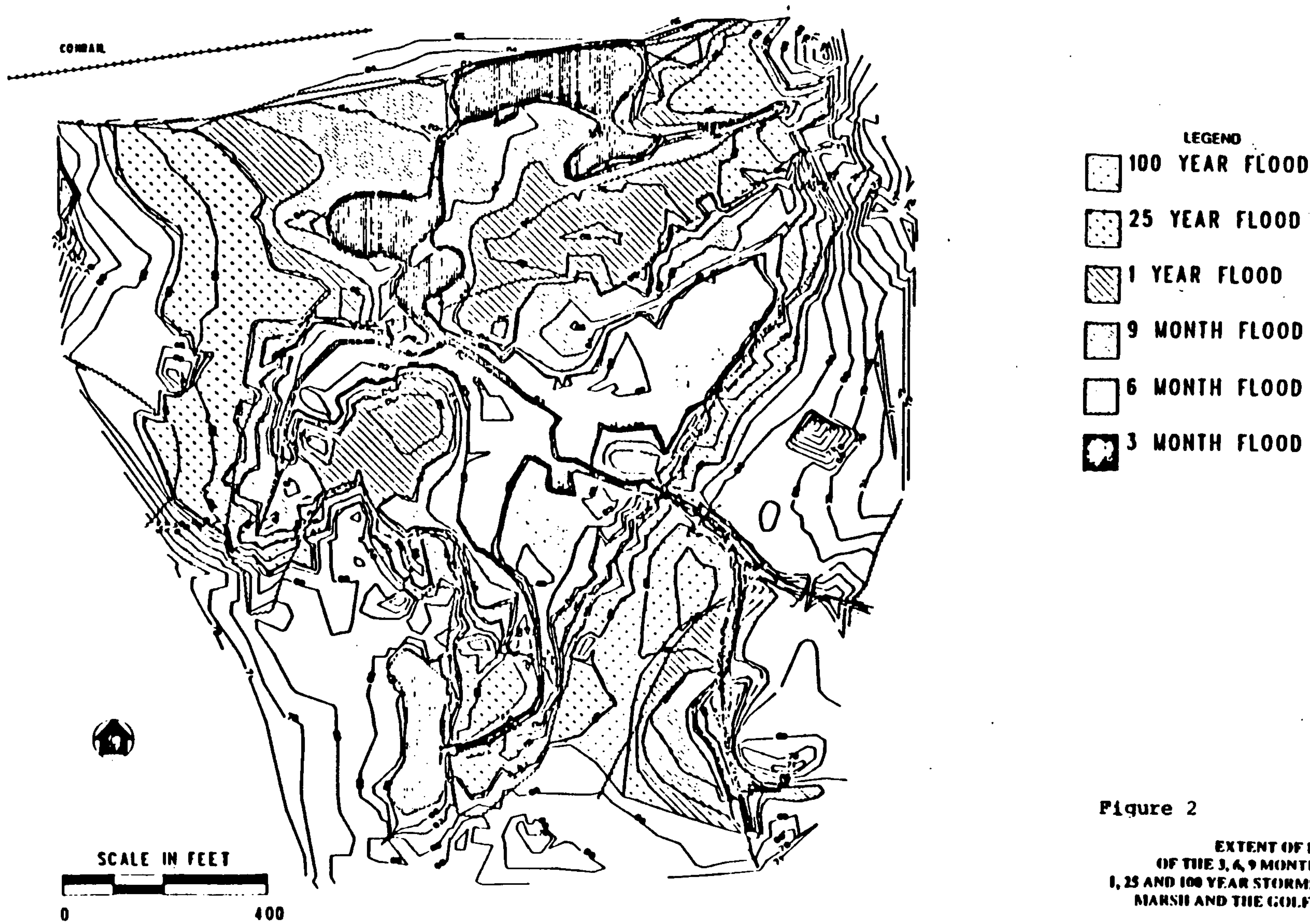



Figure 2

EXTENT OF FLOODI
OF THE 3, 6, 9 MONTH AND
1, 25 AND 100 YEAR STORMS IN MI
MARSH AND THE GOLF COURS

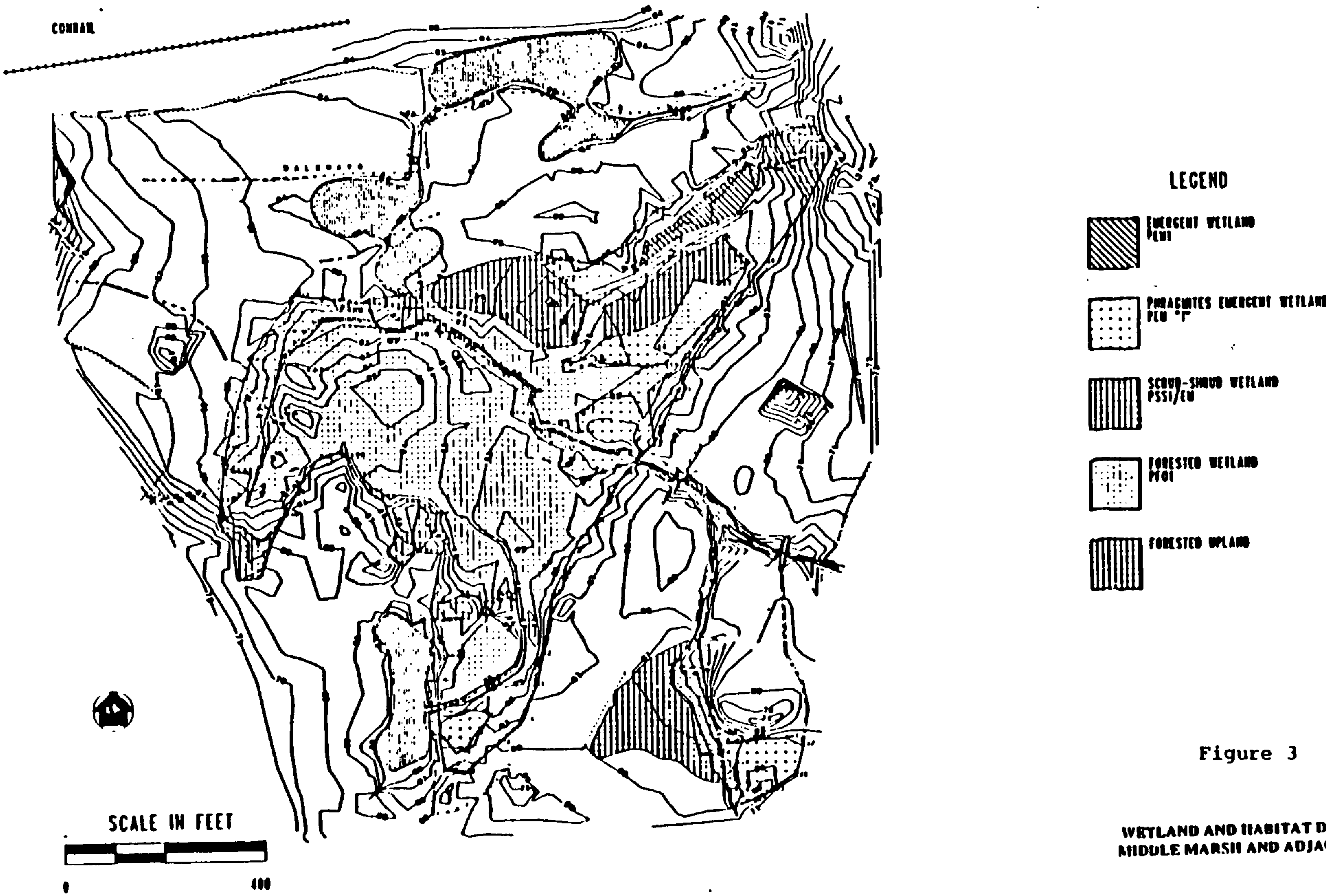



Figure 3

WETLAND AND HABITAT DELIN
MIDDLE MARSH AND ADJACENT

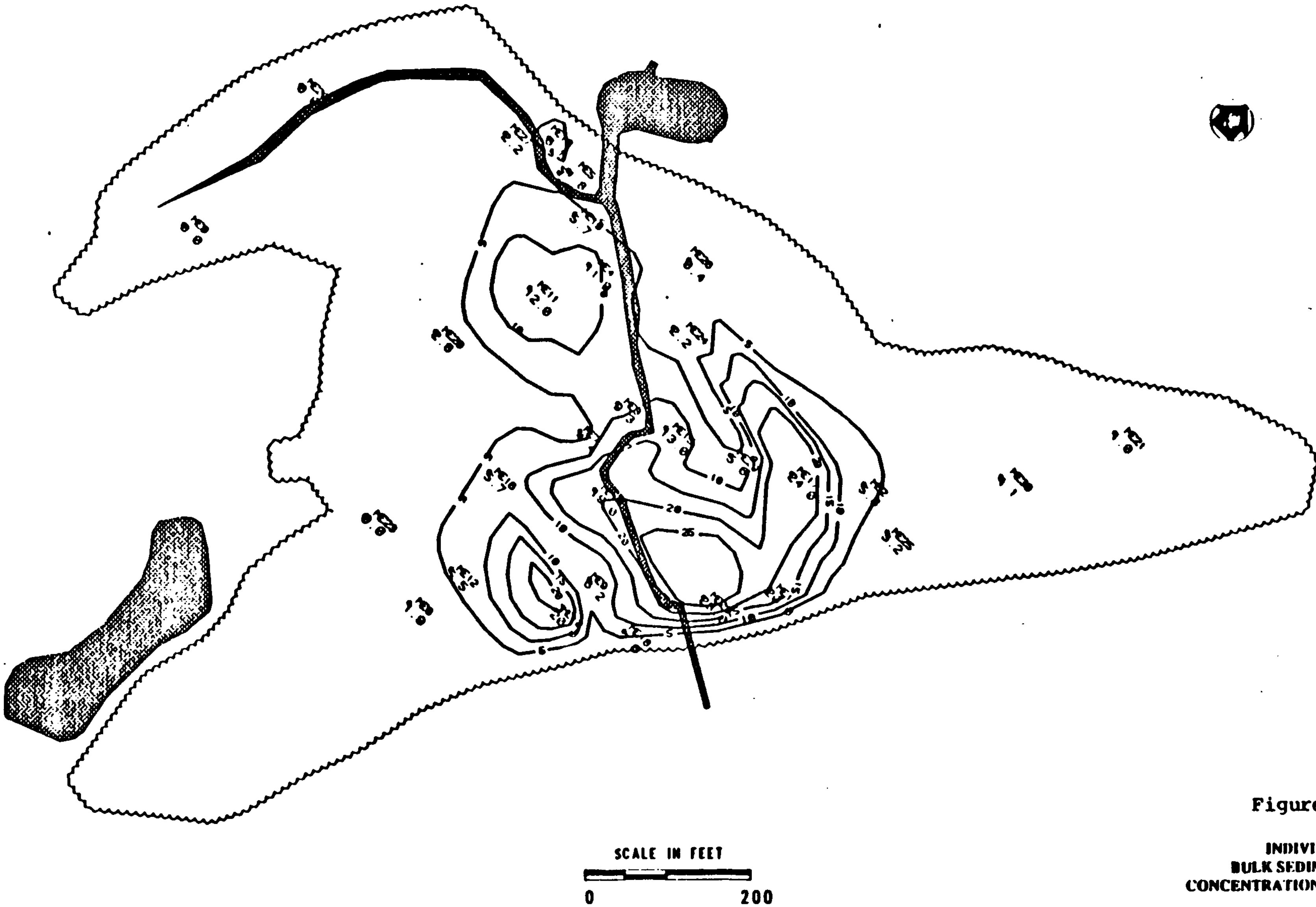



Figure 4

**INDIVIDUAL AND CONTOURED BULK SEDIMENT/SOIL PCB CONCENTRATIONS IN MIDDLE MARSH**

METCALF & EDDY

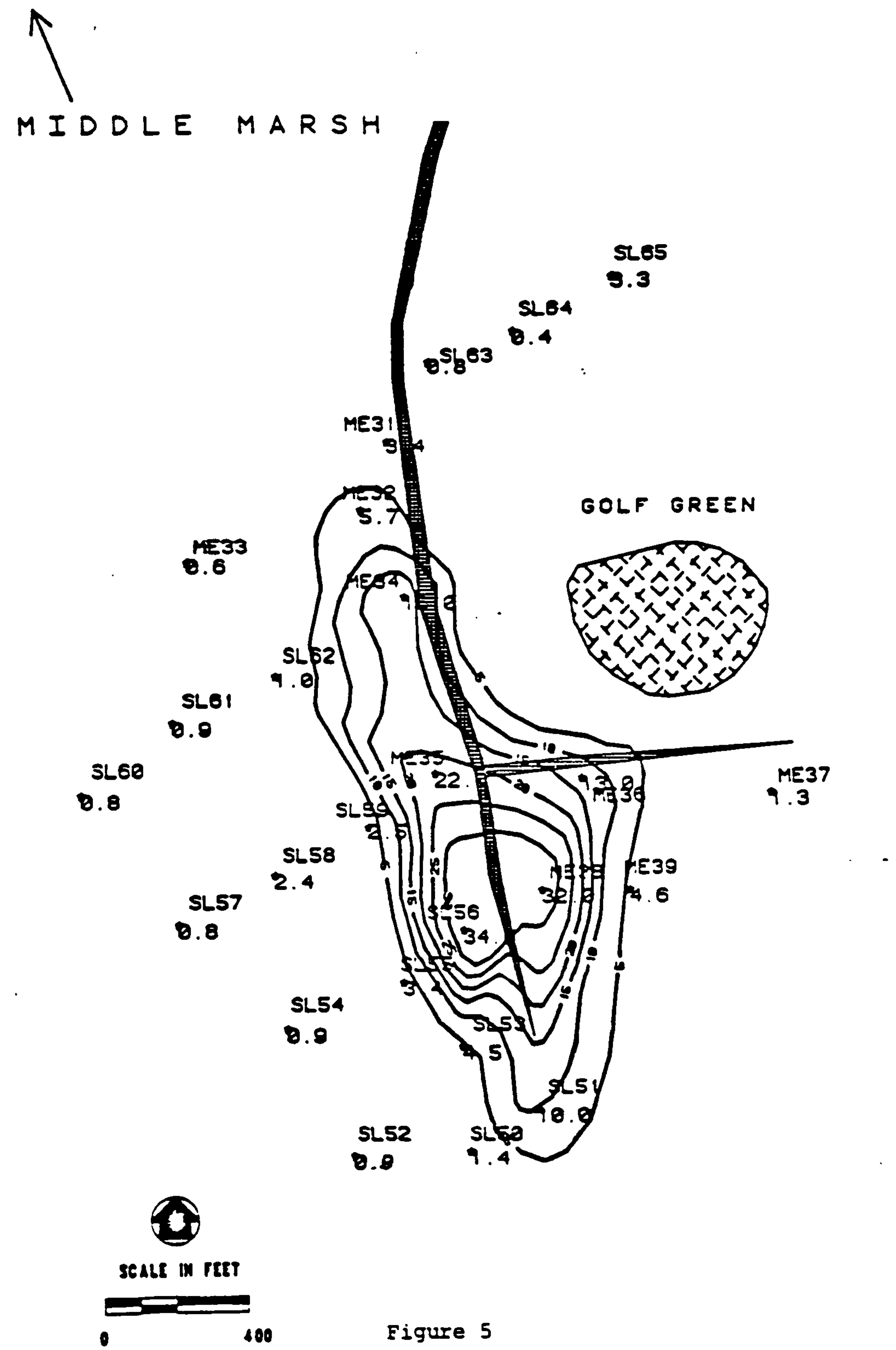
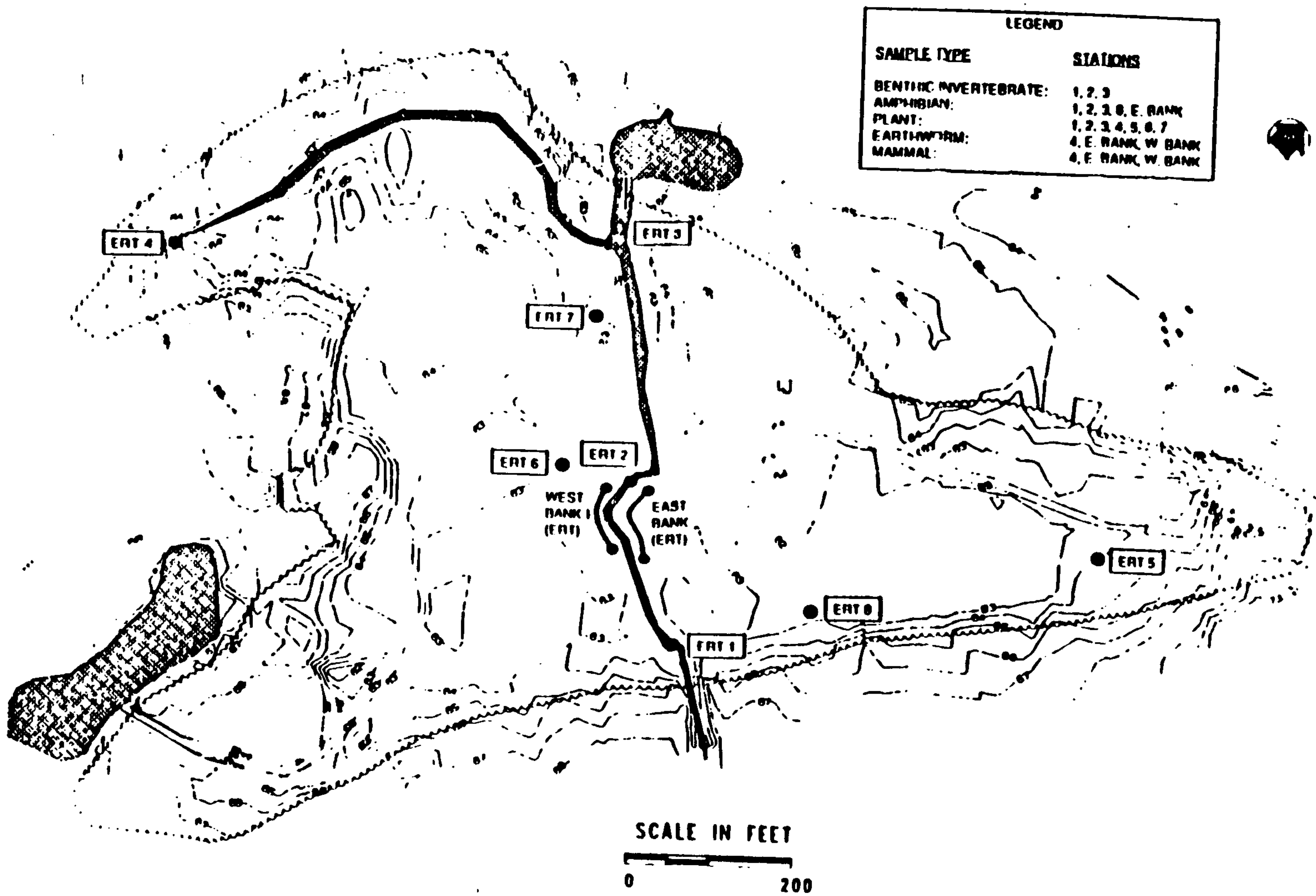



Figure 5

INDIVIDUAL AND CONTOURED BULK SEDIMENT/SOIL PCB CONCENTRATIONS IN THE ADJACENT WETLAND AND GOLF COURSE




**ENVIRONMENTAL RESPONSE TEAM (ERT)**
**BIOTA SAMPLING STATIONS (CHARTERS, 1991)**

Figure 6

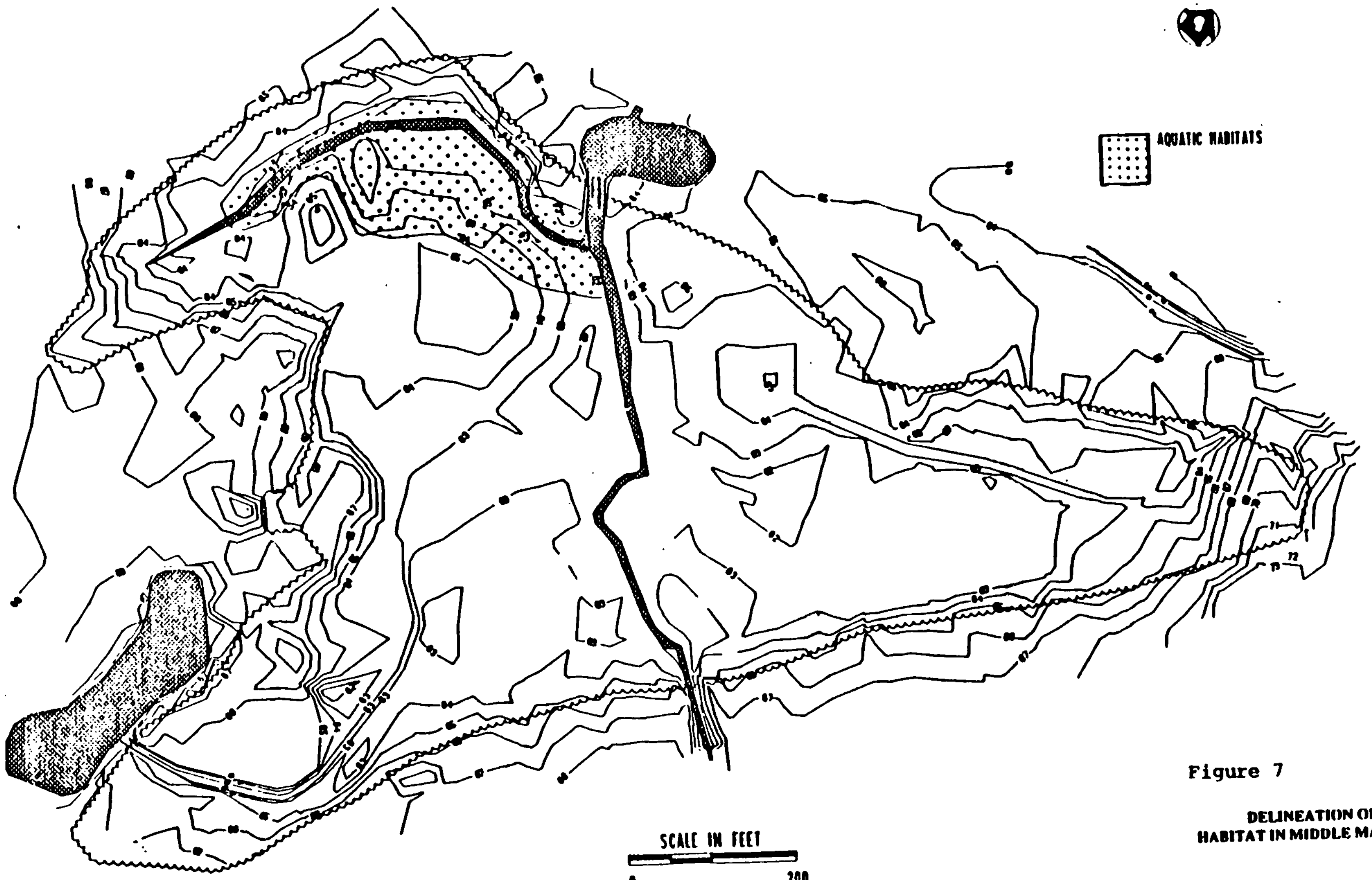
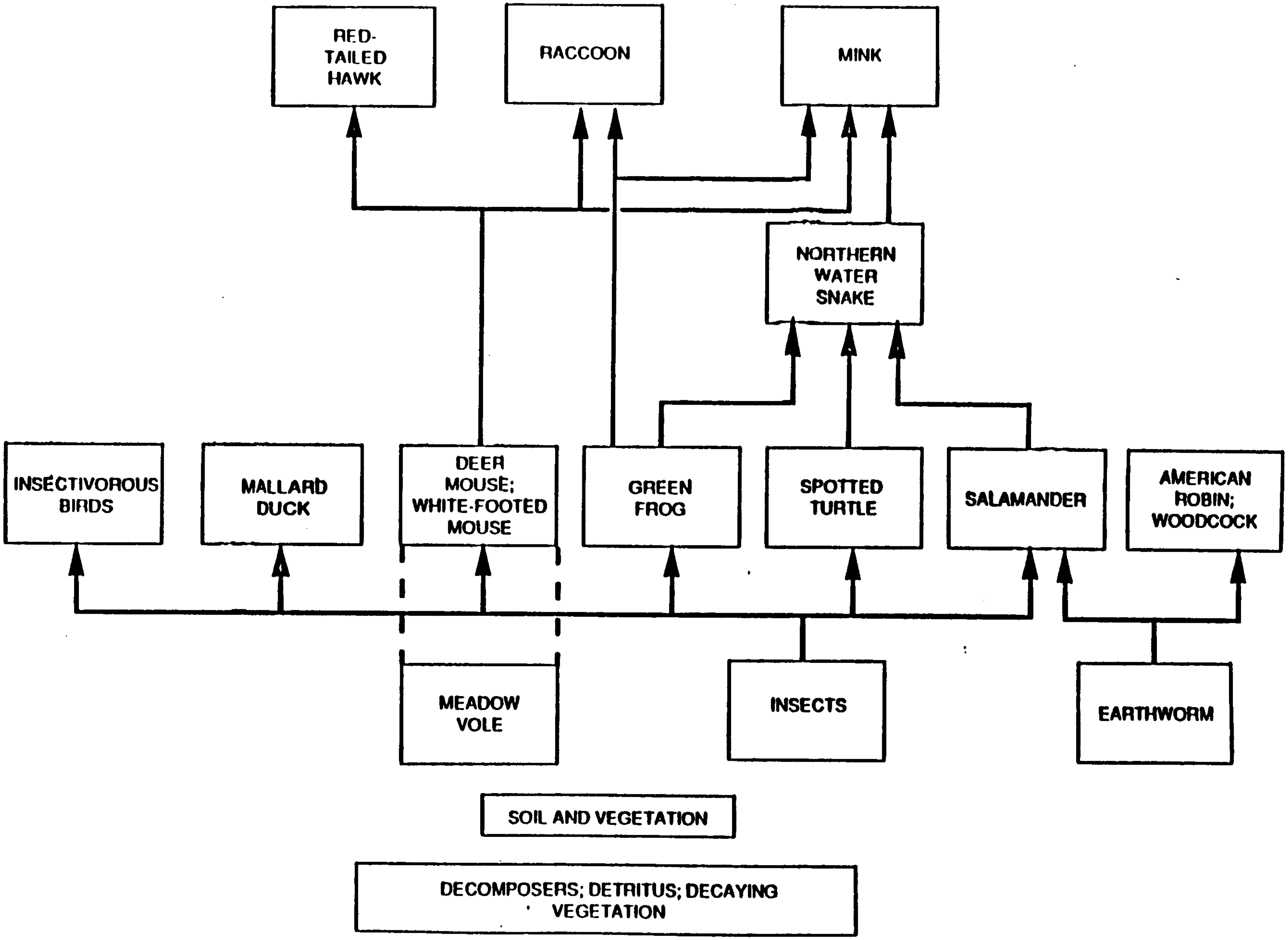



Figure 7

DELINEATION OF AQUATIC HABITAT IN MIDDLE MARSH

METCALF & EDDY




**FOOD CHAIN PATHWAY MODEL**

Figure 8


Figure 9

Areas Requiring Remediation
Within Middle Marsh
New Bedford, MA

Table 1 **ANIMAL SPECIES TYPICALLY ASSOCIATED WITH WETLANDS COVER TYPES IDENTIFIED AT MIDDLE MARSH**

| Scientific Name | Common Name | Cover Types | | |
|---|---|---|---|---|
| | | Forested Wetland | Scrub-Shrub/ Emergent | Emergent Wetland |
| AMPHIBIA | | | | |
| *Ambystoma maculatum* | Spotted salamander | ● | ● | ● |
| *Bufo americanus* | Eastern American Toad | ● | ● | ● |
| *Hyla crucifer* | Northern Spring Peeper | ● | ● | ● |
| *Rana catesbeiana* | Bullfrog | | ● | ● |
| *Rana clamitans* | Green Frog | ● | ● | ● |
| *Rana sylvatica* | Wood Frog | ● | ● | ● |
| *Rana pipiens* | Northern Leopard Frog | | ● | ● |
| REPTILIA | | | | |
| *Chelydra serpentina* | Common Snapping Turtle | | ● | ● |
| *Clemmys gutatta* | Spotted Turtle | | ● | ● |
| *Chrysemys picta* | Painted Turtle | | ● | ● |
| *Nerodia sipedon* | Northern Water Snake | ● | ● | ● |
| *Thamnophis sauritus* | Eastern Ribbon Snake | ● | ● | ● |

Table 1 ANIMAL SPECIES TYPICALLY ASSOCIATED WITH WETLANDS COVER TYPES IDENTIFIED AT MIDDLE MARSH (CONT'D)

| Scientific Name | Common Name | Cover Types: Forested Wetland | Cover Types: Scrub-Shrub/ Emergent | Cover Types: Emergent Wetland |
|---|---|---|---|---|
| AVES | | | | |
| *Ardea herodins* | Great Blue Heron | | • | • |
| *Butorides striatus* | Green-backed Heron | • | • | • |
| *Nycticorax nycticorax* | Black-crowned Night Heron | • | | |
| *Aix sponsa* | Wood Duck | • | • | • |
| *Anas rubripes* | American Black Duck | • | • | • |
| *Anas platyrhyncos* | Mallard | • | • | • |
| *Buteo lineatus* | Red-shouldered Hawk | • | | |
| *Falco sparverius* | American Kestrel | • | • | • |
| *Rallus ellegans* | King Rail | | • | • |
| *Rallus limicola* | Virginia Rail | | • | • |
| *Porzana carolina* | Sora | | | • |
| *Gallinago gallinago* | Common Snipe | • | • | • |
| *Scolopaz minor* | American Woodcock | • | • | • |
| *Tachycineta bicolor* | Tree Swallow | | • | |

Table 1 ANIMAL SPECIES TYPICALLY ASSOCIATED WITH WETLANDS COVER TYPES IDENTIFIED AT MIDDLE MARSH (CONT'D)

| Scientific Name | Common Name | Cover Types: Forested Wetland | Scrub-Shrub/ Emergent | Emergent Wetland |
|---|---|---|---|---|
| *Cistothorus platensis* | Sedge Wren | | • | • |
| *Cistothorus palustris* | Marsh Wren | | • | • |
| *Vireo griscus* | White-eyed vireo | • | | |
| *Dendroica petechia* | Yellow Warbler | • | • | |
| *Seiurus noveboracensis* | Northern Water Thrush | • | | |
| *Geothlypis triches* | Common Yellow-throat | • | • | |
| *Melospiza melodia* | Song Sparrow | • | • | |
| *Melospiza georgiana* | Swamp Sparrow | • | • | |
| *Agelaius pheoniceus* | Red-winged Blackbird | | • | • |
| *Quiscalus quiscula* | Common Crackle | • | • | |
| *Casduelis tristis* | American Goldfinch | • | • | • |
| *Picoides pubescens* | Downy Woodpecker | • | | |
| MAMMALIA | | | | |
| *Castor canadensis* | Beaver | | • | • |
| *Microtus pennsylvanicus* | Meadow Vole | • | • | • |

Table 1 ANIMAL SPECIES TYPICALLY ASSOCIATED WITH WETLANDS COVER TYPES IDENTIFIED AT MIDDLE MARSH (CONT'D)

| Scientific Name | Common Name | Cover Types: Forested Wetland | Cover Types: Scrub-Shrub/ Emergent | Cover Types: Emergent Wetland |
|---|---|---|---|---|
| *Ondatra zibethicus* | Muskrat | | ● | ● |
| *Zapus hudsonius* | Meadow Jumping Mouse | ● | ● | ● |
| *Mustela vison* | Mink | ● | ● | ● |
| *Mephitis mephitis* | Striped Skunk | ● | | |
| *Sciurus carolinensis* | Gray Squirrel | ● | | |

Table 2

SUMMARY STATISTICS FOR MIDDLE MARSH SURFACE SEDIMENT/SOIL

(Organics: ug/kg, Inorganics: mg/kg)

| Chemical | Frequency of Detection (a) | Mean Sample Size (b) | Concentration: Minimum Detected Value | Concentration: Arithmetic Mean | Concentration: Maximum Detected Value |
|---|---|---|---|---|---|
| **Organics:** | | | | | |
| Acenaphthene | 2 / 24 | 2 | 62 | 69 | 75 |
| Acenaphthylene | 1 / 24 | 1 | --- | --- | 91 |
| Acetone | 6 / 10 | 10 | 19 | 68 | 190 |
| Anthracene | 6 / 24 | 7 | 69 | 150 | 240 |
| Benzo(a)anthracene | 17 / 24 | 19 | 130 | 400 | 850 |
| Benzo(a)pyrene | 17 / 24 | 19 | 110 | 410 | 880 |
| Benzo(b)fluoranthene | 20 / 24 | 24 | 20 | 660 | 2,100 |
| Benzo(g,h,i)perylene | 7 / 24 | 12 | 74 | 300 | 500 |
| Benzo(k)fluoranthene | 16 / 24 | 20 | 20 | 400 | 1,100 |
| Benzoic acid | 9 / 24 | 11 | 73 | 490 | 1,050 |
| 2-Butanone | 2 / 12 | 11 | 4 | 15 | 30 |
| Butylbenzylphthalate | 7 / 24 | 11 | 100 | 230 | 370 |
| Chloroform | 2 / 12 | 11 | --- | 11 | 22 |
| Chrysene | 17 / 24 | 19 | 170 | 490 | 1,100 |
| 4,4'-DDD | 1 / 26 | 26 | --- | 110 | 590 |
| 4,4'-DDE | 2 / 26 | 23 | 53.8 | 74 | 210 |
| 4,4'-DDT | 3 / 26 | 24 | 120 | 92 | 205 |
| Di-n-butylphthalate | 5 / 24 | 13 | 65 | 300 | 480 |
| Di-n-octylphthalate | 2 / 24 | 2 | 130 | 140 | 140 |
| Dibenzo(a,h)anthracene | 4 / 24 | 4 | 84 | 110 | 150 |
| Dibenzofuran | 1 / 24 | 1 | --- | --- | 71 |
| 1,4-Dichlorobenzene | 2 / 24 | 2 | 91 | 120 | 150 |
| bis(2-Ethylhexyl)phthalate | 21 / 22 | 22 | 120 | 1,300 | 3,500 |
| Fluoranthene | 19 / 24 | 23 | 190 | 680 | 1,400 |
| Fluorene | 2 / 24 | 2 | 79 | 86 | 92 |
| Indeno(1,2,3-c,d)pyrene | 8 / 24 | 13 | 100 | 280 | 410 |
| Methylene Chloride | 7 / 7 | 7 | 9 | 45 | 110 |
| 2-Methylphenol | 2 / 24 | 7 | 200 | 280 | 340 |
| 4-Methylphenol | 8 / 24 | 24 | 180 | 730 | 2,300 |
| N-nitrosodiphenylamine | 1 / 24 | 1 | --- | --- | 66 |
| PCBs (Aroclor-1254) | 50 / 57 | 57 | 380 | 8,700 | 60,000 |
| Pentachlorophenol | 1 / 24 | 2 | --- | 1,100 | 1,200 |
| Phenanthrene | 16 / 24 | 19 | 130 | 400 | 830 |
| Phenol | 3 / 24 | 8 | 180 | 270 | 350 |
| Pyrene | 19 / 24 | 23 | 220 | 700 | 1,500 |
| Toluene | 1 / 11 | 10 | --- | 7.5 | 15 |
| **Inorganics:** | | | | | |
| Aluminum | 24 / 24 | 24 | 2,255 | 10,000 | 22,500 |
| Arsenic | 16 / 24 | 24 | 2 | 5.4 | 10.9 |
| Barium | 24 / 24 | 24 | 23 | 120 | 252 |
| Beryllium | 2 / 24 | 22 | 0.5 | 0.5 | 0.8 |
| Cadmium | 2 / 24 | 24 | 0.5 | 0.5 | 1.9 |
| Calcium | 24 / 24 | 24 | 702 | 5,100 | 15,100 |
| Chromium | 7 / 24 | 24 | 15 | 19 | 51.2 |
| Cobalt | 1 / 24 | 24 | --- | 3.5 | 8.4 |
| Copper | 18 / 24 | 24 | 24.8 | 47 | 114 |
| Iron | 24 / 24 | 24 | 2,425 | 37,000 | 167,000 |
| Lead | 24 / 24 | 24 | 48.7 | 340 | 845 |
| Magnesium | 22 / 24 | 24 | 1,520 | 3,300 | 7,400 |
| Manganese | 24 / 24 | 24 | 13.5 | 460 | 1,870 |
| Mercury | 1 / 24 | 15 | --- | 0.1 | 0.2 |
| Nickel | 1 / 24 | 13 | --- | 5.1 | 7.7 |
| Potassium | 14 / 24 | 24 | 512 | 880 | 3,210 |
| Selenium | 1 / 24 | 1 | --- | --- | 0.2 |
| Sodium | 3 / 24 | 24 | 210 | 140 | 566 |
| Thallium | 1 / 24 | 24 | --- | 0.4 | 1.3 |
| Vanadium | 21 / 24 | 24 | 31.7 | 61 | 110 |
| Zinc | 20 / 24 | 24 | 25.7 | 190 | 521 |

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) The number of samples in calculating the mean. This number may differ from the denominator of the frequency of detection, because non-detect samples in which one-half the dection limit exceeds the maximum value in a group of samples were not included in calculating the mean.

--- = Not applicable due to the small sample size or since only one measurable concentration was was detected.

## Table 2 (Cont'd)

### SUMMARY STATISTICS FOR THE GOLF COURSE/WETLAND AREA SEDIMENT/SOIL

(Organics: ug/kg, Inorganics: mg/kg)

| Chemical | Frequency of Detection (a) | Mean Sample Size (b) | Concentration: Minimum Detected Value | Concentration: Arithmetic Mean | Concentration: Maximum Detected Value |
|---|---|---|---|---|---|
| **Organics:** | | | | | |
| Acetone | 1 / 1 | 1 | --- | --- | 130 |
| Anthracene | 3 / 13 | 11 | 465 | 490 | 890 |
| Benzo(a)anthracene | 5 / 13 | 11 | 60 | 400 | 880 |
| Benzo(a)pyrene | 5 / 13 | 11 | 55 | 380 | 880 |
| Benzo(b)fluoranthene | 5 / 13 | 10 | 140 | 440 | 880 |
| Benzo(k)fluoranthene | 3 / 13 | 11 | 280 | 470 | 880 |
| 2-Butanone | 1 / 1 | 1 | --- | --- | 30 |
| Butylbenzylphthalate | 1 / 13 | 1 | --- | --- | 91 |
| Chrysene | 5 / 13 | 11 | 70 | 430 | 880 |
| 4,4'-DDD | 1 / 28 | 1 | --- | --- | 9 |
| Di-n-butylphthalate | 2 / 13 | 12 | 480 | 460 | 880 |
| bis(2-Ethylhexyl)phthalate | 7 / 13 | 12 | 140 | 600 | 1,500 |
| Fluoranthene | 7 / 13 | 11 | 100 | 420 | 880 |
| Indeno(1,2,3-c,d)pyrene | 2 / 13 | 11 | 335 | 440 | 880 |
| Methylene Chloride | 1 / 1 | 1 | --- | --- | 35 |
| 2-Methylphenol | 2 / 13 | 3 | 270 | 280 | 340 |
| 4-Methylphenol | 1 / 13 | 11 | --- | 450 | 550 |
| PCBs (Aroclor-1254) | 27 / 29 | 29 | 380 | 5,800 | 32,500 |
| Pentachlorophenol | 1 / 13 | 11 | --- | 2,100 | 3,750 |
| Phenanthrene | 5 / 13 | 11 | 58 | 420 | 880 |
| Phenol | 1 / 13 | 1 | --- | --- | 140 |
| Pyrene | 7 / 13 | 11 | 110 | 420 | 880 |
| Toluene | 1 / 1 | 1 | --- | --- | 15 |
| **Inorganics:** | | | | | |
| Aluminum | 11 / 11 | 11 | 5,760 | 8,400 | 10,140 |
| Arsenic | 9 / 11 | 11 | 1.9 | 2.6 | 4.3 |
| Barium | 11 / 11 | 11 | 23.7 | 37 | 67.6 |
| Beryllium | 9 / 11 | 11 | 0.6 | 0.7 | 1.2 |
| Cadmium | 9 / 11 | 11 | 0.9 | 1.2 | 2.1 |
| Calcium | 11 / 11 | 11 | 911 | 1,600 | 3,105 |
| Chromium | 10 / 11 | 11 | 15.9 | 22 | 42 |
| Cobalt | 2 / 11 | 11 | 6 | 3.1 | 6.5 |
| Copper | 11 / 11 | 11 | 8.7 | 20 | 38.8 |
| Iron | 11 / 11 | 11 | 8,190 | 11,000 | 25,200 |
| Lead | 11 / 11 | 11 | 9.4 | 110 | 352.5 |
| Magnesium | 11 / 11 | 11 | 1,430 | 2,300 | 4895 |
| Manganese | 11 / 11 | 11 | 98.4 | 190 | 365 |
| Mercury | 1 / 11 | 11 | --- | 0.1 | 0.3 |
| Nickel | 9 / 11 | 11 | 5.7 | 8 | 14.4 |
| Potassium | 10 / 11 | 11 | 387 | 640 | 1,975 |
| Selenium | 8 / 10 | 9 | 0.2 | 0.4 | 0.6 |
| Sodium | 9 / 11 | 11 | 102 | 270 | 471 |
| Vanadium | 10 / 11 | 11 | 17.1 | 23 | 43.7 |
| Zinc | 9 / 11 | 11 | 33.7 | 52 | 118 |

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) The number of samples in calculating the mean. This number may differ from the denominator of the frequency of detection, because non-detect samples in which one-half the detection limit exceeds the maximum value in a group of samples were not included in calculating the mean.

--- = Not applicable due to the small sample size or since only one measurable concentration was detected.

# Table 3

## SUMMARY STATISTICS FOR MIDDLE MARSH SURFACE WATER

| | | | Concentration, ug/L | | | |
|---|---|---|---|---|---|---|
| Chemical (a) | Frequency of Detection (a) | Mean Sample Size | Minimum Detected Value | Arithmetic Mean | Upper 95 Percent Confidence Limit on the Arithmetic Mean | Maximum Detected Value |
| Acetone | 2 / 6 | 6 | 6 | 5.5 | 6.2 | 7 |
| Benzoic acid | 1 / 6 | 1 | --- | --- | --- | 2 |
| Carbon tetrachloride | 2 / 6 | 2 | 1 | 1.5 | --- | 2 |
| bis(2-Ethylhexyl)phthalate | 1 / 6 | 1 | --- | --- | --- | 4.5 |
| PCBs (Aroclor 1254) (b) | 2 / 5 | 5 | 0.01 | 0.02 | 0.06 | 0.077 |

(a) Several metals were measured in surface water. From a human health perspective, chemicals in surface water will be evaluated for dermal absorption. Since the dermal absorption of metals is insignificant, metal concentrations are not summarized here.
(b) Represents results for filtered samples only.

--- = Not applicable due to the small sample size or since only one measurable concentration was detected.

Table 4 **PCB CONCENTRATIONS IN BIOTA SAMPLES COLLECTED IN MIDDLE MARSH (CHARTERS, 1991)**

| LOCATION | SAMPLE | PCB (AROCLOR 1254) (mg/kg) |
|---|---|---|
| ERT 1 | Benthos | 0.1 U |
| | Green Frog, *Rana clamitans melanota* | 0.25 |
| | Rose Hips, *Rosa multiflora* | 0.1 U |
| | Grass Seed Heads, *Phaloris arundinacea* | 0.1 U |
| ERT 2 | Benthos | 0.35 |
| | Green Frog, *Rana clamitans melanota* | 0.27 |
| | Rose Hips, *Rosa multiflora* | 0.1 U |
| | Grass Seed Heads, *Phaloris arundinacea* | 0.1 U |
| ERT 3 | Benthos | 0.4 |
| | Green Frog, *Rana clamitans melanota* | 0.68 |
| | Green Frog, *Rana clamitans melanota* | 0.24 |
| | Rose Hips, *Rosa multiflora* | 0.1 U |
| | Grass Seed Heads, *Phaloris arundinacea* | 0.1 U |
| ERT 4 | Benthos | 0.1 U |
| | Earthworm | 0.1 U |
| | Meadow Vole, *Microtus pennsylvanicus* | 0.1 U |
| | Short-tailed Shrew, *Blarina brevicauda* | 0.38 |
| | Short-tailed Shrew, *Blarina brevicauda* | 0.98 |
| | Rose Hips, *Rosa multiflora* | 0.1 U |
| ERT 5 | Benthos | 0.1 U |
| | Grass Seed Heads, *Phaloris arundinacea* | 0.1 U |
| ERT 6 | Green Frog, *Rana clamitans melanota* | 0.19 |
| | Rose Hips, *Rosa multiflora* | 0.1 U |
| | Grass Seed Heads, *Phaloris arundinacea* | 0.1 U |
| ERT 7 | Benthos | 0.1 U |
| | Green Frog, *Rana clamitans melanota* | 0.73 |
| EAST BANK | Earthworm | 2.3 |
| | Green Frog, *Rana clamitans melanota* | 0.39 |
| | Meadow Vole, *Microtus pennsylvanicus* | 0.36 |
| | Meadow Vole, *Microtus pennsylvanicus* | 0.38 |
| | Meadow Vole, *Microtus pennsylvanicus* | 1.6 |
| | Deer Mouse, *Peromyscus maniculatus* | 0.64 |
| | Deer Mouse, *Peromyscus maniculatus* | 0.1 U |
| | Deer Mouse, *Peromyscus maniculatus* | 0.44 |
| WEST BANK | Earthworm | 1.8 |
| | Deer Mouse, *Peromyscus maniculatus* | 0.27 |
| | Deer Mouse, *Peromyscus maniculatus* | 1 |
| | Deer Mouse, *Peromyscus maniculatus* | 0.28 |
| | White-footed Mouse, *Peromyscus leucopus* | 0.84 |
| | White-footed Mouse, *Peromyscus leucopus* | 0.68 |
| | White-footed Mouse, *Peromyscus leucopus* | 0.68 |
| ERT 8 | Green Frog, *Rana clamitans melanota* | 1.02 |

U= undetected at detection limit indicated

Table 5

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN

| MIDDLE MARSH SURFACE SEDIMENT/SOIL | GOLF COURSE/WETLAND AREA SURFACE SEDIMENT/SOIL | MIDDLE MARSH SURFACE WATER |
|---|---|---|
| Organics: | Organics: | Organics: |
| Acenaphthene | Acetone | Acetone |
| Acenaphthylene | Anthracene | Benzoic acid |
| Acetone | Aroclor-1254 | Carbon tetrachloride |
| Anthracene | Benzo(a)anthracene | bis(2-Ethylhexyl)phthalate |
| Aroclor-1254 | Benzo(a)pyrene | PCBs (Aroclor 1254) |
| Benzo(a)anthracene | Benzo(b)fluoranthene | |
| Benzo(a)pyrene | Benzo(k)fluoranthene | |
| Benzo(b)fluoranthene | 2-Butanone | |
| Benzo(g,h,i)perylene | Butylbenzylphthalate | |
| Benzo(k)fluoranthene | Chrysene | |
| 2-Butanone | 4,4'-DDD | |
| Butylbenzylphthalate | Di-n-butylphthalate | |
| Chloroform | bis(2-Ethylhexyl)phthalate | |
| Chrysene | Fluoranthene | |
| 4,4'-DDD | Indeno(1,2,3-c,d)pyrene | |
| 4,4'-DDE | Methylene Chloride | |
| 4,4'-DDT | 4-Methylphenol | |
| Di-n-octylphthalate | Pentachlorophenol | |
| Dibenzo(a,h)anthracene | Phenanthrene | |
| Dibenzofuran | Phenol | |
| 1,4-Dichlorobenzene | Pyrene | |
| bis(2-Ethylhexyl)phthalate | Toluene | |
| Fluoranthene | | |
| Fluorene | Inorganics: | |
| Indeno(1,2,3-c,d)pyrene | | |
| Methylene Chloride | Cadmium | |
| 4-Methylphenol | Copper | |
| N-nitrosodiphenylamine | Lead | |
| Pentachlorophenol | | |
| Phenanthrene | | |
| Phenol | | |
| Pyrene | | |
| Toluene | | |
| Inorganics: | | |
| Cadmium | | |
| Copper | | |
| Iron | | |
| Lead | | |
| Manganese | | |
| Zinc | | |

Table 6

TOTAL RISKS ASSOCIATED WITH CURRENT LAND-USE

| Area/Pathway | Cancer Risk Due to All Chemicals | | Cancer Risk Due to PCBs | |
|---|---|---|---|---|
| | Average | Maximum | Average | Maximum |
| **Middle Marsh:** | | | | |
| Ingestion of Sediment/Soil | 2.4E-06 | 1.0E-05 | 9.4E-07 | 6.5E-06 |
| Dermal Absorption From Sediment/Soil | 1.2E-06 | 6.3E-06 | 7.9E-07 | 5.4E-06 |
| Dermal Absorption From Surface Water | 1.1E-09 | 2.4E-09 | 4.0E-10 | 1.5E-09 |
| Total Cancer Risk | 4E-06 | 2E-05 | 2E-06 | 1E-05 |
| **Golf Course/Wetland Area:** | | | | |
| Ingestion of Sediment/Soil | 4.0E-06 | 1.3E-05 | 1.3E-06 | 7.1E-06 |
| Dermal Absorption From Sediment/Soil | 1.7E-06 | 7.3E-06 | 1.0E-06 | 5.9E-06 |
| Total Cancer Risk | 6E-06 | 2E-05 | 2E-06 | 1E-05 |

| Area/Pathway | Noncarcinogenic Risk Due to All Chemicals | | Noncarcinogenic Risk Due to PCBs | |
|---|---|---|---|---|
| | Average | Maximum | Average | Maximum |
| **Middle Marsh:** | | | | |
| Ingestion of Sediment/Soil | 3.7E-03 | 2.3E-02 | 2.9E-03 | 2.0E-02 |
| Dermal Absorption From Sediment/Soil | 2.4E-03 | 1.6E-02 | 2.4E-03 | 1.6E-02 |
| Dermal Absorption From Surface Water | 1.6E-05 | 2.4E-05 | 1.2E-06 | 4.6E-06 |
| Total Hazard Index | < 1 | < 1 | < 1 | < 1 |
| **Golf Course/Wetland Area:** | | | | |
| Ingestion of Sediment/Soil | 4.2E-03 | 2.2E-02 | 3.8E-03 | 2.1E-02 |
| Dermal Absorption From Sediment/Soil | 3.2E-03 | 1.8E-02 | 3.2E-03 | 1.8E-02 |
| Total Hazard Index | < 1 | < 1 | < 1 | < 1 |

Table 7

TOTAL RISKS ASSOCIATED WITH FUTURE LAND-USE

| Area/Pathway | Cancer Risk Due to All Chemicals | | Cancer Risk Due to PCBs | |
|---|---|---|---|---|
| | Average | Maximum | Average | Maximum |
| Middle Marsh: | | | | |
| Ingestion of Sediment | 4.9E-06 | 2.0E-05 | 1.9E-06 | 1.3E-05 |
| Dermal Absorption From Sediment | 2.3E-06 | 1.3E-05 | 1.6E-06 | 1.1E-05 |
| Total Cancer Risk | 7E-06 | 3E-05 | 3E-06 | 2E-05 |

| Area/Pathway | Noncarcinogenic Risk Due to All Chemicals | | Noncarcinogenic Risk Due to PCBs | |
|---|---|---|---|---|
| | Average | Maximum | Average | Maximum |
| Middle Marsh: | | | | |
| Ingestion of Sediment | 7.4E-03 | 4.5E-02 | 5.7E-03 | 3.9E-02 |
| Dermal Absorption From Sediment | 4.8E-03 | 3.3E-02 | 4.8E-03 | 3.3E-02 |
| Total Hazard Index | < 1 | < 1 | < 1 | < 1 |

The Seven Alternatives Advanced for Detailed Evaluation

- Alternative #1. No action (retained as a baseline, pursuant to the NCP).
- Alternative #2b. Excavation of all remediation areas with disposal of untreated sediments at Sullivan's Ledge Disposal Area and wetland restoration.
- Alternative #5. Excavation of all remediation areas with treatment of excavated materials by solvent extraction, disposal of treated sediments in Middle Marsh, and wetlands restoration with the treated sediments, enhanced by organic, nutrient-rich clean soil.
- Alternative #6a. Excavation of all remediation areas with treatment of excavated materials by solidification/stabilization, disposal of the solidified material at the Sullivan's Ledge Disposal Area landfill, and wetlands restoration with clean, organic soil.
- Alternative #6b. Excavation of all remediation areas with treatment of excavated materials by solidification/stabilization, disposal of the solidified material at the golf course in a new solid waste landfill, and wetlands restoration with clean, organic soil.
- Alternative #7a. Excavation of all remediation areas with treatment of excavated materials by an on-site incinerator, disposal of the ash material at the Sullivan's Ledge Disposal Area landfill, and wetlands restoration with clean, organic soil.
- Alternative #7c. Excavation of all remediation areas with treatment of excavated materials by an on-site incinerator, disposal of the ash materials at an off-site RCRA disposal facility, and wetlands restoration with clean, organic soil.

Table 8

TABLE 9. LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE FOR MIDDLE MARSH

| Medium/Authority | Requirement | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|---|
| Federal Regulatory Requirements | Clean Water Act (CWA) Guidelines for Disposal of Dredged or Fill Material (33 U.S.C. §1344) (40 CFR Part 230) | Applicable | No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the discharge which would have a less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken which will minimize the potential adverse impacts of the discharge of the dredged material on the aquatic ecosystem. | Any activities that involve the discharge of dredge or fill materials in wetlands shall be conducted in a manner utilizing the alternative which would have the least adverse impact on the aquatic ecosystem and the environment, pursuant to 40 CFR §230.10(a). |
| | Statement of Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, App. A) | Applicable | Federal agencies shall avoid, wherever possible, the long and short term impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands development wherever there is a practicable alternative in accordance with Executive Orders 11990 and 11988. The agency shall promote the preservation and restoration of floodplains so that their natural and beneficial values can be realized. Any plans for actions in wetlands or floodplains must be submitted for public review. | All practicable means will be used to minimize harm to wetlands and floodplains. Wetlands and floodplains disturbed by excavation will be restored to their original conditions. Temporary fill placed in the golf course and wetland for access roads and staging area will not have a significant impact on the extent of flooding. Culverts will be placed under the access roads to allow for undiverted passage of flood waters. |
| | Fish and Wildlife Coordination Act (16 U.S.C. §661 et seq.) | Applicable | Under §662, any modification of a body of water requires consultation with the U.S. Fish and Wildlife Services, to develop measures to prevent, mitigate, or compensate for losses to fish and wildlife. This requirements is addressed under CWA Section 404 requirements. | During the identification, screening, and evaluation of alternatives, the effects on wetlands are evaluated. If an alternative modifies a body of water, EPA must consult the U.S. Fish and Wildlife Service. Whenever possible, the remedial alternative describes measures to prevent, mitigate, or compensate for losses to fish and wildlife. |

TABLE 9 (Continued). LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE FOR MIDDLE MARSH

| Medium/Authority | Requirement | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|---|
| Federal Regulatory Requirements (Continued) | RCRA Location Standards (40 CFR 264.18) | Relevant and Appropriate | This regulation outlines the requirements for constructing a RCRA facility on a 100-year floodplain. | A RCRA facility that is located on a 100-year floodplains must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood, unless waste may be removed safely before floodwater can reach the facility or no adverse effects on human health and the environment would result if washout occurred. |
| | Hazardous Waste Facility Siting Regulations (990 CMR 1.00) | Relevant and Appropriate | These regulations outline the criteria for the construction, operation, and maintenance of a new facility or increase in an existing facility for the storage, treatment, or disposal of hazardous waste. | No portion of the facility may be located within a wetland or bordering a vegetated wetland, or within a 100-year floodplain, unless approved by the state. |
| State Regulatory Requirements | Massachusetts Wetlands Protection Act, (M.G.L. 131, §40) (310 CMR 10.00) | Applicable | These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling, altering, or polluting of inland wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation type and requires that effects on wetlands be mitigated. Each remedial alternative will be evaluated for its ability to attain regulatory performance standards, including mitigation of impacted wetlands. | If alternatives involve removing, filling, dredging, or altering a DEP-defined wetland, or conducting work within 100 feet of a wetland, it must be demonstrated that the modifications are not significant to the wetland or that the proposed work will contribute to the protection of the wetland. Whenever possible, remedial actions will be conducted so that impacts to wetlands will be minimized or mitigated. |

TABLE 9 (Continued). LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE FOR MIDDLE MARSH

| Medium/Authority | Requirement | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|---|
| | Endangered Wildlife and Wild Plants Regulations (321 CMR 8.00) | Applicable | These regulations established Massachusetts' list of threatened and endangered species and species of special concern. The habitat of any species listed under this requirement is protected by the regulations promulgated under the MA Wetlands Protection Act. | If alternatives involve impacts to the habitat of any listed species, appropriate actions must be taken during remediation to mitigate or minimize impacts to the species and its critical habitat. Habitats of any listed species will be identified prior to remediation. |
| State Nonregulatory Requirements to be Considered | Massachusetts Wetlands Protection Program Policy 90-2; Standards and Procedures for Determining Adverse Impacts to Rare Species | To be Considered | This policy clarifies the rules regarding rare species habitat contained at 310 CMR 10.59. | Habitats of rare species, as determined by the Massachusetts Natural Heritage Program, will be considered in the mitigation plans. |

TABLE 10. ACTION-SPECIFIC ARARs FOR THE SELECTED REMEDY (EXCAVATION AND DISPOSAL AT SULLIVAN'S LEDGE DISPOSAL AREA)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| National Pollution Discharge Elimination System (NPDES) (40 CFR 122.125) | Applicable | Regulates the discharge of water into public surface waters. Among other things, major requirements are:<br>• Use of best available technology (BAT) economically achievable is required to control toxic and non-conventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis.<br>• Applicable Federally approved State water quality standards must be complied with. These standards may be in addition to or more stringent than other Federal standards under the CWA. | Discharged waters will be monitored for the required pollutants and standards will be met. |
| Toxic Pollutant Effluent Standards (40 CFR 129) | Applicable | Regulates the discharge of the following pollutants: aldrin/dieldrin, DDT, endrin, toxaphene, benzidine, and PCBs. | All discharge waters will be monitored for the regulated pollutants and will meet standards. |
| Massachusetts Surface Water Quality Standards 314 CMR 4.00 | Applicable | These standards designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained and protected. Minimum water quality criteria required to sustain the designated uses are established. Federal AWQC are to be considered in determining effluent discharge limits. Where recommended limits are not available, site-specific limits shall be developed. Any on-site water treatment and discharge is subject to these requirements. | Water from the dewatering process will be discharged directly to the unnamed stream. If this water does not meet state standards, it will be treated prior to discharge. Effluent limitations for water discharges will be established so that such discharges shall not result in a violation of state water quality standards. |

TABLE 10 (Continued). ACTION-SPECIFIC ARARs FOR THE SELECTED REMEDY (EXCAVATION AND DISPOSAL AT SULLIVAN'S LEDGE DISPOSAL AREA)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| Clean Water Act § 404 (40 CFR 230) | Applicable | No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the discharge which would have a less adverse impact to the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken which will minimize the potential adverse impacts of the discharge of the dredged material on the aquatic ecosystem. | Any activities that involve the discharge of dredge or fill materials in wetlands shall be conducted in a manner utilizing the alternative which would have the least adverse impact on the aquatic ecosystem and the environment, pursuant to 40 CFR §230.10(a), and any excavated areas to be filled shall be filled with clean materials from off-site, in accordance with 40 CFR §230. |
| Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, App. A) | Applicable | Federal agencies shall avoid, wherever possible, the long and short term impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands development wherever there is a practicable alternative in accordance with Executive Orders 11990 and 11988. The agency shall promote the preservation and restoration of floodplains so that their natural and beneficial values can be realized. Any plans for actions in wetlands or floodplains must be submitted for public review. | This alternative will take into consideration this statement. All practicable means will be used to minimize harm to wetlands and floodplains. Wetlands and floodplains disturbed by excavation will be restored to their original conditions. Temporary fill placed in the golf course and wetland for access roads and staging area will not have a significant impact on the extent of flooding. Culverts will be placed under the access roads to allow for undiverted passage of flood waters. |
| Massachusetts Wetlands Protection Act (M.G.L. 131 § 40) (310 CMR 10.00) | Applicable | The dredging, filling, altering, or polluting of inland wetlands and work within 100 feet of a wetland is regulated. Each remedial alternative will be evaluated for its ability to attain regulatory performance standards, including mitigation of impacted wetlands. | Wetlands disturbed by excavation will be restored to original conditions. All practicable means will be used to minimize wetland disturbance. Remedial activities will be selected based on the ability to minimize adverse effects on such habitats. |

TABLE 10 (Continued). ACTION-SPECIFIC ARARs FOR THE SELECTED REMEDY (EXCAVATION AND DISPOSAL AT SULLIVAN'S LEDGE DISPOSAL AREA)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| Massachusetts Endangered Wildlife and Wild Plants Regulations (321 CMR 8.00) | Applicable | These regulations established Massachusetts' list of threatened and endangered species and species of special concern. The habitat of of any species listed under this requirement is protected by the regulations promulgated under the Massachusetts Wetlands Protection Act. | If the alternative involves impacts to the habitat of any listed species, appropriate actions must be taken during remediation to mitigate or minimize impacts to the species and its critical habitat. Habitats of any listed species will be identified prior to remediation. |
| Massachusetts Certification for Dredging, Dredged Material Disposal, and Filling in Waters (314 CMR 9.00) | Applicable | The substantive portions of these regulations establish criteria and standards for the dredging, handling and disposal of fill material and dredged material. | Excavation, filling, and disposal operations will meet substantive criteria and standards in these regulations. The remedial alternative will be designed to ensure the maintenance or attainment of the MA Water Quality Standards in the affected waters and to minimize the impact on the environment. |
| Fish and Wildlife Coordination Act (16 U.S.C. 166 et seq.) | Applicable | Any modification of a body of water requires prior consultation with the U.S. FWS to develop measures to prevent, mitigate, or compensate for losses to fish & wildlife. | Prior to excavation, EPA will consult with U.S. FWS. This alternative includes measures to prevent, mitigate, or compensate for losses to fish and wildlife. |
| TSCA, Subpart D, Storage and Disposal (40 CFR 761.60, 761.65, 761.79) | Applicable if PCB concentrations are >50 ppm; Relevant and appropriate if PCB concentrations are <50 ppm | All dredged materials that contain PCBs at concentrations of 50 ppm or greater shall be disposed of in an incinerator or in a chemical waste landfill or, upon application, using a disposal method to be approved by the EPA Region in which the PCBs are located. On-site storage facilities for PCBs shall meet, at a minimum, the following criteria:<br>• Adequate roof and walls to prevent rain<br>• Adequate floor with continuous curbing<br>• No openings that would permit liquids to flow from curbed area | Disposal of soils/sediments under the cap at the Disposal Area will comply with chemical waste landfill requirements except requirements waived in the ROD for the First Operable Unit. These regulations will be considered by U.S. EPA Region I in the selection of this alternative and in the design of storage facilities. Solid debris, excluding trees and bushes, shall be decontaminated prior to off-site transport or off-site disposal in accordance with 40 CFR 761.79; storage facilities shall be designed consistent with 40 CFR 761.65(b)(1)(i), (ii) and (iii). |

TABLE 10 (Continued). ACTION-SPECIFIC ARARs FOR THE SELECTED REMEDY (EXCAVATION AND DISPOSAL AT SULLIVAN'S LEDGE DISPOSAL AREA)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| TSCA, Subpart D, Storage and Disposal (40 CFR 761.60, 761.65, 761.79) (Continued) | | • Not located at a site that is below the 100-year flood water elevation | |
| Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities (314 CMR 8.00) | Relevant & Appropriate | Water treatment units which are exempted from M.G.L.c.21C and which treat, store, or dispose of hazardous wastes generated at the same site are regulated to ensure that such activities are conducted in a manner which protects public health and safety and the environment. | If treatment of sediment/soil dewatering water is necessary, all process will comply with Massachusetts requirements regarding location, technical standards, closure and post-closure, and management standards. |
| Massachusetts Hazardous Waste Regulations (310 CMR 30.000) | Applicable if sediments/soils are defined as hazardous waste under Mass. law; relevant and appropriate if sediments/soils are similar to hazardous wastes | Regulate the generation, storage, collection, transport, treatment, disposal, use, reuse, and recycling of hazardous waste in Massachusetts. The regulations provide procedural standards for the following: generators (310 CMR 30.300), general management standards for all facilities (301 CMR 30.510), contingency plan, emergency procedures, preparedness, and prevention (310 CMR 30.520), manifest system (310 CMR 30.530), closure and post-closure (310 CMR 30.580), landfill requirements (301 CMR 30.620), protection (310 CMR 30.660), use and management of containers (310 CMR 30.680), and facility location standards and land disposal restrictions (310 CMR 30.700). | Based on known information, EPA expects that the sediment/soil are not hazardous waste under Massachusetts law. However, if the sediment/soil is designated hazardous waste under Massachusetts law, all processes involving the contaminated sediment/soil will be conducted in accordance with state hazardous waste regulations. |

TABLE 10 (Continued). ACTION-SPECIFIC ARARs FOR THE SELECTED REMEDY (EXCAVATION AND DISPOSAL AT SULLIVAN'S LEDGE DISPOSAL AREA)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| RCRA, Land Disposal Regulations (40 CFR 268, Subpart C) | Applicable if the sediments/ soils are characteristic of hazardous waste under federal law | Prohibits the disposal of RCRA hazardous waste in the land unless treatment standards are met or a treatability variance is obtained. | Based on known information, EPA expects that the sediment/soil is not hazardous waste. However, if the sediment/soil is hazardous waste due to the presence of metals, it will be solidified to render it non-hazardous or, alternatively, to meet the treatability variance requirements in the land disposal requirements. |
| Clean Air Act (CAA) 40 CFR 50.6 | Applicable | The maximum primary and secondary 24-hr. concentration for particulate emissions from site excavation activities must be maintained below 150 )g/m$^3$, 24-hour average for particulates having a mean diameter of 10 micrometers or less. The annual standard is 50 )g/m$^3$, annual arithmetic mean. | The ambient air will be continuously monitored to ensure compliance with federal regulations. |
| Massachusetts Ambient Air Quality Standards and Massachusetts Air Pollution Control Regulations (301 CMR 7.00) | Applicable | The applicable portions of these regulations prohibit burning or emissions of dust which causes or contributes to a condition of air pollution. | Control measures will be implemented to ensure compliance with state regulations. |
| Federal Noise Control Act (40 CFR 204, 205, 211) | Relevant & Appropriate | Regulates construction and transportation equipment noise, process equipment & noise levels, and noise levels at the property boundaries of the project. | Site noise levels will be in accordance with federal requirements. |
| Toxic Substance Control Act (TSCA), Subpart G, PCB Spill Clean-up Policy (40 CFR § 761.120-135) | To Be Considered | Sets cleanup levels for PCB spills of 50 ppm or greater at 10 ppm for non-restricted access areas, and 25 ppm for restricted access areas. | Cleanup levels established in Chapter Six of the FS are consistent with this policy. |

TABLE 10 (Continued). ACTION-SPECIFIC ARARs FOR THE SELECTED REMEDY (EXCAVATION AND DISPOSAL AT SULLIVAN'S LEDGE DISPOSAL AREA)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| Interim Sediment Quality Criteria | To Be Considered | These criteria were developed by U.S. EPA for certain hydrophobic organic compounds, including PCBs, to protect benthic organisms. The criteria for PCBs is 19.5 )g PCB/g carbon. | The cleanup levels developed in Chapter 6 of the FS are consistent with interim criteria. |
| Massachusetts Allowable Ambient Air Limits - Annual (AALs) and 24-hour (TELs) | To Be Considered | These guidances are to be considered in evaluating whether a condition of air pollution exists. The TEL for PCB is 0.003 )g/m$^3$ and the AAL is 0.005 )g/m$^3$. | Massachusetts air limits and exposure levels will be considered in the evaluation of emissions monitoring results. |
| Guidance on Remedial Actions for Superfund Sites with PCB Contamination | To Be Considered | Describes various scenarios and considerations pertinent to determining the appropriate level of PCBs that can be left in each contaminated media to achieve protection of human health and the environment. | This guidance will be considered in determining the appropriate level of PCBs that will be left in the sediment/soil. Management of PCB-contaminated residuals will be designed in accordance with the guidance. |
| EPA Interim Policy for Planning and Implementing CERCLA Response Actions. Proposed Rule, 50 FR 45933 (November 5, 1985) | To Be Considered | Discusses the need to consider treatment, recycling, and reuse before offsite land disposal is used. Prohibits use of a RCRA facility for offsite management of Superfund hazardous substances if it has significant RCRA violations. | This policy will be considered in the treatment of the PCB-contaminated sediment/soil. |

TABLE 11. ACTION-SPECIFIC ARARs FOR THE CONTINGENCY REMEDY (SOLVENT EXTRACTION)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| National Pollution Discharge Elimination System (NPDES) (40 CFR 122.125) | Applicable | Regulates the discharge of water into public surface waters. Among other things, major requirements are:<br>• Use of best available technology (BAT) economically achievable is required to control toxic and non-conventional pollutant. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis.<br>• Applicable Federally approved State water quality standards must be complied with. These standards may be in addition to or more stringent than other Federal standards under the CWA. | Discharged waters will be monitored for the required pollutants and standards will be met. |
| Toxic Pollutant Effluent Standards (40 CFR 129) | Applicable | Regulates the discharge of the following pollutants: aldrin/dieldrin, DDT, endrin, toxaphene, benzidine, and PCBs. | All discharge waters will be monitored for the regulated pollutants and will meet standards. |
| Massachusetts Surface Water Quality Standards 314 CMR 4.00 | Applicable | These standards designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained and protected. Minimum water quality criteria required to sustain the designated uses are established. Federal AWQC are to be considered in determining effluent discharge limits. Where recommended limits are not available, site-specific limits shall be developed. Any on-site water treatment and discharge is subject to these requirements. | Water from the treatment process which will be discharged directly to the unnamed stream includes water from soil dewatering. If this water does not meet state standards, it will be treated prior to discharge. Effluent limitations for water discharges will be established so that such discharges shall not result in a violation of state water quality standards. |

TABLE 11 (Continued). ACTION-SPECIFIC ARARs FOR THE CONTINGENCY REMEDY (SOLVENT EXTRACTION)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| Clean Water Act § 404 (40 CFR 230) | Applicable | No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the discharge which would have a less adverse impact to the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken which will minimize the potential adverse impacts of the discharge of the dredged material on the aquatic ecosystem. | Any activities that involve the discharge of dredge or fill materials in wetlands shall be conducted in a manner utilizing the alternative which would have the least adverse impact on the aquatic ecosystem and the environment, pursuant to 40 CFR §230.10(a), and any excavated areas to be filled shall be filled with adequately treated and appropriately reconditioned materials. |
| Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, App. A) | Applicable | Federal agencies shall avoid, wherever possible, the long and short term impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands development wherever there is a practicable alternative in accordance with Executive Orders 11990 and 11988. The agency shall promote the preservation and restoration of floodplains so that their natural and beneficial values can be realized. Any plans for actions in wetlands or floodplains must be submitted for public review. | This alternative will take into consideration this statement. All practicable means will be used to minimize harm to wetlands and floodplains. Wetlands and floodplains disturbed by excavation will be restored to their original conditions. Temporary fill placed in the golf course and wetland for access roads and staging area will not have a significant impact on the extent of flooding. Culverts will be placed under the access roads to allow for undiverted passage of flood waters. |
| Massachusetts Wetlands Protection Act (G.L.C. 131 § 40) (310 CMR 10.00) | Applicable | The dredging, filling, altering, or polluting of inland wetlands and work within 100 feet of a wetland is regulated. Each remedial alternative will be evaluated for its ability to attain regulatory performance standards, including mitigation of impacted wetlands. | Wetlands disturbed by excavation will be restored to original conditions. All practicable means will be used to minimize wetland disturbance. Remedial activities will be selected based on the ability to minimize adverse effects on such habitats. |

TABLE 11 (Continued). ACTION-SPECIFIC ARARs FOR THE CONTINGENCY REMEDY (SOLVENT EXTRACTION)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| Massachusetts Endangered Wildlife and Wild Plants Regulations (321 CMR 8.00) | Applicable | These regulations established Massachusetts' list of threatened and endangered species and species of special concern. The habitat of any species listed under this requirement is protected by the regulations promulgated under the Massachusetts Wetlands Protection Act. | If the alternative involves impacts to the habitat of any listed species, appropriate actions must be taken during remediation to mitigate or minimize impacts to the species and its critical habitat. Habitats of any listed species will be identified prior to to remediation. |
| Massachusetts Certification for Dredging, Dredged Material Disposal, and Filling in Waters (314 CMR 9.00) | Applicable | The substantive portions of these regulations establish criteria and standards for dredging, handling, and disposal of different classes of fill material and dredged material. | Excavation, filling, and disposal operations will meet substantive criteria and standards in these regulations. The remedial alternative will be designed to ensure the maintenance or attainment of the MA Water Quality Standards in the affected waters and to minimize the impact on the environment. |
| Fish and Wildlife Coordination Act (16 U.S.C. 166 et seq.) | Applicable | Any modification of a body of water requires prior consultation with the U.S. FWS to develop measures to prevent, mitigate, or compensate for losses to fish & wildlife. | Prior to excavation, EPA will consult with U.S. FWS. This alternative includes measures to prevent, mitigate, or compensate for losses to fish and wildlife. |
| TSCA, Subpart D, Storage and Disposal (40 CFR 761.60, 761.65, 761.79) | Applicable if PCB concentrations are >50 ppm; relevant and appropriate if PCB concentrations | All dredged materials that contain PCBs at concentrations of 50 ppm or greater shall be disposed of in an incinerator or in a chemical waste landfill or, upon application, using a disposal method to be approved by the EPA Region in which the PCBs are located. On-site storage facilities for PCBs shall meet, at a minimum, the following criteria:<br>• Adequate roof and walls to prevent rain<br>• Adequate floor with continuous curbing | These regulations will be considered by U.S. EPA Region I in the design of storage facilities. Solid debris, excluding trees and bushes, shall be decontaminated prior to off-site transport or off-site disposal in accordance with 40 CFR 761.79; storage facilities shall be designed consistent with 40 CFR 761.65(b)(1)(i), (ii) and (iii). PCB-concentrated waste oils from the solvent extraction process will be disposed of in accordance with these regulations. |

TABLE 11 (Continued). ACTION-SPECIFIC ARARs FOR THE CONTINGENCY REMEDY (SOLVENT EXTRACTION)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| TSCA, Subpart D, Storage and Disposal (40 CFR 761.60, 761.65, (761.79) (Continued) | | • No openings that would permit liquids to flow from curbed area<br>• Not located at a site that is below the 100-year flood water elevation | |
| Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities (314 CMR 8.00) | Relevant & Appropriate | Water treatment units which are exempted from M.G.L.c.21C and which treat, store, or dispose of hazardous wastes generated at the same site are regulated to ensure that such activities are conducted in a manner which protects public health and safety and the environment. | If treatment of sediment/soil dewatering water is necessary, all process will comply with Massachusetts requirements regarding location, technical standards, closure and post-closure, and management standards. |
| Massachusetts Hazardous Waste Regulations (310 CMR 30.000) | Applicable to PCB-concentrated waste oil; applicable if sediment/soils are defined as hazardous wastes; relevant and appropriate if sediments/soils are similar to hazardous wastes | Regulate the generation, storage, collection, transport, treatment, disposal, use, reuse, and recycling of hazardous waste in Massachusetts. The regulations provide procedural standards for the following: generators (310 CMR 30.300), general management standards for all facilities (310 CMR 30.510), contingency plan, emergency procedures, preparedness, and prevention (310 CMR 30.530), closure and post-closure (310 CMR 30.580), landfill requirements (310 CMR 30.620), groundwater protection (310 CMR 30.660), use and management of containers (310 CMR 30.680), and facility location standards and land disposal restrictions (310 CMR 30.700). | Based on known information, EPA expects that the sediment/soil are not hazardous waste under Massachusetts law. However, if the sediment/soil is designated hazardous waste under Massachusetts law, all processes involving the contaminated sediment/soil will be conducted in accordance with state hazardous waste regulations. All processes involving the PCB-concentrated waste oil will be conducted in accordance with these regulations. |

TABLE 11 (Continued). ACTION-SPECIFIC ARARs FOR THE CONTINGENCY REMEDY (SOLVENT EXTRACTION)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| RCRA, Land Disposal Regulations (40 CFR 268, Subpart C) | Applicable if sediments/ soils are character- istic of hazard- ous waste | Prohibits the disposal of RCRA hazardous waste in the land unless treatment standards are met or a treatability variance is obtained. | Based on known information, EPA expects that the sediment/soil is not hazardous waste. However, if the sediment/soil is hazardous waste due to the presence of metals, it will be solidified to render it non-hazardous or, alternatively, to meet the treatability variance requirements in the land disposal requirements. |
| Clean Air Act (CAA) 40 CFR 50.6 | Applicable | The maximum primary and secondary 24-hr. concentration for particulate emissions from site excavation activities must be maintained below 150 )g/m$^3$, 24-hour average for particulates having a mean diameter of 10 micrometers or less. The annual standard is 50 )g/m$^3$, annual arithmetic mean. | The ambient air will be continuously monitored to ensure compliance with federal regulations. |
| Massachusetts Ambient Air Quality Standards and Massachusetts Air Pollution Control Regulations (301 CMR 6.00-7.00) | Applicable | All construction and treatment activities will utilize Best Available Control Technology in order to prevent contaminant transfer between other media and air. Massachusetts AALs and TELs are used in determining compliance with these regulations. Burning or emissions of dust which causes or contributes to a condition of air pollution are prohibited. | The ambient air will be continuously monitored and control measures shall be implemented to ensure compliance with state regulations. |
| Federal Noise Control Act (40 CFR 204, 205, 211) | Relevant & Appropriate | Regulates construction and transportation equipment noise, process equipment & noise levels, and noise levels at the property boundaries of the project. | Site noise levels will be in accordance with federal requirements. |
| Toxic Substance Control Act (TSCA), Subpart G, PCB Spill Clean-up Policy (40 CFR § 761.120-135) | To Be Considered | Sets cleanup levels for PCB spills of 50 ppm or greater at 10 ppm for non-restricted access areas, and 25 ppm for restricted access areas. | Cleanup levels established in Chapter Six of the FS are consistent with this policy. |

TABLE 11 (Continued). ACTION-SPECIFIC ARARs FOR THE CONTINGENCY REMEDY (SOLVENT EXTRACTION)

| ARAR | Status | Requirement Synopsis | Action to be Taken to Attain ARAR |
|---|---|---|---|
| Interim Sediment Quality Criteria | To be Considered | These criteria were developed by U.S. EPA for certain hydrophobic organic compounds, including PCBs, to protect benthic organisms. The criteria for PCBs is 19.5 )g PCB/g carbon. | The cleanup levels developed in Chapter 6 of the FS are consistent with interim criteria. |
| Massachusetts Allowable Ambient Air Limits - Annual (AALs) and 24-hour (TELs) | To Be Considered | These guidances are to be considered in evaluating whether a condition of air pollution exists. The TEL for PCB is 0.003 )g/m$^3$ and the AAL is 0.005 )g/m$^3$. | Massachusetts air limits and exposure levels will be considered in the evaluation of emissions monitoring results. |
| Guidance on Remedial Actions for Superfund Sites with PCB Contamination | To Be Considered | Describes various scenarios and considerations pertinent to determining the appropriate level of PCBs that can be left in each contaminated media to achieve protection of human health and the environment. | This guidance will be considered in determining the appropriate level of PCBs that will be left in the sediment/soil. Management of PCB-contaminated residuals will be designed in accordance with the guidance. |
| EPA Interim Policy for Planning and Implementing CERCLA Response Actions. Proposed Rule, 50 FR 45933 (November 5, 1985) | To Be Considered | Discusses the need to consider treatment, recycling, and reuse before offsite land disposal is used. Prohibits use of a RCRA facility for offsite management of Superfund hazardous substances if it has significant RCRA violations. | This policy will be considered in the treatment of the PCB-contaminated waste oil stream. |

# APPENDIX A

# RESPONSIVENESS SUMMARY

# SULLIVAN'S LEDGE SITE

# MIDDLE MARSH OPERABLE UNIT

United States
Environmental Protection Agency
Region I

*S U P E R F U N D*

# Responsiveness Summary
# Sullivan's Ledge Site
# Middle Marsh Operable Unit
# New Bedford, Massachusetts

September 1991

## Table of Contents

## Preface

The U. S. Environmental Protection Agency (EPA) held a 62-day public comment period from May 30, 1991 to July 31, 1990 to provide an opportunity for interested parties to comment on the Remedial Investigation (RI), draft Feasibility Study (FS), and the May 1991 Proposed Plan prepared for the Sullivan's Ledge Superfund Site, Middle Marsh Operable Unit, New Bedford, Massachusetts. The draft FS examines and evaluates various options, called remedial alternatives, to address soil and sediment contamination in the Middle Marsh Study Area. The Middle Marsh Study Area is defined by EPA to include the Middle Marsh -- a 13-acre wetland located within the New Bedford Municipal Golf Course -- and an adjacent wetland located between Hathaway Road and Middle Marsh. Contamination in the Middle Marsh Study Area occurred as a result of the movement of contaminants from the quarry, or Disposal Area of the Sullivan's Ledge Site. EPA identified its preferred alternative and contingency alternative for addressing sediment and soil contamination for the Middle Marsh Study Area in the Proposed Plan issued in May 1991, before the start of the public comment period.

To facilitate an efficient cleanup of the site, EPA has divided its investigation of the Sullivan's Ledge Site into two segments, known as operable units. A Remedial Investigation (RI) and Feasibility Study for the First Operable Unit (Disposal Area contamination) was conducted between 1984 and 1989. EPA held a 49-day formal public comment period on the FS and the Agency's preferred alternative for addressing contamination in the First Operable Unit and, in September 1989, signed a Record of Decision (ROD) that established EPA's plans for site cleanup. The cleanup plan for the Disposal Area includes: 1) excavation, solidification (if necessary), and on-site disposal of contaminated soils from the Disposal Area and sediments from the Unnamed Stream; 2) construction of an impermeable cap over eleven acres of the Disposal Area; 3) diversion and lining of a section of the Unnamed Stream near the Disposal Area; 4) collection and treatment of contaminated groundwater; 5) wetland and stream restoration; 6) long-term environmental monitoring; and 7) institutional controls to limit future site use. The second Operable Unit, which is the subject of this Responsiveness Summary, focuses on contamination in the Middle Marsh Study Area.

The purpose of this Responsiveness Summary is to document EPA responses to the questions and comments raised during the public comment period on the Middle Marsh Operable Unit. EPA will consider all of these questions and comments before selecting a final remedial alternative to address contamination in the Middle Marsh Study Area at the Sullivan's Ledge Superfund Site.

This Responsiveness Summary is divided into the following sections:

I. Overview of Remedial Alternatives Considered in the Draft Feasibility Study, Including the Preferred and Contingency Alternatives - This section briefly outlines the remedial alternatives evaluated in the FS and the Proposed Plan, including EPA's preferred alternative and contingency alternative.

II. Site History and Background on Community Involvement and Concerns - This section provides a brief site history and a general overview of community interests and concerns regarding the Sullivan's Ledge Site.

III. Summary of Comments Received During the Public Comment Period and EPA Responses to those Comments - This section summarizes the oral and written comments received from the public and from the Potentially Responsible Parties (PRPs) during the public comment period, and provides EPA responses to these comments.

IV. **Remaining Concerns** - This section describes issues that may continue to be of concern to the community during the design and implementation of EPA's selected remedy for addressing soil and sediment contamination in the Middle Marsh Study Area at the Sullivan's Ledge Site. EPA will address these concerns during the Remedial Design and Remedial Action (RD/RA) phase of the cleanup process.

In addition, two attachments are included in this Responsiveness Summary. *Attachment A* provides a list of the community relations activities that EPA has conducted to date at the Middle Marsh Operable Unit - Sullivan's Ledge Site. *Attachment B* contains a copy of the transcript from the informal public hearing held on July 26, 1991.

## I. Overview of Remedial Alternatives Considered in the Draft Feasibility Study, including the Preferred Alternative and Contingency Alternative

Based upon Sullivan's Ledge Site studies, EPA identified specific objectives for the Middle Marsh Operable Unit portion of the Sullivan's Ledge Site. The objectives are:

(1) Reduce exposure of aquatic organisms to PCB-contaminated pore water and sediments either through direct contact or diet-related bioaccumulation;

(2) Reduce exposure of terrestrial and wetland species to PCB-contaminated sediment/soils through direct contact or diet-related bioaccumulation;

(3) Prevent or reduce releases of PCBs to the Unnamed Stream and the Apponagansett Swamp; and

(4) Mitigate the impacts of remediation on wetlands.

EPA screened and evaluated potential cleanup alternatives for the Middle Marsh Study Area at the Sullivan's Ledge Site in the Middle Marsh Feasibility Study (FS). The FS describes the remedial alternatives considered for addressing contamination of sediments and soils, as well as the screening criteria used to narrow the list to seven potential remedial alternatives to be analyzed in greater detail. From these seven alternatives EPA selected the Agency's preferred alternative. EPA's preferred alternative for the Middle Marsh Operable Unit includes: 1) site preparation; 2) excavation of contaminated sediment/soils from portions of Middle Marsh and the adjacent wetland; 3) dewatering of the excavated materials; 4) disposal of the materials beneath the cap that will be constructed as part of the First Operable Unit for the site; 5) restoration of the affected wetlands; 6) application of institutional controls to prevent future residential use of Middle Marsh and the Adjacent Wetland; and 7) establishment of a long-term environmental monitoring program.

Because implementation of the preferred alternative is dependent upon the availability of the Disposal Area for disposal of Middle Marsh sediment/soils, EPA also proposed a "contingency alternative" for use in the event that the Disposal Area becomes unavailable. The contingency alternative includes the same site preparation, excavation, wetlands restoration, institutional controls, and long-term monitoring as the preferred alternative. However, under the contingency alternative, the excavated sediment/soils would be treated on-site by solvent extraction, and the clean, treated sediment/soils would be returned to Middle Marsh as part of the wetland restoration. The contaminants extracted by the treatment would be shipped for destruction to an incinerator located off-site.

**Remedial Alternatives Evaluated in the Middle Marsh Feasibility Study**

The seven remedial alternatives retained for detailed analysis by EPA are described briefly below. The May 1991 Proposed Plan and the Feasibility Study should be consulted for a detailed explanation of these remedial alternatives, including EPA's preferred and contingency alternatives. Copies of each document are located in the New Bedford City Hall/New Bedford Public Library and the EPA Records Center at 90 Canal Street in Boston, Massachusetts.

- **Alternative 1:** No Action

- **Alternative 2(b):** Site Preparation; Excavation; Dewatering; Disposal of Excavated Materials at the Sullivan's Ledge Disposal Area; Restoration of Wetlands; Long-Term Environmental Monitoring; and Institutional Controls.

  In the Proposed Plan issued prior to the public comment period, EPA recommended this alternative as its preferred remedy for addressing Middle Marsh Operable Unit contamination.

- **Alternative 5:** Site Preparation; Excavation; On-Site Solvent Extraction; Disposal of Treated Sediment/Soils in Middle Marsh; Wetland Restoration; Long-Term Monitoring; and Institutional Controls.

  In the Proposed Plan issued prior to the public comment period, EPA recommended this alternative as its contingency remedy for addressing Middle Marsh Operable Unit contamination.

- **Alternative 6(a):** Site Preparation; Excavation; On-Site Solidification/Stabilization; Disposal of Treated Materials at the Sullivan's Ledge Disposal Area; Wetlands Restoration; Institutional Controls; Long-Term Monitoring.

- **Alternative 6(b):** Site Preparation; Excavation; On-Site Solidification/Stabilization; On-Site Disposal in a Landfill constructed at the Golf Course; Wetlands Restoration; Institutional Controls; Long-Term Monitoring.

- **Alternative 7(b):** Site Preparation; Excavation; On-Site Incineration; Disposal of Ash at the Sullivan's Ledge Disposal Area; Wetlands Restoration; Institutional Controls; Long-Term Monitoring.

- **Alternative 7(c):** Site Preparation; Excavation; On-Site Incineration; Off-Site Disposal of Ash; Wetlands Restoration; Institutional Controls; Long-Term Monitoring.

## II. Site History and Background on Community Involvement and Concerns

The Sullivan's Ledge Superfund Site in New Bedford, Massachusetts includes a 12-acre former quarry area, called the Sullivan's Ledge Disposal Area, and sections of the New Bedford Municipal Country Club, including a 13-acre wetland named Middle Marsh and an Adjacent Wetland. The Sullivan's Ledge Disposal Area was used by local industries from the mid-1930s to the 1970s for disposal of industrial wastes. Wastes disposed of at the Sullivan's Ledge Disposal Area included electrical capacitors containing polychlorinated biphenyls (PCBs), waste oils, volatile liquids, metals, scrap rubber, and other materials. In 1984, the site was added to the National Priorities List (NPL), allowing Federal Superfund money to be used for site investigation.

EPA conducted site investigations, including a Remedial Investigation/Feasibility Study (RI/FS) between 1984 and 1989. These investigations evaluated the nature and extent of contamination present at the site, and determined that the site contaminants pose a risk to public health and the environment. In 1989, EPA released the Proposed Plan to address site contaminants.

Following consideration of public comments on the Proposed Plan and the FS, EPA issued a Record of Decision (ROD) for the First Operable Unit on June 29, 1989, establishing a cleanup plan for selected portions of the site.

In September 1990, EPA, the Commonwealth of Massachusetts and fourteen companies that have been determined to be potentially responsible for contamination in the First Operable Unit, reached a settlement. Under this settlement, the 14 companies agreed to do the following: (1) construct the remedy called for in the 1989 ROD; (2) perform operation and maintenance for thirty years after completion of construction of the remedy; and (3) pay a portion of EPA's and the State's past costs of conducting studies at the site and of overseeing the design and construction of work to be performed in the First Operable Unit. Design of the cleanup plan the portions of the site addressed in the First Operable Unit, including the Disposal Area, is currently underway.

In the 1989 Proposed Plan, EPA presented three possible cleanup options for addressing contamination found in Middle Marsh. These options included a No-Action alternative, which called for no cleanup activities to occur within Middle Marsh; and two alternatives that called for excavating sediments that contained PCBs at concentrations that may cause long-term impacts to aquatic organisms. The two alternatives differed in the amount of sediment/soil that would be excavated, and thus in the residual levels of PCBs that would remain in the area. In the 1989 Proposed Plan, EPA sought comments on the various cleanup alternatives for Middle Marsh and initially recommended a No-Action alternative. EPA stated that removal of the contaminated sediments in all areas of Middle Marsh exceeding the interim Sediment Quality Criteria could cause more harm to the environment than leaving the contaminated sediments in place.

Because Middle Marsh is located within a heavily used golf course and because of the high ecological value of wetlands, EPA was especially interested in receiving public comment on the three remedial alternatives considered for Middle Marsh. After further consideration, EPA concluded in June 1989 that additional studies of Middle Marsh and the Adjacent Wetland would be necessary to: (1) determine with greater accuracy the nature and extent of contamination in the area; (2) compare the potential environmental impacts of conducting cleanup activities to the impacts of site contamination; and (3) further identify any potential risk to human health and the environment posed by the contamination. This decision separated the study and remediation of Middle Marsh and the Adjacent Wetland into a second operable unit, called the Middle Marsh Operable Unit. The necessary additional information was developed by conducting an RI and FS for the Middle Marsh Study Area.

Community concern surrounding contamination at the Sullivan's Ledge Site has been moderate throughout EPA's involvement at the site. Comments received during the 1989 public comment period on the First Operable Unit focused on the following issues:

- Extent and nature of site contamination;
- Public health impacts resulting from site contamination;

- Future uses of the site including monitoring and maintenance; and
- EPA's community relations program.

On May 28, 1991 EPA held a public informational meeting to present the Proposed Plan for the Middle Marsh Operable Unit. Approximately 25 persons attended the meeting. Public comments at that meeting covered topics including the Disposal Area cap, financing of the Middle Marsh cleanup, future use of the golf course property, the ability of EPA's remedies for the site to control the contamination of groundwater, and incidents of human contact with the contaminated sediment/soils.

A complete list of community relations activities conducted at the Sullivan's Ledge Site is included in Attachment A at the end of this document.

## III. Summary of Comments Received During the Public Comment Period and EPA Responses

This Responsiveness Summary addresses the comments received by EPA concerning the draft FS and Proposed Plan for the Middle Marsh Operable Unit for the Sullivan's Ledge Superfund Site in New Bedford, Massachusetts. Six sets of written comments were received during the public comment period (May 30 - July 31, 1991). Five persons provided oral comments at the July 26, 1991 informal public hearing and one person provided comments by telephone. Commentors included representatives of the Massachusetts Department of Environmental Protection, the City of New Bedford, members of the Municipal Golf Course and potentially responsible parties. A copy of the transcript of the public hearing is included as Attachment B.

A. **Community Comments**

1. **The comments from citizens given at the public hearing and/or in writing are summarized below along with EPA responses.**

*COMMENT 1:* A resident commented that too much time and money may have been spent on the site.

<u>RESPONSE</u> - The remedial investigation and feasibility study (RI/FS) study process, as outlined in the "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" represents the methodology that the Superfund program has established for characterizing the nature and extent of risks posed by uncontrolled hazardous waste sites and for evaluating potential remedial options. The objective of the RI/FS process is to gather information sufficient to support an informed risk management decision regarding which remedy appears to be most appropriate for a given site. As stated in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), developing and conducting an RI/FS generally includes the following activities: project scoping, data collection, risk assessment, treatability studies, and analysis of alternatives.

The Sullivan's Ledge Superfund Site, including the Middle Marsh Operable Unit, has been the subject of Phase I (Ebasco, 1987) and Phase II (Ebasco, 1989a) remedial investigations and a feasibility study (Ebasco, 1989b) which was completed in January 1989. The remedial investigations reveal that PCBs and other contaminants have migrated from the Disposal Area to the Unnamed Stream and the wetlands just north of the Disposal Area, including Middle Marsh and the Adjacent Wetland. EPA concluded in June 1989 that additional studies of Middle Marsh and the Adjacent Wetland areas, including biological studies, would be necessary to: (1) determine with greater accuracy the nature and extent of contamination in the area; (2) compare the potential environmental impacts of conducting cleanup activities to the impacts of site contamination; and (3) further identify any potential risk to human health and the environment posed by the contamination. Thus the study and remediation of Middle Marsh and the Adjacent Wetland areas was separated into a second operable unit, called the Middle Marsh Operable Unit. The "Remedial Investigation - Additional Studies of Middle Marsh" was completed in April 1991 and the "Feasibility Study of Middle Marsh" was completed in May 1991.

EPA believes that the time and costs associated with the conduct and completion of the studies described above was not excessive but was consistent with CERCLA, the NCP and the "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA". In particular given the facts that Middle Marsh is located within a heavily used golf course and because of the high ecological value of the wetlands, these studies, including the ecological assessment were necessary to gather information sufficient to support an informed risk management decision regarding which remedy is most appropriate for the Middle Marsh Operable Unit

COMMENT 2: A resident commented that the proposed cleanup was very expensive.

<u>RESPONSE</u> - In the Agency's judgment, the selected and contingency remedies are cost effective, i.e., the remedies afford overall effectiveness proportional to its costs. In selecting these remedies, once EPA identified alternatives that are protective of human health and the environment and that attain, or, as appropriate, waive ARARs, EPA evaluated the overall effectiveness of each alternative by assessing the relevant three criteria--long term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short term effectiveness, in

combination. The No Action alternative was eliminated from consideration because it would not attain ARARs and would not be protective of the environment.

The relationship of the overall effectiveness of the selected and contingency remedial alternatives was determined to be proportional to their costs.

1. Selected Remedy

The costs associated with the selected remedy are:
Estimated Capital Costs: $2,640,000
Estimated Operation and Maintenance Cost (net present worth): $164,000
Estimated Total Cost (net present worth): $2,800,000

Of the source control alternatives discussed in Section VIII., EPA has determined that the selected remedy (excavation, dewatering, disposal under an impermeable cap) may be only slightly less effective in the long-term as alternative 6(a) (solidification/stabilization, disposal at the Disposal Area) and alternative 6(b) (solidification/stabilization, disposal at golf course landfill) because under the selected remedy, the contaminants would be placed in a RCRA landfill that would include groundwater treatment and monitoring to ensure the effectiveness of the landfill. Although this selected remedy does not provide permanence through treatment, unless required by the land disposal restrictions, it may not be necessary to solidify or otherwise treat excavated Middle Marsh and Adjacent Wetland sediment/soils because the levels of PCBs are relatively low, less than 50 ppm, and would be properly contained under a RCRA engineered cap to be constructed as part of the First Operable Unit. While the selected remedy does not provide the same degree of and/or incineration, for the Middle Marsh Operable Unit uncertainty associated with the long-term effectiveness of the selected remedy in containing relatively low levels of PCBs shall be minimized by engineering and institutional controls.

In comparison to all other containment/treatment alternatives, the selected remedy is the least costly with a present worth cost of $2,800,000. Contrastly, present worth costs of other alternatives requiring treatment include: solidification/disposal from $5.0 to $6.0 million; solvent extraction at $7.8 million; and on-site incineration from $9.8 to $10.0 million.

2. Contingency Remedy

The costs associated with the contingency remedy are:
Estimated Capital Costs: $7,620,000
Estimated Operation and Maintenance Cost (net present worth): $164,000
Estimated Total Cost (net present worth): $7,780,000

Assuming the Disposal Area would not be available for disposal of excavated materials, of the remaining source control alternatives for sediment/soil remediation, EPA has determined that solvent extraction (contingency remedy) followed by off-site incineration of the PCB-contaminated oil extract would be the most effective in permanently and significantly reducing the toxicity, mobility and volume of hazardous substances and in reducing contaminant levels in sediment/soils to cleanup levels. A comparison of present worth costs for solvent extraction and on-site incineration indicates that the present worth costs for solvent extraction is lower than on-site incineration, $7.8 million versus $10.0 million, respectively.

While the solidification/containment alternative is cheaper than the contingency source control alternative (solvent extraction), it does not provide the same degree of short-and long-term effectiveness and permanence. EPA has determined that significant uncertainties are associated with the long-term effectiveness of alternative 6(b), solidification/stabilization with on-site disposal in a landfill constructed in the golf course. In particular, this alternative would require construction of a new landfill in a golf course where public accessibility would be significant. As stated above, the selected source control alternative (solvent extraction/off-site incineration) is less expensive than the only other equally effective treatment alternative (on-site incineration). Thus, assuming the selected remedy would not be implementable, the selection of solvent extraction as the contingency source control alternative for sediment/soils is cost-effective.

COMMENT 3: A resident commented that no fish live on the site, and that the only aquatic organisms present on-site are microscopic.

RESPONSE - Table 2-3 of the RI, lists fauna observed at Middle Marsh and the immediate vicinity. Among those listed are the following aquatic organisms: bull frog, green frog, northern leopard frog and crayfish.

A qualitative benthic invertebrate survey was conducted on September 20, 1990 in submerged areas on each side of the unnamed stream in Middle Marsh at the sixteen locations (B1 to B16) indicated in Figure 4-1 of the RI. At each location, samples were collected with a dip net by agitating the water just above the sediment. Invertebrate species were identified to the lowest practical taxa. The results of sampling at each station, is listed in Table 4-3 of the RI. Obligate aquatic organisms identified included: amphipods, freshwater clams (Sphaeriidae), isopods, Alderfly larvae (*Sialus sp.*), Cranefly larvae (*Tipula sp.*), midge larvae (Chironomids), tadpoles and leeches (Hirudinea).

Finally, during field investigations, Metcalf and Eddy personnel observed fish in the unnamed stream within portions of Middle Marsh. Because of the connection between the stream, and its tributary and surrounding areas within the northwest portion of Middle Marsh, EPA has determined that fish may also inhabit the aquatic area within Middle Marsh, as designated in Figure 4-2 of the RI.

All of the organisms identified above are of suitable size and should not be described as microscopic.

***COMMENT 4:*** A resident commented that golfers would not venture into the marsh to retrieve golf balls, but that children have done so in the past.

RESPONSE - Under current and future land use conditions, the Middle Marsh and golf course areas would be expected to be frequented by golfers and maintenance workers who may contact contaminated surficial sediment/soils and surface water during activities such as golfing and landscaping. An adult was evaluated as a reasonable worst case since exposure to this age group over a thirty year period will be more significant than exposure to older children over a much shorter period (e.g., ten years or less).

As indicated in Tables 5-31 and 5-35 of the RI, total excess lifetime carcinogenic risks evaluated to reflect present and potential future exposure for the contaminants of concern in Middle

Marsh and the golf course/Adjacent Wetland areas corresponding to the average and the reasonable maximum exposure scenarios fall within EPA's acceptable risk range of $10^{-4}$ to $10^{-6}$. In addition, total non-carcinogenic risks evaluated to reflect present and potential future exposure for the contaminants of concern in Middle Marsh and the golf course/Adjacent Wetland areas corresponding to the average and the reasonable maximum exposure scenarios are less than EPA's benchmark for a hazard index of one. Therefore, EPA has determined that, based on the exposure assumptions described above, human exposure to site contaminants in Middle Marsh and the Adjacent Wetland through the current and future pathways outlined above would not result in significant increases in carcinogenic risk. EPA has further determined that there are no significant risks to human health posed by exposure to noncarcinogenic contaminants in Middle Marsh and the golf course/adjacent wetland areas. Based on the above calculations, it can be further determined that there would be no significant increases in carcinogenic risk to an older child through infrequent exposure. However, exposure of children to contamination at any levels should be minimized to the extent possible.

As part of security measures to be implemented in the golf course, signs will be posted to discourage contact with contaminated sediment/soils, as a warning to older children as well as golfers. Finally, institutional controls shall be implemented to ensure the continuing use of the Middle Marsh Operable Unit as a recreation/conservation area and to prevent residential development of the area which may result in more frequent exposure than the assumptions used to calculate human health risks as identified in the ROD.

*COMMENT 5:* A resident commented that homes would never be built on the golf course due to the value of the course as a community recreational facility.

<u>RESPONSE</u> - EPA based its assessment of future human health exposure parameters on the assumption that Middle Marsh and the Adjacent Wetland would continue to be used for a golf course or other recreation, and not for residences (e.g. housing developments). This assumption is based on the stated intention of the City of New Bedford to change the zoning of the site from residential to recreation/conservation of Middle Marsh and the fact that because the Middle Marsh study area is primarily in a wetland, future development of Middle Marsh and the adjacent wetland is highly unlikely.

EPA acknowledges your concurrence with the assumption made by EPA with respect to the recreation/conservation future land use of Middle Marsh and the Adjacent Wetland. As a component of the ROD, institutional controls shall be implemented to ensure the continuing use of the Middle Marsh Operable Unit as a recreation/conservation area and to prevent residential development of the area.

*COMMENT 6:* A resident commented that he does not want the sediment and soils from the Middle Marsh cleanup to be placed under the Sullivan's Ledge Disposal Area cap.

<u>RESPONSE</u> - EPA has determined that the selected remedy provides the best balance of trade-offs among the alternatives. The selected remedy would be protective of human health and the environment by reducing contaminant levels to meet cleanup levels. Given the low levels of PCBs detected in sediment/soils (less than 50 ppm) and the fact that the Sullivan's Ledge Disposal Area would be capped as part of the remedy for the First Operable Unit, EPA has determined that, for the Middle Marsh Operable Unit, treatment is impracticable. Excavation, dewatering and disposal of sediment/soils in the RCRA engineered landfill to be constructed at the Disposal Area provides the best balance of all alternatives

considering short- and long-term effectiveness and cost. Of all the action alternatives, excavation and capping would be the most easily implementable as it would not require use of specialized units with sometimes limited availability. The placement of excavated sediment/soils under the cap to be constructed over the Disposal Area would not significantly increase the volume of contaminated materials as would solidification alternatives but would significantly reduce the mobility of hazardous substances through engineering and institutional controls.

The No Action alternative was eliminated from consideration as a recommended alternative because it would not be protective of the environment and would not attain ARARs.

*COMMENT 7:* A resident stated that the proposed cleanup of Middle Marsh would not be effective in the long-term because the contaminated groundwater flowing from the Disposal Area would continue to contaminate the Middle Marsh area.

RESPONSE - The selected and contingency remedies address contaminated sediment/soils in Middle Marsh and the adjacent wetland by requiring excavation of sediment/soils with PCBs in excess of sediment/soil cleanup levels. These remedies contain source control components and do not include any remedial components which address the groundwater contamination at the Site.

U.S. EPA Region I issued a Record of Decision (ROD) for the First Operable Unit on June 29, 1989 which outlined remedial action for the Disposal Area and included management of migration components to address the groundwater contamination at the Disposal Area. As described in the June 29,1989 ROD, the selected remedy included construction and operation of groundwater passive and active collection, extraction, treatment and discharge systems to intercept and minimize further migration of contaminated groundwater to the golf course.

There is no data which indicates that the groundwater contamination, which originates at the Disposal Area, has migrated to the Middle Marsh area. Furthermore, as discussed above, implementation of remedial activities as specified for the First Operable Unit should mitigate the potential for contaminated groundwater to migrate from the Disposal Area to downgradient areas including Middle Marsh.

***COMMENT 8:*** A resident stated that the public hearing and the proposed plan should have been advertised more aggressively.

RESPONSE - EPA conducted community relations activities at the site in accordance with Section 300.430(f)(3) of the NCP. In particular, on May 29, 1991, EPA held an informational meeting at the Day's Inn, New Bedford to describe the results of the Middle Marsh Remedial Investigation, the cleanup alternatives presented in the Feasibility Study and to present the Agency's Proposed Plan. On May 30, 1991, EPA made the administrative record available for public review at EPA's offices in Boston and at the New Bedford Free Public Library. EPA published a notice and brief analysis of the Proposed Plan in the New Bedford Standard Times on May 24, 1991 and made the plan available to the public at the New Bedford Free Public Library. From May 30, 1991 to July 31, 1991, the Agency held a sixty-three day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public. On June 26, 1991, the Agency held a public hearing to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting and the comments and the Agency's response to comments are included herein.

A complete list of community activities conducted at the Sullivan's Ledge Site is included in Section III. of the ROD and in Attachment A to this responsiveness summary.

COMMENT 9: A representative of the golfers who use the course surrounding Middle Marsh stated that a majority of the golfers believe that a no action alternative is the most appropriate remedy for the site because of the possibility that contaminated groundwater may continue to contaminate the site for an indefinite period of time, and thus thwart the goals of the cleanup proposed by EPA. A petition to this effect with 76 signatures was received by EPA.

RESPONSE - The rationale on why the selected and contingency remedies were chosen over the No Action alternative is discussed in EPA response to comment 1 in Section A.3. below.

Refer to EPA response to Comment 7 above for explanation of the interaction of the groundwater remediation component, as specified in the 1989 ROD for the First Operable Unit, with the selected remedy for the Middle Marsh Operable Unit.

*COMMENT 10:* A resident asked why the State's standard for the protection of human health for the site is different from that used by EPA.

RESPONSE - The Massachusetts Contingency Plan establishes requirements and procedures to be followed by the Commonwealth to assess releases and threats of releases of hazardous materials. 310 CMR 40.545(3)(g)(3)(b) of the Massachusetts Contingency Plan specifies that if hazardous materials are likely to be transported to exposure points through more than one medium, the risk of harm to health shall be characterized by comparing current and reasonably foreseeable exposure point concentrations and the estimated frequency and duration of exposure to each hazardous material to estimate total site cancer risks. Under these procedures, total site cancer risks is compared to a total site cancer risk limit of one in one hundred thousand.

Under the NCP, acceptable exposure levels calculated by EPA are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between one in one ten thousand and one in one million using information between dose and response. This approach differs from the Commonwealth's in that generally, risks are evaluated separately for each medium and not added up as a total site risk. Based on the differences in these approaches, cleanup levels calculated in accordance with the MCP, and with NCP may or may not be more stringent, depending upon site-specific factors including exposure points.

*COMMENT 11:* A resident asked whether fencing the contaminated areas would be the simplest remedy for the Middle Marsh Study Area, and if so, why could fencing not be the cleanup remedy chosen for the Middle Marsh Operable Unit. This resident argued that the uncertainties regarding the transport of contaminants to the marsh and the effectiveness of EPA's proposed remedy indicate that a simpler and less expensive remedy is most appropriate for the site.

<u>RESPONSE</u> - Limited No Action which would include fencing contaminated areas in the Middle Marsh study area was not chosen as the selected or contingency remedy for the reasons outlined in EPA response to Comment 1 in Section A.3. below.

EPA did consider the factors of long-term effectiveness and cost in the selection process and concluded that both the selected and contingency remedies represent the best balance of those criteria, as described in Section 11.C. of the ROD, and described in response to Comment 2 above.

*COMMENT 12:* A resident noted that one of the quarry pits at the Disposal Area was approximately 300 feet deep. He stated his belief that there is no existing technology that can extract the contaminated water from the pits in the Disposal Area, and that the most EPA can do is prevent the contamination from becoming worse.

RESPONSE - As described in EPA response to Comment 7 above, U.S. EPA Region I issued a Record of Decision (ROD) for the First Operable Unit on June 29, 1989 which outlined remedial action for the Disposal Area and included management of migration components to address the groundwater contamination at the Disposal Area. As described in the June 29,1989 ROD, the selected remedy included construction and operation of groundwater passive and active collection, extraction, treatment and discharge systems to intercept and minimize further migration of contaminated groundwater to the golf course.

The selected and contingency remedy for the Middle Marsh Operable Unit does not address such groundwater contamination at the Disposal Area because it will be addressed as part of remedial action taken at the First Operable Unit.

EPA agrees with your statement that no existing technology can extract the contaminated water from the pits in the Disposal Area. For this reason, as part of the 1989 ROD for the First Operable Unit, EPA determined that compliance with the requirements of certain groundwater ARARs is technically impracticable and waived compliance with such ARARs,including maximum contaminant levels promulgated under the Safe Drinking Water Act.

*COMMENT 13:* A resident commented that samples he has taken from the Apponagansett Swamp show very high levels of PCBs, and therefore he believes that the PCBs in the Middle Marsh Study Area did not originate in the Disposal Area.

<u>RESPONSE</u> - EPA has determined that elevated PCB concentrations in Middle Marsh and the Adjacent Wetland have been detected as a result of the transport of contaminated soils from the Disposal Area, as described in EPA response to Comment 8 in Section C.1. below.

2. The comments from Dr. Philip Gidley given in writing are summarized below along with EPA responses.

COMMENT 1: This hazard is greatly exaggerated, not nearly as hazardous as the continuing use of golf course pesticides.

<u>Response</u> - As described in Section VI. of the RI, EPA has determined that actual or threatened releases of hazardous substances from contaminated sediments in Middle Marsh and the adjacent wetland, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to biota through aquatic and wetland/terrestrial pathways.

In summary, the application of site-specific tissue data and bioaccumulation factors to the food chain pathway model, reveals several areas in Middle Marsh and the adjacent wetland approximately 1.9 total acres that exceed levels derived to protect mink (see Figure 9 of the ROD). PCB concentrations at sampling locations ME22, ME38 and SL56 of 28, 32 and 34 mg/kg PCB , respectively exceed calculated protective levels for carnivorous birds. In addition, PCB concentrations at sampling locations ME38 of 32 mg/kg PCB, and SL56 of 34 mg/kg PCB exceed calculated protective levels for insectivorous birds.

EPA has further determined that there are no significant risks to human health posed by exposure to carcinogenic and noncarcinogenic contaminants in Middle Marsh and the adjacent wetland.

It is important to note that pesticides were detected in only four surface samples from thirty (30) stations in Middle Marsh. The pesticides detected were 4,4'-DDE, 4,4'-DDT, and 4,4'-DDD and were found at levels only slightly above detection limits with concentrations ranging from 0.13 mg/kg to 0.590 mg/kg. In the Adjacent Wetland, 4,4-DDD was found at Station SL54 at 0.009 mg/kg. No other pesticides were found at levels above detection limits in the Adjacent Wetland. Pesticides were not found on the golf course. Since 4,4'-DDD and 4,4'-DDT were found in only two samples collected under the Phase I RI, these detections of pesticides are not likely related to the Disposal Area. Furthermore, pesticides were not detected in water samples and in plant samples taken from Middle Marsh.

For the reasons stated above, pesticides were not selected as contaminants of concern at the Middle Marsh Operable Unit, and were not considered to pose a significant risk to human health.

**COMMENT 2:** A sediment trap should have been installed as early as 1981 to trap PCBs. Had this trap been installed early, there would have been substantially no contamination in the so-called Middle Marsh.

<u>Response</u> - EPA conducted an air monitoring program of the Greater New Bedford Area in 1982 and installed groundwater monitoring wells around the Sullivan's Ledge site in 1983. Based, in part, on the

results of these studies, the Sullivan's Ledge site was included on the National Priorities list in September 1984, making it eligible for superfund monies. In September 1984, EPA issued the owner of the site, the City of New Bedford, an Administrative Order under Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). In compliance with this Order, the City of New Bedford in 1984 secured the Disposal Area by installing a perimeter fence and posted signs warning against unauthorized trespassing of the site.

The perimeter fence described above was constructed to prevent exposure to the principal threats posed by the site. Although it is true that early intervention by installation of sedimentation traps may have somewhat mitigated transport of PCBs to downstream areas, EPA determined that since access to the principal threat in the short-term had been minimized through construction of the fence, the threat of release and risk associated with such releases would be addressed by the RI/FS to be conducted at the site.

Finally, significant deposition of sediment over the banks of the unnamed stream was observed by Metcalf and Eddy staff in Middle Marsh during a storm event, especially in the most upgradient areas of Middle Marsh. Therefore, the use of sedimentation basins as early as 1981 may have lessened but would not have completely prevented the contamination of Middle Marsh.

**COMMENT 3: The EPA Fact Sheet of April 1991 greatly exaggerates the ecological exposure risk by its highly theoretical premise of bioaccumulation in the food chain and fails to put this theoretical risk in its actual perspective.**

<u>Response</u> - The food chain model is a conceptual model used to represent the trophic levels between the species expected to be present in Middle Marsh. However, only site-specific tissue data

was used to develop bioaccumulation factors for small mammals, earthworms and frogs, indicator species used in the model. These site-specific factors were used in the model to evaluate the effects of contamination on environmental receptors.

As stated in the "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA", the objective of the RI/FS process is not the unobtainable goal of removing all uncertainty, but rather to gather information sufficient to support an informed risk management decision regarding which remedy appears to be most appropriate for a given site. EPA believes that the information provided by the RI/FS, including the results of the site-specific biological study and the use of the food chain model, is not highly theoretical but is sufficient to base the remedy selection for the Middle Marsh Operable Unit.

See EPA responses to Comments 10 and 14 in Section C.1. below for descriptions of how EPA calculated cleanup levels.

COMMENT 4: Vegetation absorbs very small amounts of PCB.

Response - EPA agrees with your comment that, for this site, the vegetation absorbed very small amount of PCBs. In particular, plant samples were collected at seven sampling locations in Middle Marsh. The results of the analysis of the grass seed heads (Phaloris arundinacea), and the multiflora rose hips (Rosa multiflora) indicates that no pesticides or PCBs were detected.

COMMENT 5: Malathion spraying for mosquitoes in Southeastern Massachusetts presents a much greater hazard to insects, frogs and birds.

Response - See response to comment 1 in Section A.2. above.

**COMMENT 6:** None of the aquatic organisms or animals cited in the Middle Marsh are in the human food chain.

Response - Consumption of aquatic or terrestrial organisms by humans was not considered a complete exposure pathway and therefore was not evaluated in the human health risk assessment for the Middle Marsh Operable Unit. The food chain model was developed to represent the trophic relationships between the species expected to be present in Middle Marsh and to evaluate the effects of contamination on environmental receptors.

Whether or not a species is in the human food chain is not a criterion for selecting it as an indicator species for evaluation in the ecological risk assessment. For the Middle Marsh Operable Unit, species selected for the food chain model were based on observed abundance at the site, presence of suitable habitat for the species, and likelihood of exposure. Specifically, the use of mink as an indicator species, a species known to be sensitive to PCBs, is consistent with EPA guidance. As stated in the guidance, ecologists will often use professional judgement to select a particular organism as an indicator species, that is, a species thought to be representative of the well-being and reproductive success of other species in a particular habitat. Indicator species may also be chosen because it is known to be particularly sensitive to pollutants or other environmental changes.

**COMMENT 7:** The animals are much more endangered by golf course pesticides and run-off.

Response - Pesticides were not selected as contaminants of concern, as described in response to comment 1 in Section A.2. above.

EPA found no sources of significant urban runoff other than the unnamed stream and does not believe that the heavy metals found in the interior areas of Middle Marsh have their source in areas other than Sullivan's Ledge and the urbanized drainage area. Due to the low water concentrations, heavy metals have not been evaluated as a hazard to site biota.

EPA believes that the exposure to PCB-contaminated sediments in Middle Marsh and the adjacent wetland present an unacceptable risk to biota exposed to such contaminants. EPA has determined that the source of elevated PCB concentrations in Middle Marsh and the adjacent wetland, is the Sullivan's Ledge Disposal Area (see Comment 8, Section C.1. below).

COMMENT 8: Given the low solubility of PCBs in water, the brevity of contact and small amount of solute involved, it is practically inconceivable that skin absorption could result from retrieving a wet golf ball.

Response - Assumptions regarding contact with surface water were conservatively made in order to protect maintenance workers or other individuals who spend a day retrieving golf balls from the marsh and are consistent with Region 1 risk assessment guidelines. Given the assumptions for surface water exposure used in the risk assessment and the contaminant concentrations in surface water, EPA has determined that there are no significant risks to human health posed by exposure to contaminants in surface water in Middle Marsh and the golf course/Adjacent Wetland.

COMMENT 9: The risk to golfers from golf course pesticides is far greater.

Response - See response to comment 1 in Section A.2. above.

**COMMENT 10:** The accidental ingestion of contaminated soil and sediment by golfers cited by EPA is an extraordinarily remote possibility.

Response - EPA believes that the exposure assumptions used in the human health risk assessment are reasonable given the present and future land use of the Middle Marsh Operable Unit and are consistent with Region 1 risk assessment guidance. In particular, under current land-use conditions, the Middle Marsh and golf course areas would be expected to be frequented by golfers, maintenance workers and older children who reside in the vicinity of the site. These receptors can contact contaminated surface sediment/soil during activities during activities such as golfing, working and playing.

The most significant exposure pathway for the areas of concern involve direct contact with surface sediment/soil. This is because surface sediment/soil will most likely be contacted during recreational or work activities, and the majority of the chemicals of concern were measured at the highest concentrations in surface sediment/soil.

3. The comments from the City of New Bedford given at the public hearing and in writing are summarized below along with EPA responses.

*COMMENT 1:* The City of New Bedford stated that a no action or limited action remedy should be implemented instead of EPA's Preferred Alternative. The limited action should include: (1) institutional controls including zoning restrictions, deed restrictions, and access restrictions; (2) fencing and or vegetative barriers to human access at Middle Marsh; (3) "increased remediation" of the southern portion of the unnamed stream located south of Hathaway Road during implementation of the First Operable Unit at the site.

RESPONSE - The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), requires EPA to ensure the protection of the environment in (1) selection of remedial alternatives and (2) assessment of the degree of cleanup necessary. Several sections of CERCLA make reference to protection of health and the environment as parts of a whole. Section 105(a)(2) calls for methods to evaluate and remedy "any releases or threats of releases ... which pose substantial danger to the public health or the environment." Section 121(b)(1) requires selection of remedial actions that are "protective of human health and the environment." Section 121(c) calls for "assurance that human health and the environment continue to be protected." Finally, Section 121(d) directs EPA to attain a degree of cleanup "which assures protection of human health and the environment."

Like CERCLA, the NCP refers throughout to health and environment as aspects of the evaluation and remediation processes. For example, in discussing the baseline risk assessment in a Remedial Investigation, the purpose is defined as determining "whether the site poses a current or potential risk to human health and the environment in the absence of any remedial action." The exposure assessment in the RI "is conducted to identify the magnitude of actual or potential human or environmental exposures..." The toxicity assessment "considers ... the types of adverse health or potential environmental effects associated with chemical exposures." In addition, the NCP states that "Superfund remedies will .... be protective of environmental organisms and ecosystems." The NCP further states that if, after the remedial action is completed, any hazardous substances remain on a site "above levels that allow for unlimited use and unrestricted exposure for human and environmental receptors", the lead Agency shall review the remedial action every five years to ensure that the environment continues to be protected.

Finally, the decision to select a cleanup goal based on the protection of environmental receptors exposed to site contaminants is consistent with recommendations listed by the Science Advisory Board in September 1990. In particular, the September 1990 document titled Reducing Risk: Setting Priorities and Strategies for Environmental Protection provided a recommendation that EPA should attach as much importance to reducing ecological risk as it does to reducing human health risk. The document further describes that productive natural ecosystems are essential to human health and to sustainable, long-term economic growth, and are intrinsically valuable in their own right.

The No Action alternative was not chosen as the selected or contingency remedy because it would not be protective of the environment and would not attain ARARs. Specifically, EPA has determined that actual or threatened releases of hazardous substances from contaminated sediments in Middle Marsh and the adjacent wetland, if not addressed by implementing the response actions selected in this ROD, would present an imminent and substantial endangerment to biota through aquatic and wetland/terrestrial pathways. Under the No Action alternative, biota that inhabit the Middle Marsh study area would continue to be exposed to PCBs at levels that would result in adverse impacts to animals and aquatic organisms. For the Middle Marsh Operable Unit, EPA has determined that excavation of sediment/soils with PCB concentrations exceeding cleanup levels specified in the ROD is the only practicable alternative that would be protective of the biota while minimizing adverse impact on the terrestrial and aquatic ecosystem.

Finally, the No Action alternative would not comply with the chemical-specific ARARs for surface water, federal Ambient Water

Quality Criteria. In addition, the No Action alternative may not meet the requirements of Executive Order 11990 which requires EPA to minimize the degradation of wetlands and to preserve and enhance the beneficial uses of the wetlands.

A limited action alternative which would include fencing and monitoring was not chosen as the selected or contingency remedy for the same reasons discussed above for the No Action alternative.

*COMMENT 2:* It is the view of the City of New Bedford that the cleanup effort would have a more damaging impact on the species of concern and other species inhabiting the Site than would the long-term affects of any PCB contamination. The repopulation of Middle Marsh by these species would take years and may not ever occur,

Response - A variety of mitigating measures shall be implemented during and after remedial action including protection of sensitive species, erosion control and turbidity control. Excavation, backfilling and other remedial activities shall be conducted such that the disturbance of the Spotted Turtle, a Massachusetts species of special concern known to occupy Middle Marsh is minimized. In addition, prior to initiation of remedial activities, further investigations will be performed to identify areas where the Mystic Valley Amphipods may be inhabiting. Based on the results of such an investigation, measures shall be planned and implemented to minimize adverse impacts of remedial activities, including wetlands restoration, on the Mystic Valley Amphipods.

EPA will determine when excavation activities should be performed by evaluating public access, weather conditions, stream flow, scheduling constraints and the impacts of construction activities on the state species of concern.

EPA does not believe that the remedial actions selected in the ROD will devastate Middle Marsh or its associated wildlife, including the Massachusetts species of concern, as described in EPA responses to Comments 25 and 26 of Section C.1. below.

COMMENT 3: The proposed cleanup would increase the risk of resuspension and redistribution of the contamination to other parts of the site, the golf course, Hathaway Road, and the Apponagansett Swamp.

Response - Excavation and ancillary activities to be performed as part of the selected remedy will be implemented in a manner that mitigates any contaminant migration downstream. The method of isolating contaminated sediment/soils will be determined during design of the selected remedy, considering the need to mitigate wetland impacts.

Because the areas to be excavated are wetlands, excavation and associated activities will be performed to minimize adverse impacts to wetland areas. EPA has determined that, for this operable unit, there are no practicable alternatives to the site preparation and sediment/soil excavation components of the selected remedy, that would achieve site goals but would have less adverse impacts on the aquatic ecosystem. Therefore, sedimentation basins and/or silt curtains will be installed downstream to capture any particles that may become suspended during excavation activities. During excavation and dewatering of PCB-contaminated sediments, downstream monitoring of surface water will be conducted to ensure that transport is not occurring as a result of the excavation. Excavated areas shall be isolated by means of erosion (e.g. sandbags, haybales or earthen dikes) and sedimentation control devices (i.e. sedimentation basins), and diversion structures.

COMMENT 4: Due to the mature vegetation in Middle Marsh, restoration of the marsh to state and federal standards may not be possible.

Response - The restoration program will be developed during design of the selected remedy to replace wetland functions and habitat areas. This program will identify the factors which are key to a successful restoration of the altered wetlands. The Wetlands Restoration Plan will evaluate utilizing the spotted turtle and the mystic valley amphipod as biological indicators to measure the success of restoration. Factors may include, but not necessarily be limited to, replacing and regrading hydric soils, provisions for hydraulic control and provisions for vegetative reestablishment, including transplanting, seeding or some combination thereof. Quality assurance measures shall include; (1) detailed topographic and vegetative surveys to ensure replication of proper surface elevations and vegetation; (2) engagement of a wetland replication specialist; (3) establishment of work area limits for equipment to prevent inadvertent placement of fill; (4) production of a reproducible base map and a detailed planting scheme; (5) photographic documentation.

EPA has determined that, for this Site, there are no practicable alternatives to the selected remedy that would achieve site goals but would have less adverse impacts on the aquatic ecosystem. Unless sediment/soils with contaminants greater than the target levels are excavated, the contaminants in the sediment/soils would continue to pose unacceptable environmental risks.

EPA believes that the remedial activities to be implemented at the site which will include steps to minimize the destruction, loss, or degradation of wetlands and to restore impacted wetlands, as described above, will comply with federal and state ARARs relating to wetlands, including the Executive Order 11990.

EPA believes that the Wetland Restoration Plan will meet all state and federal standards, as further described in EPA's response to Comment 27 in Section C.1. below and response to Comment 4 in Section C.3. below.

COMMENT 5: The City observed that the cleanup levels selected for the Middle Marsh Operable Unit are generally lower than the cleanup objectives proposed at the New Bedford Harbor Superfund Site.

RESPONSE - The cleanup levels established in the ROD are based on site-specific factors including total organic content, organic mat coverage, depths of overlying water and other sediment/soil characteristics. Total organic content is a particularly important parameter because it indicates the extent to which contaminants may be available for uptake by the biota.

Detailed physical, chemical and biological information was collected and evaluated for Middle Marsh to identify aquatic and wetland/terrestrial exposure pathways critical to the transfer of PCBs in Middle Marsh and the adjacent wetland. In particular, PCB tissue data of indigenous biota from the study area was evaluated to determine the extent to which accumulation of PCBs was occurring at the site. Conclusions drawn from evaluation of the information discussed above are pertinent only to the Middle Marsh Operable Unit. Cleanups levels derived to be protective at other sites may be significantly different from the levels established at this site because any number of factors may be different than those at the Middle Marsh Operable Unit.

This ROD does not attempt to establish ecological-risk based cleanup levels for PCBs to be achieved at all superfund sites. Both human health and ecological risk assessment must be performed at each site to determine endangerment to human health and the environment based on site-specific factors including receptors, exposure pathways and site characteristics.

The New Bedford Harbor Superfund Site is significantly different from Sullivan's Ledge because it is a saltwater environment with uniquely different sediment substrate, overlying water and environmental receptors. Therefore, it is expected that PCB cleanup levels established for the two sites would be different not the same.

COMMENT 6: The City argued that, since the potential for additional contaminants reaching the marsh cannot now be determined with reasonable certainty, EPA should wait and re-evaluate the site at a later date before spending the large sums of money proposed for the Middle Marsh cleanup.

RESPONSE - The remedial investigation and feasibility study (RI/FS) study process, as outlined in the "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" represents the methodology that the Superfund program has established for characterizing the nature and extent of risks posed by uncontrolled hazardous waste sites and for evaluating potential remedial options. The objective of the RI/FS process is to gather information sufficient to support an informed risk management decision regarding which remedy appears to be most appropriate for a given site.

The Sullivan's Ledge Superfund Site, including the Middle Marsh Operable Unit, has been the subject of Phase I (Ebasco, 1987) and Phase II (Ebasco, 1989a) remedial investigations and a feasibility study (Ebasco, 1989b) which was completed in January 1989. The remedial investigations reveal that PCBs and other contaminants have migrated from the Disposal Area to the unnamed stream and the wetlands just north of the Disposal Area, including Middle Marsh and the adjacent wetland. EPA concluded in June 1989 that additional studies of Middle Marsh and the adjacent wetland areas, including biological studies, would be necessary to: (1) determine with greater accuracy the nature and extent of contamination in the area; (2) compare the potential environmental impacts of conducting cleanup activities to the impacts of site contamination; and (3) further identify any potential risk to human health and the environment posed by the contamination. Thus the study and remediation of Middle Marsh and the adjacent wetland areas was separated into a second operable unit, called the Middle Marsh Operable Unit. The "Remedial Investigation - Additional Studies of Middle Marsh" was completed in April 1991 and the "Feasibility Study of Middle Marsh" was completed in May 1991.

EPA believes that results derived from the completion of the studies described above are conclusive and consistent with CERCLA, the NCP and the "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA". In particular, the site-specific data derived from the ecological assessment indicates that biota that inhabit Middle Marsh and the Adjacent Wetland are at risk from exposure to PCB-contaminated sediment/soils. Therefore, based on available information on the presence of site contaminants, implementation of the selected remedy is warranted. In addition, all monitoring data and environmental conditions shall be formally reviewed and evaluated during the operation of the remedy to ensure that appropriate response objectives are achieved.

As required by law, EPA will also review the Middle Marsh Operable Unit at least once every five years after the initiation of remedial action at the Middle Marsh Operable Unit if any hazardous substances, pollutants or contaminants remain at Middle Marsh or the Adjacent Wetland to assure that the remedial action continues to protect human health and the environment. EPA will also evaluate risk posed by the Middle Marsh Operable Unit at the completion of the remedial action (i.e., before the Site is proposed for deletion from the NPL). Future remedial action will be considered if the environmental monitoring program determines that unacceptable risks to human health and/or the environment are posed by exposure to site contaminants.

Refer to EPA response to Comment 7, Section A.1 above, for explanation of the interaction of the groundwater remediation component, as specified in the 1989 ROD for the First Operable Unit, with the selected remedy for the Middle Marsh Operable Unit.

*COMMENT 7:* The City stated that the Middle Marsh area does not contain suitable habitat for the spotted turtle, but that the spotted turtle lives in the Apponagansett Swamp.

RESPONSE - As described in Chapter 2 of the RI, the spotted turtle is found in small, shallow water bodies, frequently basking along the water's edge. It is omnivorous, consuming insects, other invertebrates, and aquatic plants underwater. During the 8 and 9 May 1990 field investigation, spotted turtles were observed in Middle Marsh in the northern part of the scrub-shrub wetland area about 500 feet from the Unnamed Stream.

## B. State Comments

The Massachusetts Department of Environmental Protection provided oral comments at the public hearing through Helen Waldorf. The State did not submit any written comments during the public comment period. The State's oral comments are summarized below.

*COMMENT 1:* A representative from the Massachusetts Department of Environmental Protection stated that a no action remedy as recommended by other commentors would not meet the State standards for protection of human health, and therefore the State would not concur with such a remedy. The State representative noted that the

State's standards for protection of human health are more stringent than those used by EPA. The State representative explained that, although EPA was requiring the cleanup of Middle Marsh for the protection of the environment, the State's standards would require the cleanup for the protection of human health.

RESPONSE - EPA acknowledges the Commonwealth's concurrence with the selected and contingency remedies for the Middle Marsh Operable Unit and its decision not to support the No Action alternative. The Commonwealth of Massachusetts/Department of Environmental Protection based its decision on review of the Remedial Investigation, Risk Assessment and Feasibility Study in order to determine if the selected remedy and the contingency remedy would be in compliance with applicable or relevant and appropriate State Environmental laws and regulations. A copy of the declaration of concurrence is attached as Appendix C to the ROD.

## C. Comments from Potentially Responsible Parties

Written comments from PRPs, except for the City of New Bedford, are summarized below. Responses to comments received from the City of New Bedford are listed in Section A.3. above.

C. **POTENTIALLY RESPONSIBLE PARTY COMMENTS**

1. **Comments from GEI Consultants, Inc. on Behalf of Acushnet Company, et al.**

COMMENT 1: Use of maximum exposure estimates in calculating the human health risk are inappropriate and are inconsistent with Superfund guidance. GEI advocated use of average exposure estimates.

Response - The Human Health Risk Assessment conducted for the Middle Marsh Operable Unit used a single set of exposure parameters with both mean and maximum concentrations for the chemicals of concern. It is Region I's opinion that a characterization of an average and a reasonable maximum exposure, as performed at Sullivan's Ledge, is advisable and is consistent with the NCP and EPA risk assessment guidance. As defined in the preamble to the NCP, EPA defines "reasonable maximum" so that potential exposures that are likely to occur will be included in the assessment of exposures.

While the NCP and the Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (RAGS 1989) calls for an evaluation of a "reasonable maximum exposure", the Region I Supplemental Risk Assessment Guidance for the Superfund Program calls for a dual analysis, part of which includes the equivalent of the "reasonable maximum exposure" referred by Region I in the guidance manual as a "reasonable worst-case" exposure. While the maximum detected concentrations are called for by the Region as part of the "reasonable worst-case" exposure, other parameters that fit into the exposure equation (e.g. frequency of exposure) are not necessarily at the maximum possible values and thus the Region believes the approach taken at this site to estimate risk is consistent with the intent of the NCP and the EPA RAGS Guidance:

> "For Superfund exposure assessments, intake variable values for a given pathway should be selected so that the estimate is the reasonable maximum exposure for that pathway. As defined previously, the reasonable maximum exposure (RME) is the maximum exposure that is reasonably expected to occur at a site. Under this approach, some intake variables may not be at their individual maximum values but when in combination with other variables will result in estimates of the RME." (RAGS 1989 pg.6-19).

Consequently, reliance on a maximum concentration as input into the exposure estimates as was done at Sullivan's Ledge in the RI (Metcalf and Eddy, 1991a) results in an exposure estimate that is consistent with the most recent Risk Assessment Guidance for Superfund (RAGS).

**COMMENT 2:** The human health risk assessment inappropriately relies on PCB data from both the 1989 and 1991 Remedial Investigations for Middle Marsh and therefore overestimates the maximum risks.

Response - EPA's incorporation of the data from the 1989 Remedial Investigation (RI) (Ebasco 1989) and the 1991 RI was appropriate. The hot spot concentration of 60 mg/kg identified during the 1989 study was located near frequently used golf course areas; it is likely that further intensive sampling in this area would yield both higher and lower concentrations. The 1989 data were of sufficient quality for risk assessment. EPA does not believe that PCB concentrations have been reduced between the 1988 and 1990 sampling periods as PCBs continue to erode off the soils in the Disposal Area and continue to be disposed in the wetlands. For these reasons, EPA believes that risks are not overstated. A discussion of trends in PCB concentrations in Middle Marsh is presented in response to Comment No. 7.

**COMMENT 3:** Use of arithmetic averages of sampling data for several substances are unreliable; these averages likely do not reflect actual conditions.

Response - In calculating the arithmetic average, EPA excluded elevated detection limits in order to avoid biasing the mean, (i.e. overestimating or underestimating the average concentration). For example, a value measured at an elevated detection of <3 ppm may have a true value anywhere from 0 to 2.9 ppm. If the true value was on the high end (close to 2.9 ppm) then, use of this data point at one-half the detection limit would be an underestimation of the true value. Alternatively, if the true value was on the low side (close to 0 ppm) then, use of the data point at one-half the detection limit would be an overestimation of the true value. This possibility of over- and under-estimation of the true values is increased when evaluating use of data with high detection limits. In this case, the detection limits were relatively high, elevated above detection limits used for EPA's Contract Lab Program. For this reason, EPA believes that the decision to exclude data points at elevated detection limits was reasonable.

It is important to note that this approach was only used when the detection limits were at values greater than the contract lab required detection limits.

GEI assumes that "low concentrations" were necessarily omitted in the calculation of the arithmetic mean. However, as stated above, in those cases where there are elevated detection limits, it cannot be assumed that the chemical in question is necessarily present at a very low concentration; the chemical may be present at a concentration just below the elevated detection limit.

The data used in the risk assessment went through the contract laboratory program (CLP) data validation, and no rejected data were used in quantifying risk, including data generated from the analyses for PAHs. As stated in the Chapter 5 of the RI, some uncertainty exists regarding the identification of benzo(b)fluoranthene and benzo(k)fluoranthene. On occasion, the analytical method could not distinguish between these two isomers and the reported results represented the total concentration of these two compounds. When this occurred, the total concentration was divided in half and assigned to each isomer. Some questions regarding Aroclor identity also arose. The 26 PCB sediment/soil samples from Middle Marsh obtained from the Phase II Remedial Investigation (EBASCO 1989) underwent REM III laboratory analysis for Aroclor 1254 and 4 samples underwent CLP confirmatory analysis results for total PCBs. The data from both analyses were used, and the CLP results were assumed to represent Aroclor 1254. However, despite these data uncertainties, because of the way in which risk to these chemicals is estimated (total PAHs and PCBs) these data uncertainties and simplifying assumptions have no outcome on the risk assessment results.

COMMENT 4: Exposure frequencies for contaminants in the Middle Marsh are overestimated, and future land-use assumptions are inconsistent with the ecological risk assessment.

Response - EPA does not agree that the exposure frequencies used in the risk assessment were overestimates and that future land-use assumptions were inconsistent with the ecological risk assessment.

As stated in the preamble to the NCP:

> "In general, the baseline risk assessment will look at a future land use that is both reasonable, from land use development patterns, and may be associated with the highest risk, in order to be protective. These considerations will lead to the assumption of residential use as the future land use in many cases. The analysis for potential exposures under the future land use conditions is used to provide decision makers with an understanding of exposures that may potentially occur in the future."

EPA believes that the exposure frequencies for contaminants in Middle Marsh are not overestimated. Specifically, the exposure frequencies are not based on a future residential use (which would have resulted in much lower cleanup levels) but are based on the continuing use of the Middle Marsh area for recreation/conservation. Furthermore, an estimate of 56 days per year (a little more than once per week; or 2 days per week during the months of April to October) as a future exposure frequency is an estimate of exposure frequency that may potentially occur to golfers and maintenance workers in Middle Marsh. As stated in the RI, golfers and maintenance workers in Middle Marsh and the Adjacent Wetland may be in fairly constant contact with the PCB-contaminated sediments for the purposes of retrieving golf balls and maintaining the golf course. The human health risk assessment is not based on exposure to hikers and nature lovers.

It is certainly possible that portions of the marsh will be drier at some point in the future due to natural processes. EPA has reasonably assumed that such a condition could result in increased human contact with soil and sediment in the Middle Marsh area. EPA does not believe that a drier Middle Marsh would preclude the existence of the aquatic and wetland/terrestrial exposure pathways presented in the RI. The Unnamed Stream would still exist and could support mink and other species included in the ecological food chain model, such as small mammals. Therefore, EPA does not agree that its assumptions were inconsistent.

**COMMENT 5:** Assumed levels of exposure to contaminated soils and surface waters overestimate realistic human exposures.

Response - The soil ingestion rate of 100 mg/day for an adult human is standard EPA policy (OSWER Directive 9850.4). Based on a review of the available literature, EPA Headquarters determined that this value (100 mg/day) for an older child or adult corresponds to upper bound values on the amount of soil and indoor dust ingested by these age groups.

Assumptions regarding contact with surface water were conservatively made in order to protect maintenance workers or other individuals who could spend a day retrieving golf balls from the marsh. In actuality, this pathway was insignificant with respect to risk to human health.

**COMMENT 6:** The human health risk assessment for PAHs in the Supplemental Remedial Investigation (SRI) is based on unrealistic and inaccurate factors.

Response - The use of the benzo(a)pyrene cancer potency factor as a surrogate for all known and suspected carcinogenic polycyclicaromatic hydrocarbons (cPAHs) is consistent with current EPA guidance and operational procedures. It is done in the absence of EPA validated health criteria for other PAHs besides benzo(a)pyrene (B[a]P). The Carcinogen Assessment Group of EPA has not yet made a recommendation with respect to a Toxic Equivalency Factor (TEF) approach for PAHs which would apportion risk on a chemical by chemical basis relative to the potency of B[a]P and may not apply the B[a]P potency factor to all CPAHS. However, until such recommendations and/or guidance are finalized, it is not the policy of EPA Region I, at this time, to use the TEF approach for PAHs, including the application of the potencies listed by GEI in Table 1.

As stated in EPA Region I guidance, use of the carcinogenic potency factor of B[a]P for carcinogenic PAHs may result in overestimation of risk because B[a]P is considered to be one of the most potent of the carcinogenic PAHs, and B[a]P is likely to constitute only a fraction of the mixture of carcinogenic PAHs present at a site. On the other hand, other PAHs that are not routinely analyzed for at Superfund sites may be carcinogenic. Thus, this approach may not account for some carcinogenic PAH constituents because they haven't been identified or classified by EPA as having carcinogenic potential. Based on the above, EPA believes that, at this point in time, the carcinogenic potency factor derived specifically for B[a]P and used for numerous PAHs in the Middle Marsh Risk assessment is a reasonable approach in determining risks posed by exposure to total carcinogenic PAHs and is consistent with both regional and headquarters guidance.

**COMMENT 7:** The concentrations of PCBs measured in Middle Marsh are not high and have significantly decreased since the measurements reported in the 1989 Remedial Investigation report for Sullivan's Ledge site.

Response - EPA has concluded that PCB concentrations in Middle Marsh are high when compared to background levels and calculated cleanup levels for the protection of the environment. EPA has determined that actual or threatened releases of hazardous substances from contaminated sediments in Middle Marsh and the Adjacent Wetland, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to biota through aquatic and wetland/terrestrial pathways.

EPA does not agree that dramatic reductions in PCB concentrations have occurred in Middle Marsh. PCBs in the environment are generally resistant to physical and biological degradation and have a high affinity for organic material such as the sediment/soil in Middle Marsh. Sampling data from the RI (Metcalf & Eddy, 1991a) indicate that PCBs are present throughout the surface sediment/soil in most of Middle Marsh and the Adjacent Wetland and are present at concentrations near 10 mg/kg at depths of up to two feet, as shown at stations ME1, ME14, ME15, and SL38. In addition, at SL38, a PCB concentration of 97.0 mg/kg was found at a depth of 0.5 to 1.0 foot near the Unnamed Stream in the Adjacent Wetland, the highest PCB concentration detected in all studies associated with the Middle Marsh operable unit.

EPA has determined that the PCB concentrations downstream of Hathaway Road are due to long-term releases of contaminated soils from the Sullivan's Ledge Disposal Area. As shown by Ebasco (1987), soil PCB levels at the surface of the Disposal Area are 1000 ppm in areas near the Unnamed Stream. On numerous occasions such as during hydrologic monitoring performed for the Remedial Investigation, EPA's consultants observed flooding of Middle Marsh with extremely turbid water from the Unnamed Stream, ponding of floodwaters in Middle Marsh, and deposition of sediments in areas found to have the highest PCB concentrations. As long as these sediments and soils are uncontrolled, they will continue to act as a source of PCBs to downstream areas including Middle Marsh.

PCB concentrations have not decreased significantly since the 1989 Remedial Investigation. The 54 percent annual rate of reduction between 1988 and 1990 cited by GEI would have reduced PCBs in Middle Marsh to near zero over several years. The data show that this has not occurred. Additional statistical examination of surface PCB concentrations from the two data sets reveals that no statistical reduction in PCB concentrations has occurred. The 1988 samples averaged 9.26 mg/kg (n = 26) and the 1990 samples averaged 7.72 mg/kg (n = 30). A simple t-test reveals that there is a 95 percent chance that any difference in the means is due to chance alone. In addition, the Wilcoxon rank-sum test, which makes the effect of outliers less apparent, showed a high degree of similarity in the two data sets. The low degree of change with time in the results is demonstrated by simply removing the "hot spot" data of 20 mg/kg (ME1) and 60 mg/kg (MM-5) from the data sets. The new averages are practically identical; 7.24 and 7.29 for the 1990 and 1988 data, respectively.

The extent to which certain sets of sampling stations were paired is overstated by GEI. In the 1989 Remedial Investigation report (Ebasco, 1989), the approximate station locations were marked on Figure 5-3. EPA's consultant sampled the ME stations at locations near the previous MM stations based on this information and the recollections of EPA staff who assisted the consultant in selecting sampling stations. For other stations such as ME6 and ME15, it was noted in the comments column in Table 2-9 of the *RI* (Metcalf & Eddy, 1991a) that these were "close to" or "near" certain MM stations; however, it was not intended to duplicate the results of the previous sampling effort. Even if it were EPA's intention, it is practically impossible to sample the exact same location twice. Even if a sample location were duplicated, the sample results would likely vary widely. Potential reasons for such differences are discussed below.

The RI (Metcalf & Eddy, 1991a), on Page 3-16, discusses potential reasons for the variability in sampling results in Middle Marsh. Such factors would account for differences between years and even differences between samples collected near each other and include "slight differences in topography, hydrology or soil type" and the effects of storms which deposit and redistribute sediments. It is entirely possible that a large storm could cause substantial changes in the location of hot spots. This high variability would make it difficult to document any trends in maximum PCB concentrations in the wetland and to determine the persistence and extent of previously identified hot spots.

EPA does not believe that dissolution, volatilization, or biodegradation have caused significant reductions in PCB concentrations in the study area. The Aroclor found in Middle Marsh is Aroclor 1254, a highly chlorinated mixture of PCBs with little solubility in water (Mackay and Wolfkoff, 1973). In backup information presented by GEI, Yoakum & Associates (1989) stated that, "The transport and fate of PCBs in aquatic systems and their partitioning into different compartments of the environment depend to a large degree on sorption reaction. Generally, sorption increases with increase in chlorine content of the chlorobiphenyl, and with surface area and organic carbon content of the sorbent." TOC and grain size analysis have shown that the sediment in Middle Marsh has a very fine grain size and thus high surface area, and a very high organic content. Griffin and Chian (1980) indicate that the total solubility in water is approximately 70 $\mu g/l$. EPA's consultant generally found less than 1 $\mu g/l$ dissolved PCB in the pore water and surface water in Middle Marsh indicating that the PCB at this site is partitioned into the solid sediment matrix. While it is true that the lower chlorinated Aroclors have some solubility in water, the more toxic and readily bioaccumulated hexa- and hepta-chlorobiphenyls are common in Aroclor 1254 and do not dissolve readily in water.

Similarly, it is only the mono, di, tri, and a few tetra substituted isomers in Aroclor 1254 that have volatility. However, Aroclor 1254, the Aroclor found in Middle Marsh, has predominantly tetra, penta, hexa and other higher isomers that are much less volatile. Binding of PCBs to solids reduces the amount of PCB that volatilizes (Griffin et al., 1978). Reuter and Havelicek (1978) found that the amount of volatility from water depends on the humic acid condition and the Ph. Meng, et al. (undated) found 3.5 percent volatilization of PCB from water, 2.6 percent volatilization from water with humic acid, and 0.74 percent when in suspension with soil. Yoakum & Associates (1989) stated that "In environmental samples where PCBs are sorbed on soil or sediment surfaces, the rate of volatilization is greatly reduced and depends upon the sorption surface". Because the PCBs in Middle Marsh were deposited with sediment, the PCBs were already adsorbed to silty organic wetland soils which are high in humic acid, greatly reducing the volatility and solubility of the PCBs.

Further, EPA does not believe that significant biodegradation has occurred in Middle Marsh, as described in response to Comment 31. This is confirmed by examinations of several chromatograms from Middle Marsh which did not exhibit dechlorination.

Research performed in the New Bedford Harbor which indicates that volatilization is the most significant process occurring at that site (as described by GEI), cannot be directly applied to the Middle Operable Unit. As stated above, the degree to which PCBs volatilize is dependent upon the sorbent reaction and sediment characteristics such as surface area and organic carbon content. These variables may be significantly different from site to site, even within the same site. For example, TOC variability within the Middle Marsh area has indicated over a ten fold difference in the range of values. Furthermore, as stated by GEI, a substantial amount of PCB that entered the water column in the harbor subsequently volatilized to the atmosphere. However, as described above, less than 1 μg/l dissolved PCB was measured in the pore water and surface water in Middle Marsh indicating that the PCB at this site is primarily partitioned into the solid sediment matrix.

**COMMENT 8:** Not all elevated concentrations of contaminants appear to be originating from the Sullivan's Ledge Site.

<u>Response</u> - EPA has determined that the elevated PCB concentrations in Middle Marsh and the Adjacent Wetland, which are the subject of this ROD, have migrated from the Disposal Area. This was determined, in part, by comparison to background PCB concentrations from samples collected at stations ME8 and ME20 during the SRI and samples SL-SO-401 and SL-SO-402 (Ebasco, 1987) in which PCB concentrations ranged from 0.71 to 1.4 mg/kg. PCB concentrations at these levels could be the result of historical waste disposal activities at Sullivan's Ledge and perhaps trace amounts from airborne contaminants from Sullivan's Ledge or other sources including the New Bedford municipal landfill. The PCB concentrations in Middle Marsh and the Adjacent Wetland are significantly above these background levels and are, on average, an order of magnitude higher. Further, contamination patterns in these areas matched what would be expected if the source of contamination was from upstream areas (i.e., the Sullivan's Ledge Disposal Area) (Metcalf & Eddy, 1991a, Boucher et al, 1990).

GEI has mistakenly identified station SL-51 as a background station. Station SL-51 was not a background station and is not elevated on a golf tee but rather was located just a few feet from the Unnamed Stream, well within the 100-year flood area. Delineation of areas of various flooding frequencies was truncated in Figure 2-6 of the RI at the edge of the map in order to stay within the mapped area and the page border. Field observations from a site visit on August 8, 1990 confirmed that this area is subject to flooding during storms below the 100-year frequency and, therefore, PCB values detected at this station can be attributed to the transport of PCBs from the Sullivan's Ledge Disposal Area via the Unnamed Stream.

EPA found no sources of significant urban runoff other than the Unnamed Stream and does not believe that the heavy metals found in interior areas of Middle Marsh have their source in areas other than Sullivan's Ledge and the urbanized drainage area. In addition, it is very unlikely that elevated PCB concentrations are due solely to urban runoff sources and are not associated with a source of PCBs such as the Sullivan's Ledge Disposal Area. EPA believes based on field observations and the results of hydraulic modeling presented on Figure 2-6 of the RI (Metcalf & Eddy, 1991a), that these pockets of elevated lead concentrations have formed in depositional areas and that concentrations are slightly less in areas near the stream due to higher water velocities. A similar pattern was observed for PCBs as shown in Figures 3-1 and 3-4 in the RI (Metcalf & Eddy, 1991a).

**COMMENT 9:** EPA's withdrawal of the original "no action" remedy appears to have been based on an erroneous comment, the contents of which were not even addressed in the SRI.

- The Carr memo incorrectly infers that statistical probabilities relating to the Sediment Quality Criterion (SQC) correspond to probabilities of harm to benthic organisms

- The SQC for PCBs is designed to protect mink, not benthic organisms

Response - GEI has mischaracterized the history of EPA's consideration of remedial approaches for the Middle Marsh Operable Unit. EPA had never made a final determination on a "no action" remedy. In February, 1989, as part of a site-wide remedy, EPA proposed a no action alternative for Middle Marsh. In the 1989 Proposed Plan, EPA noted that two other action alternatives were still under consideration. EPA specifically sought public comments on how to achieve a protective remedy for the Middle Marsh area, particularly in balancing the need to remove contaminants from the Marsh and the need to protect a functioning, valuable wetland from temporary disruption. At the end of the public comment period, based in part on comments received over the previous year and in part on further consideration within EPA of the issues, in its 1989 decision, EPA decided that further data was needed, particularly site-specific data on bioaccumulation and a more complete understanding of the aquatic and terrestrial organisms in the Marsh ecosystems. EPA now has this data. Based on these more comprehensive studies, EPA has enough information to make a reasoned careful decision that is consistent with CERCLA, the NCP and EPA's guidance.

EPA decided to re-assess its decision to select the no action alternative as the preferred alternative in part because of concerns raised by federal and state agencies over potential long-term impacts to trustee species and other resources. The U.S. Department of Interior (DOI) and the Massachusetts Department of Environmental Protection raised concerns that if the PCB-contaminated sediments in Middle Marsh are not excavated, they may continue to pose a long-term threat to a variety of aquatic and terrestrial organisms that inhabit the Middle Marsh area. The additional studies conducted during the RI (Metcalf & Eddy, 1991a) showed that PCBs in Middle Marsh pose an unacceptable risk to site biota and EPA has determined that in order to be protective of the environment, contaminated sediment/soils must be excavated.

Sediment quality criteria (SQC) are designed to ensure that benthic organisms are not exposed to bioavailable concentrations of chemicals greater than what is currently allowed by existing water quality criteria. In the case of PCBs, EPA has determined that, for Middle Marsh, the appropriate water quality criterion with which to derive protective SQC Marsh is 0.014 ug/l PCBs. The approach used by EPA to derive protective cleanup levels for the aquatic area in Middle Marsh is described in response to comment 14.

**COMMENT 10:** The SRI and FS studies for Middle Marsh assume that the PCB concentrations pose an unacceptable risk to female mink in the Marsh. However, there is no evidence that any mink, female or male, inhabit the Marsh.

<u>Response</u> - Comments 10 through 14 relate to the use of mink as an indicator species in the ecological exposure assessment for Middle Marsh. The following paragraphs describe EPA's overall approach and rationale for the ecological exposure assessment which was conducted by EPA's consultant according to EPA guidance.

The objectives of the ecological exposure assessment of Middle Marsh (Metcalf & Eddy, 1991a) were to 1) define the ecological conditions of the study area, 2) identify appropriate remediation goals, 3) determine how remediation would affect the study area, and 4) provide information for mitigation. To help meet these objectives, EPA's consultants conducted ecological site investigations consisting of wetland delineation, wildlife observations, and a habitat assessment. From this information it was determined that Middle Marsh was dominated by palustrine forested wetlands, palustrine scrub-shrub wetlands, and emergent wetlands. These areas are suitable habitat for a variety of wildlife species including small insectivorous birds, small mammals, amphibians, and reptiles.

To assist in the identification of potential exposure pathways, an ecological food chain pathway model was developed (Figure 2-11 of the RI). Species included in this model were species that were either observed on site or were expected to occur on site based upon historic occurrence, habitat requirements, food availability, home range requirements, and the likelihood of exposure. Mink were included in the ecological food chain pathway model because: Middle Marsh provides the basic habitat requirements for mink; minks are known to be susceptible to PCBs (Platonow and Karstad, 1973; Eisler, 1986); and the mink is a top level consumer in an area where site-specific data (Charters, 1991) showed that many of its food sources are contaminated with PCBs.

Mink are expected to use the site because they have historically occurred in the region (DeGraaf and Rudis, 1983). While the Middle Marsh system is not considered by EPA to be "optimum" mink habitat as defined by Allen (1986) and as modelled in the RI (Metcalf & Eddy, 1991a), it is nevertheless <u>suitable</u> for mink inhabitation as defined by the presence of life requisites. Allen (1986) stated that "the species is tolerant of human activities and will inhabit suboptimum habitats as long as an adequate food source is available". Mink food preferences are varied, and can be classified into 1) aquatic (e.g. fish, frogs and crayfish); 2) semiaquatic (e.g. waterbirds and water associated mammals); and 3) terrestrial (e.g. rabbits and rodents) (Allen, 1986). The importance of each group depends upon availability and season (Linscombe et al. 1982). EPA's observations and site-specific studies (Charters, 1991) indicate that Middle Marsh and the adjacent wetlands have relatively high populations of these prey types, particularly high numbers of frogs and small rodents.

Minks have recently been sighted in nearby areas, including the Apponagansett Swamp, and as road kills in the neighboring town of Dartmouth, Massachusetts. In addition, following the receipt of comments by GEI and others on the occurrence of mink in Middle Marsh, EPA's consultants conducted a site visit on August 26, 1991. During this investigation, mink tracks were observed and photographed in Middle Marsh near the Unnamed Stream. The mink tracks were identified by a certified wildlife biologist (Petron, 1991). In addition, a number of potentially suitable mink den sites were observed and photographed. Tracks of other small mammals were also observed. This information has been added to the administrative record.

Secondly, mink was used in the pathway model because it is representative of other sensitive species. Mink are particularly sensitive to PCBs. Platonow and Karstad (1973) found in a study of dietary effects, that mink feeding at a level of 0.64 ppm Aroclor 1254 for 160 days either died, were extremely weak, or produced young all of which died during the first day after birth. Therefore, consistent with EPA guidelines (EPA, 1989), EPA included the mink in the ecological exposure assessment and based protection of the ecosystem and development of remediation criteria (cleanup levels) on this key sensitive indicator species. As a top level predator in the marsh, protection of mink would ensure achievement of the goal of ecosystem integrity and balance. Furthermore, the known susceptibility of mink would provide a margin of error for protection of a variety of environmental receptors for which toxicological data is not known. The use of mink, a species known to be sensitive to PCB, is consistent with EPA guidance. As stated on Page 3-20 of EPA's "Risk Assessment Guidance for Superfund -- Environmental Evaluation Manual (EPA/540/1-89/001), "Ecologists will often use professional judgement to select a particular organism as an 'indicator species', that is, a species thought to be representative of the well-being and reproductive success of other species in a particular habitat. The indicator species may also be chosen because it is known to be particularly sensitive to pollutants or other environmental changes." In the absence of complete toxicological data of the effects of all pollutants and contaminants on the myriad species found in Middle Marsh, it is reasonable to extrapolate information known about a particularly sensitive species.

The exposure assessment for mink involved the development of appropriate exposure parameters. EPA determined that because of the mink's high trophic level, dietary exposure would be the primary exposure pathway. Analysis of the habitat, prey, and home range requirements suggests that mink using the site may either live, breed, and feed on-site, or live off-site and feed on-site. Densely vegetated wetlands are the preferred habitat of mink (Allen, 1986); Middle Marsh contains such habitat. There is an abundance of preferred mink prey available, in the form of small mammals, frogs, and small birds (Linscombe et al., 1982; Allen, 1986). Although on the lower end of home range sizes, the Middle Marsh and surrounding habitat is of sufficient size to support mink because of its dense habitat and abundant prey. Gerell (1970) and Allen (1986) report that most minimum home ranges documented in the literature can be attributed to situations of dense cover and/or high prey abundance. Mink often concentrate their feeding in core areas within their home range. These core areas usually are characterized by high prey densities and are in relatively close proximity to streams (Allen, 1986). Given the existence of the stream which could represent a core feeding area for mink and the apparent susceptibility of female mink to the lethal and chronic reproductive effects of dietary PCB exposure, EPA determined that the use of the female mink's home range of 20 acres was appropriate. Further, given the short time period (160 days) for the adverse effects of PCBs to occur, EPA decided not to calculate the mink's dietary exposure as an annual average but to address seasonal changes in the mink's diet which could influence its exposure. Accordingly, EPA determined that in Middle Marsh, the mink's winter diet would consist mainly of small mammals.

Based on site-specific data for sediment/soils and biota (Charters, 1991), a sediment/soil cleanup level of 15 mg/kg was calculated for wetland/terrestrial areas of Middle Marsh. The cleanup level of 15 ppm was designed to protect mink and other potentially sensitive species from chronic health effects from PCB exposure and to restore the area as viable habitat where mink and other species sensitive to PCBs may exist and breed. Use of mink as an indicator species may ensure protection of other sensitive species for which toxicological data does not exist. This cleanup level is also protective of carnivorous and insectivorous birds whose calculated cleanup levels were 25.5 and 29.2 mg/kg, respectively. A cleanup level of 15 mg/kg would also result in removal of sediments above cleanup levels developed for birds such as those at stations ME22 (28 mg/kg), ME38 (32 mg/kg), and SL56 (34 mg/kg). A detailed discussion of development of cleanup levels for aquatic areas of Middle Marsh is provided in response to comment 14.

EPA applied the cleanup level on a point-by-point (never to be exceeded) basis, rather than reducing the average site contaminant concentration to the cleanup level. This method ensures that the mink's dietary level will not exceed 0.64 ppm, which was found to cause reproductive failure and even death, and which is the basis for the ambient water quality criterion and sediment quality criterion for PCBs. EPA believes this method is especially appropriate for Middle Marsh, and is appropriate for mink and other species with feeding habits similar to mink which concentrate their feeding in a core area.

**COMMENT 11:** Ranges and territorial habits of the mink would indicate that, at most, only one mink would feed in the Marsh.

<u>Response</u> - EPA agrees that Middle Marsh would be used by a small number of mink at a time based on home range requirements. However, EPA disagrees with GEI's assertion on the use of a larger home range for mink, and that the mink's solitary and "shy" nature would preclude its presence in Middle Marsh. As discussed in detail in response to comment 10, EPA has determined that Middle Marsh will support mink and that the use of a minimum home range is appropriate. Further, EPA believes based on field observations and recent literature that the use of a 65 percent residence time is appropriate. The mink is primarily nocturnal (Gerell, 1969; Linscombe et al, 1982) and tolerant of human activity (Godin, 1977; Allen, 1986). The daytime use of the surrounding golf course would not deter mink from travelling to and from Middle Marsh. The Unnamed Stream traverses the fairways on both sides of Middle Marsh, and with its associated vegetation and cover would provide a secure travel corridor between Middle Marsh and the Adjacent Wetland and/or the Apponagansett Swamp (Petron, 1991). Finally, EPA disagrees with GEI's assertion that because mink have highly developed day vision they are more active by day and thus would be disturbed by golf course activity. It is well established that mink are primarily active at night (Allen, 1986; Linscombe, 1982; Gerell, 1969). Many primarily nocturnal carnivores have well developed day vision.

It must be noted that the rationale for the cleanup is not to protect one female mink but to restore the area as viable habitat where mink and many other species sensitive to PCB may exist and breed. Under CERCLA, EPA must ensure that its actions provide overall protection of the environment. EPA's objective is to restore Middle Marsh such that it will support all life functions for a balanced indigenous population including top level predators such as the mink, other mustelids, and other sensitive species for which there toxicological data does not exist. EPA acknowledges that the overall effects may not be immediate and dramatic, but they are nonetheless important. For example, the removal of top predators could result in increased numbers of small mammals such as mice, which are known to be present in Middle Marsh. As mice feed predominantly on seeds, this could result in reduced diversity of plant species and, as a direct result, a reduced diversity of animals such as birds that require certain plants as habitat.

EPA has determined that excavation of a portion of Middle Marsh is necessary to ensure that mink and other sensitive species can exist and breed. This approach is consistent with the recommendations of EPA's Science Advisory Board, as articulated in the report entitled Reducing Risk: Setting Priorities and Strategies for Environmental Protection, September 1990 (SAB-EC-90-021). That reports states:

> "Ecological systems like the atmosphere, oceans and wetlands have a limited capacity for absorbing the environmental degradation caused by human activities. After that capacity is exceeded, it is only a matter of time before those ecosystems begin to deteriorate and human health and welfare begin to suffer.
>
> In short, beyond their importance for protecting plant and animal life and preserving biodiversity, healthy ecosystems are a prerequisite to healthy humans and prosperous economies. Although ecological damage may not become apparent for years, society should not be blind to the fact that damage is occurring and the losses will be felt, sooner or later, by humans. Moreover, when species and habitat are depleted, ecological health may recover only with great difficulty, if recovery is possible at all. While the loss of species may not be noticed immediately, over time the decline in genetic diversity has implications for the future health of the human race."

**COMMENT 12:** The habitat ranges for mink and other animals which EPA considers to be potentially present are applied inappropriately and inconsistently across the Marsh in the computation of the ecological risk. Therefore, the exposure predictions are excessive and biased.

<u>Response</u> - EPA conducted the ecological exposure assessment for Middle Marsh by making assumptions for home ranges, food source, and other parameters based on the most recent, available scientific information. Based on the most recent literature, EPA believes that home ranges for mink and other species addressed in the ecological exposure assessment were applied appropriately. GEI asserts that mink feed in equal proportions over their entire home range. However, as described in response to comment 10, mink have a core area within their home range in which they do most of their feeding. The core area (and the home range) is smaller in areas of high prey density. This core area is also usually associated with a stream (Allen, 1986). According to Whitaker (1980), when mink inhabit areas along rivers, creeks, lakes, ponds, and marshes (such as Middle Marsh), their exposure would be weighted toward streambank areas. At this site, the streambank areas are not evenly distributed throughout Middle Marsh and the surrounding area. Two intensive sampling programs have demonstrated that the areas of highest contamination are close to the Unnamed Stream in both Middle Marsh and the Adjacent Wetland. Thus, adjusting the cleanup

level based on the size of Middle Marsh compared to the mink's home range (13/20 = 0.65) was reasonable and not overly conservative.

EPA disagrees with GEI's suggested use of an averaged bioaccumulation factor for earthworms. In the conduct of the ecological exposure assessment, EPA decided to use available site-specific data to develop bioaccumulation factors (BAFs). For small mammals, the BAF of 0.07 was based on an average of tissue levels from eleven animals captured at two different stations. However, for earthworms, there were only two data points and EPA was concerned that BAFs for earthworms could significantly exceed 0.29, the higher of the two values. Comparative literature values showed high variability which contributed to uncertainty in the analysis. In this case, EPA decided to select the higher value because of the low confidence in averaging only two values.

COMMENT 13: The mink's average dietary concentration of PCBs, if obtained solely from food sources in Middle Marsh, will be lower than the dietary concentration used in the derivation of the sediment quality criterion.

Response - The selected cleanup levels of 20 μg PCB/gram carbon for aquatic areas and 15 mg/kg for all other wetland areas were not designed to reduce the average contaminant concentration to the cleanup level. Under EPA policy, the developed cleanup levels were applied on a point-by-point (never to be exceeded) basis rather than a site average to ensure that future exposure will fall below accepted limits, regardless of where the animal spends its time or obtains its food.

EPA does not agree with the food chain exposure assumptions presented by GEI in that a number of assumptions used in the calculations are inappropriate for Middle Marsh. EPA and its consultants conducted a variety of biological studies in Middle Marsh in order to determine appropriate parameters for calculation of food chain exposure. Several technical arguments are presented below:

- The habitat evaluation conducted by EPA's consultant determined that Middle Marsh is poorly suited to muskrat. Thus, EPA does not believe it appropriate to attribute 47 percent of the mink's diet to voles and muskrat.

- Based on site-specific data, EPA does not agree with the selected bioaccumulation factor (0.02) for voles and muskrat. Tissue data from meadow voles collected near the Unnamed Stream by EPA (Charters, 1991) indicate bioaccumulation factors ranging from 0.05 to 0.21.

- EPA does not agree with the use of area averaged PCB concentrations. Cleanup levels were applied on a point-by point (never to be exceeded) basis. EPA believes this method is especially appropriate for Middle Marsh, and for mink and other species with feeding habits similar to mink which concentrate their feeding in a core area.

In addition, the method presented by GEI: (1) uses an annual average diet approach which EPA believes is inappropriate; and (2) fails to consider exposure to the PCB Aroclor that is actually present at the site. Exposure to the lower chlorinated Aroclors such as Aroclor 1016 does not produce toxic effects (as described in the material provided by GEI), as the congeners present in Aroclor 1016 are readily metabolized and are not bioaccumulated. Toxicological studies of mink and other species feeding on the more highly chlorinated Aroclors, such as Aroclor 1254 (the contaminant at Middle Marsh) have shown that sublethal and even lethal effects from relatively low doses of PCB can occur in significantly less than a year. Platonow and Karstad (1973) found in a study of dietary effects, that all adult mink died within 105 days of dietary exposure to 3.57 ppm of PCB Aroclor 1254, the same Aroclor present in Middle Marsh. In the same study, mink feeding at a level of 0.64 ppm for 160 days either died, were extremely weak, or produced young all of which died during the first day after birth. In addition, the short time period for manifestation of health effects could be a significant threat to mink young who remain together from late April/mid-May until fall (Linscombe et al., 1982). It is for this reason that EPA examined the winter diet of mink separately. Given the relative unavailability of frogs and other aquatic species during New England winters, the mink's winter diet could consist almost exclusively of small mammals. This pathway was used to derive the cleanup level presented in the RI (Metcalf & Eddy, 1991a).

Further, EPA recognized uncertainty by using the "lowest observed effect level" (LOEL) of 0.64 ppm as a protective dietary level rather than a "no effects level". As described above, the LOEL of 0.64 ppm in diet was shown to cause death and reproductive failure in mink. EPA is concerned that a dietary level below 0.64 ppm could still cause serious sublethal and even lethal effects in mink and other sensitive species. Therefore, the approach used by EPA was not overly conservative, because EPA did not use a safety factor of 10 to adjust the LOEL of 0.64 ppm to a "no effects level". However, applied as a never-to-be-exceeded basis, remediation of PCBs to the cleanup level of 15 ppm would ensure that the minks' and other sensitive species' dietary levels will not exceed 0.64 ppm. Thus, assuming 0.64 ppm is a protective dietary level and without applying a safety factor, mink and other sensitive species would be protected regardless of where they spend their time or obtain their food.

A complete discussion of the use of mink as an indicator species in the ecological risk assessment for Middle Marsh is provided in the response to Comment No. 10.

**COMMENT 14:** The food chain presented in the SRI risk assessment is based upon the erroneous presumption that mink eat contaminated trout in the Marsh. The SRI does not provide any evidence of trout (and any other fish) being present in Middle Marsh.

Response - EPA has determined that it is appropriate to derive a cleanup level in the aquatic area of Middle Marsh to account for uptake of PCBs through an aquatic food chain pathway. In particular, site-specific studies indicate that benthic organisms have accumulated PCBs and that upper trophic level consumers are at risk. As stated in the EPA document Water Quality Standards for Wetlands:

> " Applying water quality standards to wetlands is part of an overall effort to protect and enhance the Nation's wetland resources. At a minimum, all wetlands must have uses designated that meet the goals of Section 101(a)(2) of the CWA by providing for the protection and propagation of fish....**and wildlife.**"

As described above in response to comment 10 the remediation criteria were established to ensure the restoration of a healthy ecosystem, as indicated by conditions suitable for an unaffected, reproducing mink population. In order to achieve this objective, all potential food sources for mink must be free from PCB contamination that would inhibit reproduction or other critical life stages or ecological functions. It is not appropriate to protect only a portion of the mink's diet, based on presumed relative use of available acceptable food sources. All carnivores in the wild utilize food based on availability, and restoration of the population must provide for a variety of dietary mixes. Data presented by Linscombe et al. (1982) demonstrates, for example, the variability in mink diet between seasons and from location to location.

The RI (Metcalf & Eddy, 1991a) demonstrates that Middle Marsh supports an aquatic food chain which could be a significant portion of the diet of a mink or other mammalian or avian carnivore. Frogs, tadpoles, and crayfish are abundant in Middle Marsh and fish have been observed in the Unnamed Stream that travels through Middle Marsh. The actual extent of fish is unknown but, based on physical conditions and presence of suitable food, there is no reason why the stream and its tributaries could not support an abundant fish assemblage once contaminants are removed from sediments and the water column.

Therefore, a remediation criterion that ensures safe concentrations in aquatic food sources has been established.

To achieve a safe aquatic food web, the RI/FS evaluated and used sediment remediation criteria. The indicator used in evaluating sediment criteria was acceptable concentrations of PCBs in the aquatic or aquatic dependent portion of the mink diet. There was no indication of contamination effects on the benthic community and thus protection of the structure of the benthos was not an objective in establishing sediment criteria. ARARs, risk type evaluations, and review of on-site data were used in establishing sediment remediation criteria.

The interim sediment quality criterion for PCBs represents a standard which is "to-be-considered" (TBC) in the RI/FS process. The interim criterion for PCB was derived based on residue effects and not protection of the benthos from toxic effects of PCB. The sediment quality criterion was designed to ensure that benthic organisms are not exposed to bioavailable concentrations of chemicals greater than what is currently allowed by existing water quality criteria. However, as described above, the objective of sediment remediation criteria for Middle Marsh was control of residue in mink diet, so the interim criteria approach and methods for PCBs was appropriate for Middle Marsh.

The approach for sediment quality criteria does include assumptions, and in some cases the database is limited; therefore, additional considerations were used in evaluation of remediation criteria. The benthos can bioaccumulate PCB from the sediments via the pore water. Potential mink food sources such as fish, frogs, or crayfish, feed on these benthic animals and can further concentrate the PCB in their tissues. Using the same assumptions established for bioavailability, bioaccumulation, and partitioning in the relevant ARARs for water and sediment quality criteria, a PCB concentration of 0.014 μg/l in the pore water would result in an aquatic food web with PCB concentrations protective of mink reproduction, and thus the indicator was used for a healthy Middle Marsh ecosystem. Based on specific Middle Marsh site conditions of sediment organic carbon concentrations and mink diet, a pore water concentration of 0.014 μg/l would give a sediment remediation criteria of 19.5 μg PCB/Gc, which was used in the RI/FS. This approach was evaluated considering on-site data and was found to be substantiated. Sediment in the Unnamed Stream in excess of two times the upper PCB interim sediment quality criterion (EPA 1988) resulted in benthic tissue concentrations of approximately 0.4 ppm (Charters, 1991). The upper SQC is exceeded in much of the aquatic area (Area 1 in the FS) that was targeted for remediation. These benthic tissue concentrations are close to the levels in mink diet which have been shown to produce reproduction inhibition (0.64 ppm) (Platonow and Karstad, 1973). A diet of benthos (or the adult insects resulting from the benthic larvae) at the measured levels of PCB by fish, crayfish, or frogs could result in tissue concentrations above the levels shown to be harmful to mink.

Bioaccumulation of PCBs in the Middle Marsh area is further substantiated by benthic and fish sampling conducted by Environmental Science and Engineering (1978) in the Unnamed Stream in downstream areas as it flows through the Apponagansett Swamp. This area is also near the New Bedford Municipal Landfill which is also reportedly contaminated with PCBs. Benthic concentrations in the stream were 1.13 ppm Aroclor 1254 in a composite sample from six stations. PCBs were also found in fish at one station. The report concluded that "Bioaccumulation of PCBs is demonstrated by the relatively high levels detected in benthic organisms within the swamp. Transport of this contamination up the food chain to the more mobile biological organisms (i.e. fish) is occurring". This indicated that mink food sources in other areas surrounding Middle Marsh could be contaminated, and that the use of 65 percent residence time (which assumes all other food sources not related to the site are not contaminated with PCBs) was not overly conservative. If, in the calculation of the cleanup level, food sources not found in Middle Marsh had assumed to be contaminated with PCBs, then, a lower cleanup level may have been derived.

One of the uncertainties, as pointed out by GEI, in the development of the SQC for PCBs, and in the ecological exposure assessment for Middle Marsh is the use of the bioaccumulation factor of 45,000 derived from trout studies for uptake of PCBs by aquatic species. However, bioaccumulation factors for Aroclor 1254 are presented in the ambient water quality criterion document for PCBs (EPA, 1980); they range up to 238,000 for the fathead minnow, a species which could inhabit Middle Marsh. In addition, EPA states that "available information strongly indicates that field bioaccumulation factors for PCB are probably a factor of 10 higher than the available laboratory BAF values" (EPA, 1980). Laboratory values such as those BAFs listed above, are based on direct and respiratory exposure only. The higher field values would result from dietary exposure which would occur for aquatic species in Middle Marsh.

The SQC model was applied to areas of Middle Marsh that support permanent standing water, even during the dry months of the year. EPA agrees that SQC do not apply to wetland soils or semi-permanently flooded wetland areas. During the RI field studies (Metcalf & Eddy, 1991a), much of Middle Marsh was inundated and aquatic invertebrates were found in these areas. Yet SQC were not applied to these areas because the inundation was judged to be seasonal. To determine the presence of aquatic habitat, EPA conducted qualitative biological sampling in August of 1990 to determine the presence of obligate aquatic invertebrates. Aquatic habitat was limited to a large tributary of the Unnamed Stream and nearby areas that were characterized by permanent flooding up to about three feet in depth and obligate aquatic organisms, including amphipods, freshwater clams (Sphaeriidae), isopods, Alderfly larvae (Sialus sp.), Cranefly larvae (Tipula sp.), midge large (Chironomids), tadpoles and leeches (Hirudinea). These areas are inundated even during mid-summer. They maintain a self-sustaining aquatic community, serve as feeding areas for stream biota, contribute plant and animal material to the stream on a continuing basis, and could support an aquatic pathway for bioaccumulation.

It is important to note that EPA used the SQC as an indicator of potential wildlife impacts and then field verified the results. The use of SQC as part of an overall ecological risk assessment is consistent with EPA guidance. The EPA publication Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/G-89/004) includes the following statement on Page 1-3 concerning determination of risk:

> The objective of the RI/FS process is not the unobtainable goal of removing all uncertainty, but rather to gather information sufficient to support an informed risk management decision regarding which remedy appears to be most appropriate for a given site. ...These choices [as to the appropriate course], like the remedy selection itself, involve the balancing of a wide variety of factors and the exercise of best professional judgement.

In the case of Middle Marsh, the pore water PCB concentrations that exceeded the ambient water quality criterion of 0.014 $\mu g/l$, the sediment levels that exceeded the sediment quality criterion, and the elevated PCB concentrations in site biota including benthic organisms were a part of the "weight-of-evidence" judgement that there was potential endangerment to wildlife in Middle Marsh. In particular, biological tissue data verified that exposure to PCB sediment concentrations exceeding the upper sediment quality criterion resulted in accumulation of PCBs in benthic organisms, the lowest level of the aquatic food chain. EPA believes that this could result in food chain bioaccumulation, bioconcentration and ultimately exposure of mink and other sensitive species to detrimental dietary concentrations of PCBs.

**COMMENT 15:** The SQC methodology is applicable only if contaminated sediments are submerged for sufficient periods of time to establish an equilibrium between the sediments and the overlying water column. This condition is not true for most of Middle Marsh where there is NO truly aquatic environment.

Response - In this ROD, EPA applied the SQC only to a small, permanently flooded, aquatic area within Middle Marsh. Aquatic areas were identified by the combination of hydraulic modeling, field observations, and benthic reconnaissance as described in the response to Comment 14. GEI has suggested that according to definitions presented by Cowardin et al. (1979) that open water areas shallower than 6.6 feet deep are not aquatic. EPA does not agree with the use of the Cowardin definitions which were selected only as the basis for development of a wetland nomenclature system and would, in this context, indicate that millions of acres of streams and shallow areas of rivers, lakes and ponds are not aquatic. EPA has determined, based on site-specific studies, that the aquatic areas in Middle Marsh were flooded even during dry months of the year and could support an aquatic pathway for bioaccumulation.

**COMMENT 16:** The sediment quality criteria methodology, a highly controversial and complex method for evaluating risk, produces extremely unpredictable and inaccurate results. The Equilibrium Partitioning Method used to derive the SQC produces results that differ significantly from measured data from pore water samples taken at Middle Marsh.

Response - EPA's rationale for collecting and measuring PCB concentrations in the pore water and sediment was not to validate the SQC model. Interrelating pore water and sediment levels is inherently difficult due to sampling methodologies. Rather, these media were sampled to obtain a range of values for use in the ecological exposure assessment. EPA is proceeding with the equilibrium partitioning method for development of sediment quality criteria. EPA has determined that the application of this method to Middle Marsh is appropriate for prediction of the range of pore water concentrations, on average, in aquatic areas of this wetland.

**COMMENT 17:** The SQC methodology improperly assumes that aquatic organisms such as trout will be exposed to pore water concentrations of contaminants.

Response - Site-specific data has shown that the benthos in Middle Marsh bioaccumulate PCB from sediments via the pore water. Potential mink food sources such as fish, frogs, and crayfish feed on these benthic animals. EPA believes that a PCB concentration of 0.014 μg/l in the pore water would result in an aquatic food web with PCB concentrations protective of mink and other sensitive species' reproduction. The cleanup criterion for aquatic areas is designed to achieve this level of protection. A complete discussion of the use of SQCs in the ecological risk assessment for Middle Marsh is provided in the response to Comment 14.

**COMMENT 18:** The SRI correctly concludes that volatile and semivolatile organics, heavy metals, and pesticides in the Middle Marsh sediments, pore waters, and surface waters pose no threat to the environment.

Response - As indicated in the hazard assessment in the RI (pp. 4-1 - 4-3) the following conclusions were reached with respect to volatiles, semivolatiles, heavy metals, and pesticides:

> Volatile organic compounds were detected infrequently and at levels below detection limits in all media in Middle Marsh. Accordingly, volatile organics are not considered a threat to wildlife in the study area. Semivolatile organic compounds (SVOCs), especially polycyclic aromatic hydrocarbons (PAH), may cause a variety of health effects in wildlife. However, as described earlier in Chapter 3, Nature and Extent of Contamination, and as further documented in Chapter 5, Human Health Risk Assessment (Tables 5-1, 5-8 and 5-9), semivolatiles in both wetland areas appear to be within the range of background concentrations from the literature that are typically found in soils near highways. Semivolatiles were found at levels near or below detection limits in water samples indicating that exposures of wildlife to SVOCs in pore water and surface water do not represent pathways of concern. Further, measured sediment/soil levels were compared with interim sediment quality criteria (EPA, 1988b) established for fluoranthene, pyrene, benzo(a)pyrene and benzo(a)anthracene and were below the lowest site-specific sediment quality criteria. Based on these considerations, semivolatiles are not considered a hazard to wildlife in the study area.
>
> Several heavy metals detected in sediment/soil in Middle Marsh and the Adjacent Wetland are above background levels including copper, chromium, iron, lead, vanadium, manganese and zinc. However, after comparison to sediment criteria set forth by Long and Morgan (1990), lead and zinc were identified as metals for which the levels in the range of those present in the wetland areas could cause toxicity to some species. Long and Morgan (1990) found that sediment lead concentrations of 35-110 mg/kg, and sediment zinc concentrations of 50-125 mg/kg resulted in sublethal effects in aquatic biota. These values are substantially below the maximum lead and zinc concentrations in Middle Marsh of 845 and 521 mg/kg, respectively. In addition, iron may pose a threat to aquatic biota through creation of a solid floc that

adheres to sediments and smothers sediment benthic organisms. To further evaluate potential for biological impacts, surface water and pore water metals data were compared to ambient water quality criteria (EPA, 1986d). This comparison revealed that dissolved (filtered) metals concentrations were near or below ambient water quality criteria for lead, zinc and other metals. This phenomenon may be due to the binding of metals to sediments as sulfides, resulting in low bioavailability for uptake by plants and animals. In addition to lead and zinc, this phenomenon was also evident for calcium and silver in Middle Marsh water samples and has been observed at other sites (Mac et al., 1985). Due to the low water concentrations, heavy metals have not been evaluated as a hazard to site biota.

**COMMENT 19:** The remedial schedule proposed in the FS is unrealistic. Remediation of the Marsh will be seriously jeopardized by the remediation of the Unnamed Stream (during the remedial action for the First Operable Unit) if the actions are not performed simultaneously.

Response - The remediation schedule for the selected remedy is optimistic but not unrealistic. It is fast-tracked (as with all alternatives evaluated in the FS) to minimize wetland, habitat, and wildlife impacts. The schedule for the selected remedy (Figure 9-2 in the FS) includes separate tasks for site preparation and excavation and does not account for pre-design, design and contracting activities. Site preparation includes construction of access roads, removal of trees, and mobilization of equipment. One month was allotted for site preparation. This is followed by excavation or actual removal of sediments. One and a half months has been allotted for excavation. EPA believes that this time frame is realistic for the reasons discussed below.

The replacement of wetland soils will not be constrained by treatment, thus wetland protection and restoration activities may begin as soon as possible after excavation. The wetland restoration schedule does not include post-restoration maintenance and monitoring. These activities would continue for a number of years after excavation. EPA agrees that for the Middle Marsh operable unit, even with prior site preparation, one excavator may not always produce 64 cubic yards of dredged material per hour. This rate, quoted in the FS, is based on average outputs of excavators with 1/2 and 3/4 cubic yard buckets working in wet, sticky, clay (Peurifoy, 1979). However, EPA believes that this rate could be achieved if excavation was performed in several of the remediation areas at the same time. The excavation rate would also be enhanced by the use of a dragline in Area 2. The dragline is a relatively large and powerful excavator. Also, EPA expects that excavation in Area 4, a relatively dry and accessible area, could alone produce the 64 cubic yards per hour estimated in the FS. The overall operation would not be constrained by the size of the working areas or any small roots that remain in place after site preparation.

The schedules developed in the FS are estimated and are based on assumed use of effective equipment, skilled workers, and absence of severe weather disturbances that could halt work for several days. The schedule is based on a conceptual design and would be refined during design. At the conceptual level, there is uncertainty as to what excavation method would be used and the amount and type of dewatering needed.

No permits are required for remedial actions undertaken on the Site under CERCLA.

EPA agrees that the remedial activities for the two operable units would best be performed simultaneously; however, if simultaneous operations are not possible, and if the time period between the First Operable Unit and the Middle Marsh Operable Unit would be significant, EPA does not want to significantly delay remediation of the Sullivan's Ledge Disposal Area which acts as a continuing source of PCB to Middle Marsh. EPA may consider delaying final restoration of the stream depending on the degree of impact if not restored and the possible time frame for construction of the Middle Marsh operable unit. In the interim, although not fully restored, Middle Marsh would need to be stabilized in accordance with wetland guidelines.

**COMMENT 20:** There is no reasonable justification for EPA's proposed contingency alternative.

Response - EPA's selected remedy for the Middle Marsh Operable Unit is dependent on Middle Marsh excavations being conducted prior to capping the Disposal Area. If the cap is constructed before the Middle Marsh excavations are conducted, the selected remedy could not be implemented. For the First Operable Unit, EPA has determined that both solidification and disposal under a cap is necessary to ensure that in the long-term, contaminated soils will not erode into the Unnamed Stream and other downstream areas. It must be noted, however, that only soils contaminated at levels over 50 ppm will be solidified.

GEI has suggested that a significant time period could be left in between the operable units by leaving a portion of the disposal area cap incomplete. EPA is concerned, however, about the long-term potential for release of contaminated soils and further contamination of the Unnamed Stream and downstream areas including Middle Marsh and the Apponagansett

Swamp. As stated in the 1989 ROD, the cleanup level for sediment in the Unnamed Stream is 20 μg PCBs/Gc. Thus for this site, it is critical to ensure that on-site soils will not erode into the Unnamed Stream. Unsolidified and uncapped PCB-contaminated soils even at PCB levels below 50 ppm in an uncompleted cell and/or temporarily stockpiled excavated material could present a significant threat of release and recontamination of remediated areas. In addition, infiltration in the uncapped area could contribute to migration of contaminated groundwater including seepage of contaminants to the Unnamed Stream.

The NCP and its preamble encourage using operable units as early actions to eliminate, reduce or control the hazards posed by a site or to expedite site cleanup. 55 Fed. Reg. 8704. At this site, EPA decided in 1989 to split the Site into two operable units so that protective measures at the Disposal Area and Unnamed Stream could be implemented promptly at those locations, while EPA conducted further studies to characterize risks at Middle Marsh and analyze remedial approaches for Middle Marsh in greater detail. It does not make sense to decide now to wait until negotiations with potentially responsible parties (and perhaps litigation) regarding the Middle Marsh Operable Unit are over, an agreement is reached or an administrative order is issued under Section 106 of CERCLA, and design activities for the Middle Marsh Operable Unit are completed, before addressing the principal threat at the First Operable Unit. EPA is committed to selection of remedies that provide permanent protection. The Agency is concerned that leaving a partially completed cap to be completed at a later date could compromise the integrity of the remedy, lead to long-term maintenance problems and increase costs. The measures suggested by GEI could only be implemented with significant additional planning, design, operations, and maintenance to ensure that the open cell and/or stockpiled material would not present significant adverse impacts, as described above.

There are two reasons why EPA believes that it would be inappropriate to put a hold on implementation of the First Operable Unit until the implementation of the Second Operable Unit can be coordinated. First, the contamination at the First Operable Unit presents the most urgent and serious threat to human health and the environment at the Site. Significant delay in implementing protective measures to address the contaminated groundwater, soils and sediments at the First Operable Unit (the principal threats at the Site) would be inappropriate.

Second, in signing the Consent Decree relating to the First Operable Unit, EPA, the Commonwealth of Massachusetts and 14 PRPs have agreed to a schedule of activities for the First

Operable Unit. This agreement was approved by the United States District Court in April 1991 and is legally binding on EPA. If EPA acted unilaterally in extending the schedule dates without the consent of the other parties to the Consent Decree, the 14 signatory PRPs could be adversely affected -- for example, the PRPs' contracts with design contractors and subcontractors would have to be extended out for longer periods of time, causing the PRPs' costs to increase. Based on the preliminary timetables established under the Consent Decree, it is expected that remedial design for the First Operable Unit will be completed by March, 1994. If additional design activities necessary to implement the selected remedy for the Middle Marsh Operable Unit are not completed in time to be integrated into the design of the First Operable Unit, then the contingency remedy will be implemented in place of the selected remedy.

If, however, all parties to the Consent Decree for the First Operable Unit can reach agreement, EPA would consider a short extension of time (consistent with the need to address principal threats quickly) that would permit coordination of the selected remedy for Middle Marsh with the remedy for the First Operable Unit, through an Explanation of Significant Differences ("ESD") if appropriate.

**COMMENT 21:** Backfilling the disturbed wetlands, as required in the preferred remedy, is not absolutely necessary and requires destruction of wetlands elsewhere in order to obtain the most suitable materials.

Response - EPA believes that replacement of sediments is required under federal and state law. Under Section 404(b)(1) of the Clean Water Act, the remedy cannot have significant adverse environmental consequences, or cannot cause or contribute to significant degradation of waters of the U.S. In addition, all appropriate and practicable steps must be taken to minimize impacts to the aquatic ecosystem. 40 CFR Section 230 specifies that a project involving fill material should be designed and maintained to emulate a natural ecosystem. The restoration should be based on characteristics of a natural ecosystem in the vicinity of the proposed activity to ensure that the restored area will be maintained physically, chemically, and biologically by natural processes. Executive Order 11988, Floodplain Management, and Executive Order 11990, further require that actions in floodplains or wetlands restore and preserve the natural and beneficial values of the wetland and floodplain areas. E.O. 11990 requires that actions in wetlands "consider the maintenance of natural systems including conservation and long-term productivity of existing flora and fauna, species and habitat diversity and stability, and hydrologic utility." Finally, MA DEP Wetlands Protection Regulations concerning dredging, filling, altering or polluting inland wetlands are applicable to the dredging of Middle Marsh and the Adjacent Wetland and require compliance with performance standards of the regulations regarding banks, vegetated wetlands and lands under water, and a one-for-one replication of any hydraulic capacity which is lost as the result of this part of the remedial actions.

The wetland areas in question, especially Areas 2 and 4, are subject to substantial rapid changes in water surface elevation due to stormwater runoff from the upstream urbanized watershed. During hydrologic monitoring, Metcalf & Eddy observed high stream velocities exceeding two feet per second in these areas and significant scouring of the stream bottom and bank sediments. If these areas were excavated and not restored, EPA believes that there would be severe erosion problems, water quality degradation, and failure of any attempt to revegetate these areas due to the increased insurgence of stormwater, erosion, and sedimentation.

EPA agrees that excavation of another wetland in order to restore Middle Marsh would not be protective of the environment and such a measure would not be taken. However, it is not possible to identify the source of replacement sediment to be used at the site, at this time. The FS states that the replacement "soil would be conditioned with organic amendments" such as "organic dredged material from a lake or pond, sphagnum or organic silt, or other organic soils" and "chipped, uncontaminated or decontaminated trees and brush". Sediments from a dredging project not conducted to provide backfill for Middle Marsh could provide suitable material if such a project could be identified. The details of the wetland restoration will be finalized during remedial design. Details of the plan will reflect regulatory requirements, including replacement of the functional values of the impacted areas.

**COMMENT 22:** There is no justifiable reason to manage the cleared vegetation as a hazardous waste.

<u>Response</u> - EPA agrees that plants in Middle Marsh do not accumulate PCBs at significant levels. EPA also agrees that not all cleared vegetation would need to be managed as a hazardous waste and that properly handled material could be managed as a solid waste. In fact, the FS (Metcalf & Eddy, 1991b) states on Page 7-20 that non-contaminated material may be disposed of on-site or in a municipal landfill in accordance with applicable regulations. However, on Page 9-12 of the FS, in the detailed evaluation of alternatives, the FS clarifies further that only contaminated materials such as stumps and vegetation that does come in contact with contaminated mud would need to be managed as a hazardous

waste. EPA does not believe that all areas to be remediated could be cleared without generating contaminated vegetation.

**COMMENT 23**: Production rates and treatment technologies stated in the FS are unrealistic and likely unattainable.

Response - The production rate of 100 tons per day is reasonable, and is based upon direct consultations with vendors of two solvent extraction processes, Resources Conservation Company (the B.E.S.T. process) and CF Systems Corporation (liquified propane extraction). This treatment rate is expected to be consistent with excavation rates.

Resources Conservation Company (RCC) has successfully operated a 100 ton per day unit at the General Refining Superfund site (Sudell, 1988). The B.E.S.T. process unit that would probably be mobilized for a site the size of Middle Marsh would consist of two modular batch units, each capable of operating at 75 tons per day, for a total capacity of 150 tons per day. According to conversations with RCC engineers, the units taken together would occupy no more than 1/2 acre of land area.

While it is possible that extreme materials-handling or treatment problems could reduce the production rate of such a system to less than 100 tons per day, such problems should be uncovered during treatability testing and may be corrected for by measures such as feed pretreatment or increasing the number of modular units employed for treatment. Materials handling is not expected to be difficult at Middle Marsh because the soils and sediments will not contain a great deal of large-sized material which must be removed before treatment. Thus the treatment process could be expected to proceed on schedule and without significant impact to the mating of the spotted turtle. As described on pages 9-35 and 9-36 of the FS (Metcalf and Eddy, 1991b), the remediation will be conducted with sensitivity to impacts on this species through the use of extensive mitigating measures. As further described in detail in the response to Comment 26, the spotted turtle was observed in inundated areas in the northeast area of Middle Marsh. The remediation of the targeted areas near the Unnamed Stream is not expected to have an overall adverse impact on this species. A representative of the Massachusetts Natural Heritage and Endangered Species Program (Copeland, 1991) has been consulted and agrees with this assessment.

Table 1 (see attached) summarizes the results of treatability studies performed by RCC and ART International (the LEEP process) in which cleanup levels less than or equal to 2 mg/kg total PCB were attained (Steiner, 1991). Although the solvent extraction technology vendors state that attainable cleanup levels are matrix-specific, their previous experience in treating PCB-contaminated soils and sediments indicates that the cleanup levels for Middle Marsh are attainable. This assumption shall be confirmed by performing solvent extraction treatability studies on Middle Marsh sediment/soils during predesign.

The end products of the B.E.S.T. process are dry, treated soils and sediments; a concentrated oil stream containing the extracted PCBs; and a product water stream. The concentrated oil stream will be incinerated in an off-site TSCA incinerator, and the product water stream will be treated to applicable standards before being discharged to surface waters or mixed back into the treated soils. Therefore, there will ultimately be no residual toxicity associated with these streams. With regard to the treated soils and sediments, potential sources of residual toxicity are any PCBs or residual triethylamine which remain. Since the PCB concentrations will be below cleanup levels the risk associated with them is minimal. Residual triethylamine is not expected to pose a problem because it is readily biodegradable in water and soil. According to RCC's literature, triethylamine at an initial concentration of 200 ppm in water is completely biodegraded in 11 hours by Aerobacter, which are common soil bacteria.

The effectiveness of the B.E.S.T. process is not necessarily limited by the oil content of the soil, as is demonstrated by the data in Table 1. Soils with oil contents as low as 0.07 percent were effectively treated to a total PCB concentration less than 2 mg/kg. Therefore, the low oil content of Middle Marsh soils and sediments does not preclude use of the B.E.S.T. process.

Dechlorination techniques were screened from consideration in the previous FS performed by Ebasco because these techniques may not be effective on materials with initial concentrations less than 25 mg/kg PCBs. The results of this screening were maintained in the current FS (Metcalf & Eddy, 1991b). Performance of treatability studies of the KPEG process simultaneously with studies of solvent extraction would certainly be of interest, but given the information currently available, there is no compelling reason to assume that solvent extraction will be ineffective and therefore, less preferable than KPEG.

**COMMENT 24:** The proposed plan would require excavation of more wetland acreage than necessary, even accepting the SQC in the SRI.

Response - As described in the response to Comments 10 and 14, cleanup areas are not based on reducing the average sediment/soil PCB level to the cleanup level. Rather it is intended to eliminate materials with concentrations above the cleanup level. Removal of these sediments will eliminate areas where mink and other sensitive species could contact sediments that could cause reproductive failure or other health effects, regardless of where in Middle Marsh the animal spends most of its time or obtains most of its food.

The delineation of Area 1 was based on reliable PCB and TOC data. The borders of the area were delineated using a geographic information system and represents an approximation of the area that exceeds the sediment quality criterion for PCBs. GEI has asserted that the area was based on an "extreme value", namely the TOC concentration of 22,000 mg/kg at station ME5. However, an examination of the data (Table 3-1 of the RI) reveals that this value is not extreme and that there are numerous TOC values in the range of 10,000 to 30,000 mg/kg TOC, revealing that the value of 22,000 mg/kg is not an anomaly. It should be noted that additional sampling will be conducted during predesign to further refine the boundaries of Area 1 to be remediated.

COMMENT 25: The proposed plan will disturb and/or destroy the wildlife it is supposed to protect.

Response - EPA is very concerned about the impact of excavation and remediation on wildlife and habitats in Middle Marsh, and was very careful throughout the RI/FS process to assess the natural resources present at the site, to evaluate potential short- and long-term impacts, and to evaluate ways to mitigate those impacts. Although the remediation will result in some direct short-term impacts to Middle Marsh, EPA has determined that disturbance of wetlands and floodplains is the only practicable alternative that would address PCB contamination in the Middle Marsh study area while minimizing adverse impact on the terrestrial and aquatic ecosystem. The contaminants in the sediment/soil would continue to pose unacceptable environmental risks if the excavation were not performed and could be the cause of any absence of a viable and diverse ecosystem in the wetlands.

EPA has developed an extensive conceptual mitigation plan as presented in the FS. Following site cleanup activities, impacted wetlands would be backfilled with clean soil and organic material such as peat moss, organic silt, and shredded trees and vegetation. The areas would be graded, stabilized, and then planted with vegetation appropriate to the type of wetland affected. During implementation of the remedy, steps will be taken to minimize the destruction, loss and degradation of wetlands, including the use of sedimentation basins or silt curtains to prevent the downstream transport of contaminated sediments. As illustrated in Figure 9-1 in the FS, most of the required access roads in wetland areas will be placed within areas to be remediated, minimizing damage to nearby areas. In addition, excavation of Area 3 will be conducted using hand-held shovels and wheelbarrows to transport excavated sediment/soils, thus eliminating the need for access roads to this area.

Performance of this cleanup remedy will meet or attain all applicable or relevant and appropriate federal and state requirements that apply to the site including Section 404 of the Clean Water Act; Floodplain Management and Protection of Wetlands; Executive Orders 11988 and 11990, respectively; and DEP Wetlands Protection Regulations. EPA will ensure that the cleanup is conducted properly through the development of detailed specifications for performance of the work, proper equipment, experience of the contractor, mitigation, and employment of an appropriate specialist for wetland restoration.

EPA does not believe that this remedial action will devastate Middle Marsh or its associated wildlife. The project will directly affect approximately two acres of wetland, a relatively small amount compared to the total 14.5 acres of Middle Marsh and the Adjacent Wetland. Following remediation, the terrestrial and aquatic organisms that inhabit the surface soils and sediments would quickly repopulate the disturbed areas. Stream diversion and stream dewatering are not planned as part of the Middle Marsh excavation because most of the areas to be remediated do not have significant volumes of overlying waters and the sediments can be effectively removed through the use of readily available excavators. Stream diversion of a portion of the Unnamed Stream near the Disposal Area was chosen as part of the selected remedy for the First Operable Unit because of the need to line this stream portion to prevent the waters of the Unnamed Stream from being pulled into the extraction wells to be installed at the Site.

Remedial activities to be performed at the Middle Marsh Operable Unit would temporarily disturb aquatic areas but would not "dry up and destroy all aquatic life." Following remediation, EPA believes that indigenous wildlife, if displaced during construction or if adversely affected as a result of exposure to contaminants, will return to Middle Marsh. This includes the eventual return of mink, which, as stated above, are tolerant of human activity (Allen 1986).

EPA agrees that it will take several years to reestablish dense vegetation in the remediation areas, which comprise approximately 14 percent of Middle Marsh and the Adjacent Wetland. EPA further acknowledges that this action will involve removal of trees from several areas of forested wetland habitat. However, EPA is confident that the ecological forces and conditions that created forested wetland in this area will still exist following remediation and that planted trees and natural succession will reestablish forested wetland in these areas and that without PCBs, Middle Marsh will offer suitable habitat for a wide diversity of species.

EPA acknowledges that remedial activities will impact several acres of land outside of Middle Marsh; however, these activities will have little impact on wetland areas. For example, the staging area is located outside the 100 year floodplain at a considerable distance from Middle Marsh. As described on pages 9-6 to 9-12 of the FS (Metcalf and Eddy, 1991b), EPA has outlined mitigating measures to control erosion from the staging area and from access roads located within and outside the wetland. Following remediation, all access roads and other facilities would be removed from the Site and the disturbed areas returned to their original condition.

EPA conducted a full ecological assessment including wetland and habitat delineation, a wetland functional assessment, an ecological risk assessment, a detailed review of pertinent wetland and other environmental regulations, and a feasibility study including identification and evaluation of technologies that minimize damage to wetlands, and development of mitigating measures. These studies were intended to ensure that only appropriate areas were targeted for cleanup and that any impacts would be mitigated. It is anticipated that once the preferred plan is implemented, Middle Marsh will be restored as suitable habitat for mink and other species sensitive to the chronic and lethal effects of PCB contamination.

**COMMENT 26:** The proposed plan poses a substantial and unreasonable danger of destroying the habitat of the spotted turtle, a species of special concern in Massachusetts.

<u>Response</u> - EPA does not believe that the excavation conducted under the Middle Marsh Operable Unit will destroy the habitat of the spotted turtle. Although this species has been seen in Middle Marsh during the RI, it was seen in wet, swampy areas far to the north of the Unnamed Stream, whereas the remediation areas are directly adjacent to the Unnamed Stream in relatively dry, grassy, vegetated wetland areas. As stated on page 9-35 of the FS (Metcalf & Eddy, 1991b):

> During wetland field investigation, a Massachusetts Species of Special Concern, the spotted turtle, was observed in Middle Marsh. Remediation of Middle Marsh shall be conducted with sensitivity to this species. The spotted turtle courts in the period between March and May and nests in dry areas in June. Their young, or hatchlings, emerge in late August-September or over-winter in the nest until spring. Mitigating measures to

reduce impacts to the spotted turtle populations may include a detailed survey of the remediation areas to catch and translocate any adults to uncontaminated areas of the wetland, restriction of heavy equipment to defined work areas, and control of turbidity and erosion. Short-term impacts could include displacement, noise disturbance, and short-term habitat loss; however, although the entire area of Middle Marsh has been identified by the Massachusetts Natural Heritage Program as spotted turtle habitat, spotted turtle were primarily observed in inundated areas in northeast regions of Middle Marsh, and remediation of the targeted areas near the Unnamed Stream is not expected to have an overall adverse impact on this species.

Copeland (1991) of the Massachusetts Natural Heritage & Endangered Species Program stated that "In general, we believe that the spotted turtle can adapt to short-term changes in its habitat, with proper planning, executions, and design of the proposed work." EPA believes that the implementation of the remedial activities will mitigate potential impacts to the spotted turtle while ensuring suitable habitat for mink and other sensitive species.

**COMMENT 27:** The proposed wetlands restoration plan is inadequate and not consistent with existing wetland species.

Response - EPA believes that the Wetlands Restoration Work Plan to be implemented for the Middle Marsh Operable Unit will be tailored to address existing wetland species. All wetland and upland areas would be restored, to the maximum extent feasible, to similar hydrologic and botanical conditions existing prior to excavation. As described in detail in response to Comment 25, construction of all access roads, both within and outside of the wetland areas, will be conducted with mitigating measures such as sand bags, haybales, swales, and culverts to maintain existing runoff patterns and to prevent excess erosion and sedimentation in and wetland area. Following remediation, all access roads and facilities would be removed from the Site and disturbed areas returned to their original condition.

The details of the restoration plan will be developed during remedial design at which time the least disruptive and environmentally correct restoration program will be developed. The restoration plan will evaluate using the spotted turtle and the Mystic Valley Amphipod as biological indicators to measure the success of the restoration. In addition, this program will identify the factors important to successful restoration of wetland areas including, but not limited to, replacement of hydric soils, hydraulic control, and vegetation re-establishment through transplanting, seeding, or a combination thereof.

The wetland restoration plan presented in the FS is not intended as a final design and the plant species listed are examples of emergent wetland vegetation that are economically available and could thrive in Middle Marsh. However, EPA agrees that red maple may be more appropriate for restoration than red oak. Both species were found in the area. As stated on page 9-21 of the FS, quality assurance measures for the restoration of wetlands would include before and after vegetation surveys to ensure replication of proper vegetation and engagement of a wetland specialist.

**COMMENT 28:** The data which is relied upon in the FS regarding PCB concentrations in surface water and pore water samples contain several discrepancies.

<u>Response</u> - EPA's consultant sampled the pore water for PCBs at low detection limits in Middle Marsh during May and September of 1990. In transcription of the data from both data sets, several errors were made in developing the appendices that accompanied the 1991 RI. However, the data used in the text of the RI were largely correct. Table 2 of this Responsiveness Summary presents the filtered and unfiltered pore water and surface water PCB data and clarifies the transcription errors. Discrepancies in the data are discussed below.

Resampling was conducted in September 1990 to provide assurance for the May 1990 data with which there were several problems. Due to the calibration method used for the May 1990 data, the laboratory inadvertently identified Aroclors 1242 and 1260; however, during validation it was determined that the PCBs were all Aroclor 1254. This was not reflected in Appendices E3 and E4 where both aroclors (1242 and 1260) were reported. In addition, the unfiltered (total PCB) samples from the May 1990 sampling were not mixed before analysis and only the supernatants were analyzed. Thus, for this data set many of the detections of PCBs in filtered and unfiltered water were very close in concentration. This could account for some of the anomalous results between filtered and unfiltered samples in the May 1990 data set. The September 1990 sampling yielded high quality data that contained none of the inconsistencies found in the May 1990 data set. These data were used to confirm the useability of the filtered PCB water data from May 1990.

The laboratory errors associated with the May 1990 data were corrected during validation and the transcription errors for the September and May 1990 data did not affect the conclusions of the ecological exposure assessment. In fact, several of the highest detected values in pore water had been inadvertently omitted from the 1991 RI, indicating exposure of aquatic organisms to pore water concentrations may be higher than originally discussed in the RI.

EPA does not agree with GEI that uncertainties in the data were not elaborated in the RI, and that the qualifier "J" was used to indicate that a compound was "tentatively" identified. The analytical problems outlined above for the May 1990 data were described on page 2-77 of the RI(Metcalf and Eddy, 1991a).

After resampling in September 1990, it was determined that all of the dissolved (filtered) PCB water data from both sampling rounds were suitable for use in the Risk Assessment. In addition, it should be noted that the data qualified with "J" from the May and September sampling were definitely identified as Aroclor 1254, a highly chlorinated mixture of PCB congeners. The "J" for the May 1990 data was assigned under EPA validation protocol due to problems with calibration, sample cleanup and "weathering" of some peaks normally associated with this Aroclor. The "J" qualifiers for the September 1990 data were only used to indicate that surrogate recoveries were outside of prescribed limits, as required by EPA validation protocol. After data validations of both the May and September 1990 data sets, EPA used these data in the ecological risk assessment with confidence.

COMMENT 29: The TOC Analytical Method produces inconsistent, unreliable results which are not reproducible to even an order of magnitude in the laboratory.

<u>Response</u> - The TOC analysis was performed through a special analytical services (SAS) request. The initial request was performed using a Metcalf & Eddy generated SAS that was approved by EPA/ESD Lexington. This SAS calls for the use of the Lloyd Kahn method (June 13, 1989) along with the analysis of every sample in duplicate. The TOC data was not produced using the SAS protocol of Region V appended by GEI. Although the laboratory did not perform every sample in duplicate it did perform four samples in quadruplicate and seven in duplicate. This data is summarized in Table 3 along with this response. The four quadruplicate analyses had relative standard deviations of less than 20%. The duplicate analyses had relative percent differences (rpd) ranging from 4% to 52% (average 24.9%). The samples with high rpd are still within the same order of magnitude and could be averaged to yield valid information. The duplicate data show little variation within a given sample.

Field observations made by EPA's consultant while sampling Middle Marsh, as described in Tables 3-1 and 3-2 of the RI

(Metcalf & Eddy, 1991a), indicate a variation from one geographical area to another. Some samples contained biodegraded twigs, leaves, moss, and other plant matter and others were soil-like with less organic matter. This variation in the character of the sediments is most likely the reason for the variation in PCB and TOC concentration. In summary, the variation in TOC data is predominantly due to large variations in sediment character and not in the variation in the TOC analytical method.

COMMENT 30: The basic assumptions of the hydrologic computer models are not included in the SRI or available for review, either by EPA or the public. The limited information on the hydrologic computer modeling which is available indicates that the models may not have been calibrated correctly.

Response - Hydrologic and Hydraulic modeling of Middle Marsh was conducted to estimate flood flows and the spatial extent of flooding in Middle Marsh resulting from various design storms: the 1 month storm through the 100-year storm. Determining the extent of flooding in Middle Marsh was an important aspect of developing a meaningful and representative sampling program. The model results were used to identify areas in Middle Marsh that are likely to be inundated with flood flows from the Unnamed Stream for various design storms to select sampling locations, and to develop maps of areas of varying flood frequency.

TR-20 was used to estimate storm flow rates entering Middle Marsh by way of the Unnamed Stream at Hathaway Road for monitored storms and various design storms. The peak storm flow rates were then routed through Middle Marsh using HEC-2, a water surface profile model, to determine flood elevations throughout Middle Marsh.

The contributing drainage area to the Unnamed Stream at Hathaway Road is approximately 345 acres and is shown in Figure 1 (see Attached). Field investigations were conducted to determine watershed characteristics such as land use, flow patterns, stream channel and flood plain characteristics, and presence of flow control structures. Based on information obtained from field investigations and review of plans, the drainage area was divided into four subdrainage areas in order to simulate the routing of flows through upstream reaches of the Unnamed Stream. The delineation of the subdrainage areas is indicated on Figure 1. Required input information such as drainage area size, runoff curve numbers and times of concentration for subdrainage areas are presented in Table 4 (see Attached). Weighted average runoff curve numbers were determined from existing land uses for hydrologic soil group C and assuming average antecedent soil moisture conditions (II). Times of concentration were determined using the SCS Lag

Method, taking into account flow paths through enclosed drainage systems where pertinent.

The headwaters of the Unnamed Stream start at the outlet of a 60-inch diameter storm drain outfall located south of the SE on and off ramps for routes 195 and 140. From this point the Unnamed Stream flows through six culverts before discharging to Middle Marsh. Information on each of these culverts is presented in Table 5 (see Attached). It was assumed based on the magnitude and locations of storm flow inputs to the Unnamed Stream and culvert characteristics that storm flows would pass relatively unimpeded through the four upstream culverts, while the twin 48-inch culverts under Hathaway Road and 72-inch culvert, located 60 feet upstream under the car wash driveway, may significantly control the passage of flows to Middle Marsh. To take into account the overall effect of these downstream controls, detailed routing of various flows through these culverts was accomplished using the HEC-2 model. The results of the model were used to develop a rating curve of elevation versus discharge and storage which was then used as input to the TR-20 model as a control structure.

TR-20 was used to model the routing of flows through the upstream reaches of the Unnamed Stream. Information on the reach characteristics used in TR-20 are presented in Table 6 (see Attached). A schematic of the TR-20 model used to predict flows discharging to Middle Marsh is shown in Figure 2 (see Attached).

Water surface profiles in Middle Marsh were calculated for flows predicted by TR-20 using the HEC-2 model. Required input information for HEC-2 includes cross-sectional data, reach length, and friction or roughness coefficients. The cross-sectional data were based on actual field surveys conducted in Middle Marsh and the golf course along the Unnamed Stream between Hathaway Road and the Conrail railroad embankment. The cross-sections were located at points where hydraulic control structures, such as culverts and weirs exist and where stream channel and floodplain characteristics change appreciably. Roughness coefficients were derived from literature values (Chow, 1959) based on field observations of channel and floodplain vegetation characteristics. The complete HEC-2 input data sets used for Middle Marsh have been placed in the Administrative Record.

As indicated on the final RI (Metcalf & Eddy, 1991a), flow monitoring of the Unnamed Stream was conducted at several of the surveyed cross-sections during the rainstorm of April 3-4, 1991. This rain event was a large storm in which 3.17 inches fell and resulted in significant overbank flooding in Middle Marsh. To test the accuracy of the models, observed peak flow levels at the six monitored stations were compared with the water surface elevations predicted by HEC-2. As indicated in Table 7 (see Attached), it was found that the simulated values are very close to the observed values, indicating the models are representative of actual conditions.

The modeling effort was an integral part in understanding the wetland, hydrologic, and habitat functions of Middle Marsh, and in understanding the likely distribution of contamination in Middle Marsh which was not fully addressed in previous studies. The modeling results were primarily used as an aid in designing a "smart" sampling plan that would provide more detail on the most contaminated areas of the wetland rather than expending unneeded effort and funds on relatively uncontaminated areas. It should be noted that the remediation plan for Middle Marsh is based on the PCB sampling data and the ecological risk assessment, and not the results of the hydrologic and hydraulic models.

COMMENT 31: The FS for Middle Marsh did not adequately evaluate potentially appropriate remedial alternatives for Middle Marsh and failed to address critical aspects of the preferred and contingency remedies. EPA eliminated technologies because they are unproven or would require bench and pilot scale testing.

Response - EPA did not eliminate alternatives based solely on the need for bench and pilot-scale testing. The need for extensive testing is a valid consideration when evaluating alternatives, since it points to questions of effectiveness, implementability, and cost.

Examination of Table 8-2, of the FS, titled "Summary of Alternative Screening for Middle Marsh," shows that the need for bench and pilot-scale testing was not used to eliminate alternatives. The only alternative for which the need for treatability studies was specifically listed in the table was in-situ bioremediation, and the statement was given a "0" rating, meaning that the statement had no effect on selection or rejection of the alternative. When treatability studies are needed this fact was discussed in the text of the FS, as is appropriate, but it was not used as a screening tool.

The fact that a technology is unproven was used as only one of many criteria in screening alternatives for the Middle Marsh site, as is appropriate during this phase of the FS process. The fact that a technology is unproven is an important part of an evaluation of its effectiveness. In "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (U.S. EPA, 1988), contractors are directed to evaluate effectiveness based on three criteria, one of which is "how proven and reliable the process is with respect to the contaminants and conditions at the site."

The NCP specifies that innovative technologies be considered when they offer the "potential for comparable or superior treatment performance or implementability, fewer or lesser adverse impacts than other available approaches, or lower costs for similar levels of performance than demonstrated technologies." As an innovative technology, in-situ bioremediation was retained beyond the initial screening of remedial technologies and evaluated as an alternative. It was at this stage, through evaluations of effectiveness, implementability, and cost, that in-situ bioremediation was screened out. The evidence that biodegradation of PCBs takes place naturally in soils and sediments is not sufficient to recommend in-situ bioremediation as a treatment technology at this time, because current evidence does not demonstrate the potential for comparable treatment performance, fewer impacts, or lower costs. For example:

- The research papers cited by GEI discuss the limitation that aerobic bacteria can only degrade the low chlorinated PCB congeners. Unterman (1991) states that "Aroclors 1254 and 1260 are too highly chlorinated to be reasonably degraded by currently-existing bacterial strains and will probably require an anaerobic treatment." It must be noted that no anaerobic PCB-degrading bacteria have been identified or isolated and that no such process currently exists. Current researchers generally acknowledge that degradation of Aroclor 1254 would require the development of dual anaerobic/aerobic processes for its destruction. This two-stage process is still a concept and has never been demonstrated.

- Anaerobic/aerobic in-situ bioremediation processes are at the level of an emerging technology, as opposed to an innovative technology. Pilot-scale studies have yet to be performed. During preparation of the FS, M&E engineers had several conversations with engineers and scientists at the General Electric Research and Development Center. GE's research group is at the forefront of PCB biodegradation research. GE scientists have just begun (in August of 1991) their first pilot study of a combined anaerobic/aerobic process for biodegradation of PCBs in Hudson River sediments, after years of preparation. However, GE has no plans to develop and market the process as a remediation technology (Abramowicz, 1990). Even if GE's pilot test proves successful, the question of implementability then arises. There are no vendors who have successfully bioremediated PCBs in-situ. Years of development will be needed before the technology could be implemented on any site at full scale.

- Meanwhile, adverse impacts to the environment would still be occurring due to PCB contamination. Other processes (e.g. solvent extraction) could address the entire problem well before a potentially effective in-situ bioremediation process could be developed, let alone implemented.

- As discussed in the FS, it is also questionable whether wetland impacts would be eliminated by use of in-situ bioremediation. Placement of an oxygen injection system into the wetlands will undoubtedly cause disturbance of the sediments, and may require removal of all vegetation from the area. In addition, the time required to remediate the sediments in this manner is likely to be quite long, on the order of years. Hence, the disturbance would take place for a long time, while the disturbance due to excavation will be relatively short-lived.

- Allowing the PCBs to biodegrade naturally, without addition of oxygen, organisms, or nutrients, is not an acceptable option. Certain congeners may never biodegrade, while those that do will require excessive lengths of time. For example, the work of Lake et al. (1989) on New Bedford Harbor sediments, which appeared in Appendix B, Volume I of the comments on the FS, lists half-lives for PCBs ranging from 7.5 to 465 years, depending on the sample and the congener.

There is little evidence that in-situ bioremediation will effectively remediate Middle Marsh within an acceptable time frame. The combined aerobic/anaerobic process which would be needed is not yet developed sufficiently to be applied to a full-scale remediation. The level of effort needed to develop it would far exceed what would be needed to test and implement other technologies such as solvent extraction, and the potential advantages in terms of wetlands impacts are questionable.

The cost estimate for the contingency alternative does not consider residual sediment toxicity because the solvent extraction process is not expected to yield treated sediments containing residual toxicity. The sediments will be treated such that the PCB concentration is below cleanup levels, thus residual PCB levels will pose minimal risk. Residual solvent levels will also pose minimal risk. For example, if the B.E.S.T. process were to be used, the residual solvent, triethylamine, would be readily biodegraded by common soil bacteria. If liquefied propane extraction were to be used, residual solvent would not be of concern since the solvent (propane) would vaporize from the sediments under ambient conditions. In addition, the remediation timetable is not believed to be unrealistic because the solvent extraction technology vendors market 100 ton-per-day systems which should be readily implementable at Middle Marsh.

2. **Comments from Howard T. Weir, Morgan, Lewis & Bockius, and Laurie Burt, Foley, Hoag & Eliot, on behalf of Cornell-Dubilier Electronics, Inc. and Federal Pacific Electric Company**

**COMMENT 1:** EPA proposes to spend $2,800,000 to protect from the alleged effects of PCBs a single animal of a single species -- the mink -- who has never been found at the Study Area, and who in all likelihood does not live in the Study Area.

Response - EPA believes that the selected remedy is cost-effective. Of the remedies evaluated in the FS, the selected remedy is the least expensive way to meet cleanup goals established for the operable unit. Mink were selected by EPA as an indicator species to represent small carnivorous mammals that use Middle Marsh. As mammals are suspected to be the most sensitive species, selection of mink is intended to reduce the uncertainty in the exposure assessment in its attempt to protect a variety of environmental receptors. Analysis of the habitat, prey, and home range requirements suggests that mink using the site may either live, breed, and feed on-site, or live off-site and feed on-site. Mink tracks were observed and photographed in Middle Marsh near the unnamed stream during a site visit on August 26, 1991. The mink tracks were identified by a certified wildlife biologist (Petron and Boucher, 1991). A detailed discussion of the use of the mink as an indicator species, is given in Section C.1., in response to Comments 10 through 13. This section includes a discussion of the mink's range and behavior.

**Comment 2** - EPA proposes remedial actions which will destroy hundreds of trees and other vegetation, and most likely numerous types of animals and other natural environmental features, such as wildlife habitat.

Response: EPA does not believe that this remedial action will devastate Middle Marsh or its associated wildlife. EPA Region I's Waste Management Division has consulted closely with Region I's Wetland Protection Section and the

Massachusetts Department of Environmental Protection in developing the selected and contingency remedies. Both the selected remedy and the contingency remedy specifically include methods to minimize and mitigate damage to vegetation and habitat. EPA is confident that the ecological conditions in the area will remain following remediation, that planted trees and natural succession will reestablish forested wetland in these areas, and that without PCBs, Middle Marsh will offer suitable habitat for a wider diversity of species. EPA has determined that disturbance of wetlands and floodplains is the only practicable alternative that would address PCB contamination in the Middle Marsh study area while minimizing adverse impact on the terrestrial and aquatic ecosystem. Further discussion on this issue is provided in Section C.1., in response to Comments 25, 26 and 27.

**Comment 3** - EPA can schedule remedial activities at the Disposal Area and Middle Marsh to avoid an additional cost of almost $5,000,000 that its contingent alternative would require. A cell can be left open in the cap that could accommodate the excavated material from the study area.

Response: There are two reasons why EPA believes that it would be inappropriate to put a hold on implementation of the First Operable Unit until the implementation of the Second Operable Unit can be coordinated. First, the contamination at the First Operable Unit presents the most urgent and serious threat to human health and the environment at the Site. Significant delay in implementing protective measures to address the contaminated groundwater, soils and sediments at the First Operable Unit (the principal threats at the Site) would be inappropriate. The NCP and its preamble encourage using operable units as early actions to eliminate, reduce or control the hazards posed by a site or to expedite site cleanup. 55 Fed. Reg. 8704. At this site, EPA decided in 1989 to split the Site into two operable units so that protective measures at the Disposal Area and Unnamed Stream could be implemented promptly at those locations, while EPA conducted further studies to characterize risks at Middle Marsh and analyze remedial approaches for Middle Marsh in greater detail. It does not make sense to decide now to wait until negotiations with potentially responsible parties (and perhaps litigation) regarding the Middle Marsh Operable Unit are over, an agreement is reached or an administrative order is issued under Section 106 of CERCLA, and design activities for the Middle Marsh Operable Unit are completed, before addressing the principal threat at the First Operable Unit.

EPA does not agree that leaving one cell open under the cap at the Disposal Area is an environmentally sound option, based on current information. Unsolidified and uncapped soils even at PCB levels below 50 ppm in an uncompleted cell could present a significant threat of release and recontamination of remediated areas. In addition, infiltration in the uncapped area could contribute to migration of contaminated groundwater including seepage of contaminants to the Unnamed Stream. Further discussion is provided in Section C.1., in response to Comment 20.

Second, in signing the Consent Decree relating to the First Operable Unit, EPA, the Commonwealth of Massachusetts and 14 PRPs have agreed to a schedule of activities for the First Operable Unit. This agreement was approved by the United States District Court in April 1991 and is legally binding on EPA. If EPA acted unilaterally in extending the schedule dates without the consent of the other parties to the Consent Decree, the 14 signatory PRPs could be adversely affected -- for example, the PRPs' contracts with design contractors and subcontractors would have to be extended out for longer periods of time, causing the PRPs' costs to increase. Based on the preliminary timetables established under the Consent Decree, it is expected that remedial design for the First Operable Unit will be completed by March, 1994. If additional design activities necessary to implement the selected remedy for the Middle Marsh Operable Unit are not completed in time to be integrated into the design of the First Operable Unit, then the contingency remedy will be implemented in place of the selected remedy.

If, however, all parties to the Consent Decree for the First Operable Unit can reach agreement, EPA would consider a short extension of time (consistent with the need to address principal threats quickly) that would permit coordination of the selected remedy for Middle Marsh with the remedy for the First Operable Unit, through an Explanation of Significant Differences ("ESD") if appropriate.

**Comment 4** - For sediments, EPA used the equilibrium partitioning method which relies on certain assumptions which bear no relation to the actual environment at Middle Marsh. Employing the method applied to soils would have yielded a more appropriate cleanup level.

Response: The application of sediment quality criteria for this site is consistent with EPA guidance. The equilibrium partitioning method has only been applied to one small, permanently flooded, aquatic area within Middle Marsh. EPA determined, based on site-specific studies, that the aquatic areas in Middle Marsh could support an aquatic pathway for bioaccumulation. The methods used in the RI to determine areas suited to the equilibrium partitioning method and approach taken to derive cleanup levels are described in detail in Section C.1., in response to Comments 10 through 15.

**Comment 5** - EPA arbitrarily applied cleanup levels to particular portions within the Site in an apparent and ill-founded attempt to justify a cleanup. If cleanup levels are applied against site-average PCB concentrations, no risk to wildlife is presented by the site.

Response: EPA does not agree with the use of area averaged PCB concentrations to set cleanup levels. Cleanup levels were applied on a point-by-point (never to be exceeded) basis. EPA believes this method is especially appropriate for Middle Marsh, and for mink and other species with feeding habitats similar to mink which concentrate their feeding in a core area. Applied as a never to be exceeded basis, remediation of PCBs to the cleanup levels would ensure that the mink and other sensitive species would be protected regardless of where they spend their time or obtain their food. A discussion of the development of cleanup levels is provided in Section C.1., in response to Comments 13 and 14.

**Comment 6** - Any risk the Site poses to mink, it probably poses to only a single mink.

Response: Mink were selected by EPA as an indicator species to represent small carnivorous mammals that use Middle Marsh. The use of mink as an indicator species is described in response to Comment 1 and a detailed discussion is given in Section C, in response to Comment 10 through 12.

**Comment 7** - The conditions in the aquatic sediments in the unnamed stream and Middle Marsh do not match the underlying assumption for the derivation of water quality criterion including the bioconcentration factor of 45,000.

Response: Site-specific data has shown that the benthos in Middle Marsh bioaccumulate PCB from sediments via the pore water. EPA believes that a PCB concentration of 0.014 $\mu g/l$ in the pore water would result in an aquatic food web with PCB concentrations protective of mink reproduction. A detailed discussion of the use of the SQC is given in Section C.1., in response to Comment 14.

**Comment 8** - EPA improperly calculated the cleanup levels for terrestrial/wetland exposure. Specifically, if a more realistic figure of 50 acres for the home range of the mink should have been used, the cleanup levels would have been set at higher levels.

Response: EPA believes that its figures for the home range for mink are appropriate. Although on the lower end of home range sizes, Middle Marsh and the surrounding habitat are of sufficient size to support mink because of its dense habitat and abundant prey. The use of the minimum range is reasonable considering the expected home range constriction due to suburban habitat partitioning. Furthermore, all the documented minimum home ranges were in a situation of dense cover and/or high prey numbers (Allen, 1986; Gerell, 1979). Mink often concentrate their feeding in core areas within their home range which are usually characterized by high prey densities and are in relatively close proximity to streams (Allen, 1986). The golf course fairways cannot be excluded from the home range or be considered an effective barrier to the travel of mink. The unnamed stream traverses the course in an approximately perpendicular manner and, with its attendant emergent vegetation and heavier vegetated side slopes along the stream and ponds, provides an excellent travel corridor. In addition, the stream is repeatedly crossed with cart paths which have culverts. The culverts provide additional security cover. Therefore, mink can be expected to readily follow the stream for travel between Middle Marsh and the adjacent wetland or the Apponagansett Swamp.

EPA does not believe that daytime golf activities would hinder this primarily nocturnal activity. The golf fairways more likely act as open fields in influencing the mink behavior because there are no obtrusive human structures such as buildings. Although most wild mammals, carnivores in particular, are wary of humans, these animals often coexist easily with humans given their nocturnal nature. Recent literature indicates that mink are "curious and bold and may try to steal fish caught by fishermen" (Godin, 1977) and are "tolerant of human activity" (Allen, 1986).

Additional description of the rationale behind the use of the home range number in calculating cleanup levels is described in response to Comment 12 in Section C.1.

**Comment 9** - EPA's *bioaccumulation* factor for the frog of 0.22 is incorrect because it is calculated by averaging station-by-station frog-to-sediment ratios. By first averaging the frog tissue concentrations, and then the soil/sediment concentrations, and then dividing the two averaged values, the more appropriate bioaccumulation factor of 0.08 is obtained.

Response - Field observations made by EPA's consultant while sampling Middle Marsh, as described in Tables 3-1 and 3-2 of the RI (Metcalf & Eddy, 1991a), indicate a variation in sediment/soil characteristics from one area in the wetland to another. Some samples contained visible twigs, leaves, moss, and biodegraded plant matter and others were soil-like with less organic matter. Due to the variation in sediment/soil characteristics, EPA felt that an average of BAFs calculated for each frog concentration and the associated sediment/soil concentration would be more accurate than averaging the sediment/soil concentrations and the frog concentrations and calculating one BAF. This methodology was used consistently to calculate site-specific BAFs in the ecological assessment.

**Comment 10** - EPA failed to consider the effect of natural restoration processes on the study area. EPA's failure to address the effects of sedimentation of clean sediments over sediments containing contaminants in the Study Area is arbitrary and capricious and contrary to law.

Response: EPA does not believe that natural biodegradation processes will result in attainment of levels of PCBs which are protective of biota at the Middle Marsh Operable Unit within an acceptable time frame. PCBs have been present at the Sullivan's Ledge site for decades, perhaps as long as fifty years. Although there is no evidence of disposal of PCBs at the Site since the early 1970's (almost twenty years ago), elevated concentrations of PCBs still persist at the Disposal Area and in the Middle Marsh Operable Unit. EPA does not believe that dissolution, volatilization, or biodegradation have caused significant reductions in PCB concentrations in the Middle Marsh Operable Unit. PCBs in the environment are generally resistant to physical and biological degradation and have a high affinity for organic material such as the sediment/soil in Middle Marsh. Indeed, certain PCB congeners may never biodegrade; others will only biodegrade in an excessive amount of time. A detailed discussion of natural degradation is included in Section C.1., in response to GEI Comments 7 and 31.

In addition, once excavation has been performed to remove soils and sediments contaminated above the cleanup levels, natural restoration processes would not be appropriate for Middle Marsh and the surrounding wetlands because the wetlands are subject to substantial changes in water surface elevation and high stream velocities. If excavated areas were not restored, EPA believes that there would be severe erosion problems, water quality degradation, and failure of any attempt to revegetate excavated areas due to the increased insurgence of stormwater, erosion, and sedimentation.

In addition, federal and state ARARs require replacement of sediments and restoration of disturbed wetlands. Executive Orders (E.O.) 11988 and 11990 require that actions in floodplains or wetlands restore and preserve the natural and beneficial values of the wetland and floodplain areas. E.O. 11990 requires that actions in wetlands "consider the maintenance of natural systems including conservation and long-term productivity of existing flora and fauna, ... [and] hydrologic utility."

**Comment 11** - EPA has failed to adequately weigh the harm to the environment which inevitably will result from its proposed remedy against the benefits that will result if natural restoration is allowed to occur.

Response: The ecological remediation criteria for Middle Marsh and the adjacent wetland were established to protect species that inhabit, or migrate to, Middle Marsh and downstream habitats. The remedial action was selected based on objectives outlined in the FS, including "minimize the destruction, loss, or degradation of wetlands, and preserve or enhance the natural and beneficial values of wetlands" (Metcalf & Eddy, 1991b). EPA has determined that disturbance of wetlands and floodplains is the only practicable alternative that would address PCB contamination in the Middle Marsh study area while minimizing adverse impact on the terrestrial and aquatic ecosystem. This issue is discussed in detail in the ROD and in Section C.1., in response to Comments 25 and 26.

**3. Comments from Frank C. Huntington, Widett, Slader & Goldman, P.C., on behalf of 12 Potentially Responsible Parties**

EPA's responses to the comments in the "Summary of Technical Comments" section of Mr. Huntington's letter are contained in EPA's responses to comments submitted by GEI on behalf of the same PRPs. Responses to other comments raised by Mr. Huntington are given below.

**Comment 1** - There is no basis for EPA to depart from the original "no action" determination.

Response: This comment mischaracterizes the history of EPA's consideration of remedial approaches for the Middle Marsh Operable Unit. EPA had never previously made a final "no-action" determination. Rather, in the 1989 Proposed Plan, EPA proposed a no-action alternative for Middle Marsh, as part of a site-wide remedy. At that time, EPA discussed two other "action" alternatives, and specifically sought public comment on how to achieve a protective remedy for the Middle Marsh area, given the need to balance the benefits of removing contaminants from Middle Marsh against the need to protect a functioning, valuable wetland from temporary disruption. At the end of the public comment period, based in part on comments received from state and federal officials over the previous year and in part on further consideration within EPA of the issues, EPA decided that further data was needed, particularly site-specific data on bioaccumulation and a better understanding of the aquatic and terrestrial organisms that inhabit the Middle Marsh ecosystems. This approach of splitting off an operable unit for further investigation, while addressing principal threats more expeditiously, is consistent with the NCP.

The comprehensive studies have now been completed, and EPA now has sufficient information to make a reasoned, careful decision that is consistent with CERCLA, the NCP, and EPA guidance. The Metcalf & Eddy Remedial Investigation (1991), which included bioaccumulation studies, showed that PCBs in portions of Middle Marsh pose an unacceptable risk to site biota and, in order to be protective of the environment, contaminated sediment/soil must be excavated. Further discussion of EPA's decision to undertake further studies is provided in Section C.1., in response to Comment 9.

**Comment 2** - EPA's remedy selection process for Middle Marsh did not adequately address the three major criteria (effectiveness, implementability and cost).

Response: The RI concluded that remedial action was necessary to reduce exposure of aquatic and terrestrial organisms through food chain bioaccumulation and direct contact with PCB-contaminated sediments, pore water, surface water and soils. Chapter 9 of the FS provides a detailed analysis of effectiveness, implementability, and cost for each of the alternatives evaluated. Particular attention was given to the long-term effectiveness of each action in attaining the remedial action objectives -- i.e. reducing risk to aquatic and terrestrial organisms in the environment, and protecting and enhancing wetland and floodplain values. The FS included a comprehensive analysis which compared the relative performance of each alternative in relation to nine criteria set out in the NCP, including effectiveness, implementability, and cost.

**Comment 3** - The preferred alternative is not cost-effective. The proposal to spend $3 million, and perhaps as much as $8 million or more, with the goal of avoiding one chance in 10,000 that one female mink (which probably does not even exist) might become sterile is a clear violation of the NCP's mandate that remedies be cost-effective.

Response: EPA disagrees with this comment. The selected remedy and the contingency remedy are cost-effective. EPA has followed the process set out in the NCP for choosing a cost-effective remedy: EPA evaluated the long-term effectiveness, the reduction of mobility and toxicity, and short-term effectiveness of the remedial alternatives, including the "no-action" alternative, to determine the overall effectiveness of each remedial alternative; EPA then evaluated the overall effectiveness of the remedial alternatives to the cost of the alternatives.

EPA concluded that the excavation of soils and sediments contaminated with PCBs above the cleanup levels in Middle Marsh and the Adjacent Wetland, when combined with measures to minimize and mitigate damage to the wetland areas, is the most effective remedy in reducing risks to aquatic and terrestrial organisms. On the other hand, EPA does not believe that a "no action" alternative would be protective. EPA does not believe that natural degradation processes will reduce PCB levels in the Middle Marsh Operable Unit to levels that are protective of wildlife with an acceptable time frame, if at all. The half-lives of PCBs can be as great as 465 years. (See Response to GEI Comments 7 and 31 and Morgan, Lewis Comment 10). While the NCP recognizes that there may be a range of protective remedies, with some more effective than others, it is EPA's judgment, after reviewing all the data, that the "no action" remedy does not fall into the range of protective remedies.

The role of cost in selection of CERCLA remedies is carefully spelled out in the NCP. The preamble to the NCP is clear that "cost can only be considered in selecting a remedy from among protective alternatives." 55 Fed. Reg. 8726. Of the remedial alternatives which EPA considers protective, the selected remedy provides the best proportion between overall effectiveness and cost. The selected remedy is the least expensive of the action alternatives.

In the event that the selected remedy cannot be implemented within the timeframes discussed in the ROD, the contingency alternative provides a cost-effective remedy. For the reasons discussed in EPA's response to Morgan Lewis Comment #3, EPA believes that indefinitely delaying the implementation of the remedy for the First Operable Unit could be inconsistent with the NCP and with the terms of the Consent Decree entered by the District Court in April 1991. If it is impossible to implement the selected remedy without significantly delaying the remedy for the First Operable Unit, then the contingency remedy provides the balance between overall effectiveness and cost.

Mink were selected by EPA as an indicator species to represent small carnivorous mammals that use Middle Marsh. As mammals are suspected to be the most sensitive species, selection of mink is intended to reduce the uncertainty in the exposure assessment in its attempt to protect a variety of environmental receptors. A detailed discussion of the use of the mink as an indicator species is given in Section C.1., in response to Comments 10 and 11.

**Comment 4** - The preferred remedy does not comply with the Massachusetts Wetlands Regulations that provide that "no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species" and that if a project will alter a resource area which is part of the habitat of a rare species, the project "shall not be permitted to have any short or long term adverse effects on the habitat of the local population of that species."

Response: EPA believes that the selected and contingency remedies will comply with the substantive portions of Massachusetts wetlands regulations. Those regulations at 310 CMR 10.00 establish procedures for a variance from portions of the regulations, if: (i) there are not reasonable conditions or alternatives that would allow the project to proceed in accordance with the regulations; (ii) mitigating measures are proposed that allow the project to contribute to the interests identified in the Wetlands Protection Act; and (iii) the variance is necessary to accommodate an overriding community, state or national public interest. The Massachusetts Department of Environmental Protection has advised EPA that the proposed remediation appears to meet the variance criteria of 310 CMR 10.58, with the condition that the Spotted Turtle and Mystic Valley Amphipod serve as biological indicators of habitat restoration, if appropriate. The wetland restoration program will evaluate methods for using these two state-listed species of special concern as biological indicators of habitat restoration.

**Comment 5** - EPA's selection of a contingency alternative is inconsistent with the NCP because the extra cost of $5 million would result solely from EPA's refusal to integrate the schedules for remediation of the Sullivan's Ledge Disposal Area and Middle Marsh operable units. The NCP states that use of operable units "should not be inconsistent with or preclude implementation of the expected final remedy for the whole site."

Response: EPA disagrees with this comment. EPA's use of operable units to address contamination at the Sullivan's Ledge site is consistent with the NCP. First, in choosing the selected remedy in this ROD, EPA has made every effort to ensure that the Middle Marsh Operable Unit remedy is in fact consistent with the First Operable Unit remedy. The selected remedy was designed to minimize duplication of activities and to minimize costs. The contingency remedy will only be triggered if such coordination is not possible.

Second, the NCP makes it clear that it is appropriate to remediate sites in phases using operable units to eliminate, reduce or control site hazards or to expedite the completion of total site cleanup. In this case, EPA concluded that separating Middle Marsh out as an operable unit would allow implementation of the remedy at the Disposal Area and Unnamed Stream to proceed, without waiting for the conclusions of additional studies for Middle Marsh.

EPA is concerned that, unless a contingency remedy is available, the delays associated with the Middle Marsh Operable Unit (e.g. protracted litigation) could potentially prevent implementation of the remedy for the First Operable Unit for an indefinite period of time. Litigation under CERCLA can be extremely complex, lasting many years. EPA wishes to avoid a scenario where implementation of the remedy for the First Operable Unit -- which is designed to contain and treat the principal threats at the Site -- would be significantly delayed. If capping the Disposal Area is delayed, the contaminated soils could continue to migrate to downstream areas including Middle Marsh via the Unnamed Stream and would continue to be a threat to public health and the environment. Further discussion of this issue is provided in response to Morgan Lewis Comment #3 and in Section C.1., in response to GEI Comment 20.

**Comment 6** - The contingency remedy is not cost-effective. There would be no significant risk to human health or the environment from briefly delaying the installation of the cap at the Disposal Area, should that be necessary until the excavated Marsh sediments are ready to be placed there, or from briefly stockpiling the excavated sediments from the Marsh until the cap is ready.

**EPA Response** - See EPA's response to Morgan Lewis Comment #3 and GEI Comment #20 and Comment 5 above. If capping the Disposal Area is delayed, PCB-contaminated soils could continue to migrate to downstream areas, and would continue to present a threat to the environment, and if contaminant levels increase, to human health. Leaving unsolidified and uncapped soils at levels below 50 ppm in an uncompleted cell would present a significant threat of release and recontamination of remediated areas.

**4. Comments from McGregor, Shea and Doliner on behalf of Brittany Dyeing and Printing Corporation**

COMMENT 1 - The 1989 No-Action alternative remains the most reasonable and supportable option. Under the No-Action alternative, institutional controls on site access and use, and monitoring of contaminant concentrations could be required.

<u>Response</u>: The No-Action alternative and the Limited Action alternative were not chosen as the selected or contingency remedy because they would not be protective of the environment and would not attain ARARs. Additional descriptions of the

rationale for the selection of the remedies are given in response to Comment 1 in Section A.3., Comment 9 of Section C.1. and Comment 10 of Section C.2.

**COMMENT 2** - The negligible risks to aquatic organisms and predators from levels of PCBs below the 50 ppm Toxic Substances Control Act hazardous threshold do not support performance of the $2.8 million preferred remedy.

Response: EPA has determined that actual or threatened releases of hazardous substances from contaminated sediments in Middle Marsh and the Adjacent Wetland, if not addressed by implementing the response action selected in the ROD, may present an imminent and substantial endangerment to biota present in the environment at Middle Marsh and the Adjacent Wetland. A description of the results of the ecological risk assessment is given in Section VI.B. of the ROD.

EPA has further determined that none of the alternatives to excavation, including no-action, would be able to achieve the overall purpose of the project, which is to reduce risk to environmental receptors at the Site, without causing other significant adverse impacts to the environment. Given the need to excavate, the selected remedy is cost-effective, as summarized in Section XI.C. of the ROD and described in EPA response to Comment 2 in Section A.1. and Comment 1 in Section C.2.

**COMMENT 3** - EPA's preferred alternative will result in inadequately estimated adverse impacts to wetlands.

Response: EPA does not believe that this remedial action will devastate Middle Marsh or other wetlands. Performance of this cleanup remedy will meet all applicable or relevant and appropriate federal and state requirements. Further discussion on this issue is provided in Section C.1., in response to Comments 25, 26 and 27, and in Section C.2., in response to Comment 2.

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Issues raised during the public comment period that will continue to be of concern as the site moves into the RD/RA phase are described briefly below. EPA will continue to address these issues as more information becomes available during the RD/RA.

1. Until the contaminated soils are removed, questions are likely to continue to arise regarding incidents of human contact with contaminated soils and sediments.

2. Because the City of New Bedford is a PRP, the impact of the Middle Marsh cleanup on the City's finances could potentially be a significant public concern. Public opposition to the City paying for the cleanup is likely to focus on: (1) the fact that no human health risk has been identified and (2) the belief that the cleanup may not prove effective in the long-term due to the continued flow of contaminated groundwater into the area from the Disposal Area. The public may not see the value of devoting City resources to a cleanup designed to protect animals when the value of the cleanup is weighed against other municipal needs such as police protection and school financing, especially when the economy is slow.

3. Disruption of activities at the golf course and the quality of the restoration portion of the cleanup are likely to be issues that will arise when construction of the remedy commences.

## Table 1 – Solvent Extraction Treatability Study Results for PCB Contaminated Sediments

| Sample Identification | Technology | Raw Sample PCBs (mg/kg) | Composition Oil (percent) | Treated PCBs (mg/kg) | Soil Composition Percent Removal | Reference |
|---|---|---|---|---|---|---|
| Superfund A Composite | B.E.S.T. | 68 | 17 | 1.1 | 99.6 | Robbins, undated |
| Superfund B (#13) | B.E.S.T. | 83 | 44 | 1.8 | 99.6 | Robbins, undated |
| Soils | | | | | | |
| C | B.E.S.T. | 4300 | 1 | 2 | >99.9 | Weimer, 1989 |
| E | B.E.S.T. | 190 | 0.07 | 1.6 | 99.3 | Weimer, 1989 |
| F | B.E.S.T. | 3000 | 1.5 | 0.8 | >99.9 | Weimer, 1989 |
| J | B.E.S.T. | 19 | 0.09 | 0.7 | 96.9 | Weimer, 1989 |
| Natural Gas Pipeline Compressor Soils | | | | | | |
| Hot Spot | B.E.S.T. | 2000 | 0.38 | 1.5 | 99.9 | Weimer, 1989 |
| Composite I | B.E.S.T. | 550 | 0.66 | 0.77 | 99.9 | Weimer, 1989 |
| Composite II | B.E.S.T. | 510 | 0.14 | 1.2 | 99.8 | Weimer, 1989 |
| Clay Subsoil | LEEP | 1500 | NL | NL(1.5) | 99.9 | Steiner, 1991 |

NOTES:
NL = Not Listed; value in perenthesis was estimated from reported percent removal.

# Table 2 – Results of PCB Water Analysis (Aroclor 1254)

| Station | Surface Water | | Pore Water | |
|---|---|---|---|---|
| | (unfilt.) | (filt.) | (unfilt.) | (filt.) |
| ME01 | 0.08J* | 0.08J* | 1.5J* | 0.92J* |
| ME02 | 0.039J | 0.022J* | 0.78J | 0.56J |
| ME03 | 0.1J* | 0.05U | 0.87J | 0.64J |
| ME04 | 0.05U | 0.05U | 1.7J* | 1.1J |
| ME11 | 0.05U | 0.05U | 1.6J | 0.05U |
| ME14 | | | 0.27J | 0.088J |
| ME15 | 0.05U | 0.19J* | 0.05U | 4.4J |
| ME17 | 0.05U | 0.05U | 1.1J* | 1.1J* |
| ME23 | 0.05U | 0.05U | 0.17J* | 0.04J |
| ME24 | 0.061J* | 0.05U | 1.7J* | 0.05U |
| ME29 | 0.083J | 0.05U | 0.68J* | 0.45J* |
| ME36 | | | 0.12J | 0.069J |
| SL01 | 0.98J | 0.01U | 3.5J | 0.02U |
| SL04 | 2.00J | 0.01U | 1.8J | 0.7J |
| SL14 | | | 3.6J | 0.84J |
| SL15 | 1.5J | 0.01U | 7.6J | 1.4J |
| SL17 | 1.7J | 0.077J | 29J | 10J |

J = Estimated Value
U = Undetected at Detection Limit
(*) = Reported by lab as Aroclor 1248 or 1260 but changed to Aroclor 1254 during data vali

# Table 3 – Sullivan's Ledge Soil Analysis

| USEPA Sample ID | TOC | S.D. | M&E %RSD | M&E %RPD |
|---|---|---|---|---|
| *5344A-006 | 21000 | 4320.5 | 17.28 | — |
| | 31000 | | | |
| | 23000 | | | |
| | 25000 | | | |
| *5344A-022 | 15000 | 2581.9 | 16.14 | — |
| | 13000 | | | |
| | 19000 | | | |
| | 17000 | | | |
| *5344A-031 | 16000 | 2217.4 | 15.03 | — |
| | 14000 | | | |
| | 12000 | | | |
| | 17000 | | | |
| *5344A-067 | 14000 | 957.4 | 7.23 | — |
| | 14000 | | | |
| | 13000 | | | |
| | 12000 | | | |
| **5344A-008 | 9500 | — | — | 9 |
| -009 | 8700 | | | |
| **5344A-014 | 38000 | — | — | 10 |
| -015 | 42000 | | | |
| **5344A-019 | 34000 | — | — | 57 |
| -020 | 61000 | | | |
| **5344A-022 | 14000 | — | — | 15 |
| -023 | 12000 | | | |
| **5344A-032 | 19000 | — | — | 30 |
| -033 | 14000 | | | |
| **5344A-036 | 500000 | — | — | 4 |
| -037 | 480000 | | | |
| **5344A-070 | 330000 | — | — | 49 |
| -071 | 200000 | | | |

* – Indicates Samples Analyzed in Quadruplicate
** – Indicates Field Duplicates
S.D. – Standard Deviation
RPD – Relative Percent Differences
RSD – Relative Standard Deviations

## Table 4 – Catchment and Subcatchment Characteristics

| Subdrainage Area | Area (acres) | Area (sq. mi.) | Curve* Number (CN) | Time of Concentration tc (hrs) |
|---|---|---|---|---|
| 1 | 159 | 0.249 | 81.4 | 2.23 |
| 2 | 24 | 0.037 | 87.2 | 1.67 |
| 3 | 67 | 0.104 | 81.6 | 0.83 |
| 4 | 96 | 0.15 | 83.3 | 1.32 |

(*) = Weighted average curve number

## Table 5 – Culverts on Unnamed Stream

| Location | Size (in.) | Length (ft.) | Slope (ft./ft.) |
|---|---|---|---|
| Hathaway Rd. | Twin 48 circ. | 92 | 0.0011 |
| Carwash Driveway | 72 circ. | 90 | 0.0067 |
| NW Ramps for Rtes. 140 & 195 | 72 circ. | 206 | 0.0053 |
| Rte. 140 north of Rte. 195 | 72 circ. | 142 | 0.0049 |
| Rte. 195 east of Rte. 140 | 66 circ. | 220 | 0.005 |
| SW ramps for Rtes. 140 & 195 | 60 circ. | 140 | 0.0057 |

## Table 6 – TR-20 Reach Information

| Reach No. | Representative Cross Section** | Length (ft.) | Slope (ft./ft.) | Mannings Roughness coeff.(n) |
|---|---|---|---|---|
| 1 | 1 | 990 | 0.0036 | 0.1 |
| 2 | 2 | 290 | 0.004 | 0.06 |
| 3 | 3 | 856 | 0.0046 | 0.06 |
| 4 | 4 | 850 | 0.0058 | 0.1 |

(**) = See Figure 2 – TR-20 Schematic

# Table 7 – Comparison of Simulated and Observed Flood Elevations in Middle Marsh

| HEC-2 STATION | MONITORED CROSS-SECTION NO. | ELEVATION | |
|---|---|---|---|
| | | OBSERVED (Feet) | HEC-2 SIMULATED (Feet) |
| 155 | 13 | 63.5 | 63.7 |
| 255 | 12A | 63.6 | 63.8 |
| 645 | 10 | 63.8 | 64.0 |
| 1085 | 9 | 64.3 | 64.1 |
| 1355 | 7 | 65.2 | 64.5 |
| 1898 | 5 | 67.2 | 67.2 |

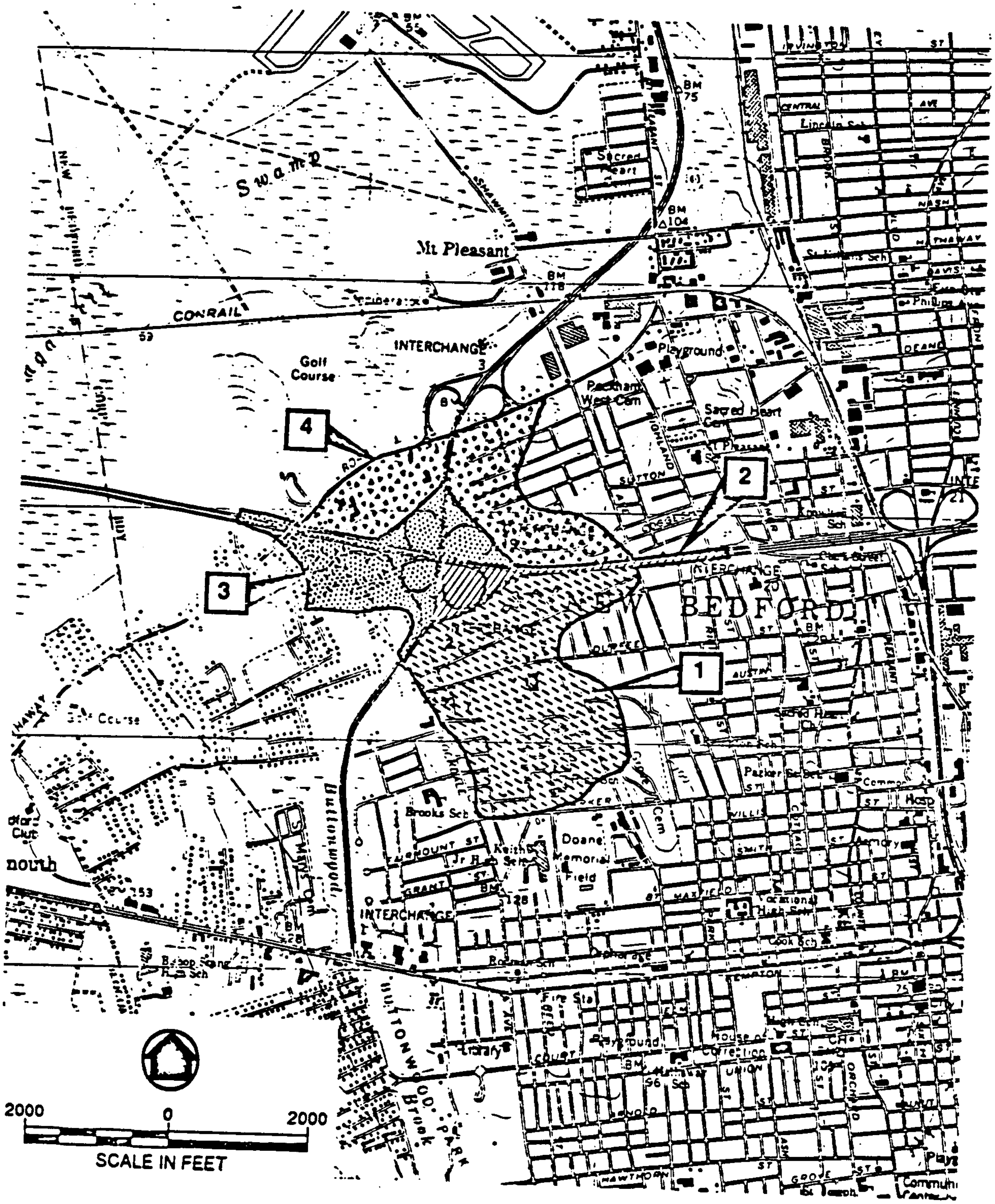


FIGURE 1. DELINEATION OF SUBDRAINAGE AREAS

POOR QUALITY ORIGINAL

METCALF & EDDY

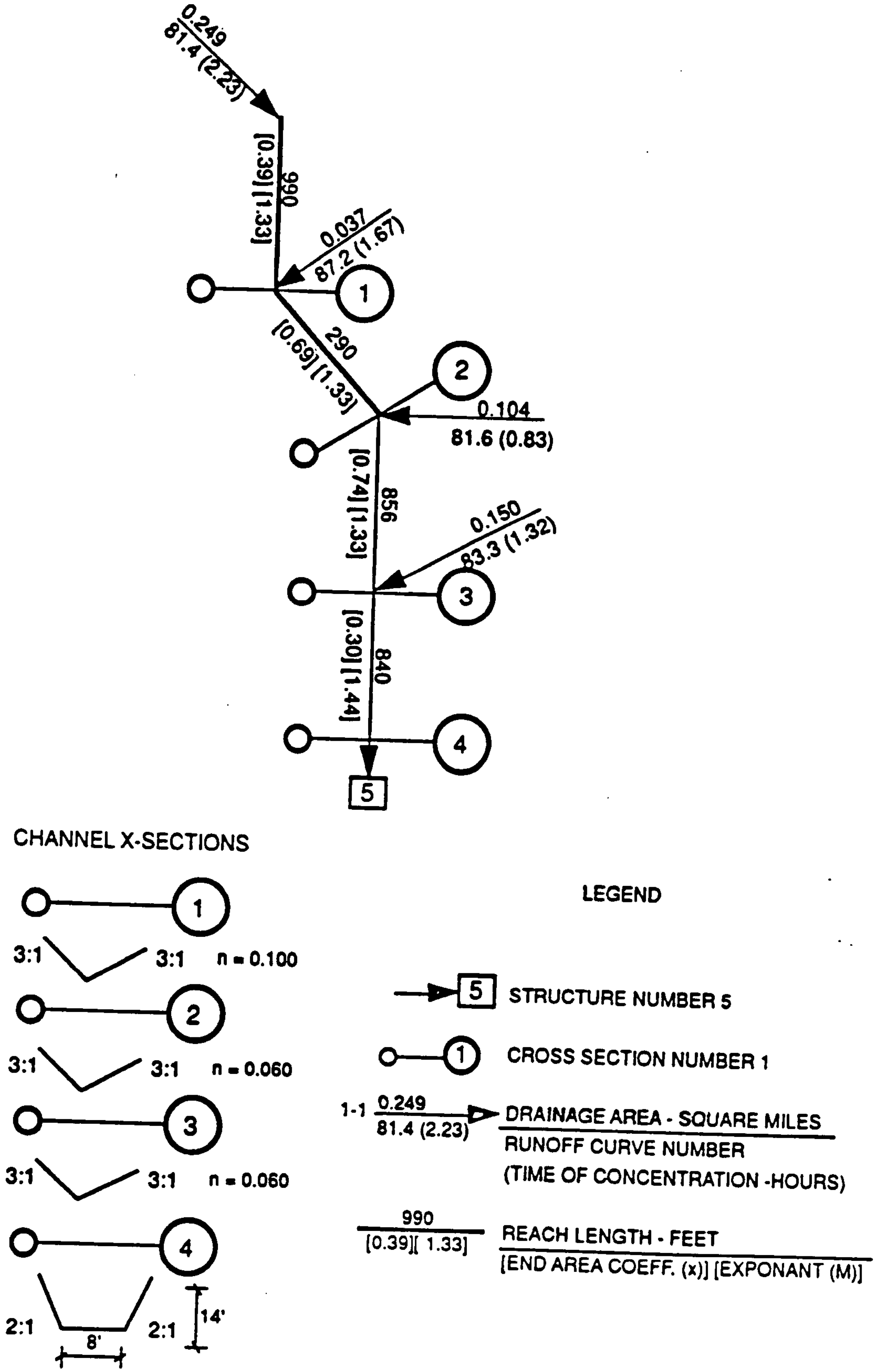


FIGURE 2. TR-20 SCHEMATIC FOR UNNAMED STREAM AT HATHAWAY ROAD

1983jp

# ATTACHMENT A

## Formal Community Relations Activities Conducted To Date at the Sullivan's Ledge Superfund Site

## ATTACHMENT A

**Formal Community Relations Activities Conducted To Date at the Sullivan's Ledge Superfund Site**

| | |
|---|---|
| Continuous | EPA maintenance of the site mailing list. |
| 9/86 | EPA Community Relations Plan completed. |
| 1/88 | EPA fact sheet for Remedial Investigation Phase I. |
| 7/88 | EPA fact sheet for Remedial Investigation Phase I & II. |
| 7/20/88 | EPA public meeting on the preliminary findings of the RI and Endangerment Assessment. |
| 1/23/89 | EPA public notice of the Proposed Plan, comment period, pubic meeting, and public hearing. |
| 1/27/89 | EPA Proposed Plan mailed with press release. |
| 2/6/89 | EPA public meeting on the Proposed Plan and Feasibility Study. |
| 2/7/89-3/27/89 | EPA public comment period on Proposed Plan and Feasibility Study. |
| 2/21/89 | EPA public hearing to accept comments on the Proposed Plan and Feasibility Study. |
| 6/30/89 | EPA press release announcing ROD for first operable unit. |
| 6/30/89 | EPA responsiveness summary for the first operable unit. |
| 7/7/89 | EPA public notice announcing the ROD for first operable unit. |
| 4/91 | EPA Middle Marsh Remedial Investigation fact sheet. |
| 5/21/91 | EPA Proposed Plan and press release for the Middle Marsh operable unit. |
| 5/24/91 | EPA public notice of the Proposed Plan, comment period, public meeting, and public hearing for Middle Marsh operable unit. |
| 5/28/91 | EPA public meeting on the Middle Marsh Proposed Plan and Feasibility Study. |
| 5/30/91-7/31/91 | EPA public comment period on the Middle Marsh Proposed Plan and Feasibility Study. |
| 6/21/91 | EPA press release announcing extension of public comment period. |
| 6/26/91 | EPA public hearing to accept comments on the Middle Marsh Proposed Plan and Feasibility Study. |
| 9/27/91 | EPA responsiveness summary and press release for Middle Marsh ROD. |

ATTACHMENT B

Transcript of the July 26, 1991 Informal Public Hearing

UNITED STATES OF AMERICA

ENVIRONMENTAL PROTECTION AGENCY

BOSTON REGION

In the Matter of:

PUBLIC HEARING RE:

PROPOSED CLEANUP PLAN FOR
MIDDLE MARSH
SULLIVAN'S LEDGE SUPERFUND SITE

June 26, 1991
Wednesday

Days Inn
Hathaway Road
New Bedford, Massachusetts

The above-entitled matter came on for hearing, pursuant to Notice, at 7:30 o'clock p.m.

BEFORE: JIM SEBASTIAN, Hearing Officer
Community Relations Coordinator
U. S. Environmental Protection Agency
and
JANE DOWNING
Site Manager/Sullivan's Ledge Superfund Site
U. S. Environmental Protection Agency
(HRS-CAN3) JFK Federal Building
Boston, MA 02203-2211

JAMIE MAUGHAN
Metcalf and Eddy

# I N D E X

# P R O C E E D I N G S

COMMENCED [7:30 p.m.]

Opening Comments

MR. SEBASTION: Good evening.

My name is Jim Sebastion. I'm from the Environmental Protection Agency. I'm what's called the Community Relations Coordinator for the Sullivan's Ledge Site. Tonight, I will be the Hearing Officer for tonight's meeting.

This is a hearing on the Middle Marsh portion of the Sullivan's Ledge Superfund Site.

With me tonight is Jane Downing. Jane is the site manager for the Sullivan's Ledge Site, including Middle Marsh. And also in the back is Jamie Maughan from the consulting firm Metcalf & Eddy. He's been helping out with the technical aspects of the site.

The purpose of tonight's meeting is to accept comments on the feasibility study and proposed plan for the remediation of Middle Marsh. We were down here, some of you may remember, last month on May 29th to describe the plan prior to the public comment period.

The format for tonight will be as follows: first, Jane will briefly describe the proposed plan again. It will be just five or ten minutes of the highlights to refresh your memory.

Second, after Jane's short presentation, we can try to answer any remaining questions you may have about the plan before the comment portion to clarify any questions you may have about the proposed plan.

Next, we will accept formal comments for the record. All the comments will be recorded and transcribed and a transcript will be made available eventually in the public information repository which is now at the city hall, New Bedford City Hall, it's been moved from the library.

I will be calling on people to make comments who have put their names on three by five cards in the back of the room. So, if you would like to comment, please put your name on a card and we will be able to call on you during the formal comment portion of the meeting. And if at some point you decide that you would like to comment and you haven't filled out a card, we'd be happy to help you out and we can assist you with that, just see Jamie in the back. I will call on people in the order that we receive the cards. The cards basically ensure that we have your name spelled correctly and that we call you up in the order that you came to the meeting. If necessary, we may need to limit the time for each commentator so that everyone has a chance to comment.

Another announcement I would like to make tonight is that the comment period has been extended. It was scheduled to end this Friday, but we received a request for a comment period extension and the comment period has now been extended another thirty days to July 31st. All written comments must be postmarked no later than July 31st for them to be considered in the final decision.

We do hope that you will submit comments. It can be on any of the alternatives, including the preferred alternatives or any of the work that has been done on Middle Marsh. All of this information is available, as I mentioned, at the information repository which is at the New Bedford City Hall in the City Clerk's office, it was formerly at the library. It's also in Boston at the EPA Record Center. We want to hear everything you have to say about the plan, be it good or bad or any of the different aspects of the plan.

We will take all of these comments into consideration when we are making a final decision. The comments will be listed along with responses to comments in a document known as a responsiveness summary, which will also be available at the information repository and it will be released at the time of the record of decision which we expect at the end of the summer.

If you have any questions about how to comment or about the plan itself, during the comment period, during the next thirty days, please let us know. Jane's number and my number are in the back of the proposed plan and we would be happy to help you with any questions you have.

Two more important points I want to get across before we start. One, when we start the comment portion of the meeting, and I'll let you know when that is, after the questions and answers, we are only receiving comments. We will listen to what you have to say, but we will not respond during that period. That's important to know, we are just accepting comments then. After we have heard your comments, if you do need some questions answered at that point, we would be happy to stay behind and answer those for you, or try.

And the second point I want to make clear before we begin is that we are accepting comments only on the Middle Marsh portion of the cleanup. The remediation for the disposal area, this area here in yellow surrounded by a green border, has already been determined. We went through a similar process a couple years ago for this cleanup and it includes a number of measures including a cap. We can not and will not accept comments on that portion of the cleanup tonight. Again, we can answer questions about that cleanup after the comment portion of the meeting, but we're not looking for comments on that portion tonight.

So, just to recap what we're going to be going over tonight, we're going to be talking -- Jane is going to briefly describe the proposed plan once again for you and then we will answer any clarifying questions that you may about our presentation and then we will accept formal comments for the record and I will be calling on you. And then we will close that formal comment portion and we will informally discuss or answer any questions that you have.

So now I would like to turn it over to Jane and she will discuss the proposed plan for an alternative.

Description of Proposed Plan

MS. DOWNING: Thank you, Jim.

As Jim stated, this will be a fairly abbreviated explanation of the preferred alternative. Most of you were here about a month ago when we went over the specifics. And I do have an overview of some of the results of the study. But please, if you have any questions after the presentation, I certainly will answer any questions or concerns that you have.

First of all, very quickly, you all probably realize where the site is, considering we are almost next door to the site. But this particular portion of the site is really focused on Middle Marsh, and Middle Marsh, as you may know, is located almost in the middle of the golf course across the street. It is about a twelve acre area and it is designated as a wetlands. There's also a small area which is also a wetlands area along the unnamed stream which is part of this study.

So, this particular study and this selection of cleanup is just for the portion of the site that is north of Hathaway Road, including Middle Marsh and a second wetland area. This will be what we'll be talking about tonight.

We looked at a number of the media within the study area during the remedial investigation. We took a number of samples including samples of sediments, surface water and what we call pore water. And pore water is just the water that you see in between the sediments.

And the results of the remedial investigation basically indicated that the contaminants that we have in those areas are PCBs, PAHs, PAHs are polyaromatic hydrocarbons, and also metals. These are consistent with the results that we found on the first part of the site. So that if you look at the results of the remedial investigation that was done at the disposal area, you can see that they're the very same type of contaminants.

Basically what has happened is, the contaminated soils have migrated from the disposal area, have migrated into the unnamed stream, and with the stream, the sediments have traveled across Hathaway Road into the golf course and then basically spread out into Middle Marsh. So, the contamination is consistent with the first part, but the major focus is PCBs.

Now, given the levels of PCBs we found in Middle Marsh, we determined that the risk to human health was minimal. The way that we felt that people would be exposed to those PCB contaminated sediments are primarily the golfers who may go in there after golf balls and touch the contaminated sediments. So, we looked at that exposure and we concluded that the levels in Middle Marsh do not pose a significant risk to golfers and to children who may periodically go in and play in those sediments.

The primary risk that is posed by those contaminated sediments is to the animals who live in Middle Marsh. As part of the study, we looked at all the animals that could potentially or the animals that do inhabit Middle Marsh. And we determined that all the animals that were sampled had PCBs in them.

So, the risk that we have found that is significant is happening through direct contact with the contaminated pore water or the contaminated sediments, and those risks are posed to the animals that inhabit Middle Marsh. That is the primary conclusion from the study.

Now, the fact that we have an unacceptable risk, we set cleanup levels so that by the time we cleaned up the site, the risk would not be unacceptable, that those animals would not have any risk to their health.

The numbers that we determined that would be acceptable, which are the cleanup objectives or the cleanup levels that we have established are two different numbers. The first one is 15 parts per million and that is mostly for the area about eleven acres of the twelve acre area. And the 15 is to protect the mammals. You may have mink, you may have frogs, you may have dogs out there, and that 15 ppm is basically to protect the terrestrial animals. We set another limit which is in a tributary stream in the northern portion and that number is twenty micrograms, and that's to protect any fish or aquatic organisms that may be in that area up there. So, there are two different cleanup levels that were selected or proposed in the proposed plan.

Now, in terms of cleanup, we have concluded that in order to meet the cleanup objectives, we need to go in and excavate four different areas in the golf course. Three of the areas are within Middle Marsh. You can see that this particular picture shows the three areas; there's a larger area here and there's two small areas, one to the south and one to the north. There's another area up here that's about a half an acre. All total, the areas that should be cleaned up in order to meet the cleanup levels are about 1.9 acres. So, we are proposing to go in and excavate almost two acres of the Middle Marsh area.

The preferred alternative has a number of components. The first one is site preparation and that is basically self-explanatory. We would have to go in and remove the trees. There are a lot of trees out in Middle Marsh, so there will have to be some preparatory work that has to be done.

We will excavate the sediments and that is a total of about 5,200 cubic yards. Again, it's about two acres that we're talking about. And once those sediments are excavated, we are proposing to take those sediments and bring it to the disposal area. Basically, we will excavate the sediments and then transport them across Hathaway Road to the disposal area and dispose of them in the disposal area. This area will be further capped as part of the first decision. So, the sediments will come from Middle Marsh, they will not be treated, they will be disposed and then capped with the cap.

In addition, we will have to restore the wetland. We will not just excavate and leave the land the way it turns out. We will have to go in, and to the extent possible, go back and restore the land. That may mean that we'll have to plant some trees and bushes.

We will have to do some long term monitoring so five, ten years down the road, we will still be back in and doing some sampling to make sure that we're truly protective of those that we feel are posing unacceptable risks.

There will also have to be some institutional controls. And what that means is that basically we can not accept a residential development in that area. We have proposed that the land use in the future for the golf course will always be similar, as a golf course, recreation area. We are not proposing that there could be a house built on that land. And what we have to do is we have to put in some deed restrictions to make sure that that would happen.

That is basically the preferred alternative. Obviously we're asking for comments tonight on what you all think of that. We have also selected a contingency alternative. And the reason we did this was because there may be a possibility that this area here may not be -- may be unavailable to accept the excavated sediments. If this area had already been capped, we could not move the sediments and dispose of them here.

So, we selected a contingency alternative that would take care of that possibility. And what that would mean is basically the sediments will have to be treated by solvent extraction and then the treated sediments will be disposed back into Middle Marsh.

The treatment is called solvent extraction and when you treat with solvent extraction, you have an oil that contains all the PCBs and that oil will be transported off site and burned in an incinerator.

We will also have to wetland restoration work similar to the preferred alternative. We will have to monitor and we will have the same institutional controls that we talked about.

And finally, just in terms of anticipated costs, the preferred alternative, we have estimated, will cost 2.8 million. The contingency alternative, where we have to treat the sediments, we have anticipated that it would cost 7.8 million dollars.

Basically that is the proposal. We are, obviously, as Jim said, asking for your comments on that today. And before we go on the record to ask for your oral comments, I would just like to ask if anybody has any questions, do you need further clarification on any point?

Question and Answer Session

FROM THE FLOOR: Yes.

I would like to know what metals you found in this site specific analysis that you made reference to earlier?

MS. DOWNING: The metals that we found, I believe they were zinc, lead, and there may have been two or three others; but, the primary ones were zinc and lead.

FROM THE FLOOR: Zinc and lead?

MS. DOWNING: Yes. And in fact--

FROM THE FLOOR: Do you remember what the portions were, the amounts?

MS. DOWNING: I don't know that.

FROM THE FLOOR: Two parts per million?

MS. DOWNING: I don't know that, but we do have the exact numbers and they are in the reports.

FROM THE FLOOR: So I can read the report and find it in there?

MS. DOWNING: Yes; you can. In fact, there are maps that show exactly where the zinc levels were found and where the lead levels were found.

The one thing that was interesting about the metals with regard to the zinc and lead, where we found the contamination was basically where we found the PCBs. What was interesting, which is what we really thought had happened, as the sediments went into Middle Marsh, during floods and during rain events, the sediments would come out of the stream and settle into Middle Marsh. So, we have some areas close to the stream that have the highest PCB contamination. There are also the areas that have the high metal contamination.

So, I think the primary ones were zinc and lead. And if my memory serves me, the highest lead value was 800 ppm, the zinc, I would have to check on.

FROM THE FLOOR: What's the average PCB level?

MS. DOWNING: The average PCB is around 15 parts per million.

FROM THE FLOOR: Throughout the whole Middle Marsh site?

MS. DOWNING: Throughout Middle Marsh; correct.

We had-- The highest spot was in this area up here, at a, I think it was greater than six inches below the surface and that highest value was 90 parts per million. The highest value in Middle Marsh was 60 parts per million.

FROM THE FLOOR: And in your average, do you include all the areas that came in below the detection limit?

MS. DOWNING: What we typically do is we take half the detection limit and use them as averaging. That's what we do when we do the risk assessment. But in the remedial investigation when we're just looking at the average, we only take those that are detected. So there are two answers to that. I would say if you just read through the remedial investigation, only look at the detection, the ones that were detected.

MR. MAUGHAN: When we looked at some numbers, I think we came up with 9.13.

FROM THE FLOOR: That's including the detector models at zero?

MS. DOWNING: There's a number of ways of looking at it all in numbers. Typically, the detection limit that you can look at is 1 ppm, although we got lower detection limits.

What was our detection limit, Jamie, do you remember?

MR. MAUGHAN: It was, yes; well below one.

MS. DOWNING: It was well below one.

So, there's a number of ways of playing with the numbers that you can get to get your average.

FROM THE FLOOR: How did you come up with the detection level of remediation?

MS. DOWNING: The 15 ppm?

FROM THE FLOOR: Right. I'm asking because in the, what is coming out in the Lowell Harbor superfund site, it looks like it's going to be about 50 parts per million. And in the Middle Marsh where we have an area that is almost at 15 parts per million, it's five times less.

MS. DOWNING: Well, the way we did it is we looked at how the PCBs were getting into the animals. So, we have PCBs in sediments. There's a certain amount of the PCBs in the sediments that will get into the animals. And that value, that factor is a site specific factor. So, whatever the factor was for my site may not be the same at any other site. In fact, it would be truly different if it's a marine environment and if you have a lot of water, it will be totally different. A lot of it depends upon the setting in itself and the organic content of that.

So what we have to do is we have to go in on a site specific basis and just figure out how much of the PCBs we're getting from the sediments to these animals. And depending upon that factor, calculate how much of the PCBs would end up in the animals as you go up the food chain. And when we did that, we determined that, as you went up the food chain, some of these animals are at risk and given that, what should the level in the sediment be to protect that.

But as I said, the reason why I have to say the number that we came up with may not be the number you get at another site is because it all depends on sediments. You will have different sediments at any different site. And certainly in marine -- marine animals would have different animals, would have different sediments, so you can't really compare the two.

FROM THE FLOOR: That's a habitat for what animals?

MS. DOWNING: Well, it's a habitat for any number of terrestrial animals. When we did the biological study, we did a whole different slew of the animals including frogs and earthworms and mice and bulls. And when we, actually I have a slide, but when we moved it out a level, we took a look at the mink and the raccoons and the birds. And that was just the sampling of some of the selected organisms. There's obviously many more organisms that we didn't look at, but we only had to select those certain amount of them.

FROM THE FLOOR: I spend a lot of time, well, are there two animals that you were concerned about?

MS. DOWNING: There were two species that were species of concern in accordance with Massachusetts law. One was the spotted turtle and the Mystic Valley anthropod. We only actually saw the spotted turtle, we didn't see the Mystic Valley anthropod.

Jamie, do you want to expand on that?

MR. MAUGHAN: For both the spotted turtle and the anthropod, the habitat is definitely there, they are potentially there. As Jane said, we did see the turtle. We did sample for the anthropod but we didn't find it.

The detection levels, this 15 parts per million are not based on either of those animals because they proved not to be the most sensitive necessarily.

MS. DOWNING: We also took a look at the birds, fish and wildlife, are very concerned about the possibility of PCBs getting in through the earthworms and some of the small mammals and getting into the birds. Birds may be sensitive. And it turned out that the cleanup level for the birds would be about 25, so they were not the most sensitive. But the most sensitive animal was the mink. With the spotted turtle, the spotted turtle did not turn out as sensitive.

FROM THE FLOOR: How do you know they're getting across the street from the quarry?

MS. DOWNING: Well, because we feel that the trail of PCBs is fairly indicative to this site. You can see how it went from the disposal area to Middle Marsh. And all of the information backs that up. We did all kinds of hydrologic study to look at where the sediments were going. So we feel pretty strongly that the contaminants we found in Middle Marsh came from the disposal area.

FROM THE FLOOR: So when the disposal area is, when remediation of the disposal area is complete, migration of PCBs and metals will cease if the upper part of the unnamed stream is also remediated?

MS. DOWNING: That will actually be an objective, cleanup objective. What we want to do is we want to stop any PCBs from coming here from, moving from this, from the Middle Marsh and getting into the Apponagansett Swamp.

Unfortunately, we can't clean up all of the PCBs. There still will be PCBs here even after we finish what we're proposing to do. But what we hope will not happen is, most of the PCBs will be gone in the sensitive area which is the closest area to the stream. The target, you can see from the diagram that we showed, most of the areas that we're proposing to excavate are very close to the stream. So if you take out those PCBs, the PCBs that will be left will be at the extremes of Middle Marsh and that would be very difficult to go from the extremes back into the stream and out into the Apponagansett Swamp.

So, we are concerned about the possible migration of PCBs and that's one reason why we have to go continually back in to monitor to make sure that that will not happen.

FROM THE FLOOR: What you're saying is that when you finish your remediation, you still will not be able to prevent the water coming from Sullivan's Ledge going across or under Hathaway Road into the Middle Marsh; once you're finished you will not be able to change the water coming in from the ledge, going under the road and into the golf course?

MS. DOWNING: Let me just step back for a minute.

What we're talking about tonight is basically the sediments. Once the remediation is complete, both for this portion of the study area and this portion over here, there should not be any migration of sediments. This will all be capped, eleven acres of it will be capped so the soils will not be moving into the stream and will not be moving down. Some of these PCBs will be gone so the sediments shouldn't be getting into the stream and moving out. So, we feel that the migration of sediments contaminated with PCBs should be stopped once we complete the action.

Now, the groundwater is a separate issue. The groundwater is something that we addressed in the first decision document. And what we basically said was, the groundwater is severely contaminated at great depths because of the quarry pits and there is really nothing we can do about that. We can't go in and try to find every single crack in the ground to find all of the contamination. So, we know that there is contamination in the groundwater. We also know that nobody is drinking that groundwater. So, in terms of any risk to the public, there really isn't any. The only problem would be if someone in the future drilled a well and started drinking the groundwater.

What we proposed in the first part of this study is even though we knew we couldn't clean it up completely so that everybody could be drinking the groundwater everywhere on this site, we still wanted to go in there and get as much of the contamination out of there as we could. So, we are going to pump and treat, we are going to drill wells and we're going as close to the pits as we can, because this is really where all the groundwater is contaminated. We are going to drill some wells around the pits, pump out as much of that as we can and treat that and discharge it. We are also going to put a trench of pipe right near the stream to collect any of the contaminated water that gets into the stream because once it gets into the stream it's going to pose a problem to any fish that may live there.

So, we're stopping it from getting into the stream and we're going to get as much of the source of that groundwater out as we can. But we have already acknowledged that we can't get it all and what we're going to do, with the cooperation of the city is put in institutional controls so that nobody will drill a drinking water well and drink any of the contaminated groundwater.

So, in summary, we're going to do as much as we can for the groundwater, but we can't clean it all up. The sediments, we feel, through the combination of the two cleanups, should stop the sediment's from going further and clean out and contain that which is contaminated today.

FROM THE FLOOR: If you stop the flow from the Ledge to the stream, will the stream dry up?

MS. DOWNING: No. What we are doing is, we are cutting off only that portion of the groundwater that is seeping into the stream. A lot of the water from the stream is coming this way, upstream. So, the stream will still be a stream. What we're just doing is intercepting any of the groundwater that may get into the stream. We don't feel we will be drying up the stream. In fact, we were concerned about that possibility because when you pump, sometimes you pull in adjacent streams.

So, also, as part of this remedy, we are going to contain this stream. It will be contained only during the time that we start pumping. So, that will not happen.

FROM THE FLOOR: Was this water tested with water from Middle Marsh, the groundwater?

MS. DOWNING: Yes; they were. They were tested as part of the first study that was done. We took a look at the water hazards and tested the water itself. I can not at this point remember exactly what levels we found. We did find that the sediments were contaminated with PCBs. The levels were not that high, I believe the highest was maybe 3 parts per million, which is a pretty low level. But these sediments will have to be excavated.

So these two water hazards are going to be cleaned up as part of the first study. The water that is above the sediments will not be, they didn't really contain contaminants.

So, in terms of the water, it's not really the surface water that we're too concerned about, it's the groundwater, it's what flows under the ground that people may be drinking. And it's this water up here where the groundwater catches the surface water, there could be a problem if we don't intercept it.

FROM THE FLOOR: One question, this is on the background of the criteria of PCBs. I assume that the danger levels are different for all different species, whether they be for humans or for minks, and now that I know, I'm never going to eat a mink I don't know.

I have a question as to what is the danger level for a human and who sets that criteria and how is it set; just a little background on what is dangerous and what is not.

MS. DOWNING: We have to, by law, look at both the risks to human health and the risks to the environment. So this is something that EPA takes a look at. And what we do is we take a look at the concentrations of the PCBs and we determine just how risky that is to human health.

As part of the first study, we set cleanup levels for PCBs because we felt that since these levels were so high, there could be someone that could break into this site, this is currently fenced, but there could be a trespasser that could break into the site and contact the soils. We didn't feel that there was a house or a resident that was continually contacting the soils every day. These soils really are the ones that we're most concerned about. And the only way that we felt that the public was being exposed was, as I said, a bypasser or a trespasser; someone hopping the fence and touching the soils.

We also thought about, well, what would happen in the future? Is there a possibility that someone would build a home on this site and should we set a cleanup level that would be protective of that, and the answer was no; we felt that the site will always be something like a parking lot or just an abandoned area.

Now, the way we set cleanup levels is it's based on two things, a cancer risk and a noncancer risk. For PCBs, PCBs is a possible human carcinogen, so it could potentially cause cancer in humans. And what we have to do is we have to set levels that we feel are going to be acceptable to the public.

The level that we picked for this area was 50 parts per million of PCBs. And that basically meant a risk of one in 100,000. So that if you touch the soils perhaps twenty seven days a year, a certain of times a year, there is a chance of getting cancer of one in a 100,000, that is the risk value. EPA normally sets cleanup levels within a cancer risk of one in 10,000 and one in a million.

And this particular that we set two years ago of 50 part per million was based on the one in 100,000 chance of getting cancer through the contact of the PCB soils.

Now, what happened when we looked at Middle Marsh was, we took a look at the numbers and we took a look at the human health risks, the human health risks of contacting these sediments are around one in 100,000 and we feel that that is an insignificant risk, that that is something that is within the acceptable range. That's why we didn't set a cleanup level because we feel already it's a protected level.

I know that was a long answer.

MR. SEBASTION: These are all good questions. I think we can get to most of them throughout the course of the evening, but several people came tonight to give specific comments for the record and I would like to move on to that portion of the evening, and then if there are any further questions that you have now or that come up during the course of the comments, we can answer those after that portion of the meeting.

The way I would like to do it, I have three commentators here now, three cards for comments here now. What I would like to do is have the commentators, when I call their names, stand up and come near a microphone so we can get your comments on tape.

Formal Comments

MR. SEBASTION: As I said, we only have three, so you don't have to cut them too short, but we do want to be able to move on and get all the comments and we also want to be able to answer some questions after. So, keep them as brief as possible and still let us know what you have to say.

The first commentator is Edward Camara.

MR. CAMARA: First, I would like to tell you that I'm very disappointed that when we're talking about three to ten million dollars, we only find these few people here. It doesn't seem logical to me. Maybe I'm goofy, but I've lived a lot of years and I know that if I don't pay all of the ten million, some of my friends are going to and it's very, very expensive when you're talking from three to ten million dollars.

And you're talking about a problem that we have in Wide Marsh, there's no question that we have a problem there. That is not the problem. That's the end of the problem. The problem is not there. And I think you have told me, or he did, before this meeting started that we were not going to talk about Sullivan's Ledge. This is the basis of all of this problem. It's not Wide Marsh. You talk about fish, well, I've lived here many, many years, believe me, there are no fish there; if they are, they are microscopic. You talk about muskrats or whatever.

I've never heard of a golfer, and I've been here since they changed this golf course and I have never found a golfer who didn't have anything but a good time there. If there's a ball that he's lost, he's lost a ball, he's not going to go into a marshland looking for a golf ball, but kids used to get them. As a matter of fact, many years ago, some little kids got little ducks and sold them to my little kids, this is how long I've lived here.

I believe that I'm the only next door resident, me, because I live up the street. I have seen this start. When I say this, I'm talking about Sullivan's Ledge in 1935 is when the WPA built this golf course, it's a fantastic course.

You talk about homes being built there, who would have the nerve to go in the middle of the golf course and say I'd like this piece of land for a house. That's idiotic. That will never happen. In 1892 they built a golf course that's called the New Bedford Country Club, try to put a house there and see how far you get away with it. That is so far in the future, it's beyond belief, beyond thinking about that we're going to take our nice golf course, let's cut it up and put condominiums here and get rid of all these golfers; they'd kill you. Does that make any sense to you?

I would hate to see 5,000 yards of garbage, junk, whatever it is, brought over and put on top of the cancer that is there, Sullivan's Ledge.

I don't have any solution for this. I've lived too many years, but I am not what you call really dumb. The only way that that problem will ever end is if the water that is coming out of that ledge, which is hundreds of feet deep, is coming out and you call something about an unnamed stream? I'll tell you what it is, it's a brook. Before it was a brook, there was a pond, Collins Pond, there was an ice house there. Part of the land that I own, they had the rights to cut ice at that pond, dig down and it picked up, Sullivan's Ledge, six inch pump pumping day and night to take the water out of that ledge so that they could cut stone out of there. It was so deep, unbelievable. You're going to stop this problem by cleaning the mess that it caused over there?

I've seen Sullivan's Ledge a place crystal clear. I drank out of that creek, that unnamed stream. How do you call it an unnamed stream. It's a little thing of water that's running down the land, that's all it is.

But you're worrying about worms, I think you said, or snakes or something. If there is a problem, there is a problem in our river which they worked on for years and years and years and it will be there for years and years and years. If you clean that mess, you've cleaned it, you haven't stopped it. All you've done is just erased it a little bit. It's going to start again. It will not stop because the water, you couldn't count the tires, you couldn't count the horses, you couldn't count the cars that have been thrown in that, because I have lived through it and you haven't.

I look at you nice, young people and I think you're from Boston and Medford or wherever you might be from, but you haven't lived here as long as I have. I knew the problems before they started.

Have you ever gone into a stream and pushed these little animals that fly on top of them, they have like four little pontoons, you might not even know about these. Does this make any sense to you at all?

MS. DOWNING: Absolutely.

MR. CAMARA: There are some kind of bugs like ants and flies and whatnot, but this little bug had like little four little pontoons, we used to brush them off and drink that. I wouldn't do that today. Now I drink scotch.

(Laughter)

MR. CAMARA: I just thought I'd like to give you a little bit of my mind. But I hate to see three to ten million dollars and I look around here and I say, we've lost something along the way, haven't we. Perhaps you didn't advertise it well enough as to what you're going to do. Did I say something wrong? I know it's not your idea. Someone should have maybe publicized it a little more because this is a big thing. I don't have ten million dollars, but someone has got to bring it out to move that junk and put it on top of the old junk? Forget it.

I think that's the end of my little speech. I hope I didn't bore you too much.

MS. DOWNING: Thank you.

MR. SEBASTION: Thank you, Mr. Camara.

MR. CAMARA: You're welcome.

MR. SEBASTION: The second commentator we have is Armand Fernandes.

MR. FERNANDES: Yes.

That's a tough act to follow. What I will say is, I think, Jim, you have an excellent choice of tie and shirt. I like the combination.

First of all, Mr. Camara's point is well taken. And unfortunately I might not be as artful and as eloquent as he's presented his case. I think he makes an argument that the City perhaps adopts in its position here tonight and its comment.

First, when we first visited the site, we discussed about no action, we talked about no action in Middle Marsh. And the City's position is we should follow through with no action with perhaps a modification or maybe we should call it limited action. Middle Marsh could be fenced in. It could be restricted by deed restrictions, zoning restrictions and access restrictions. We think fencing and other kind of barriers could be constructed around it to prevent at least that human danger we address. And I think that given-- And we could monitor, once you clean up Mr. Camara's unnamed brook, we could monitor what's happening on the other site and maybe look at it again at another point in time.

But the fact of the matter is, as again, I cited earlier, we've looked through the SRI and we saw two species, one of which is the spotted turtle. His habitat really isn't there, it might be there, but we think it lives in the swamp that you show in your chart on the board.

In terms of the levels, we averaged them out and they come out to be 9.13 parts per million, which is, as Mike pointed out here, less than what, and I know you addressed that issue, but less than what we have, or proposed have, or they're much higher, rather, in the inner harbor, with the exception of one location at one of the hot spots.

We think the restrictions we are willing to propose, once you clean up the former quarry pit, that the environment, the habitat will be as protected as we can get it. Mr. Camara may be right. The water may be flowing through there. I don't know and I don't know if anybody knows. The fact of the matter is I think we ought to take a second look at it. Ten million dollars is a lot of money.

From the legal standpoint, obviously, you might say the opinion of the City at this point is somewhat tainted.

We are told we're sued for the ten million dollar cleanup at the quarry site, we are going to be sued by the PRPs as well as some other small people, allegedly, are going to be sued. We're certainly, as owner of the site, we're responsible for cleaning it up. That makes twenty million dollars at the total Sullivan's Ledge site. We think that the environment and the citizenry of New Bedford are adequately protected by a limited no action, if you will.

And we will follow this up in more detail with a written response within the response time. But I want to thank you for your courtesy so far and you've always been helpful, although we agree to disagree quite often, and this is just another example.

Thank you.

MR. SEBASTION: Thank you, Mr. Fernandes.

The third and final commentator that we have so far is Al Palmuri.

MR. PALMURI: I represent a majority of the golfers at the municipal golf course up here and we sent a petition last week to Boston to both of you with the names of the golfers who signed the petition. And without going into a long explanation, I think most of it's been covered by the two gentlemen before me. We specifically recommend that no action be taken regarding this because of the, I would call it a no guarantee that the water will stop flowing from Sullivan's

Ledge onto the golf course. And as a result of that, we wish to be put on file that no action be taken.

Thank you.

MR. SEBASTION: Thank you.

Is there anyone else who would like to comment for the record? It's not too late and we'd be happy to hear someone else that hasn't spoken, yet would like to get on the record.

Helen, would you like to speak?

MS. WALDORF: Is that all right?

MR. SEBASTION: That's fine.

MS. WALDORF: Thank you.

I hadn't planned on saying anything, but in view of the fact that there have been three previous commentators that talked about no action and someone asked the question about risk and risk to human health, one of the things that has to be looked at, that we look at from the State, and I represent the Department of Environmental Protection, is whether or not a cleanup meets the State's risk based standards.

Unfortunately on this site, where you are not in the risk range where EPA might take into action for human health perspective, that's why there's been so much discussion of the ecology of the site, without taking an action on Middle Marsh, it appears as if the human health risk range or the human health risk would not meet the state standard if you did nothing.

So, the State's position at the moment, as it stands now, is because it would not meet our risk standard -- our risk standard says that you have to take all the media, everything, water, air, water you might drink, direct contact in the future depending on pond future land use, you have to take all those risks and all those risks must be basically, for cancer risk, around, you know, right at one in 100,000, that's all the risks taken together. Well, if you took all the risks together with the given remedial action on the site and you did nothing at Middle Marsh, you would still have a human risk that exceeds our risk range of one in a 100,000, I believe it's three or four times that, somewhere in that range.

So, our position is, you're not meeting the state standard which we feel is more stringent in this case than the federal standard.

Now, the federal people have to do what they do in making a decision based on their standard. And we have to, you know, say what we have to say based on the regulations that we have in place. So, the Massachusetts contingency plan basically says that when we look at the risk assessment that EPA did, our recommendation would be to essentially support a remedy that would remove the materials down so you can get close to our risk range.

If no action had been or was to be selected by EPA, it appears, although I can't give a definitive answer right now, I guess it would depend upon how they did that, but it appears as if we might not concur with that remedy. And the State's role in this right now is we get three choices for the record of decision, and one of the criteria they evaluate the remedy on is, one of the criteria they use to modify is community acceptance and the other one is state acceptance. And the state can either concur with the remedy, have no comment on the remedy or not concur on the remedy.

So, and Jane knows this, it's been our position all along, that although they're doing this for environmental reasons, which we support, we also have the position that you need to meet the state's health risk based standard in order to have a remedy that would meet a promulgated standard.

That's all I have.

MR. SEBASTION: Thanks, Helen.

MR. FERNANDES: If we put in these contingency controls that you alluded to briefly, would that satisfy the State standard?

MR. SEBASTION: Sorry, but we're not answering questions right now. I would like to, but we can't.

MS. ST. AUBIN: I'm Nada St. Aubin and I'm new at this, but I'm very interested in the environment. And in listening to the state and listening to the federal and listening to the City, I assume, there is an easy answer, but if you're checking comes to one in 100,000, which is practically one in the whole City of New Bedford, how would the state have a different answer to that same question if they used similar testing.

And, to make it easier, if you put a fence around the whole thing and nobody got into it, wouldn't that be the simplest solution? Because in the environment, nothing can really, it's just like testing when you go to a hospital for a disease, and we're very familiar with that because we're up at Mass. General, over the years very, very frequently, and the cut and find and take biopsies, they find things but don't know the answer. Sometimes there isn't an answer that anybody can give.

So then you try to solve it by making it unavailable to anything or anybody and as far as the muskrats or the mink, I know that other, and the frogs I know of, but that other thing I've never heard of, and I've lived a long time, too.

So I think that sometimes we do too much testing, whether it's federal, state or community and it's just a lot of wasted money and seven million dollars is a lot of money.

Thank you.

MR. SEBASTION: Thank you.

MS. DOWNING: Thank you.

MR. SEBASTION: Anyone else for a formal comment on the record?

(No response)

MR. SEBASTION: At this point I would like to close the hearing and then we can take your questions and answers and have a little more of an informal discussion for a short period and then we can all go home.

The formal hearing is adjourned.

(The public hearing adjourned at 8:30 p.m.)

CERTIFICATE OF REPORTER AND TRANSCRIBER

This is to certify that the attached proceedings before: JIM SEBASTION, Hearing Officer in the Matter of:

PUBLIC HEARING RE:
SULLIVAN'S LEDGE SUPERFUND SITE

Place: New Bedford, Massachusetts

Date: June 26, 1991

were held as herein appears, and that this is the true, accurate and complete transcript prepared from the notes and/or recordings taken of the above entitled proceeding.

Marilyn Sandberg
Reporter

07/01/91
Date

Laura Madi
Transcriber

07/01/91
Date

# APPENDIX B

# ADMINISTRATIVE RECORD INDEX

# SULLIVAN'S LEDGE SITE

# MIDDLE MARSH OPERABLE UNIT

# Sullivan's Ledge
# (Operable Unit II)

# NPL Site Administrative Record

# Index

Compiled: May 29, 1991
ROD Signed: September 27, 1991

Prepared for

Region I
Waste Management Division
U.S. Environmental Protection Agency

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# Introduction

This document is the Index to the Administrative Record for the Record of Decision for the Sullivan's Ledge National Priorities List (NPL) site (Operable Unit II). Section I of the Index cites site-specific documents, and Section II cites guidance documents used by EPA staff in selecting a response action at the site.

*Although not expressly listed in this Index, all documents contained in the June 29, 1989 Record of Decision Administrative Record (Operable Unit I) are incorporated by reference herein, and are expressly made a part of the Administrative Record for the September 27, 1991 Record of Decision Administrative Record (Operable Unit II).*

The Administrative Record is available for public review at EPA Region I's Office in Boston, Massachusetts, and at the New Bedford Free Public Library, 613 Pleasant Street, New Bedford, Massachusetts 02740. Questions concerning the Administrative Record should be addressed to the EPA Region I site manager.

The Administrative Record is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

# Sullivan's Ledge
# (Operable Unit II)
# NPL Site Administrative Record

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Sullivan's Ledge
(Operable Unit II)
NPL Site Administrative Record

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# Section I

## Site-Specific Documents

# ADMINISTRATIVE RECORD INDEX

**for the**

**Sullivan's Ledge NPL Site**
**(Operable Unit II)**

**ROD Signed: September 27, 1991**

3.0 Remedial Investigation (RI)

3.2 Sampling and Analysis Data

1. "Sampling and Analysis Plan for Additional Studies of Middle Marsh," Metcalf & Eddy, Inc. (April 1990).

*The remaining Sampling and Analysis Data for the Remedial Investigation (RI) may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.*

3.4 Interim Deliverables

1. "Final Report - Middle Marsh Investigation," EPA Environmental Response Branch, Edison, New Jersey (March 29, 1991).
2. "Hydrology and Hydraulic Data for Middle Marsh," Metcalf & Eddy, Inc. (September 1991).

3.5 Applicable or Relevant and Appropriate Requirements (ARARs)

1. Letter from Richard Cavagnero, EPA Region I to Madeline Snow, Commonwealth of Massachusetts Department of Environmental Protection (April 10, 1991). Concerning request for state ARARs.
2. Letter from Madeline Snow, Massachusetts Department of Environmental Protection to Richard Cavagnero, EPA Region I (May 9, 1991). Concerning identification of state ARARs with attached "ARARs Identification - Sullivan's Ledge - Middle Marsh OU."

3.6 Remedial Investigation (RI) Reports

Reports

1. "Final Remedial Investigation - Additional Studies of Middle Marsh, Volume I- Narrative," Metcalf & Eddy, Inc. (April 1991).
2. "Final Remedial Investigation - Additional Studies of Middle Marsh, Volume II - Appendices," Metcalf & Eddy, Inc. (April 1991).

Comments

*Comments on the Remedial Investigation and Proposed Plan received by EPA Region I during the formal public comment period are filed and cited in 5.3 Responsiveness Summaries.*

3.7 Work Plans and Progress Reports

1. "Work Plan for Middle Marsh Investigation," EPA Environmental Response Branch, Edison, New Jersey (June 23, 1989).
2. "Work Plan for Middle Marsh Investigation," EPA Environmental Response Branch, Edison, New Jersey (August 3, 1989).
3. "Health and Safety Plan for Middle Marsh," Metcalf & Eddy, Inc. (November 1989).
4. "Work Plan for Additional Studies of Middle Marsh," Metcalf & Eddy, Inc. (April 1990).
5. Trip Report on a Visit to Sullivan's Ledge Site, Janet Baldwin, Peter Boucher, James Maughan, Sandra McCarron and Reyhan Mehran, Metcalf & Eddy, Inc. (September 21, 1990). Concerning additional sample locations.

3.9 Health Assessments

1. "Addendum to Health Assessment," U.S. Department of Health of Human Services Agency for Toxic Substances and Disease Registry (September 5, 1989).
2. Integrated Risk Information System (IRIS) Status Reports, EPA Region I (March 1, 1991) for the following chemicals:
   A. Acenaphthene
   B. Acetone
   C. Anthracene
   D. Benzo[a]pyrene (BaP)
   E. Benzo[k]fluoranthene
   F. Benzoic acid
   G. Bis(2-ethylhexyl)phthalate (BEHP)
   H. Butyl benzyl phthalate
   I. Cadmium
   J. Carbon tetrachloride
   K. Chloroform
   L. Copper
   M. Dibenzofuran
   N. Dibutyl phthalate
   O. Dichlorodiphenyl dichloroethane (DDD)
   P. Dichlorodiphenyldichloroethylene (DDE)
   Q. Dichlorodiphenyltrichloroethane (DDT)
   R. Dichloromethane
   S. Fluoranthene
   T. Fluorene
   U. Lead and compounds (inorganic)
   V. Manganese
   W. Methyl ethyl ketone (MEK)
   X. N-Nitrosodiphenylamine
   Y. o-Cresol
   Z. p-Cresol
   AA. Pentachlorophenol
   BB. Phenol
   CC. Polychlorinated biphenyls (PCBs)
   DD. Pyrene
   EE. Toluene

4.0 Feasibility Study (FS)

4.6 Feasibility Study (FS) Reports

1. "Final Feasibility Study Report of Middle Marsh," Metcalf & Eddy, Inc. (May 1991).

4.9 Proposed Plan for Selected Remedial Action

1. "EPA Proposes Cleanup Plan for the Middle Marsh Study Area at the Sullivan's Ledge Site," EPA Region I (May 1991).

Comments

*Comments on the Feasibility Study and Proposed Plan received by EPA Region I during the formal public comment period are filed and cited in 5.3 Responsiveness Summaries.*

5.0 Record of Decision (ROD)

5.1 Correspondence

1. Letter from Charla Reinganum, Commonwealth of Massachusetts Department of Environmental Protection to Jay Copeland, Commonwealth of Massachusetts Division of Fish and Wildlife (April 18, 1991). Concerning how remedial measures may affect the spotted turtle and the mystic valley amphipod.
2. Letter from Richard F. Bohn, City of New Bedford to Jane Downing, EPA Region I (April 23, 1991). Concerning proposed zoning for golf course.
3. Letter from Jay Copeland, Commonwealth of Massachusetts Division of Fish and Wildlife to Charla Reinganum, Commonwealth of Massachusetts Department of Environmental Protection (May 9, 1991). Concerning response to the April 18, 1991 letter from Charla Reinganum.
4. Letter from Michael O'Reilly, Town of Dartmouth to Jane Downing, EPA Region I (May 30, 1991). Concerning mink sightings in Dartmouth.
5. Letter from Stephen A. Petron, Metcalf & Eddy, Inc. to Jane Downing, EPA Region I (September 19, 1991). Concerning the attached photographs of mink trackings observed at the site.
6. Letter from Steven E. Mierzykowski, U.S. Department of the Interior Fish and Wildlife Service to Jane Downing, EPA Region I (September 23, 1991). Concerning selection of mink for the risk assessment as appropriate.
7. Memorandum from James Mahala, Commonwealth of Massachusetts Department of Environmental Protection to Helen Waldorf, Commonwealth of Massachusetts Department of Environmental Protection (September 24, 1991). Concerning review of remedial alternatives and wetlands restoration.
8. Letter from James T. Maughan, Metcalf & Eddy, Inc. to Jane Downing, EPA Region I (September 27, 1991). Concerning analysis compliance with substantive regulations under Section 404(b) of the Clean Water Act.
9. Letter from Daniel S. Greenbaum, Commonwealth of Massachusetts Department of Environmental Protection to Julie Belaga, EPA Region I (September 27, 1991). Concerning concurrence with selected remedy and contingency remedy.

5.2 Applicable or Relevant and Appropriate Requirements (ARARs)

1. Cross-Reference: Applicable or Relevant and Appropriate Requirements (ARARs) for the Record of Decision are in Section 11.B of the Record of Decision [Filed and cited as entry number 1 in 5.4 Record of Decision (ROD)].

5.3 Responsiveness Summaries

1. Cross-Reference: Responsiveness Summary, EPA Region I (September 27, 1991) [Filed and included as an Appendix to entry number 1 in 5.4 Record of Decision (ROD)].
2. Cross Reference: Transcript, Public Hearing Summary, EPA Region I (May 28, 1991) [Filed and included as an Appendix to entry number 1 in 5.4 Record of Decision (ROD)].

*The following citations indicate written comments received by EPA Region I during the formal comment period.*

3. Letter from Thomas M. Hoban (Attorney for United Dominion Industries) to Jane Downing, EPA Region I (June 5, 1991). Concerning request for an extension of the public comment period.
4. Letter from Warren A. Fitch, Swidler & Berlin (Attorney for Emhart Industries) to Jane Downing, EPA Region I (June 6, 1991). Concerning request for an extension of the public comment period.
5. Letter from Timothy N. Cronin, Commonwealth Electric to Jane Downing, EPA Region I (June 7, 1991). Concerning request for an extension of the public comment period.
6. Letter from Timothy N. Cronin, Commonwealth Gas to Jane Downing, EPA Region I (June 7, 1991). Concerning request for an extension of the public comment period.
7. Letter from Gary W. Gifford, Goodyear Tire & Rubber Company to Jane Downing, EPA Region I (June 10, 1991). Concerning request for an extension of the public comment period.
8. Letter from A. Larry Medeiros, Titleist to Jane Downing, EPA Region I (June 11, 1991). Concerning request for an extension of the public comment period.
9. Letter from Kathleen E. McGrath, Palmer & Dodge (Attorney for Bridgestone/Firestone) to Jane Downing, EPA Region I (June 13, 1991). Concerning request for an extension of the public comment period.
10. Comments Dated June 17, 1991 from Philip T. Gidley, Gidley Laboratories on the May 1991"EPA Proposes Cleanup Plan for the Middle Marsh Study Area at the Sullivan's Ledge Site," EPA Region I.
11. Letter from Therese G. Pinter, Seyfarth, Shaw, Fairweather & Geraldson (Attorney for Chamberlain Manufacturing) to Jane Downing, EPA Region I (June 18, 1991). Concerning request for an extension of the public comment period.
12. Telephone Notes Between Jane Downing, EPA Region I and Antoine Correir (June 28, 1991). Concerning source of PCBs at the site.
13. Comments Dated July 31, 1991 from Michael J. Glinski, City of New Bedford on the May 1991"EPA Proposes Cleanup Plan for the Middle Marsh Study Area at the Sullivan's Ledge Site," EPA Region I.
14. Comments Dated July 31, 1991 from Howard Weir, Morgan, Lewis & Bockius (Attorney for Federal Pacific Electric Company) and Laurie Burt, Foley, Hoag & Eliot (Attorney for Cornell-Dubilier Electronics, Inc.) on the May 1991"EPA Proposes Cleanup Plan for the Middle Marsh Study Area at the Sullivan's Ledge Site," EPA Region I.
15. Petition, Residents and Users of the Municipal Golf Course, New Bedford. Concerning removal of PCBs from the site (July 1991).
16. Comments Dated August 5, 1991 from John F. Shea, McGregor, Shea & Doliner (Attorney for Brittany Dyeing & Printing Corporation) on the May 1991"EPA Proposes Cleanup Plan for the Middle Marsh Study Area at the Sullivan's Ledge Site," EPA Region I.

5.3 Responsiveness Summaries (cont'd.) 

17. Letter from Frank C. Huntington, Widett, Slater & Goldman (Attorney for Acushnet Company, et al) to Jane Downing, EPA Region I (August 5, 1991). Concerning the attached Comments from Acushnet Company, et al:
    A. Technical Comments, Appendix A, GEI Consultants, Inc. (August 5, 1991).
    B. Technical Comments, Appendix B, Volumes I & II, GEI Consultants, Inc. (August 5, 1991).
    C. Technical Comments, Appendix C, Volumes I, II, III & IV, GEI Consultants, Inc. (August 5, 1991).

5.4 Record of Decision (ROD)

1. Record of Decision for the Middle Marsh Operable Unit, EPA Region I (September 27, 1991).

10.0 Enforcement

10.8 EPA Consent Decrees

1. Consent Decree and attached Statement of Work, *United States of America and Commonwealth of Massachusetts v. Acushnet Company, et al*, United States District Court for the District of Massachusetts (September 28, 1990).

11.0 Potentially Responsible Party (PRP)

11.9 PRP-Specific Correspondence

1. Letter from Merrill S. Hohman, EPA Region I to John T. Ludes, Acushnet Company (April 6, 1990) with attached list of PRPs. Concerning notice of potential liability.
2. Letter from Merrill S. Hohman, EPA Region I to President, Glen Petroleum Corporation (May 30, 1990). Concerning notice of potential liability.
3. Letter from Merrill S. Hohman, EPA Region I to President, Pacific Oil Company (May 30, 1990). Concerning notice of potential liability.

13.0 Community Relations

13.3 News Clippings/Press Releases

1. "Environmental News - EPA Proposes Cleanup For Sullivan's Ledge," EPA Region I (May 21, 1991).
2. "*The* United States *Environmental Protection* Agency Invites Public Comment on the Proposed *Plan* and Feasibility Study for the Middle Marsh Study Area at the Sullivan's Ledge Superfund Site in New Bedford, Massachusetts," The New Bedford Standard Times - New Bedford, MA (May 22, 1991).
3. "Environmental News - EPA Extends Comment Period For Sullivan's Ledge," EPA Region I (June 21, 1991).

13.4 Public Meetings

1. EPA Region I Meeting Summary, Public Meeting for the Sullivan's Ledge Site (May 28, 1991).

13.5 Fact Sheets

1. "Superfund Program Fact Sheet - EPA Completes Supplemental Remedial Investigation of the Middle Marsh Study Area at the Sullivan's Ledge Superfund Site," EPA Region I (April 1991).

16.0 Natural Resource Trustee

16.1 Correspondence

1. Letter from Merrill S. Hohman, EPA Region I to Roxanne Mayer, Commonwealth of Massachusetts Department of Environmental Protection (January 12, 1990). Concerning notification of potential damage to natural resources at the site.

17.0 Site Management Records

17.7 Reference Documents

1. U.S. Environmental Protection Agency. Risk Reduction Engineering Laboratory. Project Summary: Evaluation of the B.E.S.T. Solvent Extraction Sludge Treatment Technology Twenty-Four Hour Test (EPA/600/S2-88/051), November 1988.
2. "The B.E.S.T. Solvent Extraction Process Applications with Hazardous Sludges, Soils and Sediments," Lanny D. Weimer, Resources Conservation Company (September 1989).
3. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Innovative Technology: B.E.S.T. Solvent Extraction Process (OSWER Directive 9200.5-253FS), November 1989.
4. U.S. Environmental Protection Agency. Technology Demonstration Summary: CF Systems Organics Extraction System, New Bedford Harbor, Massachusetts (EPA/540/S5-90/002), August 1990.
5. "Wetlands Protection Program Policy 90-2: Standards and Procedures for Determining Adverse Impacts to Rare Species Habitat," Commonwealth of Massachusetts Department of Environmental Protection, August 1990.
6. Memorandum from Erich W. Bretthauser, EPA Headquarters to Regional Administrators (March 22, 1991). Concerning the attached "Status Report on the Interaction of PCBs and Quicklime," (June 11, 1991).

# Section II

## Guidance Documents

# GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at EPA Region I, Boston, Massachusetts.

## General EPA Guidance Documents


1. "Protection of Wetlands (Executive Order 11990), Appendix D," Federal Register (Vol.42), 1977.

2. "Polychlorinated Biphenyls; Criteria Modification; Hearings," Federal Register (Vol. 44, No. 106), May 31, 1979.

3. U.S. Environmental Protection Agency. Office of Water Regulations and Standards. Ambient Water Quality Criteria for Polychlorinated Biphenyls (EPA 440 5-80-068), October 1980.

4. Polychlorinated Biphenyls (PCBs); Final Rules and Notice of Request for Additional Comments on Certain Individual and Class Petitions for Exemption," Federal Register (Vol. 49, No. 133), July 10, 1984.

5. "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Final Rule and Interim Final Rule and Proposed Rule," Federal Register (Vol.49, No. 209), October 26, 1984.

6. Memorandum from William N. Hedeman, Director, U.S. Environmental Protection Agency Office of Emergency and Remedial Response to Toxic and Waste Management Division Directors, Regions I-X (OSWER Directive 9280.0-02), August 1, 1985 (discussing policy on flood plains and wetland assessments for CERCLA Actions).

7. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health, and Occupational Safety and Health Administration. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985.

8. U.S. Environmental Protection Agency. Hazardous Waste Engineering Research Laboratory. Handbook for Stabilization/Solidification of Hazardous Waste (EPA/540/2-86/001), June 1986.

9. U.S. Environmental Protection Agency. Hazardous Waste Engineering Research Laboratory. PCB Sediment Decontamination - Technical/Economic Assessment of Selected Alternative Treatment, September 15, 1986.

10. U.S. Environmental Protection Agency. Hazardous Waste Engineering Research Laboratory. Project Summary: PCB Sediment Decontamination - Technical/Economic Assessment of Selected Alternative Treatments, (EPA/600/S2-86/112), March 1987.

11. "PCB Spill Cleanup Policy," Federal Register (Vol. 52, No. 63), April 2, 1987.

12. U.S. Environmental Protection Agency. Office of Water Regulations and Standards. Quality Criteria for Water 1986 (EPA/440/5-86/001), May 1, 1987.

13. Letter from Lee M. Thomas, U.S. Environment Protection Agency to James J. Florio, Chairman, Subcommittee on Consumer Protection and Competitiveness, Committee on Energy and Commerce, U.S. House of Representatives, May 21, 1987 (discussing EPA's implementation of the Superfund Amendments and Reauthorization Act of 1986).

14. Memorandum from J. Winston Porter, U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response to Addressees ("Regional Administrators, Regions I-X; Regional Counsel, Regions I-X; Directors, Waste Management Division, Regions I, IV, V, VII, and VIII; Director, Emergency and Remedial Response Division, Region II; Director, Hazardous Waste Management Division, Region X; Environmental Services Division Directors, Regions I, VI, and VII") (OSWER Directive 9234.0-05), July 9, 1987 (discussing interim guidance on compliance with applicable or relevant and appropriate requirements).

15. Memorandum from Henry L. Longest, U.S. Environmental Protection Agency Office of Emergency and Remedial Response and Gene Lucero, U.S. Environmental Protection Agency Office of Waste Programs Enforcement to Waste Management Division Directors, Regions I-X and Environmental Services Division Directors, Regions I, VI, and VII, August 11, 1987, (discussing land disposal restrictions).

16. U.S. Environmental Protection Agency. Center for Environmental Research Information. A Compendium of Technologies Used in the Treatment of Hazardous Waste (EPA/625/8-87/014), September 1987.

17. Memorandum from Denise M. Keehner, Chief, U.S. Environmental Protection Agency Chemical Regulation Branch to Bill Hanson, U.S. Environmental Protection Agency Site Policy and Guidance Branch, October 14, 1987 (discussing comments on the PCB contamination -- regulatory and policy background memorandum).

18. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Public Involvement in the Superfund Program (WH/FS-87-004R), Fall 1987.

19. Memorandum from J. Winston Porter, U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response to Regional Administrators, Region I-X (OSWER Directive 9834.11), November 13, 1987 (discussing revised procedures for implementing off-site response actions) with attached "Revised Procedures for Implementing Off-Site Response Actions."

20. U. S. Environmental Protection Agency. Office of Solid Waste and Emergency Response and Office of Research and Development. The Superfund Innovative Technology Evaluation Program: Progress and Accomplishments (EPA/540/5-88/001), February 1988.

21. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Exposure Assessment Manual (EPA/540/1-88/001, OSWER Directive 9285.5-1), April 1988.

22. U.S. Environmental Protection Agency. Office of Water. Interim Sediment Criteria Values for Nonpolar Hydrophobic Organic Contaminants (SCD #17), May 1988.

23. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) Compliance with Other Laws Manual (EPA/540/G-89/006, OSWER Directive 9234.1-01), August 1988.

24. "Massachusetts Oil and Hazardous Materials Release Prevention Plan," Code of Massachusetts Regulations (Title 40, Part 310), October 3, 1988.

25. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) (Interim Final) (EPA/540/G-89/004, OSWER Directive 9355.3-01), October 1988.

26. Memorandum from Henry L. Longest II, Office of Emergency and Remedial Response and Bruce M. Diamond, Office of Waste Programs Enforcement to Division Directors, Regions I-X, December 29, 1988 (discussing environmental evaluation at Superfund sites).

27. Interagency Cooperative Publication. Federal Manual for Identifying and Delineating Jurisdictional Wetlands, January 1989.

28. Memorandum from Bruce M. Diamond, U.S. Environmental Protection Agency Office of Waste Programs Enforcement et al. to Addressees ("Directors, Waste Management Division, Regions I, IV, VII, VIII; Director, Emergency and Remedial Response Division, Region II; Directors, Hazardous Waste Management Division, Regions III, VI; Director, Toxic and Waste Management Division, Region IX; Director, Hazardous Waste Division, Region X"), February 9, 1989 (discussing interim final guidance on soil ingestion rates).

29. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Risk Assessment Guidance for Superfund - Volume II: Environmental Evaluation Manual (Interim Final) (EPA/540/1-89/001), March 1989.

30. U.S. Environmental Protection Agency. Office of Research and Development. Ecological Assessment of Hazardous Waste Sites (EPA 600/3-89/013), March 1989.

31. Memorandum from Bill Hanson, U.S. Environmental Protection Agency Site Policy and Guidance Branch to Regional Superfund Branch Chiefs, Regions I-X, April 7, 1989 (discussing PCB Contamination at Superfund Sites).

32. Memorandum from Jonathan Z. Cannon to Regional Administrators, Regions I-X (OSWER Directive 9347.1-0), April 17, 1989 (discussing policy for Superfund compliance with the RCRA land disposal restrictions).

33. Memorandum from Henry L. Longest, U.S. Environmental Protection Agency Office of Emergency and Remedial Response to Directors, Waste Management Division, Regions I, IV, V, VII, VIII et al. (OSWER Directive 9347.2-01), June 5, 1989 (discussing land disposal restrictions as relevant and appropriate).

34. U.S. Environmental Protection Agency. Risk Assessment Work Group, Region I. Supplemental Risk Assessment Guidance for the Superfund Program (Draft Final) (EPA/901/5-89/001), June 1989.

35. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Superfund LDR Guide #1. Overview of RCRA Land Disposal Restrictions (LDRs) (OSWER Directive 9347.3-01FS), July 1989.

36. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Superfund LDR Guide #6A. Obtaining a Soil and Debris Treatability Variance for Remedial Actions (OSWER Directive: 9347.3-06FS), July 1989.

37. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Interim Final Guidance on Preparing Superfund Decision Documents (OSWER Directive 9355.3-02), July 1989.

38. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) Compliance with Other Laws Manual - Part II: Clean Air Act and Other Environmental Statutes and State Requirements (EPA/540/G-89/009, OSWER Directive 9234.1-02), August 1989.

39. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. The Feasibility Study: Development and Screening of Remedial Action Alternatives (OSWER Directive 9355.3-01FS3), November 1989.

40. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. The Remedial Investigation: Site Characterization and Treatability Studies (OSWER Directive 9355.3-01FS2), November 1989.

41. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. State and Local Involvement in the Superfund Program (9375.5-01/FS), Fall 1989.

42. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. CERCLA Compliance with Other Laws Manual - CERCLA Compliance with State Requirements (OSWER Directive 9234.2-05/FS), December 1989.

43. "Superfund Exposure Assessment Manual, Technical Appendix: Exposure Analysis of Ecological Receptors," prepared by Thomas E. Waddell, Environmental Research Laboratory. December 1989

44. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Risk Assessment Guidance for Superfund - Volume I: Human Health Evaluation Manual (Part A - Interim Final) (EPA/540/1-89/002), December 1989.

45. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. CERCLA Compliance with Other Laws Manual - CERCLA Compliance with the CWA and SDWA (OSWER Directive 9234.2-06/FS), February 1990.

46. "National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule," Part II, Federal Register (40 CFR Part 300), March 8, 1990.

47. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. The Feasibility Study: Detailed Analysis of Remedial Action Alternatives (OSWER Directive 9355.3-01FS4), March 1990.

48. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. CERCLA Compliance with Other Laws Manual - Summary of Part II - CAA, TSCA, and Other Statutes ( OSWER Directive 9234.2-07/FS), April 1990.

49. U.S. Environmental Protection Agency. Office of Water Regulations and Standards. Water Quality Standards for Wetlands-National Guidance (EPA 440/S-90-011), July 1990.

50. Memorandum from Don R. Clay, U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response to Regional Administrators, Regions I-X, (OSWER Directive 9835.15) August 28, 1990 (discussing guidance on developing risk assessments for sites remediated under CERCLA).

51. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Guidance on Remedial Actions for Superfund Sites with PCB Contamination (EPA 540 G-90 007, OSWER Directive 9355.4-01), August 1990.

52. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Short Sheet-A Guide on Remedial Actions for Superfund Sites with PCB Contamination (OSWER Directive 9355.4-01), August 1990.

53. U.S. Environmental Protection Agency. Science Advisory Board. Reducing Risk: Setting Priorities and Strategies for Environmental Protection (SAB-EC-90-021), September 1990.

54. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Superfund LDR Guide #6A (2nd Edition) Obtaining a Soil and Debris Treatability Variance for Remedial Actions (OSWER Directive 9347.3-06FS), September 1990.

55. U.S. Environmental Protection Agency. Office of Emergency Remedial Response. Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites (EPA/540/P-91/001), February 1991.

56. U.S. Environmental Protection Agency. Summary Report on Issues in Ecological Risk Assessment (EPA/625/3-91/018), February 1991.

57. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Supplemental Guidance - Interim Final) (OSWER Directive 9285.6-03), March 25, 1991.

58. U.S. Environmental Protection Agency. Office of Emergency Remedial Response. Risk Assessment in Superfund: A Primer (First Edition) (EPA/540/X-91/002), April 1991.

59. Memorandum from Don R. Clay, U.S. Environmental Protection Agency to Directors, Regions I-X (OSWER Directive 9380.0-17), June 10, 1991 (discussing furthering the use of innovative treatment technologies in OSWER programs).



POOR QU...
ORIGINAL

APPENDIX C

STATE CONCURRENCE LETTER

SULLIVAN'S LEDGE SITE

MIDDLE MARSH OPERABLE UNIT

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
**Department of Environmental Protection**

Daniel S. Greenbaum
Commissioner

September 27, 1991

Ms. Julie Belaga
Regional Administrator
U.S. EPA Region I
JFK Federal Building
Boston, MA 02103

RE: Sullivan's Ledge
Federal Superfund Site
Operable Unit Two --
Middle Marsh and
adjacent wetlands
ROD Concurrence

Dear Ms. Belaga:

The Department of Environmental Protection (the Department) has reviewed both the preferred remedial action alternative and the contingency remedial action alternative recommended by EPA for Operable Unit Two, Middle Marsh and adjacent wetlands, of the Sullivan's Ledge Federal Superfund Site. The Department concurs with EPA's selected remedy which includes excavation of contaminated soils/sediments and their containment under the Sullivan's Ledge disposal area cap that is being constructed as part of Operable Unit One. In addition, the Department concurs with EPA's contingency remedy which includes excavation of contaminated soils/sediments and treatment by solvent extraction.

The Department has evaluated EPA's preferred alternative and contingency alternative for consistency with M.G.L. Chapter 21E and the Massachusetts Contingency Plan 310 CMR 40.00 (MCP) and has determined that both alternatives are consistent with the requirements of the MCP. However, a permanent solution determination cannot be made until it has been demonstrated that the remedial measure or combination of measures will meet the Total Site Risk Limits as defined in 310 CMR 40.00 for the entire Sullivan's Ledge Federal Superfund Site.

The Department generally identifies the MCP as an applicable requirement for sites in Massachusetts while reserving the right to argue that Chapter 21E constitutes an independent enforcement authority that is not subject to the waiver provisions of CERCLA section 121 (d) (4). The Department identifies the MCP and Chapter 21E as applicable requirements, within the meaning of CERCLA, for

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Operable Unit Two of the Sullivan's Ledge Federal Superfund Site.

The selected remedy and the contingency remedy appear to meet all Massachusetts state ARARs. This will continue to be evaluated as remedial design progresses and during implementation and operation.

The Department looks forward to working with you in implementing the Operable Unit Two remedy. If you have any questions or require additional information, please contact Charla Reinganum at 292-5826.

Very truly yours,

Thomas Powers, for

Daniel S. Greenbaum, Commissioner
Massachusetts Department of Environmental Protection

cc: Robert Donovan, SERO