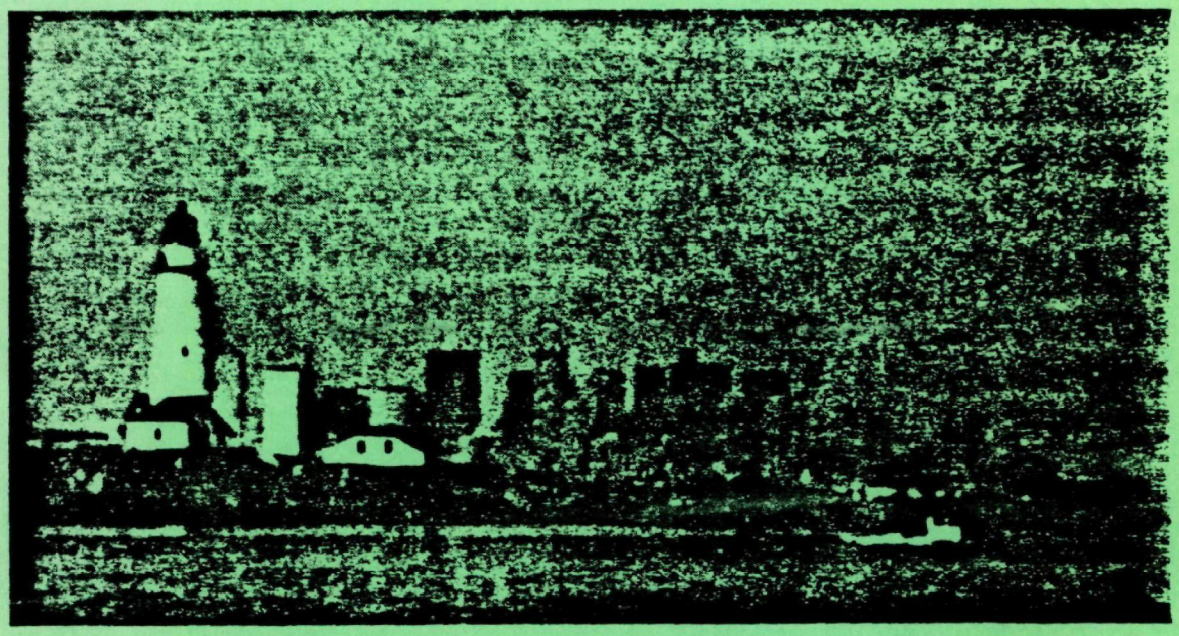
Boston Harbor Wastewater Conveyance System

Final Supplemental Environmental Impact Statement



United States Environmental Protection Agency
Region I
J.F.K. Federal Building
Boston, Massachusetts 02203
1988

Boston Harbor Wastewater Conveyance System

Final Supplemental Environmental Impact Statement

Prepared by:
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1988

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July 31, 1988

MICHAEL R. DELAND
Regional Administrator,
U.S. EPA, Region I

Date

This Final Supplemental Impact Statement has been prepared by the U.S. Environmental Protection Agency (EPA) with Assistance from the U.S. Army Corps of Engineers. This Final SEIS responds to comments and reexamines recommendations on the Draft SEIS released in April, 1988 which identified and evaluated the environmental impacts of the wastewater conveyance system for Greater Boston's wastewater treatment facility.

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

PROPOSED ACTION:	SITING AND EVALUATION OF CONSTRUCTION METHODS FOR WASTEWATER CONVEYANCE SYSTEM FOR SECONDARY TREATMENT PLANT, BOSTON HARBOR
LOCATION:	BOSTON HARBOR
DATE:	JULY, 1988
SUMMARY OF ACTION:	Final SEIS considers the environmental acceptability of alternative locations for the wastewater conveyance and outfall systems of the new wastewater treatment facilities for Boston Harbor. The Draft SEIS recommends deep rock tunnels for the inter-island and outfall conduits and a drilled riser diffuser located at least seven miles east of Deer Island.
LEAD AGENCY:	U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I, JFK Federal Building, Boston, Massachusetts 02203
COOPERATING AGENCY:	U.S. ARMY CORPS OF ENGINEERS
TECHNICAL CONSULTANT:	METCALF & EDDY, INC. Wakefield, Massachusetts
FOR FURTHER INFORMATION:	Mr. David Tomey Water Management Division U.S. EPA, Region I JFK Federal Building Boston, MA 02203 617-565-4420
FINAL DATE BY WHICH COMMENTS MUST BE RECEIVED:	September 11, 1988

Boston Harbor
Wastewater Conveyance System
Final Supplemental Environmental Impact Statement

EXECUTIVE SUMMARY

Introduction

This Final Supplemental Environmental Impact Statement (SEIS) responds to comments received on the Draft Boston Harbor Wastewater Conveyance Systems SEIS, issued in April, 1988, and reexamines the issues and recommendations discussed in that document in light of those comments and new information generated since the release of the draft document. This Final SEIS does not replace the Draft SEIS, but does present modifications and additions where appropriate.

The Draft and Final SEIS supplement an earlier Environmental Impact Statement on Siting of Wastewater Treatment Facilities for Boston Harbor, issued by EPA in 1985. The Siting EIS established Deer Island as the preferred location for the construction of a secondary treatment plant for wastewater flows from the Massachusetts Water Resources Authority (MWRA) service area, which includes most of the Metropolitan Boston area. This SEIS addresses questions related to wastewater conveyance and discharge that were left unresolved in the Siting EIS, including:

- the conveyance method and route for transporting wastewater from the proposed headworks at Nut Island to the new treatment plant at Deer Island,
- the conveyance method for transporting treated effluent from the Deer Island plant to an ocean discharge location,
- the method for discharging treated effluent into the ocean environment (i.e. the type of diffuser mechanism), and
- the location of the ocean discharge.

Comments and New Information

After the release of the Draft SEIS EPA held several public meetings and a public hearing and distributed the Draft document to an extensive mailing list in order to allow for public and agency review. Comments were received from Federal, State and Local regulatory agencies, elected officials, academic institutions, a pre-established Citizens Advisory Committee and the general public. These comments related to all aspects of the Draft document including its technical and legal scope and adequacy, the alternatives considered, the analyses conducted, the decision-making methodology used and the recommendations made. The vast majority of comments received related to EPA's recommended ocean discharge location, including comments on EPA's

analysis of a proposed discharge site known as "Site 6", and potential water quality and shoreline impacts from the new discharge (especially during an interim construction period when effluent from primary treatment facilities will be discharged).

During the public comment period new data and information was generated by MWRA, EPA and others (including some commentors) which pertained to the issues considered in the Draft SEIS, and modifications to the proposed construction project were proposed by MWRA. This new information and the proposed modifications related to the following issues:

- acceleration of the proposed construction schedule for primary and secondary treatment facilities on Deer Island,
- design and construction of the effluent diffuser,
- levels of pollutants in the ambient Massachusetts Bay water and their impact on potential exceedances of EPA Water Quality criteria as a result of the new discharge,
- levels of coliforms and viruses in the effluent and their potential impacts on beaches and shellfish areas,
- the potential for proposed discharge sites being within a current regime known as Maine Intermediate Water, and
- potential toxicity impacts from chlorination of the effluent, and the need for dechlorination to mitigate any impacts.

EPA has reviewed these comments, new information and proposed modifications in order to determine whether the recommendations contained in the Draft SEIS remain valid. EPA's response to comments and review of new information and proposed modifications constitute the bulk of the Final SEIS.

Recommendations

EPA's recommended method for conveying raw wastewater to Deer Island and treated effluent from Deer Island to the ocean discharge location; on which no new information and very few public comments were received, remains the same as stated in the Draft SEIS. EPA recommends the construction of two deep rock tunnels, an 11 foot finished inside diameter tunnel running under the Harbor floor from Nut Island to Deer Island, and a 25 foot finished inside diameter tunnel running under the ocean floor from Deer Island to the recommended discharge area.

The majority of public comments and concerns, as well as much of the new information and proposed modifications, related to the selection of the ocean discharge location. Although EPA reviewed all comments in detail, and in some instances conducted supplemental analyses, EPA has not significantly changed the

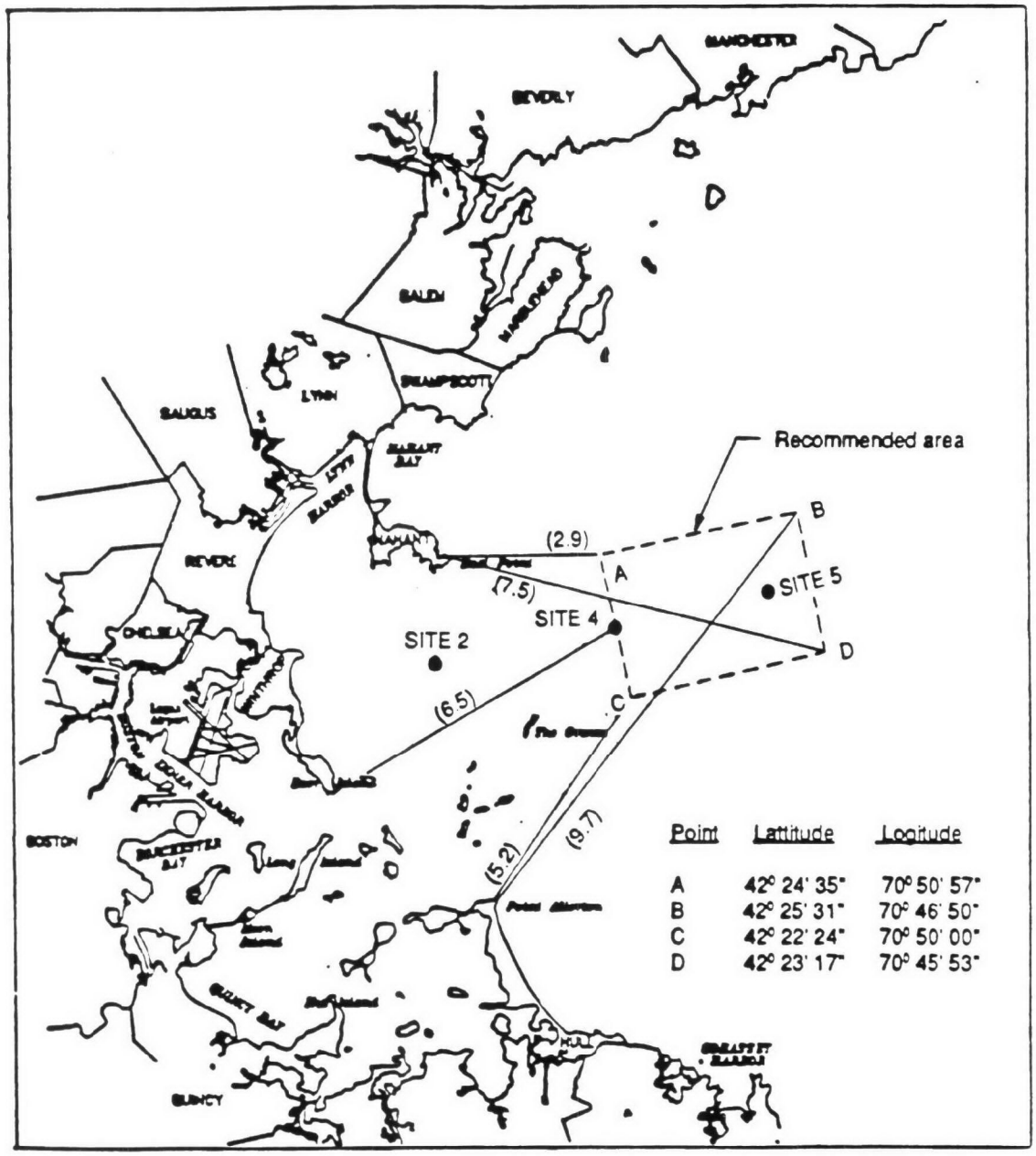
impact analysis contained in the Draft SEIS. EPA believes that many of the comments received were based on an incomplete understanding of the Draft SEIS analyses and conclusions. EPA has endeavored in the Final SEIS to better clarify the basis for those analyses and conclusions, but has determined that no changes in the technical analyses presented in the Draft SEIS, on which the discharge location recommendation is based, are required.

Therefore EPA's recommended location for the ocean discharge remains the same as that recommended in the Draft SEIS. EPA is recommending that the MWRA discharge (including all diffuser ports) be located totally within the area delineated by the rectangle shown on Figure 1. This area is bounded on the west by Site 4 and extends to the east of Site 5. The north and south boundaries are one diffuser length (approximately 2000 meters) from the centerline that connects Sites 4 and 5. The north and south boundaries were established to accommodate uncertainties related to the specific geotechnical characteristics. The exact location and alignment of the effluent diffuser within this recommended area will be determined by MWRA after completion of further geotechnical investigations and hydraulic modeling.

EPA received few comments on the recommended diffuser mechanism, but did receive significant new information from MWRA regarding cost and construction feasibility of the diffuser alternatives evaluated in the Draft SEIS. Based on this new information, EPA has slightly modified its recommended plan for diffuser design. The Draft SEIS had indicated that either of the two candidate diffuser designs (a pipe diffuser or a drilled riser diffuser) would be acceptable, even though construction of the pipe diffuser would require more dredging and would have greater (but still acceptable) environmental impacts. EPA now believes that the greater environmental impacts of constructing a pipe diffuser, in combination with the uncertainties related to the construction technology to be used (and the resultant potential for construction cost increases), make the drilled riser diffuser the preferred alternative.

The Final SEIS also discusses mitigation measures which MWRA must take to minimize adverse impacts to the environment. These measures include:

- further monitoring of the marine environment to establish and baseline for future impacts analysis,
- operation of a secondary treatment pilot plant and diffuser hydraulic model to confirm the SEIS analyses and to maximize effluent dilution at the diffuser,
- preparation of a Toxicity Reduction Evaluation, which will identify potential pollutants of concern and propose appropriate action (such as source reduction or



NOTE:
Distances
in parethases
are given in
statute miles

FIGURE 1. RECOMMENDED OUTFALL DIFFUSER LOCATION

pretreatment) to reduce the levels of those pollutants entering the MWRA sewage system.

- construction of dechlorination facilities at Deer Island to reduce chlorine toxicity in the treatment plant effluent,
- coordination with other ongoing local construction projects to maximize beneficial reuse of excavated material from tunnel construction,
- development of an integrated construction management approach to distribution of construction resources, and participation in the Governor's Office of Economic Development Task Force to ensure the availability of adequate construction resources, and
- design of the effluent diffuser in such a way as to minimize conflicts with fisherman dragging activities.

TABLE OF CONTENTS

	Page Number
List of Tables	iv
List of Figures	vi
CHAPTER 1 - INTRODUCTION	1-1
1.1 Relationship to Other Boston Harbor Documents	1-1
1.2 Summary of Draft Documents	1-1
1.3 Organization and Contents of this Final SEIS	1-3
CHAPTER 2 - COMMENTS	2-1
2.1 Comments Received	2-1
2.2 Approach to Addressing Comments	2-1
CHAPTER 3 - RESPONSE TO COMMENTS	3-1
3.1 Issue Number 1: Site 6	3-1
3.2 Issue Number 2: Shoreline Impacts	3-4
3.3 Issue Number 3: Massachusetts Bay Water Quality	3-11
3.4 Issue Number 4: Discharge of Primary Effluent	3-13
3.5 Issue Number 5: Biological Impact/Resource Considerations	3-16
3.6 Issue Number 6: Toxics	3-19
3.7 Issue Number 7: Cost	3-25
3.8 Issue Number 8: Engineering Considerations	3-27
3.9 Issue Number 9: Dissolved Oxygen	3-30
3.10 Issue Number 10: Editorial Comments	3-32
3.11 Issue Number 11: Monitoring/Mitigation	3-33
3.12 Issue Number 12: Accuracy of Models	3-33
3.13 Issue Number 13: "Insurance Policy"	3-37
3.14 Issue Number 14: Schedule	3-40
3.15 Issue Number 15: Sedimentation	3-43
3.16 Issue Number 16: Site Comparison and Recommendations	3-45
3.17 Issue Number 17: NEPA Compliance	3-48
3.18 Issue Number 18: Phytoplankton and Primary Production	3-49
3.19 Issue Number 19: Level of Treatment	3-52
3.20 Issue Number 20: Shoreline Transport	3-53
3.21 Issue Number 21: Chlorine toxicity	3-55
3.22 Issue Number 22: Geotechnical Concerns	3-55
3.23 Issue Number 23: Miscellaneous Topics	3-57
3.24 Issue Number 24: Historical Archaeological Considerations	3-57
3.25 Issue Number 25: Material Disposal	3-58
CHAPTER 4 - MODIFICATIONS TO THE PROPOSED ACTION AND ALTERNATIVES	4-1
4.1 Accelerated Secondary Treatment	4-1
4.1.1 Description of Accelerated Secondary Treatment	4-1
4.1.2 Impacts of Accelerated Secondary Treatment	4-2

TABLE OF CONTENTS (Continued)

	Page Number
4.1.2.1 Exceedance of Water Quality Criteria	4-2
4.1.2.2 Dissolved Oxygen	4-7
4.1.2.3 Other Criteria	4-7
4.1.3 Recommendation	4-7
4.2 Diffuser Conceptual Design	4-7
4.2.1 Description of Diffuser Alternative	4-7
4.2.2 Impacts of Alternatives	4-8
4.2.3 Recommendation	4-8
4.3 Water Quality Criteria Exceedances	4-9
CHAPTER 5 - ERRATA	5-1
5.1 Volume I Corrections	5-1
5.1.1 Text Changes	5-1
5.1.2 Table Changes	5-3
5.1.3 Figure Changes	5-37
5.2 Volume II Corrections	
5.2.1 Text Changes	5-25
5.2.2 Table Changes	5-26
CHAPTER 6 - REVIEW OF DRAFT SEIS RECOMMENDATIONS	6-1
6.1 Introduction	6-1
6.2 Review of New Issues	6-1
6.2.1 Beach Impact Assessment	6-1
6.2.2 Site 6 - Maine Intermediate Water	6-1
6.2.3 Diffuser Design	6-1
6.2.4 Accelerated Construction of Secondary Treatment	6-2
6.2.5 Mitigation and Monitoring	6-2
6.2.6 Chlorine Toxicity	6-2
6.3 Summary of Modifications	6-2
CHAPTER 7 - RECOMMENDED PLAN AND MITIGATION	7-1
7.1 Recommended Plan	7-1
7.1.1 Recommended Discharge Location	7-1
7.1.2 Recommended Plan for Outfall Conduit Construction	7-1
7.1.3 Recommended Plan for Diffuser Construction	7-3
7.1.4 Inter-island Conveyance Structure	7-3

TABLE OF CONTENTS (Continued)

	Page Number
7.2 Unresolved Issues	7-3
7.2.1 Actual Outfall Locations	7-3
7.2.2 Accelerated Secondary Treatment	7-4
7.3 Mitigation	7-4
7.3.1 Massachusetts Bay and Boston Harbor Monitoring	7-4
7.3.2 Identification and Control of Pollutants	7-4
7.3.3 Dechlorination	7-5
7.3.4 Material Disposal	7-5
7.3.5 Construction Resources	7-5
7.3.6 Diffuser Design	7-6
REFERENCES	
APPENDIX A Comment Letters	

LIST OF TABLES

Table		Page Number
Table 1.1	Issues Needing Further NEPA Review	1-2
Table 2.1	Guide to General Issues	2-6
Table 2.2	Guide to Commentor's Responses	2-9
Table 3.1	Comparison of Diffuser Characteristics	3-29
Table 3.2	Treatment Plant Operating Conditions	3-31
Table 4.1	MWRA Final STFP: Base vs. Alternate Schedule	4-2
Table 4.2	MWRA Final STFP: Base vs. Alternate Costs	4-4
Table 4.3	MWRA Final STFP: Base vs. Alternate Construction	4-4
Table 4.4	Ambient Constituent Comparison	4-9
Table 4.5	Mercury Concentration ng/l	4-9
Table 5.1.1.c	Nearfield Dilutions	5-4
Table 5.1.1.i	Summary of Predicted Water Quality Criteria Exceedances	5-5
Table 5.1.2.a	Comparison of Simulated Maximum Sediment Pollutant Concentrations, Primary Effluent, 5 Years Duration, Nonstratified Conditions	5-6
Table 6.4.4.b	Effluent Concentrations After Primary Treatment Year 1999, Maximum Loading Conditions on Storm Day	5-7
Table 6.4.4.c	Effluent Concentrations After Secondary Treatment, Year 2020, Average Flow	5-8
Table 6.4.4.d	Effluent Concentrations After Secondary Treatment, Year 2020, Maximum Flow	5-9
Table 6.4.4f	Mixed Primary-Secondary Effluent, Year 2020, on Storm Day	5-10
Table A.2.5	Saltwater Aquatic Life and Human Health Water Quality Criteria	5-27

LIST OF TABLES

Table		Page Number
Table A.3.1	Constituents Loading	5-29
Table A.3.7	Maximum Dissolved Oxygen Deficits (mg/l)	5-30
Table A.3.13	Aquatic Life Toxicity Criteria Compliance for Site 2	5-31
Table A.3.14	Aquatic Life Toxicity Criteria Compliance for Site 4	5-32
Table A.3.15	Aquatic Life Toxicity Criteria Compliance for Site 5	5-33
Table A.3.16	Human Health Compliance for Site 2	5-34
Table A.3.17	Human Health Compliance for Site 4	5-35
Table A.3.18	Human Health Compliance for Site 5	5-36
Table A.3.19	Summary of Predicted Water Quality Criteria Exceedances	5-37
Table 7.1.1.b	Site Comparison for Determinative Criteria	5-12

LIST OF FIGURES

Figure		Page Number
Figure 2.1	Summary of Commentors and Issue Categories	2-2
Figure 3.1	Upper Elevation Sampling Meter Data - Stations 2 & 3 (Spring 1987)	3-5
Figure 3.2	Lower Elevation Sampling Meter Data - Stations 2 & 3 (Spring 1987)	3-6
Figure 3.3	Lower Elevation Sampling Meter Data - Stations 2, 3, & 4 (Summer 1987)	3-7
Figure 4.1	Base vs Alternate Plan Schedule	4-3
Figure 4.2	Base vs Alternate Plan Cost	4-5
Figure 4.3	Base vs Alternate Plan Construction	4-6
Figure 4.2.1.c	Locations of MWRA Ventical Profiling Transect Stations	5-14
Figure 4.2.4.a	Location of MWRA Sampling Locations	5-15
Figure 4.2.5.a	Commercial Navigational Resources	5-16
Figure 4.2.5.b	Typical Commercial and Passenger Ship Routes	5-17
Figure 4.2.5.c	Commercial Fishing Resources	5-18
Figure 4.2.5.d	Beaches, Shoreline, Parks and Island Parks	5-19
Figure 4.2.5.e	Major Boating Public Access Points	5-21
Figure 4.2.5.f	Sensitive Harbor Resources	5-22
Figure 5.1.1.h	ELA Predicted Sedimentation Rates, Site 5, Primary Treatment, Stratified Conditions ($g/m^2/day$)	5-23
Figure 6.1.a	Project Time Frame	5-24
Figure A.2.2	Location of MWRA Current Meter Stations in Relation to Alternative Diffuser Sites	5-38
Figure A.3.8	Predicted Sedimentation Rates, Site 5, Primary Treatment, Stratified Conditions ($g/m^2/day$)	5-39

CHAPTER 1

INTRODUCTION

The issuance of this Final Supplemental Environmental Impact Statement (SEIS) represents a major step in the clean up of Boston Harbor and in the overall wastewater management plan for the Boston metropolitan area. This document finalizes the EPA analysis of the proposed wastewater conveyance system for the Boston metropolitan area, as set forth in the Draft Boston Harbor Wastewater Conveyance System Supplemental Environmental Impact Statement (U.S. EPA, 1988a).

1.1 RELATIONSHIP TO OTHER BOSTON HARBOR DOCUMENTS

The Draft Supplemental Environmental Impact Statement (SEIS) addressed several decisions left unresolved at the conclusion of the earlier Siting EIS (U.S. EPA 1985). The Siting EIS and associated Record of Decision established Deer Island as the preferred location for the construction of a secondary treatment plant for all Massachusetts Water Resources Authority (MWRA) wastewater flows. The siting EIS left several decisions to be addressed in future documents, including four issues addressed in the SEIS dealing with the conveyance of MWRA flows: method and route for transporting wastewater from the south system at Nut Island to Deer Island; method for conveying the treated wastewater (effluent) off-shore; method to accomplish the discharge of effluent; and location for the discharge.

These four decisions have been addressed in several documents issued over the last year. The first was the Draft Secondary Treatment Facilities Plan and Environmental Impact Report (MWRA, Draft STFP, 1987), which was prepared by MWRA to comply with the Massachusetts Environmental Policy Act and issued in November 1987. The contents of this draft MWRA document were the major input for the April, 1988 EPA Draft SEIS (U.S. EPA, 1988a) prepared in accordance with the federal National Environmental Policy Act (NEPA). After public and agency review and comment, the Draft STFP was finalized and released in April 1988 as the Final STFP (MWRA, Final STFP, 1988). A similar process was followed to finalize EPA's Draft SEIS to produce this Final SEIS.

The release of this Final SEIS will be followed by a public comment period. A Record Of Decision will be issued within the next few months which states EPA's final and official position on the decisions addressed in this Final SEIS.

The Siting EIS identified other issues, besides the conveyance of wastewater, which will be addressed in separate NEPA documents. A list of these documents, their contents and status are presented in Table 1.1.

1.2 SUMMARY OF DRAFT DOCUMENTS

The Draft STFP and SEIS contained similar conclusions concerning the four wastewater conveyance systems decisions. Each of the studies used existing information and independent evaluations to assess conveying South System flows

TABLE 1.1. ISSUES NEEDING FURTHER NEPA REVIEW

DEER ISLAND SITING ENVIRONMENTAL IMPACT STATEMENT

PROJECT FEATURES REQUIRING FURTHER ENVIRONMENTAL REVIEW	EPA NEPA REVIEW
• Construction of Inter-Island Conduit	This SEIS (1988)
• Water Quality and Construction Impacts of Outfall	This SEIS (1988)
• Disposal of Earthen or Dredged Material	This SEIS (1988) Piers EA (1988)
• Construction of Piers and Staging Areas	Piers EA (1988)
• Transport, Handling, Storage and Use of Chlorine	Piers EA (1988) Treatment Plant EA (1988)
• Long-Term Residuals Management	Residuals Management SEIS (1989)
• Combined Sewer Overflow Projects	CSO SEIS or EA (1990)

to Deer Island. Both documents concluded that from an engineering, environmental and cost standpoint, a deep rock tunnel directly from Nut Island to Deer Island was the preferred method of wastewater conveyance. Similarly, the Draft SEIS and STFP found a deep rock tunnel to be the preferred method for conveying effluent from Deer Island to the discharge location.

The two documents differed somewhat in their recommendations for the type of diffuser, or method of discharging and diffusing the effluent. The Draft STFP concluded that approximately 80 risers or shafts drilled through the sea floor into the deep rock tunnel was the preferred diffuser design. The Draft SEIS found that this method was acceptable but that, depending on the geotechnical conditions at the diffuser site, a system with many fewer risers and a pipe diffuser buried on the sea floor may have some advantages over the 80 riser diffuser. Consequently, the Draft SEIS deferred the final decision on the type of diffuser to be used until more geotechnical information and engineering analyses were available. The diffuser design is addressed further in Chapters 4 and 6 of this document.

The location of the effluent discharge was the most involved and complicated decision addressed by the two draft documents. Numerous candidate locations were identified and detailed data collection and analysis efforts were conducted at each location. There was also much input from the public, regulatory agencies, the academic community and a technical advisory group. The Draft STFP and SEIS contained independent evaluations of the alternative location using some of the same and some complementary prediction tools. Each document reached the same conclusion that the outfall location should be in an area approximately eight miles east of Deer Island (between alternative Sites 4 and 5). The majority of comments received on the draft documents related to the outfall location decision.

1.3 ORGANIZATION AND CONTENTS OF THIS FINAL SEIS

The Final SEIS presents a reexamination of the analyses, conclusion and recommendations contained in the Draft SEIS. The reevaluation takes into account public and agency comments received on the Draft, any technical information brought to light since the publication of the Draft and changes in the MWRA recommended wastewater management plan. The original contents of the Draft SEIS are not reproduced here. The Draft stands as a document of record and this Final SEIS contains modifications of or additions to the contents of the Draft where necessary. This Final SEIS also contains a complete set of recommendations as to the wastewater conveyance systems, including proposed mitigation measures.

Most of the Final SEIS is devoted to presenting the comments received on the Draft and EPA's response to the comments in Chapters 2 and 3 respectively. Chapter 4 describes changes to MWRA's proposed action or other relevant components of the MWRA wastewater management system, and the potential implications of these changes to the Draft SEIS recommendations. Chapter 5 contains errata, or changes and corrections to specific sections of the Draft SEIS. In Chapter 6, the conclusions and recommendations of the Draft are reviewed in light of comments or new information received. The conclusions are then modified or not as the information warrants. Chapter 7 presents the

Final SEIS recommended plan and mitigation measures. Chapter 7 also defines the details of the recommended plan that are still unresolved and the information needed to resolve these issues.

CHAPTER 2

COMMENTS

2.1 COMMENTS RECEIVED

As part of the EIS process, comments on the Draft SEIS were received by EPA during the 60 day comment period following the issuance of the draft document. In order to facilitate public comment, EPA held two informational public meetings (in Revere, on April 19, 1988 and in Quincy on April 20, 1988); presented the recommendations of the document to the previously established Citizen's Advisory Committee; distributed copies of the document to 16 libraries in the metropolitan Boston area and over 200 other parties including state and federal agencies, scientists and interested individuals; and notified over 2,500 other parties on EPA's mailing list of the availability of the document.

Written and oral comments were received from elected officials, government agencies and private individuals and organizations through letters and at a public hearing held in Cambridge on May 18, 1988. Every comment has been reviewed by EPA and the following is a discussion of EPA's approach to addressing the comments.

2.2 APPROACH TO ADDRESSING COMMENTS

In order to be responsive to commentors and address comments in an efficient manner, EPA has conducted a review of all comments received and developed a complete list of issues raised by commentors. From this list, a matrix of issue categories and individual commentors was developed (Figure 2.1). Synthesizing issues and responses in this manner allows all aspects of an issue to be discussed comprehensively in one section and also allows for a clear presentation of what the issues of concern are. A summary of each of these issues is presented in Chapter 3 of this Final SEIS followed by EPA's detailed response. A discussion of how the comments have affected the SEIS recommendations is presented in Chapter 6.

Some comments received by EPA were either very general, stated an opinion rather than a question or were specific to the MWRA's Draft EIR. These comments were considered by EPA but did not require a direct response. Copies of all original comment letters can be found in Appendix A of this Final SEIS. Transcripts of the public hearing are available at U.S. EPA Region I. Figure 2.1 and Tables 2.1 and 2.2 provide a guide to how and where individual commentors may find responses to their comments. The commentors were given designation codes based on whether they were elected officials (E1 to E7), government agencies (G1 to G7), private citizens (P1 to P35) or public hearing commentors (H1 to H25). The order of the presentation in Chapter 3 is based on the number of commentors raising the issue, with the most commonly raised issue presented first.

COMMENT AUTHOR	AFFILIATION	COMMENTOR CODE	1. SITE 6	2. SHORELINE IMPACTS	3. MASS. BAY WATER QUALITY	4. PRIMARY TREATMENT	5. BIOLOGICAL IMPACTS	6. TOXICS	7. COST	8. ENGINEERING CONSIDERATIONS	9. DISSOLVED OXYGEN	10. EDITORIAL COMMENT	11. MONITORING/MITIGATION	12. ACCURACY OF MODEL	13. INSURANCE POLICY	14. PROJECT SCHEDULE	15. SEDIMENTATION	16. SITE COMPARISON/RECOMMENDATIONS	17. NEPA COMPLIANCE	18. PHYTOPLANKTON	19. LEVEL OF TREATMENT	20. SHORELINE TRANSPORT	21. CHLORINE TOXICITY	22. GEO-TECH CONCERNS	23. MISCELLANEOUS TOPICS	24. HISTORICAL/ARCHAEOLOGICAL	25. MATERIAL DISPOSAL
Francis O. Doris	Massachusetts Senate	E1	•	•																							
Alfred E. Saggese, Jr.	Massachusetts House of Rep.	E2	•	•																							
Walter J. Boverini	Massachusetts Senate	E3	•						•																		
Richard J. Lombard	Hahant Selectman	E4	•	•								•		•	•	•											
John F. Burke	Swampscott Selectman	E5	•	•	•	•	•																				
George V. Colella	Revere Mayor	E6	•	•	•	•																					
Joan von Sternberg	Marblehead Selectman	E7	•	•	•	•	•															•					
David Kiley	Corps of Engineers	G1		•			•	•			•	•	•				•		•	•		•					•
Richard Delaney	Coastal Zone Management	G2	•									•	•					•									
W. Leigh Bridges	Div. of Marine Fisheries	G3						•					•														
Paul F. Levy	Mass. Water Resources Authority	G4	•			✓	•	•		•	•	•	•	•				•		•		•					
Eugene Canty	Hahant Conserv. Commission	G5	•	•	•		•																				
Paul Reavis	Boston Redevelopment Authority	G6		•			•		•	•	•	•				•		•	•						•		
R. T. Ramond	Marblehead Parks & Recreation	G7		•																		•					
Michael Kendall	Hale and Dorr	P1	•	•	•	•		•		•	•		•	•	•		•		•								
Angela Raven Benson	Hahant Resident	P2	•	•		•										•											
D. Hardwick	"No address"	P3	•	•	•	•	•																				
Joseph & Rachel Gardner	Lynn Residents	P4	•	•	•	•	•									•											
Charlotte & Leslie Moore	Hahant Residents	P5	•						•						•												
Edward H. Noll, III	Swampscott Resident	P6	•	•	•	•	•																				
Daniel C. Cotton	Cohasset Resident	P7	•	•					•																		

FIGURE 2-1. SUMMARY OF COMMENTORS AND ISSUE CATEGORY RESPONSES

COMMENT AUTHOR	AFFILIATION	COMMENTOR CODE	1. SITE 6	2. SHORELINE IMPACTS	3. MASS. BAY WATER QUALITY	4. PRIMARY TREATMENT	5. BIOLOGICAL IMPACTS	6. TOXICS	7. COST	8. ENGINEERING CONSIDERATIONS	9. DISSOLVED OXYGEN	10. EDITORIAL COMMENT	11. MONITORING/MITIGATION	12. ACCURACY OF MODEL	13. INSURANCE POLICY	14. PROJECT SCHEDULE	15. SEDIMENTATION	16. SITE COMPARISON/RECOMMENDATIONS	17. NEPA COMPLIANCE	18. PHYTOPLANKTON	19. LEVEL OF TREATMENT	20. SHORELINE TRANSPORT	21. CHLORINE TOXICITY	22. GEO-TECH CONCERNS	23. MISCELLANEOUS TOPICS	24. HISTORICAL/ARCHAEOLOGICAL	25. MATERIAL DISPOSAL
James R. Rose	Revere School Committee	P8	•	•					•																	
Dan McDonald	Lynn Resident	P9	•		•	•																				
Amy Goldsmith	Clean Water Action Project	P10	•		•																					
Mr&Mrs Daniel Livingston	Nahant Resident	P11	•	•	•	•	•																			
Debra Hardwick	"No address"	P12	•	•	•	•	•																			
Judith Skinner	Coalit. on Alt. Sew. Treat. (COAS	P13	•	•	•				•											•		•				
"Undecipherable"	"No address"	P14	•	•	•	•	•																			
Polly Bradley	Safer Water in Mass. (SWIM)	P15	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•		
Daniel B. Curll, III	Boston Harbor Associates	P16									•	•						•	•		•					
Lawrence A. Schafer	Newton Resident	P17						•		•				•			•	•	•							
Philip D. Moriz!	Malden Resident	P18	•					•		•			•					•					•			
Maria Walsh	Nahant Resident	P19	•	•	•	•	•															•				
Philippa Longin	Marblehead Resident	P20	•	•	•	•																				
Megan LeGault	Westford Resident	P21	•		•	•																				
Ellen Burns	Saugus Act. Vol. for the Env.(SAV	P22	•	•	•	•	•																			
Morgan Hardwick-Witman	Northeastern University	P23	•	•	•	•																				
Donald R. F. Harleman	MIT	P24									•						•				•					
David Terkla	UMass-Boston	P25				•				•								•								
John N. Silva	South Shore Coalition	P26	•		•	•			•																	
Hugh N. Knapp	Nahant Village Church	P27	•	•	•														•							
Lawrence A. Schafer	Newton Resident	P28						•									•			•						

FIGURE 2-1. SUMMARY OF COMMENTORS AND ISSUE CATEGORY RESPONSES (CONT.)

COMMENT AUTHOR	AFFILIATION	COMMENTOR CODE	1. SITE 6	2. SHORELINE IMPACTS	3. MASS. BAY WATER QUALITY	4. PRIMARY TREATMENT	5. BIOLOGICAL IMPACTS	6. TOXICS	7. COST	8. ENGINEERING CONSIDERATIONS	9. DISSOLVED OXYGEN	10. EDITORIAL COMMENT	11. MONITORING/MITIGATION	12. ACCURACY OF MODEL	13. INSURANCE POLICY	14. PROJECT SCHEDULE	15. SEDIMENTATION	16. SITE COMPARISON/RECOMMENDATIONS	17. NEPA COMPLIANCE	18. PHYTOPLANKTON	19. LEVEL OF TREATMENT	20. SHORELINE TRANSPORT	21. CHLORINE TOXICITY	22. GEO-TECH CONCERNS	23. MISCELLANEOUS TOPICS	24. HISTORICAL/ARCHAEOLOGICAL	25. MATERIAL DISPOSAL
Lawrence A. Schafer	Newton Resident	P29						●		●																	
David Novak	Save the Harbor, Save the Bay	P30	●						●																		
Dorothy Allen	Hahant Resident	P31	●	●	●	●	●	●		●	●	●	●	●			●	●	●	●	●		●				
S. David Graber	Winthrop Consultant	P32		●	●		●	●	●			●	●	●								●					
Polly Bradley	SWIM Part II	P33	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			
Sharon Dean	New England Aquarium	P34	●		●	●	●	●			●		●			●	●	●		●			●				
David Standley	Quincy Consultant	P35														●											
Adele Toro	Franklin Park Improv. Assoc.	P36	●		●	●	●																				
Phil Kavizi	Malden Resident	M1	●					●		●													●				
James Rowan		M2	●												●												
Daniel Curil	Boston Harbor Associates	M3										●							●		●						
Donald Harleman	MIT	M4									●						●				●						
Lawrence A. Schafer	Newton Resident	M5						●		●							●	●									
David Standley	Quincy Consultant	M6											●														
Richard J. Lombard	Hahant Selectman	M7	●	●																							
Larry Alexander		M8		●					●						●												
Bud Erlich		M9				●																					
Sam Maloof		M10				●															●						
Carol Wasserman		M11	●		●				●																		
David Carter	SWIM Part II	M12	●								●			●													
Polly Bradley	SWIM Part II	M13	●	●		●	●					●			●												

FIGURE 2-1. SUMMARY OF COMMENTORS AND ISSUE CATEGORY RESPONSES (CONT.)

COMMENT AUTHOR	AFFILIATION	COMMENTOR CODE	1. SITE 6	2. SHORELINE IMPACTS	3. MASS. BAY WATER QUALITY	4. PRIMARY TREATMENT	5. BIOLOGICAL IMPACTS	6. TOXICS	7. COST	8. ENGINEERING CONSIDERATIONS	9. DISSOLVED OXYGEN	10. EDITORIAL COMMENT	11. MONITORING/MITIGATION	12. ACCURACY OF MODEL	13. INSURANCE POLICY	14. PROJECT SCHEDULE	15. SEDIMENTATION	16. SITE COMPARISON/RECOMMENDATIONS	17. NEPA COMPLIANCE	18. PHYTOPLANKTON	19. LEVEL OF TREATMENT	20. SHORELINE TRANSPORT	21. CHLORINE TOXICITY	22. GEO-TECH CONCERNS	23. MISCELLANEOUS TOPICS	24. HISTORICAL/ARCHAEOLOGICAL	25. MATERIAL DISPOSAL
S. David Graber	Winthrop Consultant	#14						●				●														
David Kellum		#15	●	●											●			●								
Dorothy Allen	Hahant Resident	#16	●	●		●			●	●																
Daniel McAuliffe		#17	●	●																						
Brian Michael Holmstead		#18	●						●					●	●											
Rumin Koebel		#19								●																
Ruth-Ann Donahue Seltzer		#20	●	●										●	●											
Bill Coffey		#21																								
Jim Rosen		#2-																								
Jeanne Beronet		#22																								
Bill Dennon		#23	●																					●		
Susan Brange		#24	●																							

FIGURE 2-1. SUMMARY OF COMMENTORS AND ISSUE CATEGORY RESPONSES (CONT.)

TABLE 2-1. GUIDE TO GENERAL TOPICS

COMMENT	COMMENTOR CODES
1. SITE 6	E1,E2,E3,E4,E5,E6,E7,G2,G4,G5,P1, P2,P3,P4,P5,P6,P7,P8,P9,P10,P11 P12,P13,P14,P15,P18,P19,P20,P21 P22,P23,P26,P27,P30,P31,P33,P36, H1,H2,H7,H8,H9,H11,H12,H13,H14,H15, H16,H17,H18,H20,H2-,H23,H24
2. SHORELINE IMPACTS	E1,E2,E4,E5,E6,G1,G5,G6,G7,P1,P3, P4,P6,P7,P8,P11,P12,P13,P14,P15, P19,P20,P22,P27,P31,P33,H7,H13,H16, H17,H20
3. MASS. BAY WATER QUALITY	E5,E6,E7,G5,P3,P4,P6,P9,P10,P11, P12,P13,P14,P15,P19,P20,P21,P22, P23,P26,P31,P32,P33,P34,P36,H11
4. PRIMARY TREATMENT	P1,P15,P25,P31,P33,P34,H11,H16
5. BIOLOGICAL IMPACTS	G1,G4,G6,P15,P31,P32,P33,P34,H13
6. TOXICS	G1,G2,G3,G4,P1,P15,P17,P18,P28,P29, P31,P32,P33,P34,H1,H5,H14
7. COST	G4,G6,P15,P24,P26,P32,P33,H4,H10, H11,H15,H16,H18
8. ENGINEERING CONSIDERATIONS	G4,G6,P1,P15,P17,P25,P31,P33,H5,H19
9. DISSOLVED OXYGEN	G1,G4,G6,P1,P15,P16,P17,P24,P31, P33,H3,H4,H5
10. EDITORIAL COMMENT	E4,G1,G2,G4,G6,P15,P16,P31,P32, P33,H3,H13,H14
11. MONITORING/MITIGATION	G1,G3,P34,H6
12. ACCURACY OF MODEL	E4,G4,P1,P15,P17,P31,P32,P33,H12, H18,H20
13. INSURANCE POLICY	P15,P33,H8,H13,H15,H20,H2-
14. PROJECT SCHEDULE	E4,E5,E6,E7,G4,G5,G6,P2,P3,P4,P6, P9,P11,P13,P14,P15,P19,P20,P21,P22, P23,P26,P33,P36,H9,H13

TABLE 2-1. GUIDE TO GENERAL TOPICS (CONT.)

COMMENT	COMMENTOR CODES
15. SEDEMENTATION	G1,P1,P15,P17,P24,P28,P31,P33,P34, H4,H5
16. SITE COMPARISON/ RECOMMENDATIONS	G2,G4,G6,P15,P17,P25,P31,P33,H5, H12,H15
17. NEPA COMPLIANCE	P15,P16,P17,P31,P33
18. PHYTOPLANKTON	G1,G4,G5,P15,P31,P33,P34
19. LEVEL OF TREATMENT	P16,P24,P31,P32,P33,H3,H4,H10,
20. SHORELINE TRANSPORT	G1,G4,P19,P32
21. CHLORINE TOXICITY	G1,P15,P18,P31,P32,P33,H1,H16
22. GEO-TECH CONCERNS	G6,P15,H23
23. MISCELLANEOUS TOPICS	G4,G6,P17,P32,H3,H5
24. HISTORICAL/ ARCHAEOLOGICAL	G1
25. MATERIAL DISPOSAL	G1

TABLE 2-2. GUIDE TO COMMENTOR'S RESPONSES

COMMENT AUTHOR	AFFILIATION	COMMENTOR CODE	COMMENT NUMBERS
Francis O. Doris	Massachusetts Senate	E1	1,2
Alfred E. Saggese, Jr.	Massachusetts House of Rep.	E2	1,2
Walter J. Boverini	Massachusetts Senate	E3	1
Richard J. Lombard	Hahant Selectman	E4	1,2,10,12,14
John F. Burke	Swampscott Selectman	E5	1,2,3,14
George V. Colella	Revere Mayor	E6	1,2,3,14
Joan von Sternberg	Marblehead Selectman	E7	1,3,14
David Kiley	Corps of Engineers	G1	2,5,6,9,10,11,15,17,18,20,21,24
Richard Delaney	Coastal Zone Management	G2	1,6,10,13
W. Leigh Bridges	Div. of Marine Fisheries	G3	6,11
Paul F. Levy	Mass. Water Resources Authority	G4	1,4,5,6,7,8,9,10,12,14,16,18,20
Eugene Canty	Nahant Conserv. Commission	G5	1,2,3,14,18
Paul Reavis	Boston Redevelopment Authority	G6	2,5,7,8,9,10,14,16,22,23
R. T. Hamond	Marblehead Parks & Recreation	G7	2
Michael Kendall	Hale and Dorr	P1	1,2,4,6,8,12,15
Angela Raven Bonan	Nahant Resident	P2	1,14
D. Hardwick	"No address"	P3	1,2,3,14
Joseph & Rachel Gardner	Lynn Residents	P4	1,2,3,14
Charlotte & Leslie Moore	Nahant Residents	P5	1
Edward H. Noll, III	Swampscott Resident	P6	1,2,3,14
Daniel C. Cotton	Cohasset Resident	P7	1,2
James R. Rose	Revere School Committee	P8	1,2
Dan McDonald	Lynn Resident	P9	1,3,14
Amy Goldsmith	Clean Water Action Project	P10	1,3
Mr&Mrs Daniel Livingston	Nahant Resident	P11	1,2,3,14
Debra Hardwick	"No address"	P12	1,2,3

TABLE 2-2. GUIDE TO COMMENTOR'S RESPONSES (CONT.)

COMMENT AUTHOR	AFFILIATION	COMMENTOR CODE	COMMENT NUMBERS
Judith Skinner	Coalit. on Alt. Sew. Treat. (COAS	P13	1,2,3,14
"Undecipherable"	"No address"	P14	1,2,3,14
Polly Bradley	Safer Water in Mass. (SWIM)	P15	1,2,3,4,5,6,7,8,9,10,12,13,14,15,16,17,18,21,22
Daniel B. Curll, III	Boston Harbor Associates	P16	9,10,17,19
Lawrence A. Schafer	Newton Resident	P17	6,8,9,12,15,16,17
Philip D. Narizi	Malden Resident	P18	1,6,21
Marie Walsh	Nahant Resident	P19	1,2,3,14,20
Philippe Langin	Marblehead Resident	P20	1,2,3,14
Megan LeGault	Westford Resident	P21	1,3,14
Ellen Burns	Saugus Act. Vol. for the Env.(SAV	P22	1,2,3,14
Morgan Hardwick-Witman	Northeastern University	P23	1,3,14
Donald R. F. Harleman	MIT	P24	7,9,15,19
David Terkla	UMass-Boston	P25	4,8,16
John M. Silva	South Shore Coalition	P26	1,3,7,14
Hugh H. Knapp	Nahant Village Church	P27	2,1
Lawrence A. Schafer	Newton Resident	P28	6,15
Lawrence A. Schafer	Newton Resident	P29	6
David Novak	Save the Harbor, Save the Bay	P30	1
Dorothy Allen	Nahant Resident	P31	1,2,3,4,5,6,8,9,10,12,15,16,17,18,19,21
S. David Graber	Winthrop Consultant	P32	3,5,6,7,10,12,19,20,21,23
Polly Bradley	SWIM Part II	P33	1,2,3,4,5,6,7,8,9,10,12,13,14,16,17,18,19,21
Sharon Dean	New England Aquarium	P34	3,4,5,6,11,15,18
Adele Toro	Franklin Park Improv. Assoc.	P36	1,3,14
Phil Navizi	Malden Resident	M1	1,6,21
James Rouen		M2	1
Daniel Curll	Boston Harbor Associates	M3	9,10,19,23

TABLE 2-2. GUIDE TO COMMENTOR'S RESPONSES (CONT.)

COMMENT AUTHOR	AFFILIATION	COMMENTOR CODE	COMMENT NUMBERS
Donald Harleman	MIT	M4	7,9,15,19
Lawrence A. Schafer	Newton Resident	M5	6,8,9,15,16,23
David Standley	Quincy Consultant	M6	17
Richard J. Lambard	Hahant Selectman	M7	1,2
Larry Alexander		M8	1,13
Bud Erlich		M9	1,14
Sam Metcof		M10	7,19
Carol Wasserman		M11	1,3,4,7
David Carter	SWIM Part II	M12	1,12,16
Polly Bradley	SWIM Part II	M13	1,2,5,10,13,14
S. David Graber	Winthrop Consultant	M14	1,6,10
David Kellum		M15	1,7,13,16
Dorothy Allen	Hahant Resident	M16	1,2,4,7,21
Daniel McAuliffe		M17	1,2
Brian Michael Holmstead		M18	1,7,12
Rumin Koebel		M19	8
Ruth-Ann Donahue Switzer		M20	1,2,12,13
Jim Rowan		M2-	1,13
Bill Dennan		M23	1,22
Susan Brange		M24	1

CHAPTER 3

RESPONSE TO COMMENTS

The following is a presentation of the comments received on the Draft SEIS and EPA's response. As discussed in Chapter 2, the comments are grouped into categories, or issues. General comments on each issue are discussed first, with specific comments or questions and responses following the general discussion. As will become evident, many of the issues overlap, and where this occurred, the reader is referred to other appropriate discussions in the text. Also, all section numbers referred to in the response correspond to sections of the Draft SEIS.

3.1 ISSUE NUMBER 1

Site 6

Many commentors have proposed that the outfall be sited at an offshore location known as "Site 6". This site is approximately 9 miles from Nahant and is about 2 miles southeast of the EPA's recommended outfall area. These commentors believe that the recommended outfall area was selected only because it was the best of the areas studied, and that it is not acceptable on an absolute scale. Commentors also noted that EPA's elimination of Site 6 during screening may not have considered the presence of a different oceanographic regime, specifically Maine Intermediate Water, in the vicinity of Site 6.

EPA Response

EPA evaluated Site 6 in the Draft SEIS screening process, which was used to establish potentially acceptable outfall areas for further evaluation (Section F.5.1). The screening process eliminated areas of Massachusetts Bay that were clearly environmentally unsuitable for location of the outfall, and preliminarily excluded areas where substantial construction difficulty, time and costs did not appear to be outweighed by additional environmental benefits. Site 6 fell within this latter area because even though it was shown to provide some additional dilution over more inshore sites, when the dilution was applied to effluent pollutant concentrations and these were compared to EPA water quality criteria and Massachusetts water quality standards, there was no practical additional benefit predicted. This is true even though Site 6 offers more rapid effluent dispersion as demonstrated by a commentor. The water quality criteria exceedances exhibited at Sites 4 and 5 would still occur at Site 6 even given the increased dispersional characteristics of the site.

The screening process in the Draft SEIS did not specifically consider Maine Intermediate Water (MIW). However, an evaluation of Maine Intermediate Water has been performed for this Final SEIS (see below). The evaluation revealed that during the winter and early spring, MIW is present at all proposed outfall sites. During summer, MIW is generally at least 18 miles and perhaps as far as 45 miles off-shore. MIW develops onshore during fall and moves offshore during spring at a rate averaging 1 to 2 miles a day. This indicates

that the potential benefits of entraining the effluent in MIW and thereby minimizing shoreward transport are substantially the same at Site 6 as at the other more shoreward sites.

Following screening of potential outfall sites, a detailed evaluation of sites within the potentially suitable area was performed (Draft SEIS Chapter 5). The site evaluation included comparison of the characteristics of each site to established decision criteria. These decision criteria were developed through a public process that involved input from citizens, the academic community regulatory agencies and advocacy groups. The decision criteria included both absolute and comparison criteria, that is, comparison to some external criterion (such as consistence with established water quality standards), and comparison to the other sites being considered. An essential part of the entire site selection process was the comparison of each site to such absolute decision criteria.

Based on the above discussion, EPA believes that it has thoroughly evaluated the potential benefits of Site 6, and that any such benefits do not alter the site evaluation conducted in the Draft SEIS, or the recommended outfall location contained therein.

Characteristics of Site 6

Commentors brought forth many other purported benefits of Site 6 including better dilution, reduced beach impacts, reduced lobster fishery impacts and better bedrock conditions at and en route to Site 6 which could decrease the duration and cost of outfall construction. The dilution and beach impact comments were directly tied to the belief that Site 6 was more likely to be within the MIW regime, and that therefore the effluent would be carried away from shore in a different manner than would effluent from the other sites considered. This is not true, as discussed above. Also, EPA believes that the beach impacts related to discharge at the recommended outfall location will be negligible (see Issue #2). Regarding lobster fisheries, the Draft SEIS concluded that a discharge at the recommended outfall area will not have any significant short or long term effects on fish and lobsters in the area. Although it is possible that the abundance of fish and lobsters at Site 6 may generally be less than at other sites, there is no reason to conclude that impacts at Site 6 would be significantly less than at Site 5. The issue of bedrock conditions at Site 6 is addressed in Issue #22.

Effluent Pumping

EPA was requested to clarify the need for effluent pumping to reach Site 6 or the other candidate outfall sites. As discussed in Section F.2.1.2.2 of the Draft SEIS, at the currently planned plant elevation effluent pumping would be required for an outfall at Site 6. As has been pointed out by several commentors, it would be possible to raise the elevation of the plant and avoid the need for effluent pumping. However raising the plant elevation provides no cost or engineering benefit. At about Site 4.5 or 5 the cost of gravity flow and pumped effluent are similar and beyond Site 5 a pumped system is less expensive. This is because a tunnel for a pumped system is smaller (because it is not as critical to reduce friction) and for longer tunnels the increased

cost of a pump station is offset by the reduced per foot cost of tunnel construction. Also there are influent pumping implications that could increase the total project cost if the plant elevation were raised. In summary, effluent pumping would be the least costly system for a Site 6 outfall, but this does not produce an abrupt increase in cost compared to an outfall at other candidate sites. Consequently, the pumpng of effluent was not a factor in the Site 6 analysis.

Maine Intermediate Water

Several commentors have raised the possibility that Site 6 is more likely to be within the Maine Intermediate Water (MIW) regime than any of the other candidate sites. Commentors also point out that discharge within MIW could result in a trapped effluent plume which would not reach the surface and would be less likely to be transported shoreward. These commentors have asked EPA to investigate the possibility of MIW at Site 6 and to determine if the elimination of Site 6 during screening should be reevaluated. Presented below is an evaluation of MIW in the potential outfall area.

The evidence for MIW is presented in Hopkins and Garfield (1979). They describe MIW as a mass of relatively uniform density water in the Gulf of Maine which generally occupies at least the water layer between 160 and 400 feet. MIW is identified by its salinity - temperature signal which is approximately 1° to 6° C and 32 to 33 parts per thousand salinity, however these ranges vary depending on the season, year and location. The major identifier for MIW is a temperature minimum, thus the MIW is colder than the water above and below the layer.

Formation of MIW appears to be from at least three sources (Hopkins and Garfield, 1979). One source is cooling of nearshore waters during winter. These denser waters sink and move off-shore to contribute to the MIW layer. The second source of the MIW is from the Scotian Shelf, which is an area east of a line connecting Nova Scotia and Georges Bank. This water apparently enters the Gulf of Maine at the surface during discrete winter events and then sinks to the MIW layer. The final source of MIW is continental slope water which can enter the Gulf only during the stratified (summer) season.

Because of the complex formation of MIW and direct susceptibility to weather events, the water mass is seasonally dynamic and highly variable from year to year. MIW is at maximum volume in the winter and early spring due to the accumulation of winter nearshore cooling and periodic inputs from Scotian Shelf waters. During this period MIW extends to within 4 miles of shore in Massachusetts Bay (Hopkins and Garfield, 1979).

During summer, vertical stratification establishes a different relationship between MIW and Massachusetts Bay waters. The bottom waters in the Bay are partially trapped by Stellwagen Bank. This bottom water, which initially was MIW, undergoes some mixing with upper waters due to internal waves at the interface (Chereskin 1983, Halpern 1971a, Halpern, 1971b). The waves are due to tides and instabilities as flow passes over Stellwagen Bank. The results are that the bottom layer temperature increases, bottom layer salinity decreases and the entire volume of MIW diminishes rapidly. The decrease in

volume is due to surface cooling, mixing with other water masses and the lack of input from nearshore and the Scotian Shelf. By September, the landward extent of MIW has decreased drastically (generally 35 to 40 miles offshore in Massachusetts Bay) compared to winter (Hopkins and Garfield, 1979).

The pattern described above fits well with data collected in 1987 as part of the MWRA facilities plan (MWRA, Draft STFP V, A and X, 1987). Early spring data collected at stations as close to shore as Sites 2 and 3 show salinity and temperature signals well within the range which defines MIW (Figures 3.1 and 3.2). This is true for both surface and bottom water, indicating winter formation of MIW in the nearshore area. By summer, presumably through a combination of warming, isolation and lack of new formation (as described above), the water with the MIW temperature and salinity signal is not obvious in the study area at Sites 2 and 3 (Figure 3.3). As far offshore as the Foul Area disposal site, which is about 17 statute miles from Deer Island and about 5 miles east of Site 6, MIW was not present in the summer of 1987, even in the bottom waters (Figure 3.3, data from MWRA, Draft STFP V,X, 1987). This is to be expected based on the summer time 35 to 40 mile offshore limit of MIW described by Hopkins and Garfield (1979).

In conclusion, it does not appear that MIW is a factor in differentiating among outfall sites. All candidate sites are within the area of winter-time MIW formation. During this time the water column is well mixed and water comparable to MIW density is formed. As the summer progresses the water column at all sites, and at least as far offshore as the Foul Area warms, freshens and stratifies. Even in the bottom waters as far as 17 miles offshore, the density decreases below that of MIW by a combination of warming and offshore movement. By late summer the MIW is well offshore far beyond any potential outfall site.

3.2 ISSUE NUMBER 2

Shoreline Impacts

Commentors feared that the use of public beaches would be impaired because effluent transported onshore would result in high levels of disease-causing organisms (such as bacteria and viruses), undesirable algae blooms and debris on the beaches. Commentors were also concerned that shellfish beds near the shoreline would be impacted by pathogens or toxics from the effluent.

EPA Response

Shoreline impacts from the presence of coliform bacteria, viruses, and algae were analyzed by comparing the predicted effluent concentrations of these organisms to concentrations at which adverse environmental or public health effects could be expected. The concentrations of these organisms that could negatively impact the shoreline were determined using the Massachusetts Surface Water Quality Standards, U.S. EPA Water Quality Criteria or values from scientific literature when standards or criteria were not available. As discussed below, no adverse impacts along <u>any</u> shorelines are expected as a result of these organisms.

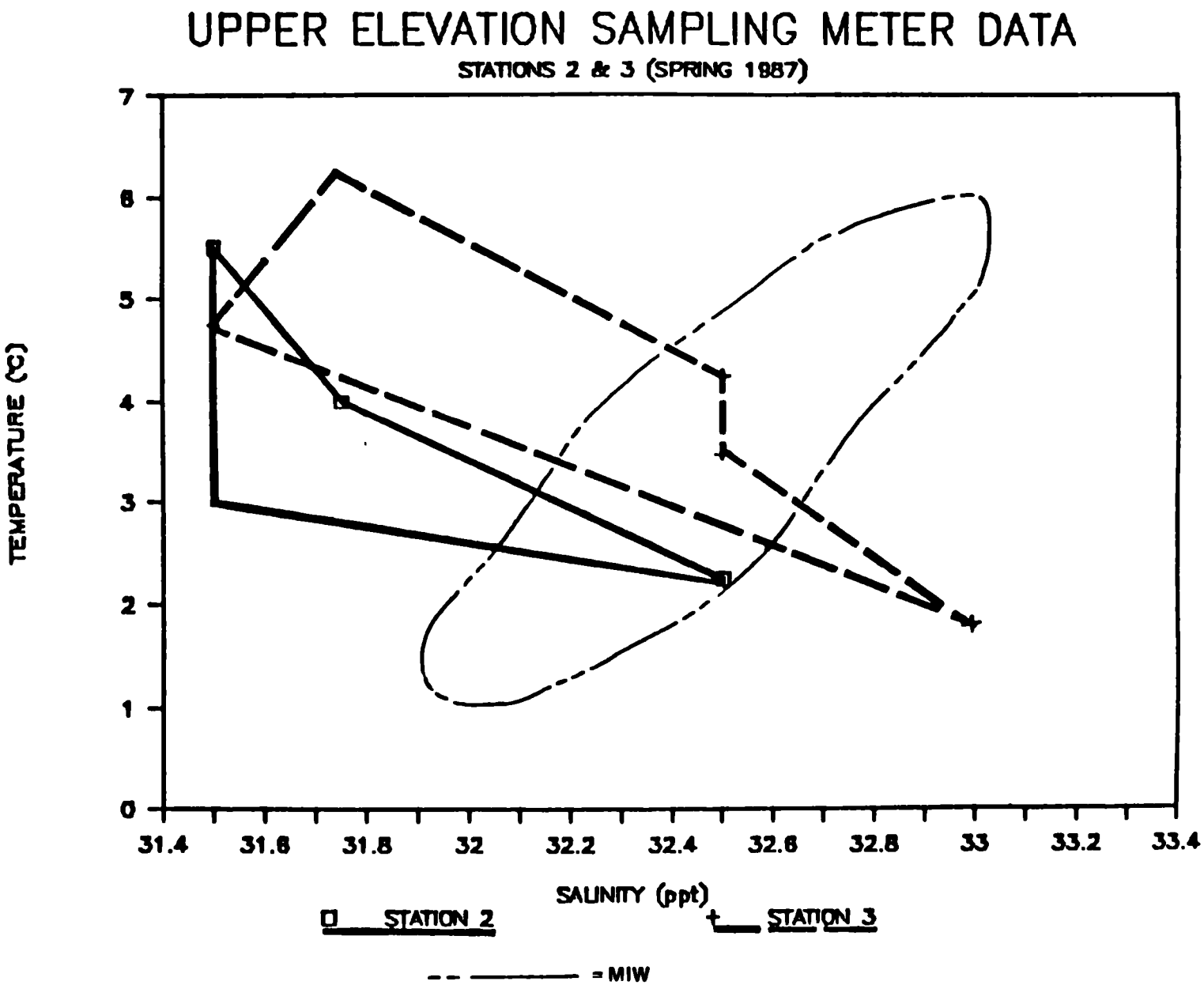

UPPER ELEVATION SAMPLING METER DATA
STATIONS 2 & 3 (SPRING 1987)
TEMPERATURE (°C)
7
6
5
4
3
2
1
0
31.4
31.6
31.8
32
32.2
32.4
32.6
32.8
33
33.2
33.4
SALINITY (ppt)
STATION 2
STATION 3
= MIW

FIGURE 3.1

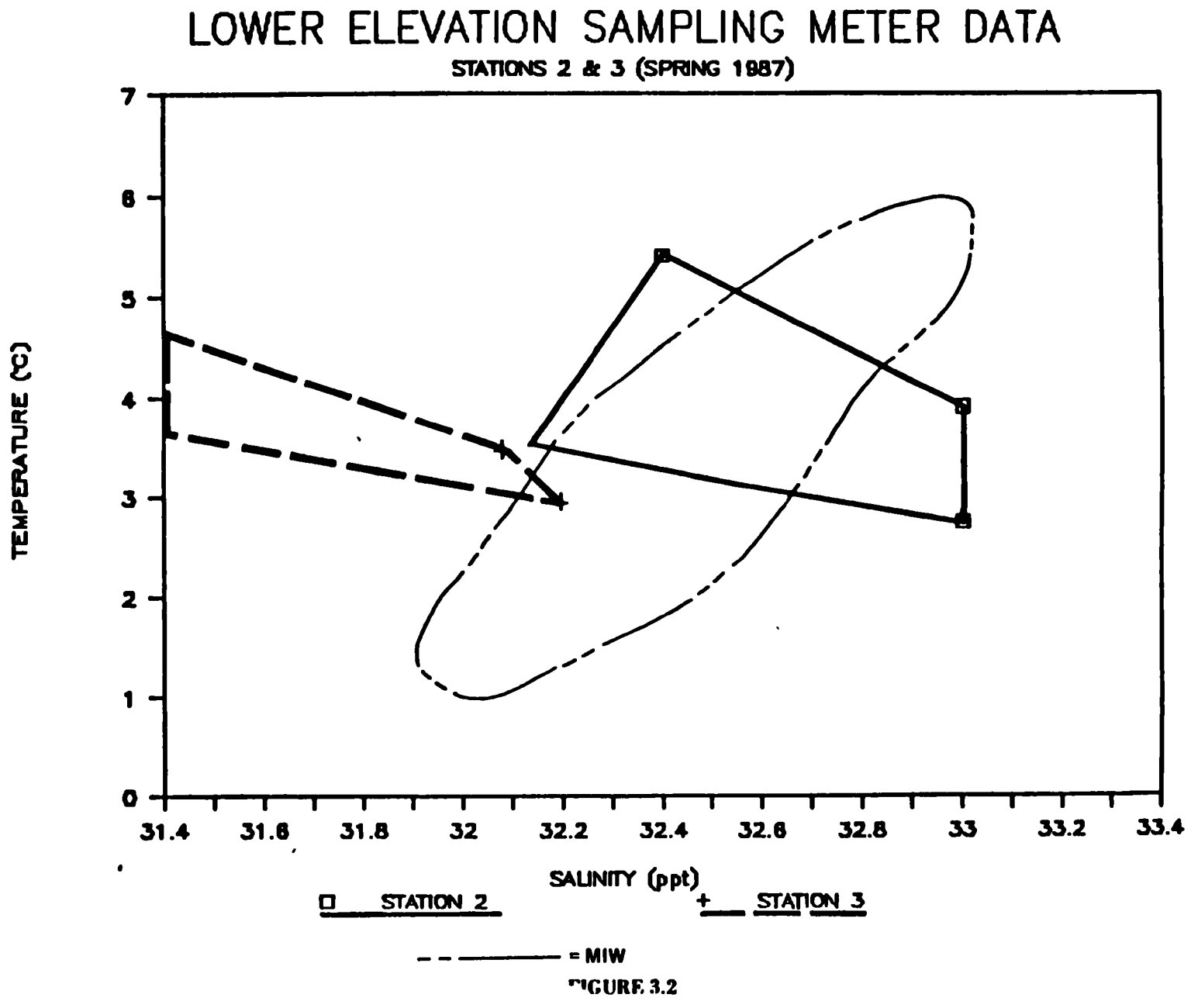

LOWER ELEVATION SAMPLING METER DATA
STATIONS 2 & 3 (SPRING 1987)
TEMPERATURE (°C)
7
6
5
4
3
2
1
0
31.4
31.6
31.8
32
32.2
32.4
32.6
32.8
33
33.2
33.4
SALINITY (ppt)
STATION 2
STATION 3
= MIW

FIGURE 3.2

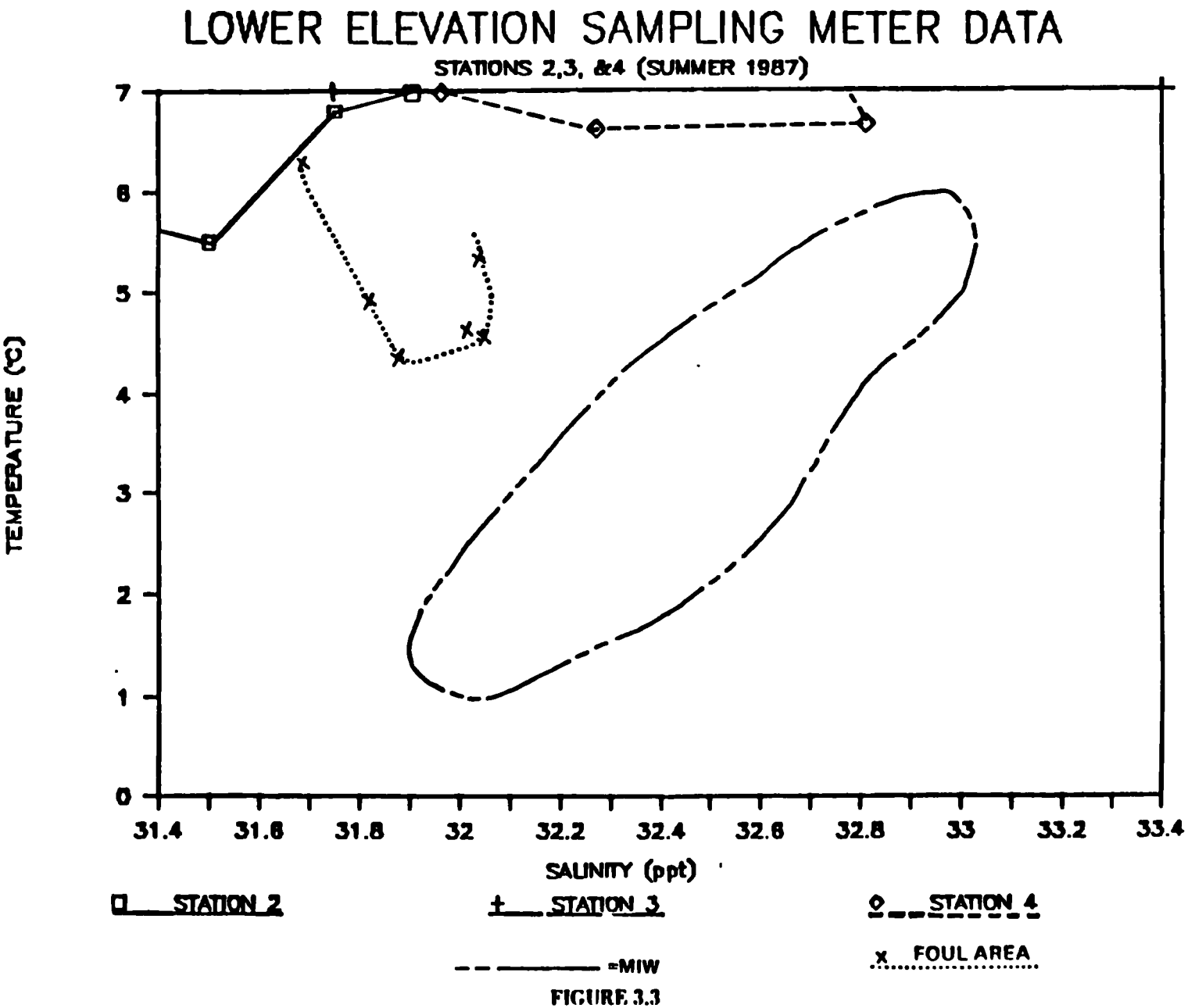

LOWER ELEVATION SAMPLING METER DATA
STATIONS 2,3, &4 (SUMMER 1987)
TEMPERATURE (°C)
0
1
2
3
4
5
6
7
31.4
31.6
31.8
32
32.2
32.4
32.6
32.8
33
33.2
33.4
SALINITY (ppt)
STATION 2
STATION 3
STATION 4
=MIW
FOUL AREA

FIGURE 3.3

For the purpose of comparison, the Draft SEIS evaluated the differences in shoreline impacts expected from a discharge in President Roads and a discharge at the recommended area (Section F.2.1.4.2). While this analysis was conducted at the screening level only, the results clearly indicated that the maximum possible percentage of effluent that would reach the shoreline from the recommended area during extreme conditions (0.30 to 0.41 percent) is far less than the percentage of effluent that would reach the shoreline from President Roads (1.52 to 2.70 percent). Thus, a discharge at the recommended area, rather than at President Roads, would provide for the better protection of the shorelines, allowing them to improve in quality.

Coliforms

In general, the "safeness" of any body of water for swimming is determined by measuring coliform bacteria in a water sample. Concentrations of coliform bacteria can be expressed in two ways: total coliform and fecal coliform which refer to bacteria associated with the feces of warm-blooded animals (such as humans and dogs).

While adequate detention time for disinfection has been included in the Deer Island treatment plant's design, it is possible that the interim primary effluent could receive less than adequate disinfection during periods of high flow (Draft SEIS Section H.3.3.1). A total breakdown of disinfection would probably not occur because of the redundancy for disinfection and power systems built into the treatment plant design (Draft SEIS Section H.2.1.1).

It is impossible to predict the actual coliform levels in the effluent should disinfection be incomplete. It is possible, however, to calculate the levels of coliform in the effluent that would need to exist to exceed the Massachusetts Surface Water Quality Standards and/or U.S. EPA Water Quality Criteria and result in beach closures. The federal permit which regulates the discharge of secondary effluent from the proposed Deer Island treatment facilities establishes discharge limitations for fecal coliform bacteria of 400 MPN (Most Probable Number)/100 ml and 200 MPN/100 ml for daily maximum and monthly average values, respectively. The permit limitations for total coliform bacteria require a monthly maximum level of 1000 MPN/100 ml and a monthly average of 700 MPN/100 ml. The Metropolitan District Commission will post warning notices to swimmers at 200 MPN/100 ml in the surface waters at the beach.

A 90% reduction in bacterial numbers has been found to occur between 2 and 6 hours after being discharged to seawater (Hyperion Engineers, 1957). Conservatively combining this reduction rate with the highest percentage of effluent predicted to reach the shoreline and the shortest predicted excursion time for the effluent to reach the shoreline, the effluent fecal coliform level would have to be at least 1,271,000/100 ml (3,178 or more times greater than the maximum monthly permit limitation of 400 MPN/100 ml) before the U.S. EPA average monthly water quality criterion of 200 MPN/100 ml would be exceeded at the shoreline. This level of effluent fecal coliform would be extremely unlikely because it is above the range of expected influent fecal coliform levels (100,000 to 1,000,000 MPN/100 ml). Even with incomplete disinfection, the influent concentration of coliform bacteria would be

somewhat reduced during the treatment process by solids removal processes, natural bacteria die-off and some disinfection. Therefore, even if an incomplete disinfection event coincides with worst-case shoreline transport conditions, fecal coliform levels in the wastewater treatment plant effluent will not be a threat to swimmers or result in any beach closures or warning.

Since incomplete disinfection is not expected to be continuous, it is appropriate to compare a single extreme event to maximum allowable coliform levels. U.S. EPA has established a maximum monthly criteria (allowed to occur in only 10% of the samples collected over a 30 day period) for fecal coliform in shellfish harvesting waters of 43 MPN/100 ml. Combining the highest percentage of effluent predicted to reach the shoreline and the shortest predicted excursion time for the effluent to reach the shoreline from, the monthly maximum fecal coliform level would have to be 273,570 MPN/100 ml (684 or more times greater than the daily federal permit limitation of 400 MPN/100 ml) before the U.S. EPA maximum monthly Water Quality Criteria of 43 MPN/100 ml would be exceeded at the shoreline. No Massachusetts standard exists for fecal coliform in Class SA waters.

For total coliform bacteria, the Massachusetts Surface Water Quality Standard for monthly maximum total coliform standard is 230 MPN/100 ml (allowed to occur in 10% of the samples collected over a 30 day period). This standard is "designated for the uses of protection and propagation of fish, other aquatic life and wildlife, for primary and secondary contact recreation; and for shellfish harvesting without depuration in approved areas." Based on the highest percentage of effluent predicted to reach the shoreline and the shortest predicted excursion time for the effluent to reach the shoreline, monthly maximum total coliform levels could be as high as 1,462,000 MPN/100 ml (1,462 or more times higher than the monthly maximum permit limitation of 1000 MPN/100 ml) before a violation of the state total coliform standard would occur at the shoreline.

It is highly improbable that coliform levels 684 to 3,178 times greater than allowed by the federal permit would occur in the Deer Island effluent. In addition, it has been shown that even with absolutely no removal of coliform from the wastewater, beaches would not be closed to swimmers due to fecal coliform levels. No shellfishing restrictions are expected as a result of coliform bacteria. Other activities, such as boating, fishing and shoreline development are also predicted to be unaffected by the coliform bacteria.

One commentor questioned the appropriateness of using coliform bacteria as an indicator of human health risk. Water quality indicators are generally microorganisms or chemicals whose densities in the water column can be quantitatively related to potential health hazards. Important characteristics of indicators are that they have consistently high densities, are present exclusively in fecal wastes and have survival rates comparable to pathogens during sewage treatment and transport from source to target (Mitchell, 1978).

Total and fecal coliform measurements were used in the shoreline impact analysis to predict potential public health impacts. EPA's methodology for predicting shoreline coliform concentrations took into account coliforms resulting only from the human waste stream and therefore are indicative of fecal wastes.

The use of enterococcus as a public health impact indicator was suggested by a commentor. Several recent studies have found a high correlation between enterococci and gastro-intestinal disorders and as a result some states have adopted this standard for use at bathing beaches. However, some difficulty has been experienced in counting enterococcus colonies due to the growth of atypical colonies on the growth media. EPA feels that total and fecal coliform concentrations are appropriate in this case for predicting potential health risks and can be compared to established standards.

Viruses

Another issue raised by commentors was the potential impact for viruses from the effluent to impact the shoreline. There are no state or federal water quality criteria for viruses, and viral concentrations are not regulated in the federal permit. However, based on a typical wastewater viral concentration of 1000 PFU (plaque forming units as an estimate of viruses) /liter, MWRA estimated the effluent viral concentrations to be 94 and 6 PFU/liter for primary and secondary effluents, respectively (MWRA, Final STFP V,C 1988). These concentrations correspond to a maximum of 0.39 PFU/liter and 0.025 PFU/liter at the shoreline respectively for discharges of primary and secondary effluents, from the recommended area. MWRA converted these predicted viral concentrations to incremental risk values. One illness (gastrointestinal) among 2,564 swimmers was predicted during the discharge of primary effluent while one illness in 40,000 was predicted during the discharge of secondary effluent. EPA conducted a survey in 1975 of actual illness rates occurring due to swimming and found the illness rate to be 6 per 1000 swimmers (or one per 167 swimmers) at Nahant (MWRA, Final STFP V, C, 1988). EPA's current recreational standard is 19 illnesses per 1000 swimmers (one per 53 swimmers). Thus, the predicted illness rate resulting from construction of the new outfall is well within EPA guidelines and is much lower than existing conditions.

Algae & Aesthetics

Some commentors were concerned that the effluent would cause algal blooms at the shoreline, which would impact beach aesthetics. Algae growth is directly related to the level of available nutrients (such as nitrogen and phosphorous) in the water. Nutrients from the effluent will result in some increased plant growth, with eventual impacts on higher food chain organisms. However, there will be no change in the number or extent of algal blooms at the shoreline as a result of the new outfall (see Issue #18). With regard to beach aesthetics, it should be stressed that with the implementation of MWRA's interim residuals plan in 1991, no sludge or floatable solids will be discharged to Boston Harbor. The solids portion of the Deer Island treatment facilities waste will be processed and disposed of on land. Since no solids will be discharged to the harbor, no solids such as toilet paper or tampon applicators will be washed ashore.

Toxics

Some commentors were concerned that toxic chemicals from the effluent could reach beaches and shellfish areas. Exceedances of water quality criteria

discussed in EPA's Draft SEIS (and Issue #3) will occur only in the vicinity of the outfall; further dilution and dispersion will occur as effluent is brought to shore such that it will not be identifiable from the ambient ocean water. Ambient exceedances of water quality criteria for PCBs and arsenic exist now in the open ocean and at the beaches. The impacts of these exceedances are discussed in Chapter 5 of the Draft SEIS and in Issue #3 of this chapter.

3.3 ISSUE NUMBER 3

Massachusetts Bay Water Quality

Many commentors were concerned that the water quality in Massachusetts Bay would be degraded as a result of the new outfall discharge. They cited the results of EPA's own analyses, which show that certain water quality criteria and standards will be exceeded at the new outfall site either during the interim primary discharge period or after the commencement of secondary treatment. Because of this, comments were made that Boston Harbor is being cleaned up at the expense of Massachusetts Bay.

EPA Response

In conducting its Draft SEIS water quality analysis, EPA considered Boston Harbor to be an integral and inseparable part of the Massachusetts Bay marine ecosystem. As such, EPA established decision criteria for siting the new outfall which would protect the water quality of the entire ecosystem. These decision criteria included consistency with EPA Water Quality Criteria (U.S. EPA, 1986) and compliance with Massachusetts Surface Water Quality Standards. In order to assess each proposed outfall site against the established water quality decision criteria, EPA compared predicted levels of pollutants and other constituents (such as nutrients) at each site to the established water quality criteria or standards.

EPA Water Quality Criteria are based on available scientific data on the effects of pollutants on public health and welfare, aquatic life, and recreation. They establish numeric levels for pollutants in water which will provide adequate protection to public health and aquatic life. Two types of EPA Water Quality Criteria exist. Aquatic life criteria establish levels of pollutants which will not adversely affect the health of aquatic organisms. Public health criteria establish levels of pollutants which, if taken up by fish which are subsequently eaten by humans, would protect humans against the risk of cancer. These criteria are not rules or standards and are not legally enforceable.

On the other hand, the Massachusetts Surface Water Quality Standards (which were mandated by the Clean Water Act) are legally enforceable. These standards establish regulatory thresholds for certain pollutants and other constituents that will protect the health and resources, and maintain the uses of, a given water body. For example, Massachusetts has established numerical water quality standards for Dissolved Oxygen (DO), coliforms and pH.

EPA's water quality analysis with regard to the interim discharge of primary effluent is discussed in Issue #4. This discussion will focus on the water quality impacts expected at the new outfall site during discharge of secondary effluent.

For the secondary effluent discharge, EPA predicts that there will be one exceedance of the EPA aquatic life water quality criteria at the recommended outfall area: Mercury is predicted to exceed the criteria by 68% at site 4 and by less at site 5 (Chapter 4 of this Final SEIS). As discussed in Section 5.1.3 of the Draft SEIS, no significant marine ecosystem effects are expected from this exceedance due to the small areal extent of the exceedance, the low probability that fish would continuously remain in the vicinity of the discharge (as assumed in the development of the criterion), and the small magnitude of the exceedance.

Water quality public health criteria are based on risks assessed from lifetime consumption of fish exposed to pollutants. EPA predicts that the carcinogenicity criteria for PCBs and arsenic at the one in 100,000 public health risk level (i.e. a one in 100,000 chance of developing cancer) will be exceeded at the recommended outfall area. However, existing levels of the two compounds in Massachusetts Bay water already exceed these criteria by significant amounts; PCB currently exceeds criteria by approximately 10 times, arsenic currently exceeds criteria by approximately 3 times.

Without such high "background" levels, the MWRA discharge by itself would not exceed the criterion for arsenic. PCBs in the MWRA discharge could, however, still result in an exceedance the criterion by up to 20 percent even if the currently existing levels were lower. One reason for this may be that, even though PCBs were not detected in the MWRA sewage during testing, EPA conservatively assumed that they existed at the analytical detection limit of 0.5 ug/l (parts per billion). The actual influent PCB levels could be much lower. However, based on EPA's conservative assumption, the predicted PCB concentrations in the water could result in an increased risk to public health. This risk would not decrease were the outfall sited further offshore.

EPA has recommended that regular sampling and analysis of PCB's and other constituents of concern in water, sediment and animal tissue in the vicinity of the proposed and existing discharges be conducted. Also, EPA recommends that MWRA implement a pollutant source identification and control program to help identify and reduce concentrations of pollutants in the sewage (see Chapter 7 of this Final SEIS).

Discharge of secondary effluent at the recommended outfall area will comply with Massachusetts water quality standards for coliforms, pH and dissolved oxygen.

In conclusion, EPA considered the protection of water quality in the Massachusetts Bay/Boston Harbor marine ecosystem in determining its recommended outfall location. Compliance with all legally enforceable water quality standards was a prerequisite for siting, as was protection of the marine environment and public health. The siting of the new outfall will both improve the water quality of Boston Harbor and protect the water quality of Massachusetts Bay.

Degradation of Standards

Many commentors were concerned that the siting of the new outfall would result in a degradation of Massachusetts Surface Water Quality Standards. This is not true. As discussed above, a new outfall in the recommended area will meet all Massachusetts Water Quality Standards as currently written, including the Dissolved Oxygen standard of 6.0 mg/l.

Antidegradation

Some commentors also suggested that siting of the new outfall at the recommended area would violate the antidegradation provisions of the Clean Water Act. This is also not true. The Clean Water Act prohibits new discharges that could change the existing uses of a water body. A new outfall in the recommended area will not change existing uses or significantly degrade water quality outside the effluent mixing zone.

3.4 ISSUE NUMBER 4

Discharge of Primary Effluent

Many commentors were concerned that the discharge of primary effluent during the construction of the new secondary treatment plant would have adverse impacts on the Massachusetts Bay marine environment and public health. Some questioned the wisdom of discharging the primary effluent at the new outfall site (a pristine environment) instead of continuing to use the existing discharge at President Roads (a degraded environment) until the secondary treatment plant has been completed. The acceptability and reversibility of the impacts from the interim primary discharge were also questioned.

EPA Response

A discussion of the potential impacts of an interim primary discharge on the marine environment must be prefaced by a general discussion of primary treatment within the context of the MWRA proposed action. The proposed action is the construction of a secondary treatment plant at Deer Island. Secondary treatment of municipal wastewater is required by the Clean Water Act (see Issue #19 for a further discussion of the need for secondary treatment). In order to construct the new secondary plant without shutting down the existing plant, the construction effort will be phased, with the new primary portion of the treatment plant coming online approximately 5 years before the startup of the new secondary portion (according to the current federal court schedule). It is the potential marine ecosystem and public health impacts during this interim primary discharge period (approximately 5 years) at the recommended outfall area that will be discussed in this section.

The predicted impacts from discharge of primary effluent at the new outfall site would not be acceptable on a long-term basis and would violate the Clean Water Act. However, as pointed out above, during the interim period, they are not expected to produce any permanent or geographically extensive impairment of the marine ecosystem in Massachusetts Bay, and the cessation of the existing discharge will improve the Boston Harbor ecosystem during the interim

period. Therefore EPA accepts the short-term impacts of an interim primary discharge as a mean of achieving the long-term goal of providing full secondary treatment for all MWRA flows. Just as other temporary impacts, such as construction noise, are a necessary cost of achieving a long term solution, the impacts of the interim discharge of primary effluent are a cost of the proposed action.

Water Quality

EPA conducted a detailed evaluation of the potential impacts expected from interim discharge of primary effluent at the recommended outfall area in Chapter 5 of the Draft SEIS. The analysis revealed that, compared to a secondary discharge, a discharge of primary effluent would result in decreased compliance with EPA Water Quality Criteria and Massachusetts Surface Water Quality Standards (particularly the dissolved oxygen standard), and increased accumulation of toxics in sediments. However, the impacts in these areas will be of relatively short duration or limited extent, or will be reversed after the onset of secondary treatment, and thus will have no lasting effect.

There are two types of EPA Water Quality Criteria: aquatic life criteria, which establish levels of pollutants which will not adversely affect the health of sensitive aquatic organisms, and public health criteria, which establish levels of pollutants which, if taken up by fish that are subsequently eaten by humans, would protect humans against the risk of cancer. During interim primary treatment, levels of copper, heptachlor, DDT, mercury and PCB could exceed aquatic life water quality criteria by 0.20 to 3 times within the recommended area. These exceedances, however, may not be significant because they are only marginally above the criteria, which are inherently conservative. Therefore, impacts would only be expected on the most sensitive forms of the most sensitive aquatic species and would, at worst, affect only population propagation of very few species over a relatively small area. Such an impact over the interim construction period would not permanently alter the number or types of species found within the study area.

There will also be exceedances of public health water quality criteria during the interim primary discharge period. However, these criteria are based on a human's lifetime consumption of fish exposed to a constant level of pollutants. Exposure to the pollutant levels expected during primary discharge would only be for an interim period. Therefore the risk associated with the public health criteria exceedances are not actually applicable to this relatively short-term event.

Dissolved Oxygen

Discharge of interim primary effluent would also result in violations of the Massachusetts water quality standard for Dissolved Oxygen (DO) of 6 mg/l. Such violations of the DO standard are predicted to occur no more than once a year during a fall sediment resuspension event, and will only last for a matter of hours. However, EPA has determined that the DO violations which might occur are within the normal range of natural variability, and that marine organisms exposed to those violations would not suffer any long-term effects (Section 5.1.3.1.5).

Sediments

Lastly, discharge of primary effluent would result in greater levels of sediment toxicity and organic enrichment (with resultant benthic and demersal organism impacts) than would discharge of secondary effluent. These impacts are of concern for the interim primary period, but will reverse after the onset of secondary treatment.

The direct impacts of sediment organic enrichment will be reduced upon termination of the primary discharge since the amount of organics in the effluent, which produce the impact, will decrease greatly. Benthic organisms continuously digest organics at the same rate as the organic input (up to a point where the system is overloaded or there is not enough oxygen for them to do so; Draft SEIS, Section 5.3.1.1). Once the input rate is reduced the benthic community assimilation rate will decrease correspondingly and the affected area should return to baseline conditions within a year or two (Swartz et al., 1986; Oviatt et al., 1987).

The amount of toxic compounds built up in the sediments during the interim primary discharge will take longer to reverse because it requires physical dilution of the toxics through resuspension and redistribution of the sediments and natural deposition. With the initiation of secondary treatment, the amount of both solids and toxic compounds in the effluent will be drastically reduced. As a result, the mass of toxic compounds deposited in the sediments will be generally less than a tenth of that occurring during primary treatment and will be well below levels known from the literature to cause toxic adverse effects (Section 5.1.3.1.2). Thus the direct impact ceases. The concentrations of toxics in the sediment that built up during the interim primary discharge will begin to diminish due to dilution by natural resuspension and redistribution of the sediments. Also, the natural deposition of background sediments will dilute concentrations eventually to levels close to existing background conditions. The reversal rate will depend on the frequency of resuspension events and the resulting amounts of resuspension and redistribution. It will also depend on the amount of toxic material that was deposited during the period of primary discharge: the longer the period of primary discharge, the longer it will take to lower the sediment concentration and reverse the impact.

Duration of Primary Treatment

Although these interim impacts were discussed in the Draft SEIS for only a 5 year period (reflecting the current federal Court schedule), EPA has since revisited its analysis and finds that the above discussion would still hold true for an interim primary period longer than 5 years, should construction of the secondary treatment plant be delayed for any reason. In fact, MWRA has recently proposed to accelerate the schedule for construction of parts of the secondary portion of the new treatment plant (see Chapter 5 of this document).

Alternatives

In light of the above predicted impacts, several commentors suggested that it would make better environmental sense to discharge the interim primary

effluent through the existing outfall in President Roads rather then degrade the area around the new outfall site. The Draft SEIS compared the impacts from primary discharge at the existing President Roads location to the new outfall location (Section F.2.1.4). The comparison revealed that interim primary discharge at the new outfall location was far superior to use of the existing President Roads location. In particular, it provided for better shoreline protection (Hull and North Shore, Tables F.2.f and F.2.g of the Draft SEIS) and minimized cumulative adverse impacts on Boston Harbor. Also, the relocation of the existing discharge to the new outfall site will have a beneficial impact on the existing conditions in the harbor.

Level of Analysis

One commentor asserted that EPA had not adequately assessed differences between candidate outfall sites during interim primary treatment. Chapter 5 of EPA's Draft SEIS contains a full evaluation of the potential impacts from a new outfall at each of the candidate sites. However, as described in Chapter 7 of the Draft SEIS, EPA's decision on siting of a secondary discharge was based mainly on the potential impacts predicted at each site during secondary treatment.

3.5 ISSUE NUMBER 5

Biological Impact/Resource Considerations

Several commentors were concerned that the outfall would have negative impacts on the health of aquatic organisms including benthic organisms, endangered species and commercially and recreationally important fish and shellfish.

EPA Response

EPA assessed potential marine ecosystem impacts during both primary and secondary treatment under worst case and normal conditions in the Draft SEIS. The assessment included an evaluation of changes in sediment and water quality as a result of the discharge, and the resultant impacts on biota (Section 5.1.3). Sediment quality parameters examined included organic enrichment and toxics accumulation (see Issue #15), while water column parameters included nutrient enrichment, toxics, and dissolved oxygen (see Issue #6, 9 and 18).

The long term impacts of secondary effluent are discussed below. Impacts to marine organisms during the interim primary discharge period are discussed in Issue #4.

Potential impacts to benthic (bottom dwelling) and higher trophic level organisms due to organic enrichment or toxic contamination of the sediments were assessed by comparing predicted organic and pollutant concentrations at each proposed outfall site to threshold values. These threshold values (found in the scientific literature) indicate levels of pollutants which will or will not cause adverse effects. The areal extent (if any) of the impacted area was then determined (Sections 5.1.3.1.1 and 5.1.3.1.2). Literature values used were based on values known to cause adverse effects such as reproductive

impairments and disease in sensitive aquatic species. No degraded conditions due to organic enrichment are expected to occur in the recommended area while small areas (less than 3.2 km^2) of increased benthic production are expected. Also, no adverse effects due to sediment toxic accumulation are predicted. Therefore, no increased incidence of shellfish diseases or finrot are predicted for marine species including recreational and commercial fisheries.

EPA assessed marine ecosystem impacts due to water quality changes by predicting nutrient enrichment (Section 5.1.3.1.3), water column acute and chronic toxicity (Section 5.1.3.1.4), and dissolved oxygen depletion (Section 1.3.1.5) at each proposed outfall site. The methodology and results of the nutrient enrichment predictions are discussed in Issue #18. Potential acute and chronic toxic affects were determined by comparing predicted concentrations of pollutants to EPA Water Quality Criteria for Protection of Aquatic Life (U.S. EPA, 1986). These criteria are established to provide protection to sensitive stages (such as larvae or juveniles) of sensitive species. During secondary treatment, only mercury is expected to exceed criteria for chronic (long-term) exposure within the recommended area; however this largely is due to the already high ambient levels as discussed in Section 5.1.3.1.4 of the Draft SEIS. No pollutants are expected to exceed acute (short-term) criteria. Therefore significant aquatic life community impacts or disease would occur only in the immediate vicinity of the discharge (see Issue #6 for further discussion on toxics).

Potential impacts due to depletion of dissolved oxygen were assessed in the Draft SEIS by comparing predicted DO concentrations at each proposed outfall site to the Massachusetts water quality standard for DO (6 mg/l). During secondary treatment, DO is not predicted to violate this standard (Section 5.1.3.1.5) and therefore no adverse effects are expected (see Issue #9 for further discussion on DO).

Suspended Solids and Increased Turbidity

One commentor requested that EPA discuss the impacts of suspended solids or turbidity on light penetration and photosynthesis in the outfall area. The expected increase in suspended solids from the discharge is expected to be minimal and within the range of natural variability. The average background Total Suspended Solids (TSS) concentration ranges from approximately 1.5 to 3 mg/l (MWRA, Final STFP V, M, 1988) in Massachusetts Bay, averaging approximately 2.2 mg/l (Section B.3.3.2). Even during worst case dilution conditions, the maximum increase in TSS expected to occur during interim primary and secondary treatment respectively is 0.5 to 1.1 mg/l and 0.2 to 0.6 mg/l in the recommended outfall area. These increases in TSS will not result in a reduction of photosynthesis or in physical burial of organisms since they are within the range of natural variability.

Fishing

Another commentor wanted to know why EPA showed all the proposed outfall areas to be equally productive fishing areas, when MWRA showed Site 2 to be more productive. Despite the fact that National Marine Fisheries Service fish

landing data indicated differences between the sites, the Massachusetts Division of Marine Fisheries (which generates the data) feels that the movement of fishermen within the area of Sites 2, 4 and 5 makes differences in fish landings indistinguishable. Therefore EPA feels that the MWRA data was not quantitative enough to distinguish between sites and found no evidence to indicate that sites were significantly different from each other in terms of fish productivity.

Endangered Species

Concern was expressed that EPA did not fully evaluate potential impacts to endangered species, including the potential effects of the new discharge on prey species. During preparation of the Draft SEIS, EPA consulted with the National Marine Fisheries Service, who indicated that the proposed discharge would not have significant adverse effects on any Federally listed threatened or endangered species. The impact analysis for aquatic enrichment and toxicity (summarized above) supports a conclusion that no significant impacts on any prey species (such as zooplankton or fish) will occur. The National Marine Fisheries Service has not indicated a concern in this area. EPA feels that by coordinating with the appropriate state and federal agencies on this matter it has complied with requirements of the Endangered Species Act, the Marine Mammal Protection Act and the National Environmental Protection Act.

Fish Histopathology, Bioaccumulation and Body Burden Studies

One commentor suggested that EPA should have used the results of the MWRA fish histopathology, body burden and bioaccumulation studies in the Draft SEIS. Although EPA feels that the fish histopathology and body burden studies are an important start in developing a biological database for Massachusetts Bay, the natural movements of winter flounder in and out of Boston Harbor limit their usefulness for outfall siting purposes. The bioaccumulation studies also represent a valuable monitoring tool, as shown in the success of the international "mussel watch" program, however the studies done by MWRA were not conclusive and could not be used to distinguish between the proposed outfall locations.

Lobster Distributions

One commentor suggested that EPA could not fully evaluate potential impacts on lobsters without winter distribution data. EPA acknowledges that little is known about lobster distributions during winter. The Massachusetts Division of Marine Fisheries also concedes a lack of information in this regard, but indicates that legal or near legal size lobster probably move offshore during the fall in response to cooling coastal waters. Tagging studies in Maine and Cape Cod indicate fall offshore and spring inshore movements. Lacking any better information, EPA conservatively assumed that lobsters were present at all times during the year at all proposed outfall sites.

Spawning

One commentor suggested that the recommended outfall location is too close to the State regulated Winter Flounder spawning area. Winter Flounder spawning

activities occurring within the spawning closure line exhibited on Figure 4.2.2.d of the Draft SEIS would not be subject to adverse effects from a discharge at the recommended outfall location. The predicted impact areas for sediment nutrient enrichment and toxicity, or water quality toxicity and dissolved oxygen depletion are significantly seaward of the regulated spawning area.

Sensitive Habitats

Comments were made that the Draft SEIS did not address impacts to sensitive habitats such as salt marshes, mud flats, submerged vegetation, Areas of Critical Environmental Concern (ACECs) and ocean sanctuaries. Salt marshes and mudflats as well as ACECs (including Back River and Weir River on the South Shore and Belle Isle Marsh in Revere) are located along the shoreline (see Figure 4.2.5.F in Chapter 5 of this document). These areas will not be affected by the discharge of primary or secondary effluent into Massachusetts Bay since as discussed in Section 5.1.3 of the Draft SEIS, impacts due to organic enrichment and toxic accumulation in the sediments as well as nutrient enrichment, toxics accumulation and DO depression in the water column will be limited to a very small area in the immediate vicinity of the discharge and will not significantly affect the shoreline. Another area of critical concern in Massachusetts Bay/Boston Harbor is the South Essex Ocean Sanctuary. This Sanctuary is located approximately 1 mile north of the recommended outfall location (Figure 4.2.5.F in Chapter 5 of this document) and as discussed in Section 5.1.3 of the Draft SEIS, will not be affected by the discharge since the impacts will be limited to an area in the immediate vicinity of the outfall.

Benthic Impacts

Concern was raised regarding the analysis of impacts on infaunal and epibenthic organisms with respect to turbidity, sedimentation and depressed DO. EPA addressed impacts due to turbidity earlier in this section. Impacts of sedimentation and depressed DO levels are discussed in Section 5.1.3 of the Draft SEIS. The discussion includes an analysis of both infaunal and epifaunal benthic organisms (Sections 5.1.3.1.1 and 5.1.3.1.5).

3.6 ISSUE NUMBER 6

Toxics

Many comments were received relating to toxic chemical in the effluent and their potential impacts on public health and the marine environment. These comments have been grouped into subcategories, which are discussed below.

EPA Response

Criteria

These comments relate to how EPA predicted exceedances of water quality criteria for toxic chemicals, what impacts those exceedances might have and how EPA evaluated toxic compounds for which there are no established criteria.

In particular, one commentor asked for clarification on the approach used to calculate background constituent concentrations under different net drift (or net current) scenarios. Background concentrations were considered along with concentrations expected from the discharge and concentrations expected from other discharges in the area (see below) to determine criteria exceedances. Average and worst case background buildup of constituents were simulated in the Draft SEIS. As described in Section A.2.1.4, there are three long-term water movement patterns in Massachusetts Bay: one when the net drift, or actual movement of water after tidal oscillation has been filtered out, is from the north to the south; one when the net drift is south to north; and one when there is virtually no net movement of water and the effluent remains in the vicinity of the discharge. Measurements indicate that each of the conditions occur about one third of the time. As described in Section A.3.6.3, the north to south and south to north net drift condition produce the same background concentrations in the vicinity of the discharge. Since these net drift conditions occur approximately two thirds of the time, the background concentrations under these net drift conditions was termed "average". The no net drift condition produces the highest background concentrations and was thus termed the "worst case". The actual predictions of water quality exceedances was based on a joint probability analyses which considered the probability of occurrence of each net drift condition over time; the use of the terms "average" and "worst case" was for presentation purposes.

There were questions raised as to how other discharges were incorporated into the predictions of toxic concentrations and how changes in these sources might affect the Draft SEIS predictions. As described in Section A.3.8.3, input of toxic compounds from other sources were addressed in two ways. The major sources (e.g. South Essex Sewer District (SESD), Inner Harbor Combined Sewer Overflows (CSOs), Lynn and Swampscott) were input directly into the model as point sources. The projected flows and loads from each of these sources was input to the model in a manner similar to that done for the alternative MWRA outfall locations. Predicted concentrations in the vicinity of candidate outfall locations were then combined with the predicted concentrations from the MWRA discharge and background concentrations to give overall pollutant concentrations at the edge of the outfall mixing zone. Other minor discharges were accounted for indirectly by measuring the existing or ambient concentration of the toxic compounds, which included input from other existing sources. For each of the candidate outfall locations, the contributions from the projected MWRA discharge, the other sources and the measured existing concentrations were combined.

This approach was conservative because there was some "double counting" of toxic concentrations. The measurement of existing concentrations contained some contribution from existing sources including the SESD, Lynn and Swampscott discharges and CSOs. Inputting these sources directly to the model created some redundancy. However, the impact of these discharges is small compared to the MWRA discharge (mainly because the quantity of the discharges is small compared to the MWRA discharge). Therefore, reductions in the level of contaminants released from these other sources would not change the number of predicted water quality exceedances, although it might slightly reduce the severity of the exceedances. Also, when the new outfall begins to operate

there will be no discharges of sludge or effluent from Nut or Deer Island so the ambient water column concentration of some pollutants should decrease. Because of this conservative approach it is likely that the actual concentration at the edge of the mixing zone will be lower than was predicted in the Draft SEIS.

Commentors were also concerned with potential effects of effluent constituents for which there are no established standards or criteria. It is true that there are a number of contaminants found in the MWRA influent for which EPA has not established Water Quality Criteria. EPA recognizes this and has developed a whole effluent toxicity testing procedure as part of a nationwide toxics control program to assess the combined effects of individual effluent constituents on marine organisms. Such test were performed on the primary and mocked up secondary effluents as part of the MWRA Final STFP (V X, 1988) and are discussed below and in Chapters 6 and 7.

There was concern expressed over the potential for synergistic or cumulative effects of the numerous constituents of the effluent. The whole effluent toxicity tests mentioned above fully address the potential for synergistic toxicity. The Draft SEIS addressed each constituent individually for each alternative outfall location (Section A.3.8.3). This analysis showed that at least for primary effluent there was some potential for aquatic life toxicity from the single compound concentrations of copper, heptachlor, DDT, mercury and PCB. However, the whole effluent toxicity testing (MWRA, Final STFP V, BB, 1988) demonstrated that, even given these predicted exceedances, the effluent as a whole will not have toxic effects at the predicted dilution in the recommended area.

There were several concerns raised over the predicted exceedances of water quality criteria. Commentors asked how EPA could allow a discharge that could result in any water quality exceedances. EPA feels that the proposed action is fully consistent with the nationwide Water Quality Criteria Goals established by EPA (U.S. EPA, 1986). The predicted exceedances during the interim primary discharge are discussed in Issue #4. During secondary effluent discharge, the only predicted aquatic life exceedance is for mercury, which is only marginally above the criteria. EPA does not feel that this one limited exceedance prevents the proposed action from attaining the goals set forth in the water quality criteria. As indicated above, whole effluent toxicity testing for both primary and secondary effluents indicate no toxic affects to marine life, even during the most restrictive dilution scenarios (such as summer stratified conditions). Except for arsenic and PCBs, where the ambient concentrations produce exceedances, there are no public health criteria exceedances at the 1 in 100,000 risk level. Since these are due to ambient conditions, outfall siting cannot eliminate the predicted violations. Compliance with water quality goals is an important objective for the management of MWRA wastewater. As described above, EPA feels that the recommended plan meets these goals. However, as discussed in Chapter 7, continued monitoring, analysis and reevaluation of potential exceedances are necessary to maintain consistency with the Water Quality Criteria.

One commentor indicated that, in cases where background levels of contaminants exceed EPA Water Quality Criteria (such as PCBs and Arsenic), the MWRA

discharge should not be required merely to meet existing ambient levels. EPA shares the commentors concern about the level of these constituents in the ambient water and has no intention of adopting ambient levels as "revised" criteria. Although a study of the causes of the high ambient levels is beyond the scope of this SEIS, EPA is requiring MWRA to conduct a Toxicity Reduction Evaluation in an effort to minimize MWRA's contribution to the problem (Chapter 7). EPA does not believe, though, that such an evaluation would affect the outfall siting decision.

Comments were made that EPA over-estimated the concentrations of PCBs and pesticides at the edge of the mixing zone since the analytical detection limit or measurements made 10 years ago was used to represent the actual concentration of these constituents in the effluent (in lieu of better data). EPA has consistently used a conservative approach throughout its analyses in order to insure a margin of safety in all of its predictions (see Issue #13). The actual concentrations of PCBs and pesticides in the effluent are less than the detection limit and therefore the actual concentrations at the edge of the mixing zone will likely be less than that predicted, however, EPA maintains a policy of conservativeness in its assumptions and predictions whenever possible and therefore feels the use of detection limit concentrations is appropriate.

One commentor suggested that EPA used inaccurate PCB effluent concentrations in its prediction of water quality. EPA maintains that the PCB effluent concentrations used in its predictions were appropriate. MWRA collected PCB data in the fall of 1986 and spring of 1987 using a detection limit of 0.0005 mg/l for Aroclors 1016, 1221, 1232, 1242, and 1248 and a detection limit of 0.001 mg/l for Aroclors 1254 and 1260. PCBs were not detected using these detection limits. In 1984 MDC surveys, Aroclors 1254 and 1260 were not detected in the whole effluent using a detection limit of 0.00004 mg/l. These isomers were detected in the concentrated solids of the effluent at levels two to three orders of magnitude lower than the 1242 Aroclor. It is unlikely that either of these isomers would be detected in the 1986-87 whole effluent surveys using a detection limit 25 times higher. Since the PCB detected in the 1984 whole effluent was exclusively Aroclor 1242, EPA believes it is appropriate to use the lower detection limit of 0.0005 mg/l for the SEIS analysis.

One commentor requested clarification on the impact of mercury on the mysid shrimp life cycle. The EPA criterion for protection of aquatic life from mercury is 1.9 ug/l for acute exposure and 0.10 ug/l for chronic exposure. According to U.S. EPA (1985c), mean acute values range from 3.5 ug/l for a mysid shrimp to 1680 ug/l for winter flounder. In general, shrimp and other related organisms appear to be more sensitive than fish to acute toxic effects of mercury. In a life cycle experiment with mysid shrimp where the mysid shrimp were exposed to mercury for several generations, inorganic mercury at a concentration of 1.6 ug/l significantly influenced the period of first brood, time of first spawn and productivity (U.S. EPA, 1985c); however, no acute effects were observed. This concentration (1.6 ug/l) is an order of magnitude higher than that predicted at the edge of the mixing zone.

Concern has been raised over potential organoleptic (taste and smell) criteria exceedances as a result of the outfall discharge. MWRA (STFP V,A 1988) predicted that the MWRA discharge may approach or exceed organoleptic criteria for 2,4-dichlorophenol at all sites based on comparison of the analytical detection limit with a 50:1 dilution to the criteria of 0.3 ug/l. This is a very conservative estimate since it is based on the detection limit concentration of the compound and the actual concentration in the water column will likely be less. Therefore it is unlikely that 2,4-dichlorophenol will have a significant effect on the taste and smell of seafood.

Public Health

There was concern expressed by one commentor that the arsenic criteria used was not appropriate because arsenic is not carcinogenic in fish flesh, whereas another commentor felt EPA had too readily negated the potential carcinogenic effects of arsenic. There was also a question on the areal extent of the potential carcinogenicity risk. The carcinogenicity criteria used to compare candidate outfall locations and predict public heath effects (Section A.3.8.3) were specifically developed for evaluating surface water discharges. The criteria were based on a life-time consumption of fish which have reached equilibrium with the predicted water column pollutants (Section A.3.8). EPA acknowledges that there is conflicting evidence in the literature on the potential for human health effects from arsenic in the marine environment and this is discussed in the Draft SEIS (Section 5.1.4.2). Discharge of secondary effluent from the recommended location will not significantly increase the area of risk beyond the mixing zone. As discussed above the only compounds predicted to exceed public health criteria are compounds that already significantly exceed criteria in the ambient waters. The ambient waters will continue to exceed the criteria well beyond the mixing zone and the area of exceedance will not be altered by a discharge in the recommended area.

In light of the recently reported potential for public health risk from consuming fish and shellfish from Quincy Bay, a commentor asked why EPA was predicting no public health risk from PCB contaminated sediments at the new outfall site. EPA does not feel that the predicted PCB concentrations in the sediments at the recommended outfall location are comparable to those in Quincy Bay. The predicted long-term maximum concentrations from a secondary discharge were conservatively predicted to be less than 0.3 ug/g in the immediate vicinity of the outfall and much less (less than 0.1 ug/g) outside of the mixing zone (Section B.3.5). These predicted values are 3 to 13 times lower than the measured concentrations in Quincy Bay (maximum of 1.7 ug/g) where high concentrations of PCBs in the hepatopancreas (tamalley) of lobsters have been reported (U.S. EPA, 1988b).

Concern has also been raised regarding the potential health risk from PCBs in the water column. EPA based its analysis of water column public health impacts consistency with EPA Human Health Water Quality Criteria (Section A.3.8 for a description of these criteria). EPA has acknowledged that, even though existing levels of PCBs already exceed the criterion, PCBs in the MWRA effluent may contribute to potential impacts and therefore recommends continued PCB monitoring and better source control (see Chapter 7).

One commentor suggested that the Federal Food and Drug administration (FDA) limit of 2 ppm PCB in fish tissue (as sited in Draft SEIS) is too high a level to protect human health and a value of 0.5 ppm may be more appropriate. EPA did not based its analysis of public health impacts on the FDA limit but rather on U.S. EPA Water Quality Criteria for Protection of Human Health. The criteria for PCB in the water column is 0.79 ng/g for a 1 in 100,000 risk of cancer. This criteria is based on an average bioaccumulation factor for PCBs in fish and shellfish of 31,200 (U.S. EPA, 1980). If this concentration factor is applied to the predicted water column concentration of 9.2 ng/l (at Site 4 under secondary treatment), the resultant fish tissue concentration would be 0.3 ppm. This concentration is lower than the FDA's Level as well as the commentor's suggested level for fish tissue concentration.

A commentor felt that because the Draft SEIS did not report a chronic toxicity value for copper that this potential impact was not addressed in the document. EPA did address chronic or long term toxicity of copper in the Draft SEIS. The Water Quality Criteria, include only a criterion for short term or acute toxicity of copper. This is because in the marine environment, protection of aquatic life from short term effects due to exposure to copper is also adequate to protect from chronic effects.

Bioaccumulation

Several commentors felt that the SEIS should specifically address bioaccumulation of toxic compounds in light of the bioaccumulation studies done by MWRA. EPA feels that the potential effects of bioaccumulation were thoroughly and analytically addressed in the Draft SEIS. Bioaccumulation can produce impacts in two distinct areas: ecosystem effects and public health. Each of these are discussed below.

When a compound is present in the water column or sediments, the organisms will accumulate the compound to some degree. When the environmental concentration becomes high enough the organisms will accumulate levels that impair some essential life process (e.g. respiration or reproduction). At these levels ecosystem impacts result. The water quality criteria (for water column exposure) and literature values presented in the Draft SEIS (for sediment exposure) are established to define levels where bioaccumulation could have some ecosystem effect. Since the aquatic life criteria will not be exceeded (except for mercury as discussed in Chapter 4) from a discharge at the recommended area, no significant ecosystem impacts are anticipated.

The public health criteria are also established to prevent bioaccumulation to a level that results in fish tissue concentrations which would be potentially hazardous to public health if the fish were consumed by humans. The projected concentrations of all effluent constituents were compared to the public health criteria (Sections 5.1.4.2 and A.3.8.3). As described in the Draft SEIS the potential for public health impacts, including those resulting from bioaccumulation, were minimal and acceptable at the recommended location.

One commentor questioned why toxicity and bioaccumulation within the mixing zone was not assessed. It is not necessary to evaluate toxicity and bioaccumulation within the mixing zone. EPA acknowledges that adverse

environmental effects will be occur within the immediate area where effluent mixing takes place. This mixing is confined to an area within approximately 500 feet of the diffuser and therefore is considered relatively small, hence the extent of such impacts would be relatively inconsequential. Acute toxicity and bioaccumulation beyond the mixing zone were evaluated in detail in the Draft SEIS.

Sediments

There was a comment that the sediment analysis, including accumulation and reversibility, should be performed for aldrin, heptachlor, DDT and bis (2-ethylhexyl) phthalate. As discussed in Section B.3.4 of the Draft SEIS, the sediment accumulation analysis was performed for all constituents of concern, including those cited by the commentors. The results are presented for primary effluent in Tables B.3.c and d. The only results presented for secondary effluent are for the compounds demonstrating a potential problem from primary effluent (Tables B.3.a and b), which includes any which might be problematic during a secondary discharge. The sediment concentration reversibility was built into the analysis by allowing the deposition from a primary discharge to build up for five years and then be diluted with background sedimentation and resuspension (Section B.3.4). The reversibility of sediment impacts are evidenced in the predicted concentrations after five years of a secondary discharge.

3.7 ISSUE NUMBER 7

Cost

Some commentors charged that EPA's outfall siting decision was based on cost, not on environmental considerations and thus, the outfall was not being sited further from shore because it would be too expensive. It was suggested that a cost/benefit analysis be performed to weigh the benefits of a longer outfall with its cost.

Other commentors remarked that too much burden is being placed on the ratepayers and that the combination of secondary treatment and a short outfall (such as the current outfall location or a site closer to shore than the recommended area) would have acceptable environmental impacts.

EPA Response

Cost was a secondary consideration in the evaluation of the proposed outfall sites and was not used to rule out any sites. The Draft SEIS determined that costs increased approximately linearly with increasing distance from shore from sites 2 to 6, with no abrupt changes in cost from site to site (Draft SEIS, Appendix F). As a result, there was no cut-off point where cost could appropriately be used to rule out sites from consideration.

EPA's primary consideration in siting the outfall was finding a site that met the environmental decision criteria established in the Draft SEIS. The outfall siting process was conducted in two steps: preliminary screening followed by detailed evaluation. During the screening step EPA identified

3 sites which appeared to have suitable environmental characteristics. Had none of these sites met the pre-established environmental criteria after detailed evaluation, the initial screening process would have been re-evaluated and other potentially suitable outfall locations (including Site 6) would have been investigated. However, Sites 4 and 5 (the recommended area) did meet the decision criteria and therefore no additional iteration of the siting process was conducted.

Cost - Benefit Analysis

The premise behind the suggestion to conduct a cost/benefit analysis is that the loss of resources within Massachusetts Bay and along its shoreline due to impacts from the outfall would outweigh the increased construction cost of a longer outfall. EPA's draft SEIS concludes that no long-term adverse impacts to the Massachusetts Bay ecosystem and shoreline will occur as a result of the new outfall sited within the recommended area. In addition, extending the outfall beyond the recommended area offers no perceivable additional environmental benefit (Draft SEIS Section 7.1 and Appendix F, also see Issue #1). Thus a cost-benefit analysis was not necessary.

On the other hand, EPA has determined that siting the outfall any nearer to shore (at a lower cost) than the recommended area would not be environmentally acceptable (Draft SEIS, Section 7.1.1). In particular, a more shoreward outfall location would not adequately protect shorelines, would result in violations of the Massachusetts Dissolved Oxygen water quality standard, and would negatively impact the Boston Harbor ecosystem. By siting the outfall in the recommended area, EPA feels it is receiving the optimal environmental benefit per dollar spent.

Diffuser Cost

It was noted that a wide variation in costs exists for diffuser construction, specifically for diffusers constructed at Sites 4, 4.5, 5 and 6. Diffuser construction cost increases with the diameter, the depth of water at the discharge site and the average riser length (through bedrock and overburden soil) of the diffuser. As summarized below, at Site 4.5, the average riser length is significantly less (185 feet) than the riser lengths at Sites 4 and 5, (220 and 235 feet, respectively) while the tunnel diameters and the depths of water at all three sites are similar (Table 3.1). The difference in cost between a diffuser at Site 4.5 versus one at either Site 4 or 5, is therefore related to the average riser lengths of the diffusers.

A diffuser at Site 6 would require a slightly larger inside diameter and would be in significantly deeper waters than would a diffuser at Site 5. While this suggests that the cost of a diffuser at Site 6 would be higher than at Site 5, there is sparse seismic data available to characterize the geologic conditions at Site 6. Therefore, the construction cost of a diffuser at Site 6 was estimated to be approximately equal to the cost of a diffuser at Site 5.

TABLE 3.1 COMPARISON OF DIFFUSER CHARACTERISTICS

Location	Inside Diffuser Diameter (feet)	Depth (feet)	Average Riser Length (feet)	Diffuser Cost (million dollars)
Site 2	22	75	210	125
Site 2.5	23	90	170	117
Site 3	23	65	170	123
Site 3.5	24	85	215	145
Site 4	24	90	220	141
Site 4.5	24	95	185	129
Site 5	25	100	235	145
Site 6	26	150	NA	145

NA - Seismic data not available.

3.8 ISSUE NUMBER 8

Engineering Considerations

EPA received a number of comments and questions related to various engineering considerations of the project, such as treatment plant design and operating parameters, and tunnel and diffuser design and construction.

EPA Response

The analyses and recommendations made in the Draft SEIS are based on sound engineering and technical judgement, consistent with the level of information available, and reflect current engineering practices. Individual questions/comments are addressed below.

Treatment Plant Flows and Loads

There were several comments that the wastewater flows and pollutant loads projected for the treatment plant design did not account for input from Combined Sewer Overflows (CSOs), expansion of the MWRA service area or incomplete secondary treatment during high flows. Although the treatment plant design was not the subject of the Draft SEIS, design parameters and assumptions translate directly to effluent quality predictions and therefore EPA reviewed the treatment plant design to ensure that all effluent quality scenarios were accounted for.

The effluent quality values used in the Draft SEIS were calculated by combining the influent sampling results (MWRA Draft STFP, III, B and L, 1987) with predicted pollutant removal rates. The removal rates used in the Draft SEIS were generally consistent with removal rates found at other similar plants, except as noted below for high flows.

The treatment plant is designed to handle all the flows that can get through the sewer system to Deer Island, including an allowance for CSO's and population growth through the year 2020. Any substantial future increase in the MWRA service area, either as the result of further population growth or the addition of new towns or cities to the MWRA system, might be accommodated up to the carrying capacity of the sewers themselves, or through decreases in the amount of infiltration and inflow (leakage into the sewers) currently planned MWRA. However, expansion would be inconsistent with MWRA's enabling legislation and with the MWRA Board of Director's stated intentions regarding future flows and load increases to the facilities. Future increases in wastewater flows in the greater Boston area beyond the carrying capacity of the sewers will have to be addressed independently from the treatment plant, and would be subject to separate environmental review at that time.

The new secondary facilities will be designed for a flow of 1080 mgd (million gallons per day). During peak non-storm days, flows are projected to be less than 1080 mgd, and therefore all flows will receive secondary treatment. During storm days, when flows are over 1080 mgd, the balance of the flows (up to the 1270 mgd maximum capacity) will receive only primary treatment. The water quality analysis in the Draft SEIS accounted for this possibility and included the mixed primary - secondary scenario in the water quality analysis.

One commentor took exception to EPA's statement on page H-27 of the Draft SEIS that the treatment plant would be highly stressed under peak flow and load conditions (based on review of the data presented in Table 11-13-12 of Volume III of the MWRA Draft STFP). Table 3.2 shows some treatment plant operating conditions under average and high flow conditions:

TABLE 3.2 TREATMENT PLANT OPERATING CONDITIONS

	Average Day	Maximum Day	Storm Day
Flow, mgd	390	950	1,080
BOD to Secondary, (lb/d)	408,000	886,000	960,000
F/M LVSS	0.7	1.4	1.5
HRT, hr	48	1.0	0.9
Clarifier overflow (gpd/ft^2)	437	1,986	1,211

As can be seen, peak loading conditions are significantly higher (100 to 150 percent) above average loadings and are at the upper limits of loadings used for pure oxygen systems reference. The pilot plant scheduled to operate during the secondary design phase will provide the best test of performance capability under the full range of treatment plant operating conditions.

One commentor questioned the value of 7 mgd for CSO flow given on page 6-2 of the Draft SEIS. This value was obtained from MWRA Draft STFP V, A (1987), page 4-89. However on page 4-85 of the same volume, the value for Boston CSO's and stormwater is given as approximately 28 mgd, which is a more realistic value. The value for CSO flows on page 6-2 should have read 28 mgd; this value was used by both MWRA and EPA for water quality modeling.

Treatment Plant Operation

One commentor pointed out that it is unlikely that zinc will cause a process upset at the concentrations expected based on the MWRA sampling program. Based on a review of publications, EPA agrees (WPCF, 1977 and Public Health Service, 1965).

Some commentors requested that EPA conduct a comparative analysis of disinfection alternatives. A detailed analysis of disinfection is outside the scope of this SEIS. However, MWRA performed such an analysis in Volume III of the Secondary Treatment Facilities Plan and concluded that purchased sodium hypochlorite (chlorine) disinfection was the preferred alternative for primary and secondary treatment because it provided the best combination of cost and long-term reliability. Ozonation was judged the least reliable in that there is a risk that the coliform standards (and hence satisfactory disinfection) would not be met during periods of high storm flows. Ultraviolet light disinfection was considered acceptable but less desirable because of historic operational problems and lack of process control. EPA reviewed this analysis and concurs.

Tunnel and Diffuser Design

Commentors were concerned that a deep rock tunnel of the length proposed represents new technology and that unforseen problems could arise during tunnel construction or operation. EPA acknowledges that construction of a tunnel of this length carries inherent risks. However, shorter bored bedrock tunnels (of the type recommended) have been successfully constructed elsewhere. It will be difficult to construct an outfall to reach the recommended discharge area no matter what technology is employed, and the analysis performed by MWRA (Final STFP V, 1988) and reviewed by EPA indicates that a deep rock tunnel is the best alternative. EPA's recommended mitigation (Final SEIS Chapter 7) includes measures such as hydrodynamic modeling of the tunnel system and extensive geotechnical investigations before finalizing the outfall design. These additional investigations should reduce the uncertainty related to tunnel design.

Questions were raised regarding the outfall diffuser design, including its orientation to the current and its potential impact on fishing activities. The Draft SEIS raises the possibility of modifying the proposed orientation of the diffuser to maximize dispersion by placing the diffuser perpendicular to the prevailing ambient current (Section A.3.3.2). Although this could be beneficial, it is not a requirement and would be secondary to such other orientation considerations as geotechnical conditions and bathymetry. However if continued monitoring of currents reveals a persistent and dominant east - west component to the current (as discussed in the Draft SEIS), a north -

south alignment for the diffuser should be considered if it can be accomplished within other constraints.

As discussed in the Draft SEIS there is the potential for bottom fishing activities to conflict with the individual diffuser risers (Section 5.1.5.2). To minimize the potential for conflict, consideration to fishing will be given during final design of the diffuser structures (Final SEIS Chapter 7).

Suggestions were made that alternative tunnel configurations (such as multiple headings) and diffuser configurations should be considered. EPA sees no advantage to constructing the outfall tunnel from multiple headings simultaneously. Such a process would necessitate constructing a new island or enlarging an existing one, which would have cost implications and environmental impacts. The only potential advantage would be to reduce the construction time of the tunnel but as discussed in Issue #14, the current schedule calls for completion of a single heading tunnel to coincide with the completion of the treatment plant and diffuser.

EPA did consider alternative diffuser configurations. As discussed in Section A.3.3.2 of the Draft SEIS, the current meter data seems to indicate that a diffuser oriented approximately 90^{o} to the tunnel axis could provide additional initial dilution. The Draft SEIS suggested (Section A.3.3.2) that such an orientation for the diffuser should be given consideration during design. Other configurations such as a branched or radial diffuser design are not efficient because the plumes from the individual ports overlap and entrainment of dilution water is reduced.

3.9 ISSUE NUMBER 9

Dissolved Oxygen

There were several question on specific values and assumptions used in the prediction of dissolved oxygen (DO) deficits, including questions on sediment resuspension, DO concentrations used in the analyses and the vertical distribution of biochemical oxygen demand (BOD). Some commentors felt that the DO conditions predicted by EPA did not represent a problem at any candidate outfall site, others felt that DO was a major problem at every site.

EPA Response

EPA evaluated the amount of dissolved oxygen expected in the receiving waters as a result of the discharge of effluent at each of the candidate outfall sites for the full range of oceanographic conditions using the mathematical models TEA and ELA (Draft SEIS Sections 5.1.1.5 and A.3.8). The evaluation included consideration of both unstratified conditions, which generally occurs from October to June when the effluent is mixed over the entire water column, and summer stratified conditions when the effluent is confined to the lower layer and the effluent Biochemical Oxygen Demand (BOD) is exerted only in the bottom portion of the water column. The DO concentrations resulting from the combined effects of effluent discharge and resuspension of deposited effluent particles were also evaluated in the Draft SEIS.

The minimum DO concentrations predicted in the vicinity of the discharge were compared to the Massachusetts Water Quality Standard of 6 mg/l. No DO violations are predicted to occur at the recommended outfall location durig secondary treatment. Where predicted DO values were below the standard during interim primary treatment the ecosystem effects of the low DO concentrations were evaluated in light of the expected magnitude and duration of the violations.

Sediment Oxygen Demand

One commentor suggested that EPA evaluate the contribution of a summer phytoplankton bloom to any sediment oxygen demand. The analysis of resuspended solids oxygen demand was conducted by calculating the quantity of effluent solids (and the BOD associated with those particles) deposited during a theoretical quiescent 90 day summer period (Draft SEIS Section 5.1.3.1.5). The BOD from resuspension of the deposited particles was then combined with the BOD from the discharge to produce a total DO deficit and resulting DO concentration in the receiving waters. This analysis was confined to effluent solids. It is likely that at least in the immediate vicinity of the outfall the effluent would stimulate phytoplankton production (Draft SEIS Section 5.1.3.1.3) and that the phytoplankton cells could contribute to the accumulated solids. This was considered in the Draft SEIS, but was not included in the DO evaluation for the reasons described below.

Fall or late summer is the most likely period when a resuspension event could produce water column DO impacts. Consequently, for phytoplankton cells to contribute to sediment DO demand, those cells would have to accumulate during the summer. Summer is the most active period for benthic animal and bacterial growth, and they have been shown to assimilate all the freshly deposited phytoplankton plus any unused phytoplankton material deposited during the spring and winter (Doering and Oviatt, 1986; Doering et. al., 1986; Rudnick, 1986). Therefore any increased summer phytoplankton production from the discharge would be respired by the benthos and not available to contribute to BOD from a resuspension event.

DO Violations During Primary Treatment

Commentors were also concerned that, as predicted in EPA's 301(h) waiver analysis, sediment resuspension events during the interim primary period could cause violations of the Massachusetts DO standard of 6 mg/l. This is true, and is echoed in the Draft SEIS (Section 5.1.3.1.5). However, as discussed further in Issue #3, the extent of such violations within the recommended outfall location will not cause adverse impacts to the marine ecosystem.

Water Column DO Concentrations

Some commentors felt the ambient late summer/fall DO concentration of 6.5 mg/l used in the Draft SEIS analysis (Section A.3.6.4. and 5.1.1.7) was too low. Others felt that ambient waters were already below the 6 mg/l standard and thus any discharge would worsen the violation. The choice of the ambient value used, described in Section 5.1.1.7.1 of the Draft SEIS, was based on a full review of all DO data available. Values were selected for various

scenarios which EPA determined best represented the general conditions being simulated. Two sets of data (September, 1986 and Fall, 1987) indicated ambient DO levels slightly below 6.0 mg/l. The Fall 1987 data was later discounted due to questions about instrument calibration and quality assurance (MWRA Final STFP V, A, 1988). However the value of 6.5 mg/l used in the EPA analysis was based on a compilation of data and it is consistent with the ambient DO value used in the 301h waiver evaluation.

Some commentors misunderstood the use of vertical averaging of DO concentrations in the Draft SEIS. The Draft SEIS (Section 5.1.1.5) evaluated both stratified and non-stratified conditions. Under non-stratified conditions it is appropriate to vertically average the DO deficit because the water column is totally mixed, which accomplishes vertical averaging. Under stratified conditions, EPA's computer model isolated the bottom water layer and did not mix the DO deficit between the top and bottom layers. The deficit was applied only within the bottom layer, to account for mixing within the lower layer.

A comment was made that DO data was misstated in the Draft SEIS. The Draft SEIS states that water quality data collected in September, 1986 indicated DO concentrations in the lower layer ranging from 5.9 mg/l to 6.8 mg/l. Reexamination of the September 14, 1986 transect data indicates that bottom DOs can be as low as 5.5 mg/l in the Site 2 areas. Except for this measurement, the lowest DO measurement for this period (5.9 mg/l) was approximately 4000 feet inshore of Site 4. The recognition of the lower DO values at Site 2 only strengthens the Draft SEIS recommendation to eliminate Site 2 and they do not affect the outfall siting recommendation.

DO Concentration in Effluent

There was a comment that EPA's assumption that there would be no DO in the effluent was too conservative. While EPA acknowledges that it is likely there will be DO in the effluent at most times, during periods of low effluent flow (and thus longer travel time in the outfall tunnel) there could be an oxygen demand exerted in the outfall tunnel which could substantially lower the effluent DO. Because no other data was available, EPA used the conservative value of 0 mg/l for effluent DO.

3.10 ISSUE NUMBER 10

Editorial Comments

Several comments were received that resulted in editorial changes to the Draft SEIS. These changes include corrections or additions to the Draft, or further explanation of Tables or Figures contained in the Draft. These comments are addressed in Chapter 5 of this Final SEIS, where revisions to the Draft are enumerated.

3.11 ISSUE NUMBER 11

Monitoring/Mitigation

EPA received varied comments on the types of monitoring and mitigation activities that should be conducted by MWRA to offset potential impacts from the new discharge. In general, commentors were in agreement that a monitoring program should be developed, particularly for toxics and PCBs, and that it should include sampling of water, sediments and aquatic organisms. Also, commentors agreed that stringent pretreatment or source reduction requirements be imposed to limit the amount of toxics entering the sewer system. Some commentors suggested that a pretreatment or source reduction program should be based on the results of the monitoring program. That is, that the level of constituents found to be of concern after monitoring be reduced through pretreatment or source reduction. On a different matter, one commentor suggested that EPA establish time frames for diffuser dredging which could minimize impact to marine organisms.

EPA Response

EPA agrees that a monitoring program is necessary to better establish baseline conditions at the recommended outfall location and to determine marine impacts after startup of the discharge. EPA also agrees that source reduction/pretreatment could result not only in a lessening of potential outfall impacts, but also a lessening of the amount of toxics in sludge and therefore impacts from sludge treatment or disposal. These issues are discussed in further detail in Chapter 7.

In relation to dredging, EPA believes that the comment was geared toward the construction of a pipe diffuser (which would require significant dredging) and that EPA's new recommended plan to construct a drilled riser diffuser will in itself minimize dredging impacts. This issue is further discussed in Chapters 4, 6 and 7.

3.12 ISSUE NUMBER 12

Use and Accuracy of Models

Water quality and sediment models were used extensively in the Draft SEIS, both to compare alternative outfall locations and to predict impacts resulting from the effluent discharge. Commentors expressed concern about the accuracy of the model predictions and the extent to which the models were used to make decisions.

EPA Response

EPA endeavored in its Draft SEIS to predict and evaluate the potential impacts of the new discharge as accurately as possible. This required a multi-faceted approach to impact analysis, including (1) a review of the results of recent laboratory and mesocosm (miniature ecosystem) experiments on the fate and effects of wastewater in the marine environment, (2) an analysis of the operations of other wastewater treatment plants and the impacts of their

discharges, (3) identification of the habitats of various types of marine life in Massachusetts Bay, (4) a literature review of the direct impacts of pollutants on marine life, and the indirect impacts on marine habitats, and (5) computer modelling to predict future water quality and sediment conditions resulting from the new discharge. The models used represent state of the art tools for simulating oceanographic conditions.

Three separate water quality models (one near-field model and 2 far-field models) and a sediment quality model were utilized. The near-field model (called ULINE) predicts initial dilution of the effluent near the outfall. The far-field models (called TEA/ELA and Transient Plume Model) predict the larger scale transport and physio-bio-chemical processes that the effluent undergoes (see below for more information). Lastly, the sediment quality model predicts levels of pollutants in the sediments due to deposition of effluent solids and mixing with background sediments.

EPA utilized computer models because they are the best prediction tools available. Even though the use of these models contributed greatly to EPA's analysis of water quality impacts, they did not dictate the outfall siting decision. EPA drew on its national experience with the operation of municipal wastewater treatment plants and their outfalls to predict impacts from the new outfall, and considered other factors such as cost, construction duration and materials disposal in making the outfall decision.

Model Accuracy and Calibration

Generally, models are fitted to specific applications by a calibration process. For the far-field model TEA/ELA, this was accomplished in the Draft SEIS by adjusting model parameters to simulate measured data which represented a wide variety of hydrodynamic and water quality conditions in the Massachusetts Bay system. The nearfield model ULINE was calibrated with laboratory data. There was not appropriate information available to fully calibrate the other models, so the structure of the models and the assumptions that were used to develop the model inputs were very conservative to provide a margin of safety (see Issue #13).

Model Coverage

In order to ensure that the models would predict the full range of potential impacts, EPA developed scenarios which incorporated various combinations of oceanographic (i.e. current speed or stratification) and treatment plant operational (i.e. flows or pollutant loads) conditions. Over a hundred such scenarios were modeled for each proposed outfall location, including "worst case" scenarios. For example, in the extreme event analysis, the worst wind conditions found over a 15 year period of record were used to model shoreline transport.

Also, the TEA and ELA models used by EPA represent the most highly resolved grids ever developed for study of Boston Harbor and Massachusetts Bay hydrodynamics and water quality. This spacial coverage and resolution was more than enough to predict steady state conditions (Draft SEIS, Section A.f). All reasonable oceanographic conditions (i.e., north to south

net drift, south to north net drift and no net drift stratified and none stratified) were modeled. If greater net drifts occur than were modeled, the farfield dilution would increase and conditions would be better than predicted. Therefore, the temporal coverage was conservative and provided a margin or environmental safety.

There is general agreement that the existing data set used as input for the models accounts for the range of tidal variations expected throughout the year. More variable, however, are the seasonal differences in net drift (or currents). Sampling during the spring and summer of 1987 revealed three general boundary tilt scenarios, as discussed above. These occur roughly over equivalent lengths of time. Although more recent sampling in the fall/winter period at the recommended outfall location indicated differences in the frequency of currents of various directions, the direction of movement and more importantly, the magnitude of the movement are within the range of conditions found in the Spring/Summer sampling. Thus, the model operating assumptions are generally cover the range of year round conditions at the candidate outfall sites.

Surface Gravity Waves

A commentor felt that the effects of surface gravity waves should have been included in EPA's analysis. The velocities associated with surface gravity waves are orbital, with a period much lower than the time scale of any of the phenomena considered in the models. These velocities do not lead to any net transport of any constituent, except very close to the shore. One effect that surface gravity waves could have on the distribution of pollutants from the effluent is to increase their dispersion, which, in general, would tend to reduce concentrations from those predicted in the Draft SEIS. The effect of gravity waves in resuspending sediments was considered in the analyses.

Open Boundary Measurements

Some commentors questioned the adequacy of the open boundary measurements used in the model. The open boundary used was the line between Gloucester and Provincetown. Tidal gauges were monitored at each end of this line for approximately 6 months. Since the model only simulates the daily tide (semi-diurnal occurance) only one lunar month of tidal data to define the range of ocean boundary conditions but almost three months of data were used to determine boundary conditions. Tide gauge measurements at intermediate stations along the model open ocean boundary between Cape Ann and Cape Cod would have better resolved the angle and velocity of the tidal currents entering Massachusetts Bay, however the influence of these variations along the boundary, which is far removed from the candidate discharge sites, would likely not be significant with regard to currents and background build up of pollutants at these sites.

Friction Coefficient

One commentor felt that the bottom friction coefficient used to calibrate the model was unrealistically high. The lower friction factor used by MWRA resulted in predicted tidal ellipses at Site 5 which did not accurately match

actual tidal ellipses. Although the friction value of 0.1 used by EPA is very high, the model predicted ellipses which closely matched those measured (see Draft SEIS Section A.3.6.2 and Attachment A.6). The stated goal of the hydrodynamic modeling was to produce currents for use in the water quality transport modeling that were similar to actual currents and adjustment of the friction coefficient achieved this objective.

Freshwater Inputs

Some commentors felt that freshwater flows from the Merrimack River should be directly input to the model. The foremost effect of large freshwater inflows is to produce vertical salinity stratification, and this was included in the model. Also, the natural background contaminant concentrations included those pollutants contributed by the Merrimack River and other freshwater flows. Residual currents from freshwater inflows are very small. They were, however, included in the current meter measurements and, as such, were used for model calibration and evaluation.

Joint Probability

A commentor questioned the independence of the factors used in the joint probability analysis. The parameters used were current speed, stratification, discharge flow rate, and discharge loading. All possible combinations of these parameters, except flow rate and loading, are independent. At high flow rates, the loading can increase and the Draft SEIS (Section H.3) accounts for this for flows greater than 1000 MGD by assuming decreased treatment plant efficiency (see Issue #8). At flow rates between about 600 MGD and 1000 MGD, there could be some dependence of flow and loads that was not accounted for in the modeling. However, these effects would be very small and should not effect the overall analysis.

Modeling of Lower Layer

A comment was made that the limitations of modeling the lower water layer should be discussed in particular the assumption that the pycnocline is horizontal. Some of the vertical density profiles gathered during the field surveys indicate a pynocline (or interface between upper and lower layers) of variable depth as a function of offshore distance. This is attributed to tidal effects. A review of all the field data indicates that on the average the pycnocline is approximately horizontal. It is agreed that the effluent plume will probably not be completely trapped in the lower layer at Site 2, particularly at the end of the summer, when the pycnocline is deep. This was recognized in the dissolved oxygen analysis, but not in the toxic constituent analysis. This results in over-predicted background concentrations of toxic constituents at Site 2, but would not change the overall evaluation of a discharge at Site 2.

One commentor questioned the basis for the statement in the Draft SEIS that the thickness of the lower layer would be about 3 meters at Site 2. The basis for this statement is provided on pages A-32 and A-34 of the Draft SEIS.

3.13 ISSUE NUMBER 13

"Insurance Policy"

Since the outfall could last 100 years and the treatment plant potentially much less, concern has been expressed that EPA has only one chance to make decisions that will last 100 years and cannot afford to make any mistakes. This was also seen as a justification for considering an outfall site farther offshore, such as Site 6.

EPA Response

All of the decisions made in EPA's Draft SEIS were based on sound scientific and engineering analyses. Conservative assumptions were used throughout the analyses to ensure that every decision would have a built-in margin of safety. These conservative assumptions related to all facets of the outfall decision, including treatment plant flows and loads, sediment and water quality modeling, and biological analyses. The conservative assumptions and analyses in fact provide "insurance" that conditions at and around the new outfall site will be as predicted in the Draft SEIS or better. The following is a summary of the conservative assumptions and approaches used in the Draft SEIS.

Treatment Plant

- MWRA removal efficiencies (% of pollutant removed during secondary treatment) of non-conventional pollutants were based on the most conservative literature values found. EPA conducted an independent review of these rates and concurred. The removal rates were used to estimate effluent concentrations. For PCBs and pesticides, no data was available to estimate primary treatment removal efficiencies, so a 0% efficiency was assumed. These conservative assumptions assure that levels of toxics will be equal to or less than those predicted in the Draft SEIS.

- During maximum flow conditions (1270 MGD), even more conservative removal rates were to account for potential plant inefficiencies at high flow rates.

- Maximum pollutant influent loads were combined with maximum flow periods to insure that worst case scenarios had been considered.

- Pollutant levels were estimated during both expected groundwater conditions (high and low) rather than one yearly average groundwater condition.

- Pollutants not detected in the influent sampling program were assumed to have a concentration equal to the detection limit even though their actual concentration was lower (or perhaps zero), insuring that the level of toxics predicted in the Draft SEIS were conservatively accounted for.

- A full and complete technical review of the treatment plant with respect to effluent quality was conducted (Draft SEIS, Appendix H) and the review concluded that there was more than adequate redundancy and reliability in the conceptual design. Even so, several worst case scenarios were developed and effluent produced under these scenarios was included in the water quality modelling.

- Maximum plant influent rates included high groundwater conditions, storm flows and projected CSO returns (sewage currently being discharged through CSOs which could be returned to the plant after CSO remediation).

Water Quality

- The EPA Water Quality Criteria Continuous Concentration (CCC) for protection of aquatic life is based on a maximum concentration over 4 consecutive days in 3 years. However, in the Draft SEIS (Section A.3.8), CCCs were compared to the predicted concentration on the highest individual 4 days in 3 years. It is unlikely that these 4 days would actually be consecutive as required for exceedance. The highest 4 day average concentrations in 3 years are likely to be much lower than the non-consecutive 4 day concentration, and therefore actual CCC violations would be less frequent than predicted in the Draft SEIS.

- The MWRA nearfield background concentration used in the calculation of carcinogenicity risk corresponded to maximum stratified conditions (thus much less dilution) which occur about 10% of the time, and was therefore higher than the long term average (which would be mostly unstratified) expected at the edge of the mixing zone (Draft SEIS, Section A.3.8). Therefore the actual cancer risk would be lower than that predicted in the Draft SEIS.

- The nearfield model (ULINE) used to calculate initial dilutions is known to under-predict dilution (Draft SEIS, Section A.3.5) by up to 60%. Actual dilutions will be better than predicted, resulting in pollutant concentrations at the edge of the mixing zone lower than predicted.

- Existing ambient concentrations of all pollutants were used in the analysis, and no reduction was applied to account for removing sludge and existing Nut and Deer Island discharges. Existing water quality conditions in Massachusetts Bay incorporated cumulative non-point source pollutant inputs which may currently be occurring (i.e. atmospheric, coastal runoff and ocean dumping inputs). In addition, projected inputs from the Lynn, Swampscott and SESD treatment plants and Boston CSO discharges were input into the model.

Sediment Quality

- A 5 percent fraction of the primary effluent solids was assumed to have a settling velocity of 0.1 cm/sec. Laboratory and other sources

indicate that the fastest fall velocity will likely be 0.01 cm/sec (or ten times slower than the fastest fall velocity assumed), resulting in considerably less sedimentation in the diffuser area than predicted because sediment would have more time to be carried farther away while settling (Draft SEIS, Section B.2.4). In turn, this would result in smaller resuspension oxygen demand and smaller areas of impact for sediment toxicity and organic enrichment than predicted in the Draft SEIS.

- Resuspension of sediments was assumed to occur at a frequency of sediment concentration of toxic compounds once in five years for the analysis of sediment concentrations of toxic compounds (Draft SEIS, Sections B.3.3.3 and B.3.4). Should more frequent resuspension occur, which is likely, it will tend to redistribute sediments over larger areas, reducing sediment toxicity from that predicted in the Draft SEIS.

- In the sediment toxicity analysis, no decay rate of pollutants was applied (Draft SEIS, Section B.3.4). In other words, pollutants were assumed to undergo no chemical or biological degradations, but were assumed to remain completely intact. This resulted in greater predicted sediment toxicity and enrichment impacts than would actually occur.

- It was assumed in the toxicity analysis that mixing of the sediments by benthic organisms (bioturbation) would occur to a sediment depth of only 3 cm (Draft SEIS, Section B.2.5.5). Some MWRA survey data show that bioturbation is actually taking place over a much deeper level, mixing as much as 8 cm of sediments. Mixing to this deeper level would result in greater dilution of the contaminants and therefore less area of benthic impact than predicted in the Draft SEIS.

- In modeling the sediments, when the measured Massachusetts Bay existing concentration or treatment plant influent concentration of a constituent was undetected, the analytical detection limit for that constituent was used as the concentration input into the model. For example, in the case of PCB's, although no PCBs were detected in the influent, the detection limit used by MWRA in the sampling was 0.5 ug/l (parts per billion). Although EPA believes that some assumed value of PCBs is justified because of the presence of PCBs in sludge, actual levels lower than 0.5 ug/l could result in decreases in the extent or area of impact from those predicted in the Draft SEIS.

- In the water column toxicity analyses, the toxic components were assumed to be entirely dissolved in the water (Draft SEIS, Section .3.6), whereas in the sediment toxicity analyses, the toxic components were assumed to be entirely attached to suspended solids (Draft SEIS, Section B.3.4). This amounts to the most extreme and conservative evaluation in each case, in effect, a "double counting" of toxics in the Draft SEIS.

Marine Ecosystems

- Concentrations used to compare sediment toxic effects were the lowest values found in the scientific literature which showed any adverse effect (Draft SEIS, Section 5.1.3.1.2) to insure that all potential sediment toxic impacts on which information was available would be evaluated in the Draft SEIS.

- Concentrations used for assessment of organic enrichment impacts on the benthos were the most conservative values found in the scientific literature (Draft SEIS, Section 5.1.3.1.1) to insure that all potential sediment enrichment impacts would be evaluated in the Draft SEIS.

- Sediment organic enrichment impacts were considered for both stratified and non-stratified conditions rather than a yearly average (Draft SEIS, Section 5.1.3.1.1).

- Concentrations used for assessment of water column nutrient enrichment impacts were the most conservative values found in the scientific literature (Draft SEIS, Section 5.1.3.1.3) to insure that all potential water column impacts would be evaluated in the Draft SEIS.

- Water column nutrient enrichment impacts were determined for both average conditions and worst case (no net current direction) conditions which occur approximately 10 percent of the time (Draft SEIS, Section 5.1.3.1.3).

- In the assessment of Dissolved Oxygen, worst case conditions during resuspension events (occurring rarely for very short periods of time) were considered as well as average conditions (Draft SEIS, Section 5.1.3.1.5).

- In the assessment of water column impacts, comparisons to U.S. EPA Criteria for Protection of Aquatic Life are conservative since they are based on lowest known concentration of pollutant to cause effects on very sensitive organisms.

In summary, EPA feels that decisions made from the analyses conducted in the Draft SEIS are sound decisions and that because these analyses are based on very conservative approaches to modeling and impact assessment, there is a margin of environmental safety built in.

3.14 ISSUE NUMBER 14

Schedule

Several commentors raised concerns regarding scheduling aspects of the new treatment plant construction (including construction of the new primary and secondary facilities, outfall tunnel and diffuser and inter-island tunnel) and the impacts of the federal court mandated construction schedule on

decision-making. In particular, commentors charged that EPA's decision on outfall siting was dictated by the constraints of the court schedule. Also, some commentors urged that the construction schedule for the new treatment plant be accelerated, although others questioned what impacts an accelerated schedule would have on the duration of interim primary treatment and the removal of the existing discharges from Quincy Bay and President Roads. Following a general discussion of scheduling, each of these concerns, as well as other specific issues raised, are discussed.

EPA Response

MWRA's proposed construction schedule was established in 1985 and was based on the conceptual understanding of the proposed construction project at the time and on standard engineering practice. This schedule was adopted by the federal court, and provides a framework for determining MWRA's progress towards compliance with the Federal Water Pollution Control Act (MWRA Final STFP VII, 1988). The court schedule incorporates major milestone dates for critical events such as the initiation of secondary treatment and the elimination of sludge discharges to Boston Harbor. It also incorporates interim dates for accomplishing certain steps such as planning and permitting which must precede major milestones.

EPA and the court recognize the inexact and dynamic nature of the original schedule. To date, it has been revised several times to reflect current thinking on construction sequencing and design, and to accommodate unavoidable delays. It is anticipated that the dynamic scheduling process will continue and that there will be many modifications to reflect the actual construction process. However, EPA will continue to review any proposed modifications to the schedule to ensure that its intent, which is to achieve MWRA compliance with the Federal Clean Water Act in an expeditious manner, is met.

Recommended Location

The evaluation and ultimate recommendation of the outfall location was independent of the court schedule. The proposed outfall locations were evaluated against decision criteria that were established to assure protection of the marine environment and public health. Some decision criteria also addressed engineering feasibility and cost issues, including a criterion which evaluated the length of time it would take to construct a tunnel to each of the proposed sites. This criterion reflects EPA's concern that all aspects of the Harbor cleanup project proceed expeditiously; adherence to the court schedule was not considered. In fact, it is projected that construction of the outfall tunnel to EPA's recommended outfall area will take longer than contemplated in the court schedule, and as described above, anticipates that the schedule be modified to reflect this recommendation.

Duration of Interim Primary

During the construction of the new secondary treatment facilities, MWRA will discharge primary treated effluent from the new outfall for an interim period (see Issue #4). This interim period will commence when the construction of the primary facilities, inter-island tunnel, outfall tunnel and diffuser are

completed, and will terminate when the secondary facilities are completed. Commentors were concerned that delays in construction could affect the duration of this interim period.

EPA has reviewed the construction elements and believes that it is more likely that the construction of the tunnels or the primary facilities would be delayed than the construction of the secondary facilities. The tunnel construction involves a relatively new technology, and the tunnel boring rate is highly dependent on the type of rock encountered, which could be highly variable. The construction of primary facilities occurs sequentially before the construction of secondary facilities, so any delays except for labor shortages (such as land use conflicts or existing plant tie-ins) would more likely occur during the primary construction period. Such delays would result in a shortening of the interim primary discharge period. However, even should unforseen circumstances result in an interim primary period extension, EPA has determined that construction and operation of interim primary facilities is a necessary step in reaching the long-term goal of secondary treatment for all MWRA flows (see Issue #4).

Existing Harbor Discharges

There is no alternative to leaving the existing Nut and Deer Island discharges in place before certain critical facilities are completed (i.e. interisland tunnel for Nut Island and the new outfall tunnel for Deer Island). Once these facilities are completed there may be some alternatives for modifying the existing discharges before the new primary facilities and outfall are completed. As discussed further in Chapter 4 of this Final SEIS, MWRA must perform a full evaluation of these alternatives and their impacts and submit the evaluation for public and agency review before any action is taken.

Potential Construction Delays

Commentors suggested that the outfall and diffuser construction could be delayed due to uncontrollable factors such as adverse weather, which could make construction difficult or unsafe for workers. EPA acknowledges that such delays are possible, and has selected methods, such as tunnel construction, which minimize the risk of such delays. As discussed above, EPA also acknowledges that the court schedule will remain dynamic during construction to account for such unforseen circumstances.

Another commentor noted that if EPA's conservative tunneling advance rate of 50 ft/day is assumed, the outfall would not be completed prior to the planned start-up of the new primary treatment plant in 1995. EPA acknowledges the current lack of geotechnical information and thus specified a conservative range (50 to 70 ft/day) of tunneling rates in the Draft SEIS. Assuming that Cambridge Argillite is the dominant rock, the outfall tunneling rates would probably be closer to 70 ft/day or more (MWRA, STFP 1988). However, if harder rock dikes, shears or fracture zones are encountered, then a slower tunneling rate through that rock area may be more realistic. This cannot be assessed until the geotechnical information becomes available (see Issue #22).

Accelerated Secondary Treatment

Commentors urged that the construction of new secondary facilities be accelerated or proceed simultaneously with the construction of new primary facilities. In fact, MWRA has proposed an amendment to the schedule which would allow for a partial acceleration of secondary treatment facilities construction. As described in Chapter 4 of this Final SEIS, EPA supports the accelerated construction of secondary facilities. However, as discussed in detail in that Chapter, there are several currently unresolved issues concerning the accelerated schedule which must be addressed by MWRA before accelerated secondary construction can be implemented. These issues include impacts on interim primary discharge duration, transportation, construction activities and sludge processing.

3.15 ISSUE NUMBER 15

Sedimentation

The approach and methods used in the Draft SEIS to address the impacts of sedimentation of effluent solids was questioned by several commentors. Specifically there were questions about EPA's analysis of predicted sediment transport, fate and impacts, with some commentors feeling that the Draft SEIS over-predicted sedimentation and its associated impacts, while others felt that these were under-predicted. This issue, plus specific questions raised concerning sedimentation, are discussed below.

EPA Response

EPA recognized that the deposition of effluent solids (or sedimentation) could potentially be significant in the outfall siting decision, and so presented an evaluation of these impacts in its Draft SEIS. The potential impacts were addressed by first estimating the transport of the discharged solid particles from the diffuser both horizontally and vertically (Section A.3). The fate of these particles once they reached the sea floor was also considered (Sections A.3.6.5 and B.3) and finally the impact of the particles on the marine ecosystem was assessed for each alternative discharge site (Sections 5.1.3.1.2). Horizontal transport of solids was predicted using the mathematical model TEA, which simulates the currents and circulation in Massachusetts Bay (Sections 5.1.1.5 and A.3.6 and Issue #20) under various current and water column conditions. Vertical transport was predicted by applying a settling rate for different sizes of solid particles. The rates were determined based on laboratory experiments and theoretical settling rates (Section B.2.4). Combining the horizontal transport of the solids over time (from the model) and the vertical transport over time (from the settling rates) yielded a prediction of where and at what accumulation rate the particles would settle.

Determining the fate of the effluent particles once they reached the sea floor was the next step in the process. The particles could remain in place, decay due to chemical and biological processes, or be transported to other areas. The fate of the solid particles is therefore dependent on physical, chemical, biological and geological factors which are not well known. As elsewhere in

the Draft SEIS when there was only limited information available, the analysis of sediment fate was performed based on reasonable worst case scenarios.

For determining organic carbon enrichment and sediment oxygen demand impacts the reasonable worst case scenario assumed that the particles were totally decayed due to biological and chemical processes (maximizing biotic metabolisis) and were not resuspended (note that this assumption was reversed when considering water column DO impacts to account for the effects of sediment resuspension on water column DO, Draft SEIS Section A.3.6.4). For determining potential toxic impacts, the worst case scenario assumed that no chemical or biological decay occurred (maximizing build up of toxics in the sediment) and that no resuspension of the particles occurred (minimizing dilution of the toxics).

The final step in the evaluation of sediments was to determine what potential ecosystem impacts might be expected based on the predicted sedimentation rates and concentrations. This was done by comparing levels of predicted DO, organic carbon and toxics to established water quality standards or literature values that indicate the potential for benthic organism impacts.

Biodegradation

Some commentors stated that EPA had overstated sediment impacts because it had failed to account for biodegradation of the effluent solids. As discussed above, a conservative approach was taken for assessing sediment impacts. Consequently, when biodegradation could create impacts (as in the areas of nutrient enrichment or oxygen demand) it was considered in the analysis. However, for areas where biodegradation would reduce sediment impacts (as in the toxic analysis) it was not considered.

Sediment Resuspension

Another comment concerned sediment resuspension and whether or not reconcentration of the sediments in an area away from the discharge could result in significant impacts or be site determinative. It is possible that sediment particles and their associated toxics could be resuspended and transported to depositional areas on the sea floor. Due to the slow rate of settlement of secondary particles compared with the storm frequency, the geographic distribution of settling solids will probably not be outfall site determinative. Several potential long-term depositional areas include Stellwagen Basin, Boston Harbor or isolated depressions scattered throughout Massachusetts Bay. There is currently no means of assessing the transport and ultimate fate of resuspended particles from the effluent, or determining into which depositional area, if any, they might fall. However, if resuspended effluent particles reached a depositional area they would be mixed with and diluted by particles from other areas of the sea floor. Because the original deposition of the particles in the area of the outfall did not result in sufficiently high toxic concentrations to cause significant impacts (as determined in the Draft SEIS), their redeposition in any other area would also not cause impacts.

Deposition Rate

One commentor stated that the sediment deposition rate was understated in the Draft SEIS because it was lower than the rate used in EPA's 301(h) (primary treatment) waiver analysis. The same basic method was used to predict initial deposition in both the 301(h) waiver analysis and the Draft SEIS. The same particle size categories and the same settling rates for each category were used. There were some differences in the predicted accumulation due to different effluent mass loading rates resulting from better data on expected influent loads and treatment characteristics.

Another comment was that EPA's use of the 0.1 centimeters/second (cm/sec) settling rate for 5% of the effluent solids was too conservative and that sediments large enough to settle this fast would be removed during primary treatment. EPA used three theoretical settling rates for primary effluent solids (0.001, 0.01 and 0.1 cm/sec) and two settling rates for secondary effluent (0.001 and 0.01 cm/sec). The faster settling rate for primary effluent (0.01 cm/sec) was used to account for potential aggregation of the effluent particles in the marine waters, which would cause the aggregate particles to fall faster. The aggregation process is poorly understood, but the use 0.1 cm/sec as a settling rate for a percentage of the particles is a conservative approach, and was used in the 301(h) waiver analysis (MDC, 1984).

3.16 ISSUE NUMBER 16

Site Comparison and Recommendation

EPA received several comments concerning individual sites and the way sites were compared, the way the outfall location decision was made and whether or not the decision was correct.

EPA Response

The outfall selection criteria and methodology is discussed in Chapter 7 of the Draft SEIS. Specific comments are addressed below.

Comments on Sites and Site Comparisons

One commentor was concerned that the sea floor at Site 5 had been characterized as rocky in the Draft SEIS, when in fact there is a substantial amount of sediment on the bottom. The Draft SEIS acknowledges that the sea floor in Massachusetts Bay is extremely heterogeneous on a small scale and that it is difficult to characterize large areas (Section 4.2.3) as rocky or soft bottom. In the Draft SEIS depositional areas (areas where sediments accumulate) were considered to represent the worst case for potential sediment impacts, and all sites were conservatively assumed to be depositional for the sediment impact analysis. Therefore even though Site 5 was described as rocky compared to nearshore sites in the Draft SEIS discussion, it was conservatively considered to be depositional in the analysis.

Several commentors did not agree with the conclusion in the Draft SEIS that the impacts produced from an outfall at Sites 4 and 5 would be similar.

Specifically, commentors believed that site 5 was "better" than site 4 in the areas of sediment accumulation, discharge of primary effluent and dilution characteristics. As described in Issue #15, the sediment impact analyses in the Draft SEIS were based on several worst case assumptions, including the assumption that all proposed outfall sites were in depositional areas (see above). Under this assumption the predicted sediment impacts on a secondary outfall at Sites 4 and 5 were similar and acceptable (Draft SEIS Section 5.1.2). If in actuality Site 4 is more depositional than Site 5, as indicated by some of the marine sediment chemistry (MWRA Draft STFP V, M 1987) and pointed out by some of the commentors, this assumption is more accurate for Site 4 than Site 5. If this is the case, the predicted impacts at Site 4 would not change, and the impacts at Site 5 would be less than predicted in the Draft SEIS. However, as elsewhere in the SEIS, when there was not substantial evidence to show less than worst case conditions, such conditions were assumed at all sites, and for sediment analyses both Sites 4 and 5 were assumed to be depositional.

During interim primary discharge an outfall at Site 4 would result in worse DO violations and water quality criteria exceedances than an outfall at Site 5. However, as described in Issue #4, EPA has determined that the impacts of a primary discharge at either Site 4 or 5 are reversible and acceptable for an interim period.

EPA's analysis of water quality impacts for the discharge of secondary effluent demonstrated that the predicted exceedances of water quality criteria were the same for an outfall at either Site 4 or Site 5. Site 5 does have better dilution characteristics than Site 4, however when the dilutions are combined with the predicted pollutant loadings and compared to water quality criteria, the additional dilution at site 5 does not reduce the number of water quality exceedances.

A commentor pointed out that progressive vector plots of an effluent particle using the model TEA indicated that dispersion is greater at Site 5 than at Site 4 and thus Site 5 is preferable to Site 4. Although this is true, as discussed above this greater dilution does not provide any additional practical environmental benefit in that the predicted number of water quality criteria exceedances are nearly the same. As discussed below, EPA developed decision criteria which were used to site the recommended outfall area. These decision criteria incorporated the effluent dispersion and dilution, and pollutant loadings and fate characteristics of each proposed site (as reflected in water quality criteria and standards compliance and sediment and nutrient impacts), as well as institutional factors such as cost and constructability. Taken together, EPA determined that both Sites 4 and 5 provided similar, acceptable levels of environmental protection.

Comments on Decision Methodology

One commentor suggested that a "Physiographic Determinatism" method (or using overlays to "shade out" undesirable areas) be used to select the outfall location. This approach was used in the Draft SEIS screening process to eliminate clearly unsuitable areas (Section 3). Also, although EPA did not prepare overlays of the general outfall area to graphically show areas of

predicted impacts, EPA's decision criteria generally reflected such areas, and use of the criteria allowed EPA to select an outfall area that minimized impacts while ensuring compliance with all legally required standards. Within this recommended outfall area a form of "Physiographic Determinatism" will again be employed to consider geotechnical, engineering and construction concerns for the precise diffuser location.

Some commentors felt that the outfall site selection process was arbitrary and should have been based on absolute standards. As described above and in Issue #1, EPA compared each proposed outfall site to established decision criteria. These criteria included the ability to meet Massachusetts Water Quality Standards, which are absolute. Other decision criteria included the level of consistency with published water quality criteria and reported literature values of the levels of pollutants which will not effect biota. Although these criteria allow latitude in their interpretation, they are not arbitrary - they are based on absolute numbers which reflect the current knowledge on marine systems impacts.

Comments on the Outfall Siting Decision

Some commentors pointed out that Broad Sound is in a recirculation cell and thus is not suitable for an outfall location. Others were concerned that the new outfall would exacerbate conditions in the already stressed Broad Sound ecosystem. MWRA's current data and modeling results do indicate that there are areas in Broad Sound with reduced flushing or "recirculation". Boston Harbor and Site 2 have some of these properties (Draft SEIS Section 4.2.1) However, the Draft SEIS analyses show that there is considerable flushing at Sites 4 and 5 and that the background build up of pollutants does not result in significant water quality impacts. EPA did not try to quantify the level of stress in Broad Sound, but rather used existing ambient data for the water quality (Section 4.2.2) and sediment (Section 4.2.3) analyses to reflect existing conditions in the Sound. In addition, contributions from existing pollution sources (including Lynn, SESD, Swampscott and Inner Harbor CSO's) were directly input to the water quality model.

Some commentors questioned the acceptability or adequacy of the recommended outfall area given projected water quality criteria exceedances. As discussed in Issue #3 and 6, these criteria are established to provide adequate protection to public health and aquatic life. These criteria are used as guidelines - every individual criterion does not have to be satisfied at all times to meet the overall objective of the water quality. Although there are some projected exceedances, the overall objectives of the Water Quality Criteria are met at the recommended area (see Issue #3 and 6 for a broader discussion). Selection of a different outfall location (including Site 6, see Issue #1) would not change this prediction.

Another commentor stated that violations of the Massachusetts Dissolved Oxygen standard, the impacts of phytoplankton blooms and "background buildup" at Site 2 do not warrant selection of a more seaward site. As discussed above, the outfall siting decision was based on a number of criteria including the ones mentioned by the commentor. EPA feels that application of these criteria at Site 2 (in combination with the others listed in Chapter 7 of the Draft

SEIS), and the impacts predicted during the interim discharge period show that the potential impacts of a new discharge at Site 2 are unacceptable.

3.17 ISSUE NUMBER 17

NEPA Compliance

Some commentors questioned whether the Draft SEIS was prepared in accordance with the National Environmental Policy Act (NEPA). Compliance with NEPA is required in order for the project to be eligible for federal funding, and was committed to by EPA in the Record of Decision on siting of the new Treatment Plant.

EPA Response

EPA's Draft SEIS complies with both the procedural requirements and the intent of NEPA. A reasonable range of alternatives were considered, and the potential impacts of those alternatives were evaluated and compared, resulting in the recommended plan. A full public participation program was conducted (Draft SEIS Chapter 9) during preparation of the SEIS.

Cumulative Impacts

Some commentors asked that EPA address cumulative (or combined) impacts from all aspects of the proposed MWRA Boston Harbor clean up project. Section 6.2.4.6.3 of the Draft SEIS deals specifically with cumulative impacts. EPA considered potential impacts from those parts of the project for which environmental reviews had already been completed (such as the piers and staging areas) as well as impacts from other sources (such as water quality impacts from surrounding treatment facilities). As each additional piece of the MWRA project undergoes environmental review, EPA will consider its impacts as well as the cumulative impacts of all the other pieces which have been reviewed. For example, the cumulative impact analysis in the residuals management SEIS will include impacts from the MWRA piers and staging areas, treatment plant and outfall.

Duration of Impacts

Other commentors felt that the Draft SEIS should have addressed impacts over 100 years, which they believed to be the life of the outfall. The effluent discharge impact analyses in the Draft SEIS were generally based on either "steady state" or short term worst case predictions. Steady state predictions were done for water quality, marine biota and public health impacts. Worst case analyses were done for sediment and shoreline impacts. The steady state and worst case predictions are independent of the duration of the discharge as long as the effluent characteristics do not significantly change. Therefore the impact predictions made in the Draft SEIS are appropriate for any duration.

No Action

Some commentors felt that EPA had not complied with the NEPA requirement to consider a "no action" alternative. Because this is a supplemental EIS (supplementing the 1985 Siting EIS; U.S. EPA, 1985a), and a "no action" alternative was considered in the Siting EIS consideration of such an alternative is not required for the SEIS. EPA did, however, briefly discuss a "no action" alternative in Section 3.1 of the Draft SEIS.

Assessment of Benefits

Several commentors requested that EPA should have presented a realistic assessment of impacts to water-related recreation, especially with respect to the purported improvements to harbor water quality. The Draft SEIS assessed the impacts to water-related recreation in Section 5.1.5.3 and Appendix D.4.4. The anticipated benefits of the project, described in Section 2 of the Draft SEIS, are a result of the entire Boston Harbor clean up effort, of which the new secondary treatment plant and outfall is an important part. Poorly treated effluent from the existing treatment plants, sludge discharges and Combined Sewer Overflows (CSOs) all contribute to the continuing degradation of Boston Harbor. Clearly, the actions defined in the EPA 1985 Siting EIS and this SEIS are considered a priority action for improving water quality conditions. However, the precise benefit of this step, independent of other planned remediation of sludge and CSO discharges, cannot be practicably assessed.

Size of Recommended Area

One commentor contended that EPA's recommended outfall area in the Draft SEIS was too large to actually constitute a decision on outfall siting and thus violated NEPA. NEPA requires EPA to conduct a thorough evaluation of the anticipated impacts of a reasonable range of alternatives for a project, and to make that information available to decision-makers and the public. NEPA does not dictate the details of decisions to be made (or the specificity of those decisions) other than that they should, "restore and enhance the quality of the human environment and avoid or minimize adverse impacts of (the project) upon the quality of the human environment. (40 CFR Part 1500)." EPA believes that these goals have been achieved in the Draft SEIS.

3.18 ISSUE NUMBER 18

Phytoplankton and Primary Productivity

Several questions were raised regarding the methodology and assumptions made in EPA's analysis productivity and its potential impacts, contained in Section 5.1.3.1.3 of the Draft SEIS. Some commentors were also concerned about algae blooms and their impacts on beaches.

EPA Response

Phytoplankton are marine plants living suspended in the water column which derive their energy for growth and reproduction from sunlight through the

process of photosynthesis. During photosynthesis, dissolved nutrients in the water such as nitrogen and phosphorous are used by the plankton. Nitrogen is generally considered a "limiting factor" for phytoplankton metabolism, i.e. when all other factors such as the phosphorous, silica and trace metals are available (as is true in Massachusetts Bay; Parker, 1975; MWRA Final STFP Y and Z, 1988) the growth of a phytoplankton population is limited by the amount of nitrogen in the water. Thus EPA predicted nitrogen loadings from the new discharge to determine the potential for over-stimulation of phytoplankton growth, which might shift phytoplankton species composition and oxygen depletion thus degrading water quality and adversely effecting higher trophic levels such as zooplankton and fish.

In the Draft SEIS, EPA defined nitrogen threshold values from laboratory studies from which the potential for phytoplankton stimulation and oxygen depletion could be predicted. From these, the areal extent of nitrogen levels above thresholds were predicted using computer modeling to compare the extent of potential impact at each candidate outfall site (Draft SEIS Section 5.3.1.3). As indicated in Table 5.1.3.e, discharge within the recommended outfall area will result in small increases in phytoplankton productivity, but will not result in oxygen depletion or changes in species composition changes outside the effluent mixing zone. Therefore the new discharge will have negligible effects on the phytoplankton community and water quality of Massachusetts Bay.

Nutrient Spike Experiments

One commentor noted that the results of MWRA's nutrient spike experiments had not been used by EPA in the phytoplankton analysis. Another commentor stated that the spiking experiments were not useful because they were too short term. EPA considered the MWRA nutrient spike experiments in Section 5.1.3.1.3 of the Draft SEIS; however, the data was not used in this analysis since it only took into account short-term (48 hour) effects of a one time dose of nutrients as opposed to long term continuous exposure to nutrient enrichment (as would potentially occur from the outfall discharge).

Relative Impacts Comparison

A concern was raised that according to MWRA spike experiment data, primary production and nutrient enrichment appear to be more tightly coupled at site 5 than at site 2 and therefore the impact due to nutrient enrichment may be greater at Site 5 than Site 2. EPA agrees that nutrients and primary production may initially be more tightly coupled offshore where the nutrient level is low; however EPA's conclusion that nutrient enrichment impacts would be greatest at site 2 were derived from an analysis of the dispersion of the nutrients at each site. Since a phytoplankton assemblage will develop in response to a nutrient concentration, that assemblage will occur no matter where that particular nutrient concentration occurs; therefore, the important site differences are related to the area over which the nutrient concentration occurs. Since less area will have elevated nutrient levels at site 5, there will be less impact

Threshold Values

One commentor wanted clarification of the origin of the nitrogen threshold values. These threshold values were derived from long term marine system nutrient addition studies using multiple nutrient dose levels (Oviatt et al., 1986; Frithsen et al., 1985). These experiments consisted of adding daily doses of nutrients into 6 separate mesocosms (14 m^3) in a logarithmic series with each mesocosm receiving a different dose level. The nitrogen dosing ranged from 2.88 mM N/m^2/day to 92 mM N/m^2/day. The threshold value of 0.5 mg/l was determined from the experimental dose which resulted in oxygen depletion in the mesocosm system (the 92 mM N/m^2/day). The steady state nitrogen concentration in the system was derived from this dose level and mesocosm turnover rates. There was relative agreement between the derived steady state concentratin and weekly measured concentrations (Frithsen et al., 1985).

Nitrogen Loadings

One commentor criticized EPA's assumption that effluent nitrogen loads will be equal during both primary and secondary treatment. This commentor felt that nitrogen loads during secondary treatment could be twice those produced during primary. In the Draft SEIS, the effects of nutrient enrichment were assumed to be the same during both primary and secondary treatment since the total nitrogen loading under both treatment levels is the same. The relative proportion of ammonia, nitrate and nitrite will differ between primary and secondary effluent. These different forms are taken up at different rates by the ecosystem, but all the nitrogen will be in the system long enough to be reach equilibrium. Therefore EPA took a conservative approach by assuming that all nitrogen was immediately available for use.

Algal Blooms

One commentor asked why EPA is predicting algae blooms at Site 2 when the present, more nutrient rich, discharge in Boston Harbor does not cause algae blooms. Extremely high nutrient levels do occur in Boston Harbor as reported in MWRA (Final STFP V,2, 1988). These high nutrient levels result in increased productivity of up to 5.2 gC/m^2/day. These high rates produce algal bloom conditions.

Pilayella littoralis

Several commentors had concerns about algae blooms, including blooms of ***Pilayella littoralis***, and its potential impacts on beaches. Blooms of the nuisance algae ***Pilayella littoralis*** have been known to occur on Nahant Bay since the early 1900's. During warm weather, the northern portions of Nahant-Lynn (Long) Beach and Little Nahant (Short) Beach experience a severe stench problem. The stench is the result of anaerobic wet decomposition of algal biomass buried chiefly during the annual late winter/early spring natural beach build up process (Quinlan, 1984, Quinlan, 1982; Wilce et al., 1982).

According to Quinlan (1984), practically all of the *Pilayella littoralis* in Nahant Bay exists in an abnormal free-living population that floats just above the sand/water interface virtually everywhere inshore of the 6 m mean low water depth contour. Quinlan's research showed that the growth of *Pilayella* alga appeared to be nitrogen limited, and that nitrogen was supplied by diffusion from overlying waters, by recycling of nutrients within the algal clouds, and by transport of regenerated nutrients out of the intertidal sands through tidal and wave action, bioturbation, and beach erosion Wilce et al., (1982).

The unique hydrographic features of Nahant Bay ecosystem appear to retain the algae within the Bay (Wilce and Quinlan, 1984; Quinlan et al., 1983). The waters off Lynn Harbor and Broad Sound are not considered to be nutrient sources by Quinlan and Wilce (1984).

As discussed in Section 5.1.3.1.3 of the Draft SEIS, increased nitrogen concentration at levels causing increased algal production are only expected to occur within a small area near the outfall in the recommended area. No impacts due to nutrient enrichment are expected to occur in Nahant Bay or at any shoreline. Also, as discussed above, some of the major processes influencing *Pilayella* blooms are physical and the outfall discharge will not affect these processes.

3.19 ISSUE NUMBER 19

Level of Treatment

Some commentors questioned the need for secondary treatment, particularly for a discharge as far off-shore and as deep as the outfall location recommended in the draft SEIS. The suggestion was made that EPA was over-conservative in its analysis, and that the money required to construct and operate the new secondary treatment facilities could be better used to address other pollution problems such as discharges of raw sewage from Combined Sewer Overflows (CSO's).

EPA Response

The Federal Clean Water Act of 1972 as amended in 1977 requires secondary treatment of all municipal wastewater unless granted a waiver of this requirement by EPA. Although MWRA's predecessor agency, the MDC applied for such a waiver on two separate occasions, EPA has denied these requests. In addition, the MWRA has now committed (both in federal court and through publication of its Secondary Treatment Facilities Plan) to construct a secondary treatment plant on Deer Island. Consequently, the need for secondary treatment of MWRA wastewater was not a question addressed by this SEIS, and a comparison of the impacts of primary effluent versus secondary effluent is not required.

The inadequacy of primary treatment, as determined by an extensive technical evaluation of the projected impacts, is reflected both in EPA's denial of MWRA's application for a waiver of secondary treatment requirements and in the draft SEIS. The evaluation of an interim primary discharge presented in

Chapter 5 and summarized in Chapter 7 of the Draft SEIS (also see Issue #4) reinforces the technical evaluation done during the review of MWRA's waiver application. Specifically, the discharge of primary effluent is predicted to have adverse impacts on water quality (particularly dissolved oxygen) and sediment quality (particularly toxics accumulation). As discussed in Issue #4, although these impacts may be acceptable for 5 years, they are not acceptable on a permanent basis.

EPA's analyses were conservative, especially where inadequate data existed to accurately evaluate impacts (see Issues #13) in order to preserve a margin of safety. However, EPA believes that the worst case anticipated conditions fall within the potential range of real conditions, although they are not likely to occur frequently.

CSO control, although considered a part of the overall Harbor cleanup effort, will be the subject of a separate environmental review. Decisions made on CSO's will be independent of the level of treatment decisions already made. Required CSO discharge control measures will be based on protection of public health and the marine ecosystem, and will not be determined by the resources required to construct and operate the secondary treatment facilities.

3.20 ISSUE NUMBER 20

Shoreline Transport

Several commentors were generally confused about how EPA evaluated effluent transport toward the shoreline and its potential impacts on the shoreline in the Draft SEIS. Other commentors had specific questions on the factors considered (such as wind and storm effects, types of pollutants and locations of beaches analyzed) and how they were input to the shoreline impacts evaluation.

EPA Response

EPA addressed effluent transport and shoreline impacts in the Draft SEIS in three ways: in the screening analysis, in the analysis of general circulation patterns in Massachusetts Bay, and in an analysis of extreme events, such as onshore winds and currents. One of EPA's screening criteria was the elimination of outfall areas which could directly impact the shoreline (Appendix F). This was done using the mathematical model TEA (see Issue #20) to delineate areas in the ocean eastward of which effluent could not be carried from the outfall to shore in one tidal cycle. Any outfall site shoreward of this area was eliminated from further consideration.

Using the TEA/ELA mathematical model, the farfield transport of effluent was determined to predict approximate steady state conditions at the shoreline (Draft SEIS Section 5.1.1.5 and A.3.6). Steady state conditions were determined at each of the candidate sites evaluated in detail (2, 4 and 5) for the three persistent conditions of a northerly drift, a southerly drift and no drift. From this information the concentration of effluent and thus any of its constituents could be estimated at any shoreline location.

As summarized below, two separate and independent approaches were used to evaluate the potential effects of extreme events on shoreline areas. The two analyses, which were based on different methods and data, yielded the similar result that no shoreline effects from a discharge at the recommended area were predicted (Draft SEIS Section 5.1.1.6) As discussed in Issue #2, even under extreme wind events and less than full disinfection at the treatment plant even the most sensitive uses at the shoreline such as shellfishing and bathing are not expected to be affected.

MWRA (Final STFP V, A 1988) employed one method based on wind measurements (results cited in the Draft SEIS Section F.2.1.4.2). MWRA analyzed approximately 15 years of wind data measured at Logan Airport to determine the maximum velocity and duration of an onshore wind event. These wind data were then converted to surface water currents. For each candidate discharge site these estimated currents were used to predict travel time and dilution of effluent at the shoreline during the once in fifteen year wind event.

The other method of extreme event analysis involved inputing measured current data to the Transient Plume Model (Draft SEIS Section 5.1.1.6 and A.3.7). The Transient Plume Model converts the current data into transport patterns for the effluent plume. Each current meter record (taken approximately every half hour) transported the plume in the measured direction at the measured velocity. This process continued for the entire period of record and the maximum predicted concentration of effluent at the shoreline headland was recorded. The nearest shoreline headland is predicted to receive this maximum concentration which, as in most cases, will occur in a small area of beach. Beaches further away received lower concentrations.

Wind Effects

The MWRA analysis of extreme events was based on a longer wind database which included infrequent events such as northeasters and other large storms. The measured currents directly reflected wind effects and since the currents were used as the forcing factor in the Transient Plume Model, it also incorporated wind effects. Both methods actually conservatively over-predicted the influence of wind because they assumed the effluent would reach shoreline even under stratified conditions when the plume would remain trapped in the bottom waters which do not extend to shore.

Constituents Evaluated

The shoreline transport of dissolved effluent constituents (including toxic compounds), particulate matter and potential pathogens were all considered in EPA's analysis. The steady state concentrations of the dissolved compounds were evaluated using a mathematical model. This was appropriate because the impacts of these compounds is not based on rare or extreme events. Similarly, the evaluation of potential effects of sediments at the shoreline was based on the results of steady state model predictions (see Issue #20). The prediction of potential shoreline impacts from pathogens was performed using extreme events (Issue #2) because even short term exposure to pathogens can have adverse affects.

Beaches Considered

Beaches along the Massachusetts coast in the study area were inventoried for the Draft SEIS and the list has been greatly expanded based on comments received (see Chapter 5). However, EPA's evaluation of shoreline impacts in the Draft SEIS did not consider only identified beaches. The evaluation identified points of land first encountered by an effluent particle transported by an extreme wind event, usually the closest point of land to the alternative outfall site. This point was then considered to be a potential beach and the predicted conditions were compared to the EPA and state bathing water and shellfishing standards (Issue #2). Depending on the alternative site and the wind event under evaluation, the point first reached was generally Hull, Nahant or Winthrop. All other land falls would require greater effluent travel time and additional dilution would be achieved: thus any other beaches (including Devereaux Beach, a concern of several commentors) would be impacted less than the beaches identified in the Draft SEIS. In the case of long beaches, the reported impact represents the highest impact at any point along the beach and does not imply that the entire beach would be exposed to this level of effluent.

3.21 ISSUE NUMBER 21

Chlorine Toxicity

Some commentors had questions or comments relating to MWRA's proposed effluent chlorination facilities and what impacts chlorination could have on water quality and marine life. Comments were also received on the potential need for dechlorination to mitigate any impacts. Chlorine toxicity and the need for dechlorination are discussed in Chapters 6 and 7 of this Final SEIS.

3.22 ISSUE NUMBER 22

Geotechnical Information

Concerns have been raised regarding the difficulty and cost of constructing the outfall tunnel and diffuser at the recommended location. Specifically, some commentors have postulated that the amount and depth of bedrock en route to the recommended location, as opposed to a more southerly and easterly location (Site 6), will increase the cost, duration and difficulty of outfall tunnel construction.

EPA Response

When evaluating potential outfall sites, EPA considered not only a site's environmental acceptability, but also its geotechnical suitability. The outfall area recommended in the Draft SEIS was judged to contain suitable geotechnical conditions, but the specific conditions within that area were not well enough documented to exactly define the site and alignment of the diffuser. The Draft SEIS defined a large recommended area (approximately 6 square miles) that is environmentally acceptable, within which further geotechnical studies are recommended (Section 7.2). These geotechnical investigations will better define the detailed bathymetry (underwater

topography), depth to bedrock and condition of the bedrock and overburden in the recommended area in order to select a diffuser location that optimizes constructability, within an area that is environmentally acceptable.

The maximum depth to bedrock along the tunnel alignment is important because it can determine the depth of the access shaft at Deer Island and it can influence the depth of the diffuser risers. The depth of the access shaft increases as the maximum depth to bedrock (and thus the maximum depth of the tunnel) increases, so that an appropriate slope can be maintained along the tunnel from the shaft to the diffuser. However, increasing the shaft depth has very minimal effect on the overall outfall construction cost, duration or difficulty. The total shaft cost is estimated at only $10 million out of a total outfall construction cost of over $450 million and the shaft cost changes very little with depth (Draft SEIS Section 5.2.3). Also, the time it takes to construct the access shaft is much shorter than the time required to bore the tunnel or to drill the diffuser risers, therefore any extra time required to build a deeper access shaft would not impact the total time required for outfall construction.

The depth to bedrock, which will determine the depth of tunnel, could have a more significant impact on the constructability of the diffuser. The diffuser will consist of approximately 80 riser shafts drilled from the sea floor into the outfall tunnel. The shorter these risers can be, the less time and money it will take to construct the diffuser. However, even if the detailed geotechnical studies show the bedrock to be deeper than assumed in the Draft SEIS, it may be possible to modify the slope of the outfall tunnel to minimize the depth of each riser.

Based on review of all available geotechnical information and the above considerations, there does not appear to be any geotechnical advantage to a more southerly or easterly location for the outfall diffuser. Note that, as commentors acknowledge, there is little detailed geotechnical data available in the area of Massachusetts Bay under consideration (including Site 6). There is no reason to believe that a different tunnel alignment or diffuser location would significantly decrease the cost, duration or difficulty of construction. The geotechnical concerns raised during the public comment period do add emphasis to the Draft SEIS recommendation for extensive geotechnical investigations as part of the mitigation plan (Draft SEIS Section 7.2).

Size and Shape of Recommended Area

One commentor suggested that the geotechnical conditions at Site 6 could be investigated by simply changing the shape of EPA's recommended outfall area - that is by redrawing the rectangle shown on Figure ??? in the Draft SEIS to be longer and thinner. As discussed above, geotechnical investigations at Site 6 are not recommended by EPA. The size of the rectangle shown on Figure 7.1 is based on EPA's determined area of environmental acceptability. The width of the rectangle represents approximately a diffuser length on either side of the line between Sites 4 and 5 in order to accommodate the optimum diffuser alignment determined after detailed investigation (see Issue #8).

Earthquake Impacts

Comments were received concerning the potential for damage to the outfall/diffuser system during an earthquake. Rock tunnels are rarely damaged by an earthquake because in order for this to happen, the bedrock must be sheared. Such damage would only be associated with a catastrophic seismic event. Since rock tunnels are inherently stable in earthquakes, the outfall tunnel is expected to withstand significant seismic events. It is highly unlikely that such a catastrophic earthquake would occur in Boston Harbor/Massachusetts Bay. Seismic investigations currently being conducted in the vicinity of the proposed outfall will confirm the geologic nature of the underlying rock structure.

3.23 ISSUE NUMBER 23

Miscellaneous Topics

The following are EPA's response to various miscellaneous comments which do not fall into any other categories.

EPA Response

Noise and Ventilation Impacts

One commentor questioned the potential for air quality and noise impacts from ventilation of the outfall tunnel. No air quality impacts are expected since the treatment plant and tunnel will be designed to meet all applicable air quality standards for the Commonwealth of Massachusetts, which are consistent with the National Ambient Air Quality Standards. Also, EPA concurs with the MWRA (Final STFP III, 1988) analysis that no noticeable noise increase above ambient conditions are expected to occur during plant operation at Deer Island.

Navigation Impacts of Diffuser

The diffuser will be located at a depth of 60 to 120 feet, which is too deep to effect any marine traffic. There could be some potential navigation impacts during construction (as discussed in Chapter 5 of the Draft SEIS). During the Corps of Engineers permit review process, it is anticipated that the Coast Guard, Massport, the Harbor Police and other marine traffic agencies would provide input on specific mitigation measures if needed. All regulations and permitting requirements will be followed to minimize impacts.

3.24 ISSUE NUMBER 24

Historical/Archaeological Considerations

One commentor raised concerns regarding the Historical and Archaeological review process for the outfall siting, particularly that prehistoric archaeology and indirect impacts to historic properties due to construction needed to be addressed.

EPA Response

As required by the National Historic Preservation Act of 1966, a reconnaissance survey (literature review) of the potential for historical shipwrecks at the proposed outfall locations was conducted by MWRA and reviewed by EPA. The conclusions of the survey were that a potential for historic wrecks in the area existed, and that this potential increased closer to shore. The second step in determining the significance of potential historical/archaeologic resources will be a field survey of the recommended outfall site to identify any potential prehistoric resources or shipwrecks eligible for listing on the National Register of Historic Places.

As discussed in Issue #22, although this final SEIS identifies a recommended outfall area, the precise location and alignment of the outfall diffuser is dependent on further geotechnical investigations. This data will be reviewed along with the location of any historical/archaeologic resources, to exactly site the diffuser. If the diffuser cannot be sited to avoid adverse impacts to such resources, appropriate mitigation measures and recording protocol will be developed. Indirect effects due to construction activities will also be addressed in the diffuser siting process by considering the location and structural integrity of any historical/archaeologic resources in relation to construction techniques.

3.25 ISSUE NUMBER 25

Material Disposal

One commentor was concerned that the outfall site and diffuser design were not well enough defined to adequately assess dredging and disposal impacts. The commentor also indicated that testing of the dredged material might be required prior to disposal and that potential disposal options should be discussed.

EPA Response

As discussed in Chapter 3 of the Draft SEIS, EPA considered two types of diffusers: a pipe diffuser and a drilled riser diffuser. The major difference in impacts between the two diffusers is that construction of the pipe diffuser would generate approximately 1.4 million cubic yards (cu yds) of dredged material, whereas construction of the drilled riser would generate only approximately 12,000 cu yd of dredged material. As discussed in Chapters 4, 6 and 7 of this Final SEIS the drilled riser diffuser has been chosen as the preferred diffuser design based on minimal dredging and disposal impacts, and engineering and economic feasibility. The exact location of the diffuser cannot be determined until detailed geotechnical investigations are complete (see Issue # 22). The dredged material generated during construction is expected to be clean. The U.S. Army Corps of Engineers has reviewed the sediment data taken from the recommended outfall area and has made a preliminary determination that it is exempt from further testing (including bioassay/bioaccumulation testing), and is environmentally acceptable for ocean disposal.

As indicated in Section 5.2.4 and 5.4.4 of the Draft SEIS, up to 2 million cu yds of excavate will be generated during construction of the outfall and inter-island tunnels. It is hoped that all of this material will be used on Deer Island or sold as construction aggregate for the Third Harbor Tunnel/Central Artery or other construction projects. However, up to 1.5 million cu yds may have to be disposed of by other means. Potential disposal/reuse options could include using the excavate to "cap" Spectacle Island, other landfills or the Foul Area Ocean Disposal Site. Disposal will have to comply with all Federal, State and Local laws and regulations.

CHAPTER 4

MODIFICATIONS TO THE PROPOSED ACTION AND ALTERNATIVES

This Chapter describes changes and potential changes to the project as presented in the Draft SEIS based on new information developed since release of the Draft document. As described in Chapter 1, the Draft SEIS considered the construction of a new secondary wastewater treatment plant and associated outfall as presented in MWRA's Draft Secondary Treatment Facilities Plan. Since releasing its draft document, MWRA has made two major changes to its recommended plans with regard to scheduling of secondary treatment facilities construction and diffuser design. A description of these changes, an evaluation of their potential impacts and implications to the Final SEIS recommendations are discussed below.

4.1 ACCELERATED SECONDARY

4.1.1 Description of Accelerated Secondary

In Volumes III, V and VII of the Final Secondary Treatment Facility Plan and Environmental Impact Report (MWRA, Final STFP, 1988), MWRA considered alternatives to the sequential primary/secondary construction schedule presented in the Draft STFP. These alternatives were considered in response to a federal court mandate that required MWRA to consider the feasibility of an accelerated construction schedule. Two alternatives were considered with each involving completion of a portion of the secondary facilities before the court scheduled date of 1999 for full secondary treatment. One alternative proposed achieving secondary treatment of approximately 25% of the average flows by 1996, whereas the other alternative proposed achieving secondary treatment of approximately 50% of the flows by the same date. Both of these accelerated partial secondary treatment scenarios could only be achieved at the cost of delayed new primary treatment for south system flows. The delay would be for approximately one year past the court mandated 1995 date for completion of the new Deer Island primary treatment plant.

Both alternatives were evaluated initially by MWRA. Secondary treatment of 50% of the flows by 1996 was determined to be infeasible because of space and construction constraints, hence secondary treatment of 25% of the flow by 1996 was designated the Alternate Plan. After review of the two alternative accelerated secondary scenarios, EPA concurs that the early completion of 50% of the secondary facilities is not achievable and MWRA's Alternative Plan is potentially achievable.

The scheduling of critical components of the construction project are different for the Base (original plan contained in the MWRA Draft, STFP, 1987) and Alternate Plans (see Table 4.1 and Figure 4.1). The removal of the Prison from Deer Island is a critical issue that must be addressed before the construction scheduling of the Alternate Plan can be achieved. As discussed below, there are other critical issues related to the discharge of existing effluent after 1995 which must be fully addressed before the Alternative Plan can be finalized.

TABLE 4.1. MWRA FINAL STFP: BASE VS ALTERNATE SCHEDULE

Activity	Abbreviation*	Completion Year	
		Base	Alternate
Inter-Island Conduit	II COND	1995	1995
Outfall	OUTFALL	1995	1995
Primary for North System	PRIM NS	1995.5	1995
Primary for Both Systems	ALL PRIM	1995.5	1996
South System Pump Station	SS PUMP	1993.5	1993
Connection of South System	SS CONECT	1995.5	1996.5
Secondary 25% of FLow	SEC-1	1999	1996.5
Secondary All Flows	SEC FULL	1999	1999

* Abbreviations refer to abbreviations used in Figure 4.1.

4.1.2 Impacts of Accelerated Secondary

EPA identified three potentially significant differences between the Base and Alternate plans in the areas of cost, peak construction requirements and effluent discharge (thus water quality implications). The cost comparison (Table 4.2 and Figure 4.2) shows little difference between the two plans while the construction resources demands (Table 4.3 and Figure 4.3) are slightly more severe for the Alternate Plan. The Base and Alternate plans will result in different water quality conditions at the recommended outfall location during the approximatley 1996 to 1999 period. These water quality conditions are discussed below.

Under the Base Plan, primary effluent from the entire MWRA service area would be discharged through the new outfall to Massachusetts Bay for an interim period (approximately 1995 to 1999) while the secondary facilities are being constructed. The water quality implications and environmental impacts of this discharge are fully described in the Draft SEIS. The Alternate Plan calls for a discharge which is a mixed primary (average of 75% of the flow) and secondary (average of 25% of the flow) effluent for an interim period from approximately 1996 to 1999, when full secondary treatment of all flows will be achieved. The MWRA performed a comparison of environmental impacts of the two plans for the interim period in their Final STFP (V, A and B, 1988). The conclusions are summarized below.

4.1.2.1 Exceedances of Water Quality Criteria. The number of predicted water quality exceedances are the same for the Base and Alternate Plans. However since the mass loading of many constituents is somewhat reduced by partial secondary treatment, the degree by which criteria are exceeded will be reduced (i.e. the exceedances will not be as severe).

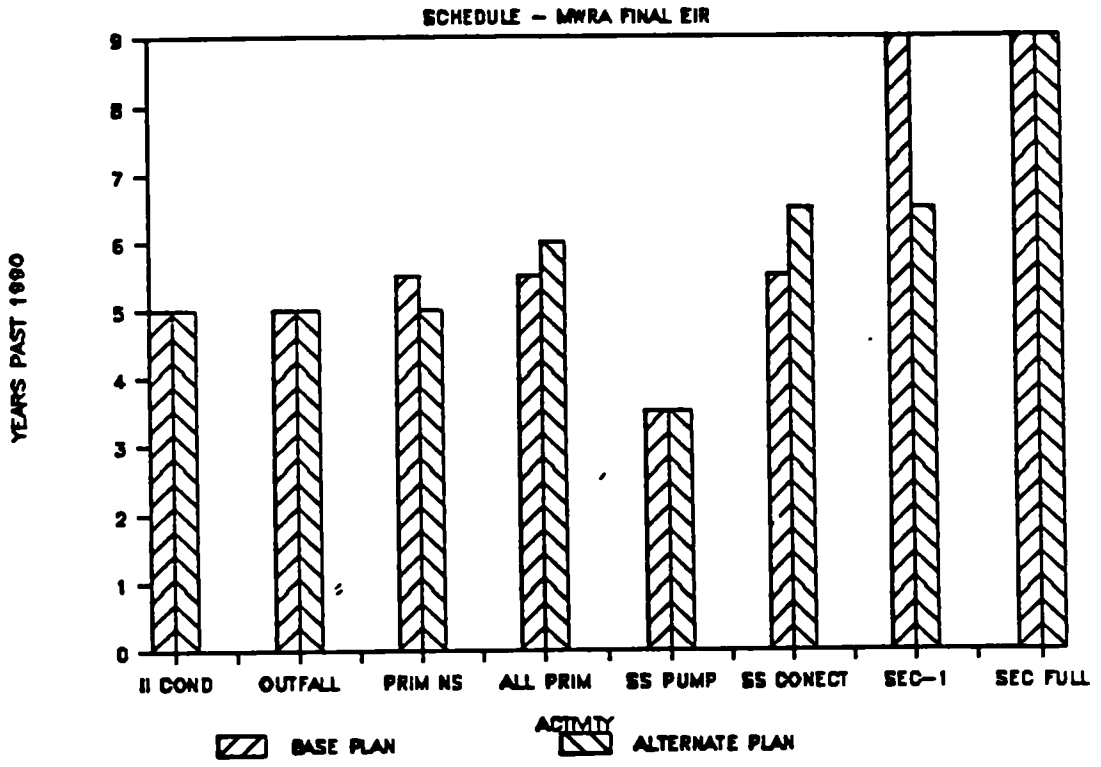


FIGURE 4.1 BASE vs ALTERNATE PLAN SCHEDULE

TABLE 4.2. MWRA FINAL STFP: BASE VS ALTERNATE COSTS

Cost Basis	Abbreviation**	Cost in Billion $ Base	Alternate
Capital			
Current	CUR	2.94	2.96
Inflated	INFLA	4.65	4.63
Bonds	BOND	4.63	4.59
Required Revenue			
1997	REV 97	0.63	0.66
2000	REV 20	0.84	0.83
Cost per Residence*			
Boston			
1997	BOS 97	0.55	0.57
2000	BOS 20	0.71	0.71
Needham			
1997	NED 97	0.69	0.72
2000	NED 20	0.90	0.89

* Costs in thousand $ per year.
** Abbreviations refer to abbreviations used in Figure 4.2.

TABLE 4.3. MWRA FINAL STFP: BASE VS ALTERNATE CONSTRUCTION

Construction Requirement	Abbreviation*	% of Base Plan Requirement Base	Alternate
Concrete by 1996	CONCRETE	100	130
Peak Daily Work Force	WORKERS	100	108
Materials Handled by 1996	MATERIAL	100	127
Off Site Lay Down Area	AREA	100	115

* Abbreviations refer to abbreviations used in Figure 4.3.

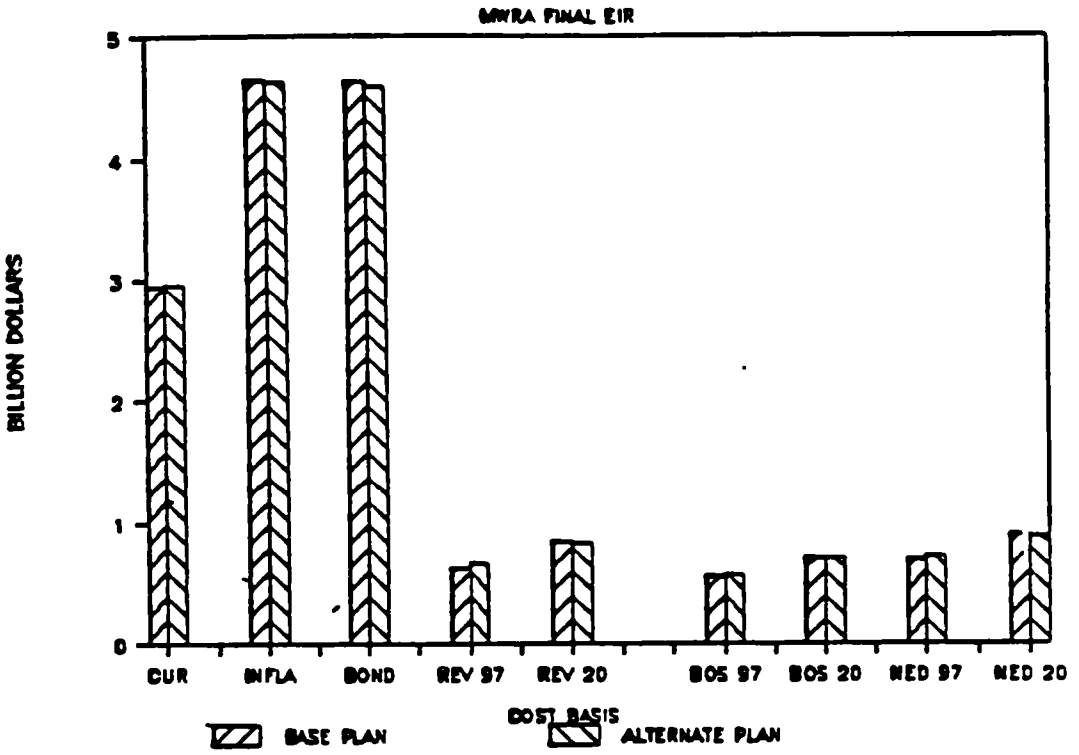


FIGURE 4.2 BASE vs ALTERNATE PLAN COST

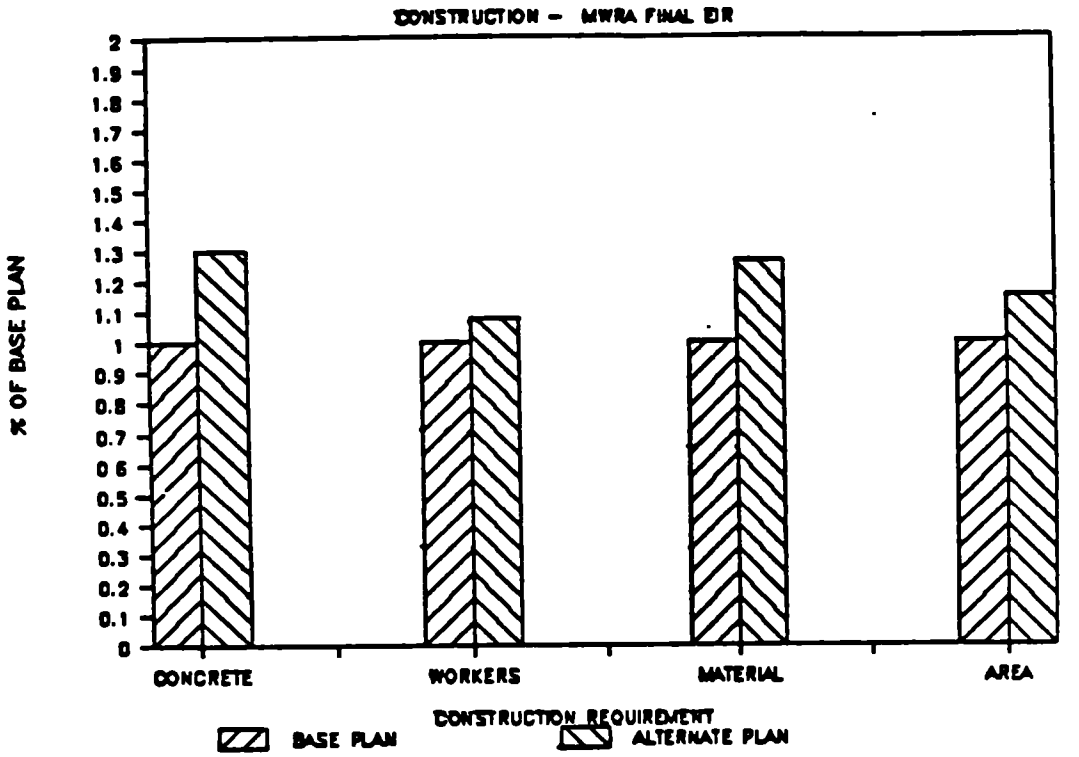


FIGURE 4.3 BASE vs ALTERNATE PLAN CONSTRUCTION

4.1.2.2 **Dissolved Oxygen.** With both the Base and Alternate Plans there are some predicted violations of the Massachusetts Dissolved Oxygen standard of 6 mg/l at the recommended location during the interim period. The extent of the violations will be reduced under the Alternate plan, but the violations predicted under either plan will not adversely effect aquatic life (Section 5.1.3.1.5).

4.1.2.3 **Other Criteria.** The MWRA Final STFP (1988) concludes that the sedimentation rates for the Alternate Plan would be approximately the same as those predicted for the Base Plan. Therefore, the sediment impacts (both organic enrichment and toxicity) would be similar for both plans. Based on the anticipated minor reduction in mass emission of solids, EPA concurs with this conclusion. The Alternative Plan is not expected to be substantially different from the Base Plan in any other areas.

4.1.3 Recommendation

EPA fully supports the concept of accelerated construction and operation of even a portion of the secondary facilities. There are some environmental benefits associated with such a plan and the early commitment of resources to implement secondary treatment is a demonstration by MWRA of their commitment to comply with the Clean Water Act and the federal Court order. However, as presented below, there are some outstanding issues that MWRA must address and submit for environmental review before the accelerated secondary construction plan can be finalized.

MWRA must perform a complete technical evaluation and environmental comparison of the alternatives available for the discharge of primary effluent during the construction period, especially the approximately one year period (circa 1995-1996) during which MWRA is under Court order to cease discharges to Quincy Bay and President Roads. This evaluation must address water and sediment quality effects, fate and effects of toxic compounds, ecosystem and recreation effects, and additional construction impacts required to implement each of the discharge alternatives. The potential for and implication of delays during the construction of the outfall or secondary treatment facilities must also be assessed.

The implications of simultaneous construction of primary and a portion of the secondary facilities must also be addressed. The MWRA must demonstrate that the existing construction mitigation plan is adequate for the potentially increased impacts of construction noise and transportation of materials and laborers resulting from an accelerated secondary construction schedule. The adequacy of the proposed staging areas and pier facilities must also be evaluated.

4.2 DIFFUSER CONCEPTUAL DESIGN

4.2.1 Description of Diffuser Alternatives

The Draft SEIS presented two conceptual design alternatives for the outfall diffuser (Section 3.4.1 and Appendix F.4). One alternative design consisted of approximately 80 risers drilled into the outfall tunnel, each with a

multiport cap. The other consisted of a limited number of risers (one to ten), each terminating in a large pipe multiport-diffuser buried in a trench below the sea floor. Information developed since publication of the Draft SEIS has not lead to a change in either of these alternatives, but as described below, additional information has affected the comparison of the alternatives.

4.2.2 Impacts of Alternatives

The Draft SEIS presented the potential impacts associated with the construction and operation of each of the diffuser alternatives (Section 5.3). EPA concluded that the 80 drilled riser diffuser had the least environmental impact because compared to the pipe diffuser, its construction would require significantly less dredging and dredged material disposal (12,000 cubic yards compared to 1.4 million cubic yards) for that alternative. Also, construction of the pipe diffuser disrupted much more benthic habitat.

In addition, the drilled riser diffuser is more easily constructed than the pipe diffuser. There is a great deal of uncertainty associated with construction of the pipe diffuser, including safety of working conditions, risk of construction delays, availability of construction equipment, potential for cost overruns, and lack of contingencies should the construction technique fail. The construction of a multiriser pipe diffuser in San Francisco was delayed 17 months, costing millions of dollars, when severe winds and waves knocked a custom-built barge from its moorings (Camp, Dresser & McKee/Stone & Webster, personal communication).

Drilled riser diffusers, however, have been constructed under similar conditions, and information concerning construction techniques and manpower and equipment requirements is available. The amount of work performed on barges in the open ocean is minimized and thus the risks associated with construction are minimized.

In general, the cost of a pipe diffuser might be slightly less than that of a drilled riser diffuser, but cost estimates for a pipe diffuser vary considerably because of the uncertainty and risk surrounding its construction.

4.2.3 Recommendation

The Draft SEIS concluded that either the pipe diffuser or the drilled riser diffuser were acceptable and more information was needed to make a decision. With the additional information referenced above and the impact evaluation performed in the Draft SEIS it is now clear that the drilled riser is the superior diffuser alternative. It has the least on and off site impact from dredging and there are less risks and potential difficulties associated with its construction. Therefore EPA's preferred diffuser design is a drilled riser diffuser. However, should follow-up studies leading to the final design of the diffuser (including hydraulic modeling and geotechnical investigations) show that the cost of construction of a drilled riser outweighs the negative aspects of a pipe diffuser (as outlined above), EPA could accept a pipe diffuser. Dredging (and ocean disposal of dredged material) conducted for

construction of either diffuser will require a permit from the U.S. Army Corps of Engineers, which will consider cost, constuction difficulties and environmental impacts based on the final diffuser design.

4.3 WATER QUALITY CRITERIA EXCEEDANCES

The predicted Water Quality Criteria exceedances for each candidate outfall site are presented in the Draft SEIS Section 5.1.1.7 for primary and secondary effluent respectively. These exceedances are based on predicted concentrations at the edge of the effluent mixing zone, which in turn are based on the combined input from MWRA effluent, other sources and ambient waters. Since publication of the Draft SEIS, additional data on ambient concentrations has become available. The new information is presented in Table 4.4.

TABLE 4.4. AMBIENT CONSTITUENT CONCENTRATIONS COMPARISON

Constituent	DSEIS Ambient Concentration	New* Ambient Concentration
Copper	74 ng/l	301 ng/l
Fluorene	1 ng/l	5 ng/l
Mercury	4 ng/l	9.3 ng/l

*MWRA, Final STFP V,A, 1988.

When this new ambient data is used, the predicted concentrations at the edge of the effluent mixing zone change correspondingly. With the exception of mercury, no changes in exceedances occur as a result of the new data. For mercury, the new concentrations at the edge of the mixing zone within the recommended area are shown in Table 4.5.

TABLE 4.5. MERCURY CONCENTRATIONS (ng/l)

	Primary Treatment		Secondary Treatment		CCC
	DSEIS	FSEIS	DSEIS	FSEIS	Criteria
Site 4	54	64	31	42	25
Site 5	30	43.5	23	30	25

Thus, mercury would exceed the CCC criterion not only at Site 4 but also at Site 5 under both primary and secondary treatment. Thus, the implication of mercury concentration identified for Site 4 in the Draft SEIS (Section 5.1.3.1.3) would also apply to Site 5. This does not change the overall comparison to water quality criteria goals or the recommendation.

CHAPTER 5

ERRATA

The errata contained herein correspond to the Draft SEIS, 1988 prepared by the U.S. EPA, Region I. After technical and editorial review of comments received, the following changes were made.

Corrections are presented first by volume and are grouped within each volume according to text, table, and figure changes.

5.1 VOLUME I CORRECTIONS

5.1.1 Text Changes

Page 1-5. Date for complete construction of interisland conveyance system changed from "4/94" to "12/94."

Page 4-39. Third paragraph, second sentence from the end changed from "...with incursions of colder water occurred twice." to read "...with incursions of colder water which occurred four times."

Page 5-23. Third paragraph, first sentence changed from "...resuspension events for both stratified and non-stratified conditions." to read "...resuspension events and under stratified conditions only."

Page 5-32. Fifth paragraph, second sentence from the end changed from "...with a PCB concentration greater than the comparison level of 0.01 ug/g...." to read "...with a PCB concentration greater than the comparison level of 0.1 ug/g...."

Page 5-35. Third paragraph, last sentence changed from "This is consistent with literature values discussed above." to read "Therefore, when adjusted for organic carbon content, this value is consistent with the literature values discussed above."

Page 5-35. Fourth paragraph, third sentence changed from "...5.1.3.c to 5.1.3.d)." to "...5.1.3.a and 5.1.3.b.)"

Page 5-35. Fifth paragraph, fourth sentence changed from "...5.1.3.a and 5.1.3.b)." to "...5.1.3.c and 5.1.3.d.)"

Page 5-47. Fifth paragraph, third sentence changed from "...96 percent smaller at Site 2 than Site 4 during no net drift conditions." to read "...96 percent smaller at Site 4 than Site 2 during no net drift conditions."

Page 5-50. Second paragraph, fourth sentence changed from "...productivity at a concentration of 1.6 mg/l...." to read "...productivity at a concentration of 1.6 ug/l...."

Page 5-62. Fifth paragraph, last sentence changed from "Therefore, the tunnel construction, not the diffuser construction, will be the critical factor in meeting the court's deadline." to read "At Site 5, the tunnel construction, not the diffuser construction, will be the critical factor in meeting the court's deadline while diffuser construction is the critical item at other sites."

Page 6-9. First paragraph, first sentence changed from "...only until mid-1000...." to read "...only until mid 1999." Add new paragraph at end to read: "Tables 6.4.4.a to 6.4.4.e present estimates of loading rates and effluent concentrations for conventional and non-conventionl constituents of concern for the above mentioned scenarios. Table 6.4.4.a presents estimates assuming primary treatment at a flow of 377 mgd and average influent loading. Table 6.6.4.b presents estimates assuming less than adequate disinfection during storm conditions with flow of 1,270 mgd and maximum influent loading under primary treatment. Table 6.4.4.c presents estimates of loadings and effluents concentrations for secondary treatment assuming average flows of 390 mgd and average influent loads. Table 6.4.4.d presents these estimates assuming 1,080 mgd of secondary effluent mixed with 190 mgd of primary treated effluent with average loadings. Table 6.4.4.e presents estimates of up to 1,270 mgd of primary treated effluent through secondary treatment facilities (as would occur during power outage) with maximum loadings."

Page 7-5. Fourth paragraph, first sentence changed from "...the MWRA discharge alone would exceed the criteria for arsenic...." to read "...the MWRA discharge alone would not exceed the criteria for arsenic...."

5.1.2 Table Changes

Page 5-7. Table 5.1.1.c. Nearfield Dilutions

(Numbers in bold were corrected)

Page 5-26. Table 5.1.1.i. Summary of Predicted Water Quality Criteria Exceedances

(Numbers in bold corrected)

Page 5-28. Table 5.1.2.a. Comparison of Simulated Maximum Sediment Pollutant Concentrations, Primary Effluent, 5 Years Duration, Non-stratified Conditions

(Column headings in bold realigned)

Page 6-11. Table 6.4.4.b. Non Conventional Pollutant Effluent Concentrations After Primary Treatment Year 1999, Maximum Loading Conditions on Storm Day

(Title of table changed)

Page 6-12. Table 6.4.4.c. Effluent Concentrations After Secondary Treatment, Year 2020

(Title of table and numbers in bold changed)

Page 6-13. Table 6.4.4.d. Effluent Concentrations After Secondary Treatment, Year 2020

(Title of table changed)

Pages 6-15 and 6-16. Table 6.4.4.f. Mixed Primary-Secondary Effluent, Year 2020

(Heading in bold realigned and columns with numbers in bold realigned)

Page 7-3. Table 7.1.1.b. Site Comparison for Determinative Criteria

(Numbers and letters in bold corrected)

TABLE 5.1.1.c. NEARFIELD DILUTIONS

Diffuser Configuration					
Length(m)	Orientation[1]	Percentile[2]	SITE 2	SITE 4	SITE 5
2000	45°	10	57	75	92
		50	98	128	150
		90	163	259	272
2000	90°	10	61	79	105
		50	114	150	190
		90	222	369	388
3000	45°	10	72	91	122
		50	120	159	196
		90	232	385	404

(1) Angle between diffuser and ambient current.
(2) Percent of the time that the dilution is less than the value indicated.

TABLE 5.1.1.1 SUMMARY OF PREDICTED WATER QUALITY CRITERIA EXCEEDANCES

Criterion Constituent	Ambient	CONCENTRATION/CRITERION RATIOS(1) Primary Site 2	Primary Site 4	Primary Site 5	Secondary Site 2	Secondary Site 4	Secondary Site 5
CMC							
copper		2.1	1.71				
CCC							
heptachlor		3.49	2.11	1.51	1.01		
4,4'-DDT		3.55	1.99	1.34			
mercury		4.04	4.04	2.56	2.69	1.68	1.2
PCBs		2.37	1.46	1.09			
Carcinogenicity							
(10^{-5} risk factor)							
aldrin		13.30	6.02	3.26	1.41		
4,4'-DDT		11.40	5.04	2.65	1.21		
heptachlor		3.66	1.73				
dieldrin		1.57					
arsenic	2.85	3.51	3.17	3.04	3.32	3.09	2.99
PCBs	9.24	72.75	38.00	24.80	14.69	11.70	10.57
(10^{-6} risk factor)							
aldrin		133.1	60.23	32.11	14.08	6.35	3.43
4,4'-DDT		114.1	50.38	26.46	12.08	5.33	2.79
heptachlor		36.64	17.30	9.81	4.30	2.03	1.15
dieldrin		15.68	6.02	3.26	1.66		
fluorene		7.50	3.56	2.04			
arsenic	28.45	35.07	31.75	30.37	33.25	30.95	30.84
PCBs	92.40	727.50	379.78	247.96	146.86	117.00	105.70

(1) Concentration ÷ Criterion (e.g. at Site 2, for primary, the predicted concentration is 2.1 times the CMC criterion for copper).

TABLE 5.1.2.a. COMPARISON OF SIMULATED MAXIMUM SEDIMENT POLLUTANT CONCENTRATIONS, PRIMARY EFFLUENT, 5 YEARS DURATION, NONSTRATIFIED CONDITIONS

Chemical	Background Concentration (ug/g)			Maximum Simulated Concentration (ug/g)		
	Site 2	Site 4	Site 5	Site 2	Site 4	Site 5
PCBs	0.01	0.02	0.01	1.38	1.03	0.77
Metals						
Arsenic	2.87	5.53	4.62	3.79	5.78	4.97
Copper	12.56	17.88	6.71	130.63	104.02	72.30
Mercury	0.15	0.17	0.11	1.82	1.41	1.04
Nickel	4.66	9.24	4.88	29.67	28.72	21.00
Selenium	2.00	2.00	2.00	11.12	8.65	6.92
Silver	2.44	0.10	0.10	7.88	4.40	3.28
Zinc	26.12	47.54	25.03	283.20	233.63	166.69
Pesticides						
Aldrin	0.04	0.04	0.04	0.30	0.23	0.18
4,4-DDT(2)	0.04	0.04	0.04	0.14	0.11	0.09
Dieldrin(2)	0.04	0.04	0.04	0.04	0.04	0.04
Heptachlor	0.04	0.04	0.04	0.13	0.10	0.09
Acid Base Neutrals						
Bis(2-ethylhexyl)phthalate	NA(1)	NA	NA	20.21	14.89	11.02
Butylbenzyl phthalate	NA	NA	NA	14.19	10.46	7.74
Di-n-octylphthalate	NA	NA	NA	22.71	16.74	12.39

1. NA = No data available - zero background concentration assumed.
2. Analyzed for public health impacts only.

TABLE 6.4.4.b EFFLUENT CONCENTRATIONS
AFTER PRIMARY TREATMENT YEAR 1999,
MAXIMUM LOADING CONDITIONS ON STORM DAY(1)

Pollutant	Maximum Influent Loadings, lb/d(2)	Removal Rate, Percent	Effluent Loadings, lb/d	Effluent Conc., mg/l
BOD	1,305,000	21	1,026,000	971
TSS	1,480,000	40	882,000	83
METALS				
Arsenic	12.3	25	9.23	0.00087
Cadmium	14.8	15	12.58	0.00119
Chromium	157.4	40	94.44	0.00892
Copper	639.3	35	415.54	0.03923
Lead	130.2	46	70.31	0.00664
Mercury	17.5	22	13.65	0.00129
Nickel	149.8	15	127.33	0.01202
Selenium	153.9	10	138.51	0.01308
Silver	26.8	30	18.76	0.00177
Zinc	2840.1	40	1704.06	0.16088
ACID BASE NEUTRALS				
Butylbenzyl Phthalate	120.5	0	120.50	0.01138
Bis (2-Ethylhexyl) Phthalate	124.4	0	124.40	0.01174
Di-N-Octyl Phthalate	115.2	0	115.20	0.01088
Florene	16.5	0	16.50	0.00156
VOLATILE ORGANICS		(3)		
Bromomethane	106.8	NA	106.80	0.01008
Methylene Chloride	293.3	0	293.30	0.02769
Chloroform	42.8	NA	42.80	0.00404
Trichloroethylene	90.0	20	72.00	0.00680
Benzene	22.6	0	22.60	0.00213
Tetrachlorethylene	134.0	0	134.00	0.01265
Ethylbenzene	63.7	0	63.70	0.00601
Styrene	55.7	0	55.70	0.00526
PESTICIDES AND PCB				
PCB	4.0	0	4.00	0.00038
Aldrin	0.8	0	0.80	0.00008
DDT	0.2	0	0.20	0.00002
Heptachlor	0.8	10	0.72	0.00007
Dieldrin	0.1	0	0.10	0.00001

1. Wastewater flow of 1270 mgd was used to calculate effluent concentrations.
2. Maximum influent loadings were estimated during the Facilities Plan (MWRA, STFP VA, 1987).
3. "NA" represents no information available. No removal of pollutant was assumed.

TABLE 6.4.4.c EFFLUENT CONCENTRATIONS AFTER SECONDARY TREATMENT, YEAR 2020, AVERAGE FLOW[1]

Pollutant	Average Influent Loadings, lb/d[2]	Removal Rate, Percent	Effluent Loadings, lb/d	Effluent Conc., mg/l
BOD	570,000	91	48,800	15
TSS	515,000	91	48,800	15
METALS				
Arsenic	7.6	50	3.8	0.00117
Cadmium	8.4	50	4.2	0.00129
Chromium	88.5	76	21.2	0.00653
Copper	399.8	82	72.0	0.02213
Lead	69.5	57	29.9	0.00919
Mercury	5.0	75	1.3	0.00038
Nickel	79.1	32	53.8	0.01654
Selenium	53.3	50	26.7	0.00819
Silver	18.0	90	1.8	0.00055
Zinc	866.2	76	207.9	0.06391
ACID BASE NEUTRALS				
Butylbenzyl Phthalate	63.7	95	3.2	0.00098
Bis (2-Ethylhexyl) Phthalate	78.3	90	7.8	0.00241
Di-N-Octyl Phthalate	65.8	90	6.6	0.00202
Florene	16.5	90	1.7	0.00051
VOLATILE ORGANICS				
Bromomethane	62.3	95	3.1	0.00096
Methylene Chloride	120.3	95	6.0	0.00185
Chloroform	22.3	90	2.2	0.00069
Trichloroethylene	43.6	95	2.2	0.00067
Benzene	16.5	95	0.8	0.00025
Tetrachlorethylene	61.7	90	6.2	0.00190
Ethylbenzene	33.4	95	1.7	0.00051
Styrene	37.5	90	3.8	0.00115
PESTICIDES AND PCB				
PCB	3.2	92	0.3	0.00008
Aldrin	0.7	90	0.1	0.00002
DDT	0.2	90	0.0	0.00001
Heptachlor	0.8	90	0.1	0.00002
Dieldrin	0.1	90	0.0	0.00000

1. Wastewater flow of 390 mgd was used to calculate effluent concentrations.
2. Average influent loadings were estimated during the Facilities Plan (MWRA, STFP III, 1987).

TABLE 6.4.4.d EFFLUENT CONCENTRATIONS AFTER SECONDARY TREATMENT, YEAR 2020, MAXIMUM FLOW[1]

Pollutant	Average Influent Loadings, lb/d[2]	Removal Rate, Percent	Effluent Loadings, lb/d	Effluent Conc., mg/l
BOD	1,227,000	71	360,300	40
TSS	1,391,000	74	360,300	40
METALS				
Arsenic	7.6	50	3.8	0.00042
Cadmium	8.4	50	4.2	0.00047
Chromium	88.5	76	21.2	0.00236
Copper	399.8	82	72.0	0.00799
Lead	69.5	57	29.9	0.00332
Mercury	5.0	75	1.3	0.00014
Nickel	79.1	32	53.8	0.00597
Selenium	53.3	50	26.7	0.00296
Silver	18.0	90	1.8	0.00020
Zinc	866.2	76	207.0	0.02308
ACID BASE NEUTRALS				
Butylbenzyl Phthalate	63.7	95	3.2	0.00035
Bis (2-Ethylhexyl) Phthalate	78.3	90	7.8	0.00087
Di-N-Octyl Phthalate	65.8	90	6.6	0.00073
Florene	16.5	90	1.7	0.00018
VOLATILE ORGANICS				
Bromomethane	62.3	95	3.1	0.00035
Methylene Chloride	120.3	95	6.0	0.00067
Chloroform	22.3	90	2.2	0.00025
Trichloroethylene	43.6	95	2.2	0.00024
Benzene	16.5	95	0.8	0.00009
Tetrachlorethylene	61.7	90	6.2	0.00069
Ethylbenzene	33.4	95	1.7	0.00019
Styrene	37.5	90	3.8	0.00042
PESTICIDES AND PCB				
PCB	3.2	92	0.3	0.00003
Aldrin	0.7	90	0.1	0.00001
DDT	0.2	90	0.0	0.00000
Heptachlor	0.8	90	0.1	0.00001
Dieldrin	0.1	90	0.0	0.00000

1. Wastewater flow of 1080 mgd was used to calculate effluent concentrations.
2. Average influent loadings were estimated during the Facilities Plan (MWRA, STFP III, 1987).

TABLE 6.4.4.f MIXED PRIMARY-SECONDARY EFFLUENT, YEAR 2020, ON STORM DAY[1]

Pollutant	Average Influent Loadings, lb/d	Primary[2] Removal Rate, Percent	Primary[2] Effluent Loadings, lb/d	Primary[2] Effluent Conc., mg/l	Secondary[3] Removal Rate, Percent	Secondary[3] Effluent Loadings, lb/d	Secondary[3] Effluent Conc., mg/l	Plant Effluent Loading, lb/d	Plant Effluent Conc., mg/l
BOD	1,305,000	25	146,500	94	68	360,300	80	506,800	88
TSS	1,480,000	50	111,100	70	71	360,300	80	471,400	84
METALS									
Arsenic	7.6	25	0.9	0.00058	80	3.9	0.00083	4.7	0.00085
Cadmium	8.4	15	1.1	0.00067	80	4.3	0.00088	5.4	0.00051
Chromium	88.5	80	7.9	0.00501	60	30.1	0.00334	38.0	0.00359
Copper	399.8	35	38.9	0.02454	70	102.0	0.01132	140.9	0.01330
Lead	69.5	86	5.6	0.00354	70	17.7	0.00197	23.3	0.00220
Mercury	5.0	22	0.6	0.00037	70	1.3	0.00014	1.9	0.00018
Nickel	79.1	15	10.1	0.00635	30	47.1	0.00523	57.1	0.00540
Selenium	53.3	10	7.2	0.00453	80	27.2	0.00302	34.8	0.00325
Silver	18.0	30	1.9	0.00119	80	3.1	0.00034	4.9	0.00047
Zinc	866.2	80	77.8	0.04907	70	221.0	0.02453	298.7	0.02820
ACID BASE NEUTRALS									
Butylbenzyl Phthalate	63.7	0	9.5	0.00601	70	16.3	0.00180	25.8	0.00243
Bis (2-Ethylhexyl) Phthalate	78.3	0	11.7	0.00739	50	33.3	0.00370	45.0	0.00425
Di-N-Octyl Phthalate	65.8	0	9.8	0.00621	70	16.8	0.00186	26.6	0.00251
Florene	16.5	0	2.5	0.00156	70	4.2	0.00047	6.7	0.00063
VOLATILE ORGANICS		(4)							
Bromomethane	62.3	NA	62.3	0.03932	75	13.2	0.00147	75.5	0.00713
Methylene Chloride	120.3	0	18.0	0.01136	80	61.4	0.00681	79.4	0.00749
Chloroform	22.3	NA	22.3	0.01407	50	9.5	0.00105	31.8	0.00300
Trichloroethylene	43.6	20	5.2	0.00329	70	11.1	0.00123	16.3	0.00154
Benzene	16.5	0	2.5	0.00156	70	4.2	0.00047	6.7	0.00063

TABLE 6.4.4.f (Continued) MIXED PRIMARY-SECONDARY EFFLUENT, YEAR 2020, ON STORM DAY[1]

Pollutant	Average Influent Loadings, lb/d	Primary[2] Removal Rate, Percent	Primary[2] Effluent Loadings, lb/d	Primary[2] Effluent Conc., mg/l	Secondary[3] Removal Rate, Percent	Secondary[3] Effluent Loadings, lb/d	Secondary[3] Effluent Conc., mg/l	Plant Effluent Loading, lb/d	Plant Effluent Conc., mg/l
VOLATILE ORGANICS (Cont.)									
Tetrachlorethylene	61.7	0	9.2	0.00583	70	15.7	0.00175	25.0	0.00236
Ethylbenzene	33.4	0	5.0	0.00315	70	8.5	0.00095	13.5	0.00128
Styrene	37.5	0	5.6	0.00354	70	9.6	0.00106	15.2	0.00143
PESTICIDES AND PCB									
PCB	3.2	0	0.5	0.00030	70	0.8	0.00009	1.3	0.00012
Aldrin	0.7	0	0.1	0.00007	70	0.2	0.00002	0.3	0.00003
DDT	0.2	0	0.0	0.00002	70	0.1	0.00001	0.1	0.00001
Heptachlor	0.8	10	0.1	0.00007	70	0.2	0.00002	0.3	0.00003
Dieldrin	0.1	0	0.0	0.00001	70	0.0	0.00000	0.0	0.00000

1. Flow conditions are up to 190 mgd primary treated effluent mixed with 1080 mgd secondary treated effluent for a total of 1270 mgd.
2. Estimates based on 190 mgd.
3. Estimates based on 1080 mgd.
4. "NA" represents no information available. No removal of pollutant was assumed.

TABLE 7.1.1.b SITE COMPARISON FOR DETERMINATIVE CRITERIA

Criteria	Measure	Secondary Sites 2	4	5	Primary Sites 2	4	5	Draft SEIS Reference
Mass Surface Water Quality Standards	Min DO (mg/l)	5.9	6.3	6.4	2.2	5.0	5.7	Table 5.1.1.h; Ch. 5.1.1.7.1; App. A.3.8.1
U.S. EPA Aquatic Life Water Quality Criteria	Number of Exceedances	2	1	0	5	5	4	Table 5.1.1.i; Ch. 5.1.1.7.3; App. A.3.3
U.S. EPA Public Health Water Quality Criteria	Number of Exceedances	4	2	2	6	5	4	Ch. 5.1.4
Pollutants at Shoreline/ Offshore Recreation and Aesthetics	Hours to Shore	6.6	9.4	15.5	6.6	9.4	15.5	MWRA, STPP V,A, 1987
	% Effluent at Shore	1.3	0.6	0.6	1.3	0.6	0.6	Table 5.1.1.f; Ch. 5.1.1.6; App. A.3.7.1
Sediment Enrichment	km^2 Degraded	1	0	0	2	1	1	Table 5.1.3.6.a Ch. 5.1.3.1.1
	km^2 Changed	5	3	3	33	19	12	
Water Column Enrichment	km^2 Degraded	1	0	0	1	0	0	Table 5.1.3.e; Ch. 5.1.3.1.3
	km^2 Changed	159	7	4	158	5	4	
Sediment Toxicity	km^2 of Effect	0	0	0	3	2	2	Table 5.1.3.d; Ch. 5.1.3.1.2
	PCB km^2 >0.1 ppm	6	5	4	18	13	10	
Commercial and Recreational Species	Relative	Moderate	Minor	Minor	Minor	Minor	Minor	Ch. 5.1.5
Cost	$ Millions	276	389	468	276	389	468	Ch. 5.2.3
Construction Duration	Months	47	51	56	47	51	56	Ch. 5.2; Ch. 5.2.5
Disposal of Excavated Material	Million yds^3	0.8	1.3	1.9	0.8	1.3	1.9	Ch. 5.2.4

5.1.3 Figure Changes (Also see the following pages)

Page 4-9. Title of Figure 4.2.1.c changed from "Locations of MWRA Survey Transects" to read "Locations of MWRA Survey Vertical Profiling Transect Stations," and legend was revised from "T Northern Transects and S Southern Transects" to read "T Northern Stations and S Southern Stations"

Page 4-33. Figure 4.2.4.a. Location of MWRA Sampling Locations was revised.

Page 4-47. Figure 4.2.5.a. Commercial Navigational Resources was revised.

Page 4-48. Figure 4.2.5.b. Typical Commercial and Passenger Ship Routes was revised.

Page 4-50. Figure 4.2.5.c. Commercial Fishing Resources was revised: "Approximate Numbers of Lobster Buoys and Lines" - removed, "Surf Clams" in Nahant Bay moved closer to the causeway, "Summer Lobster Fishery" - removed, "Fall Lobster Fishery" - removed, and "Trawl Closure Line" - added.

Page 4-51. Figure 4.2.5.d. Beaches, Shoreline Parks, and Island Parks - a.) Beaches were revised, b.) The following sources were added: EOEA, 1986; EOEA, CZM, 1983; and EOEA, CZM, 1975.

Page 4-53. Figure 4.2.5.e. Major Boating Public Access Points was revised.

Page 4-54. Figure 4.2.5.f. Sensitive Harbor Resources was revised.

Page 5-20. Figure 5.1.1.h. ELA Predicted Sedimentation Rates, Site 5, Primary Treatment, Stratified Conditions was revised.

Page 6-3. Figure 6.1.a. Project Time Frame - South Flow Pump Sation construction time extended to be completed by 12/94 rather than 4/93.

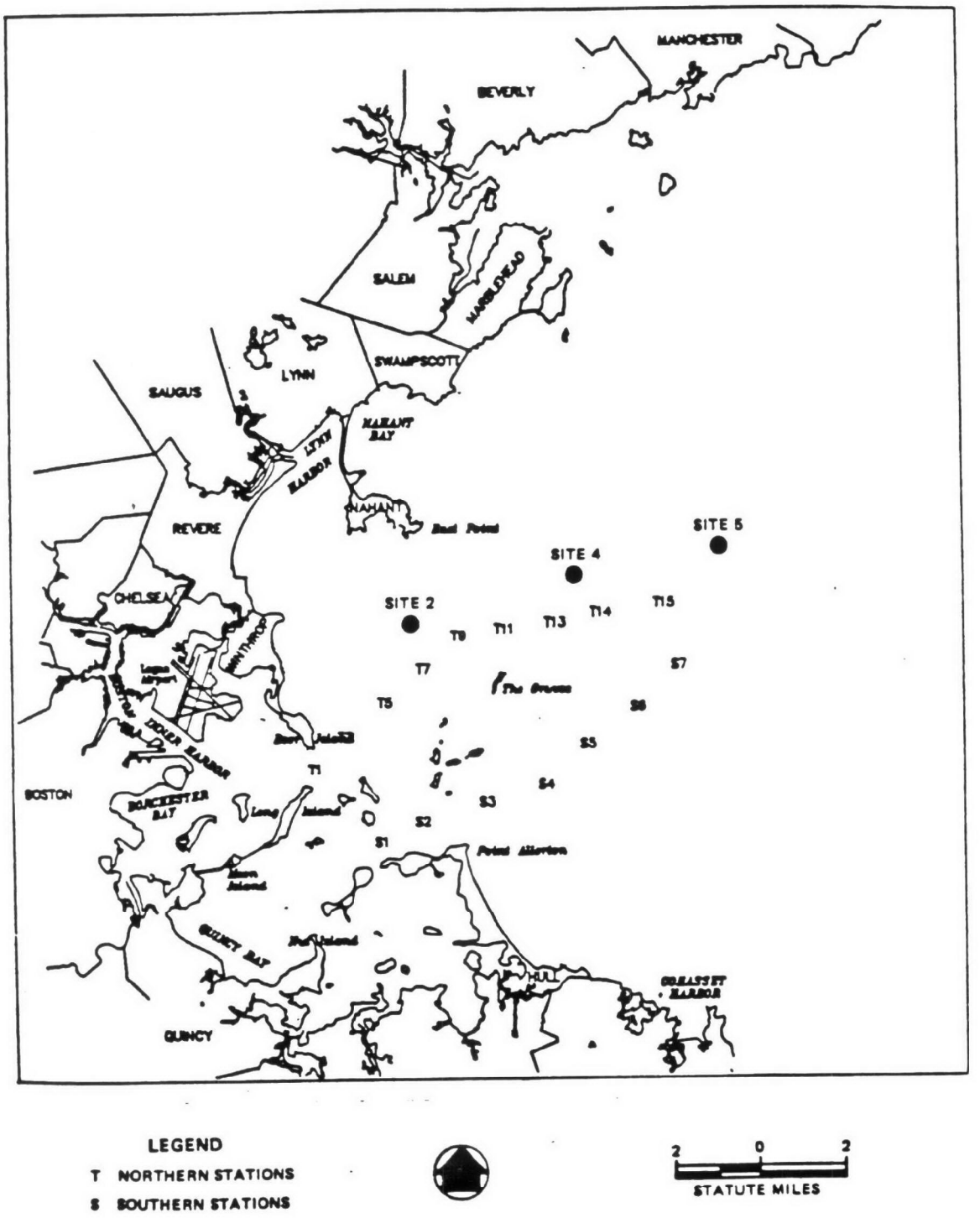


FIGURE 4.2.1.c. LOCATIONS OF MWRA VERTICAL PROFILING TRANSECT STATIONS

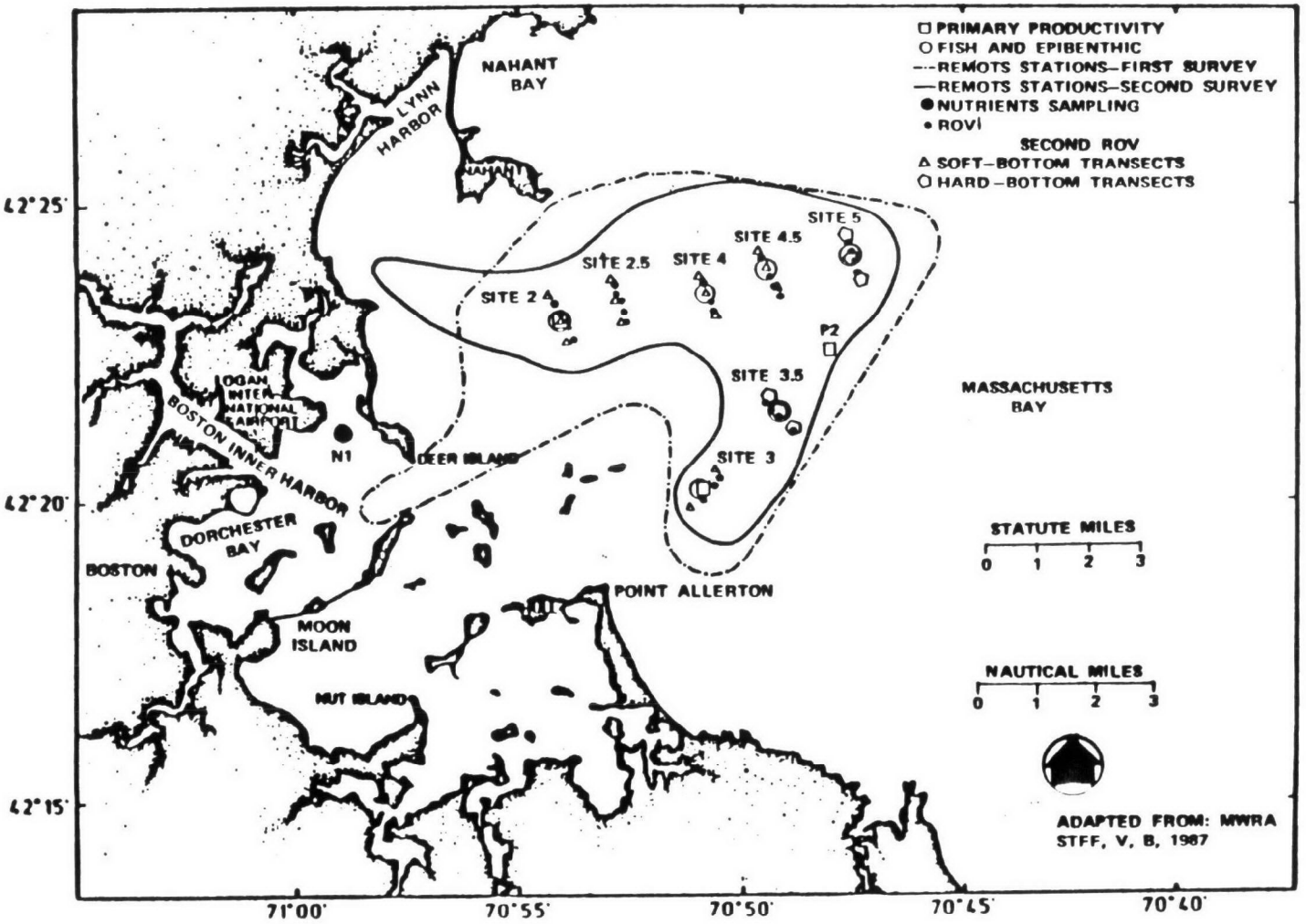
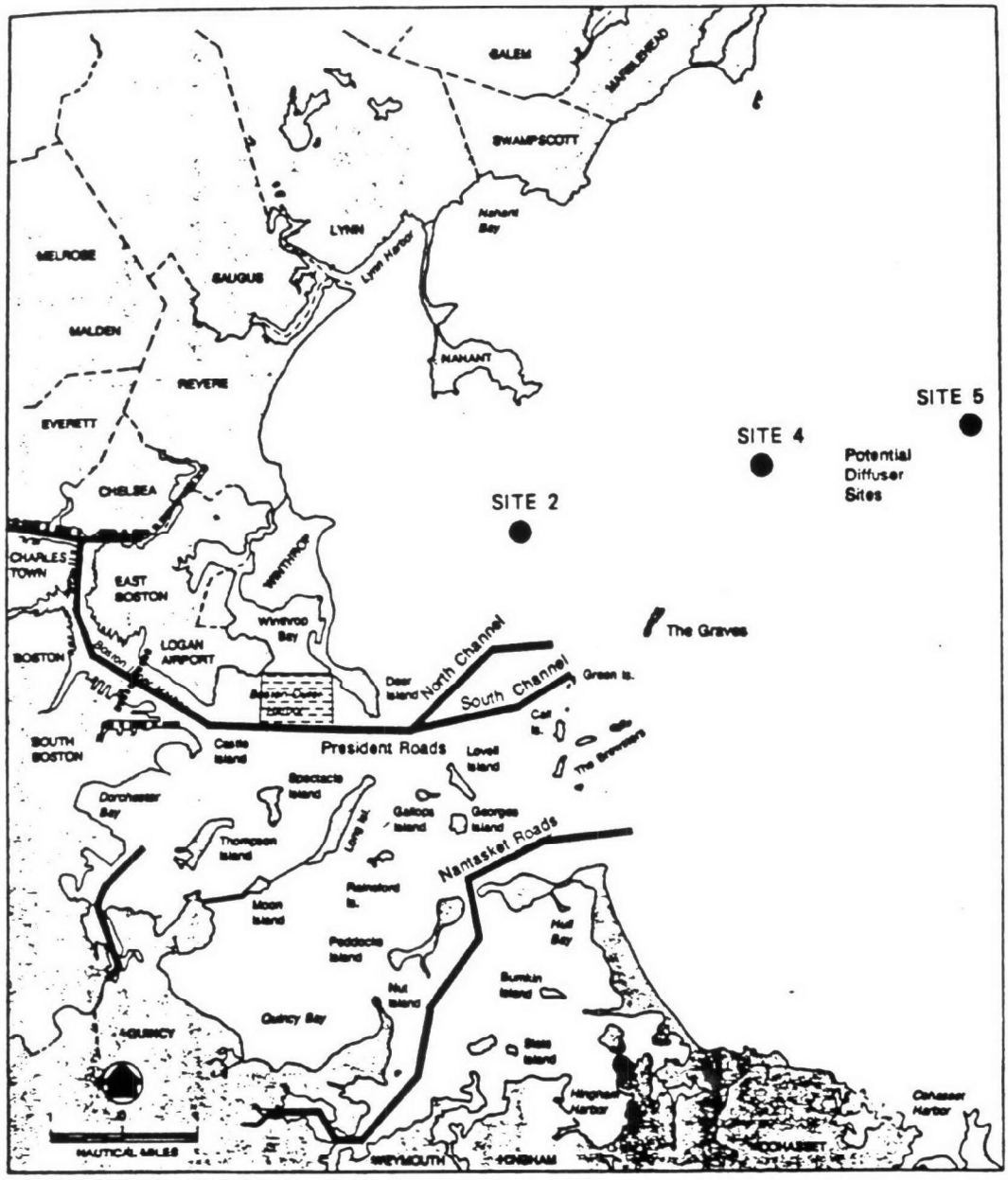


FIGURE 4.2.4.a. LOCATION OF MWRA SAMPLING LOCATIONS

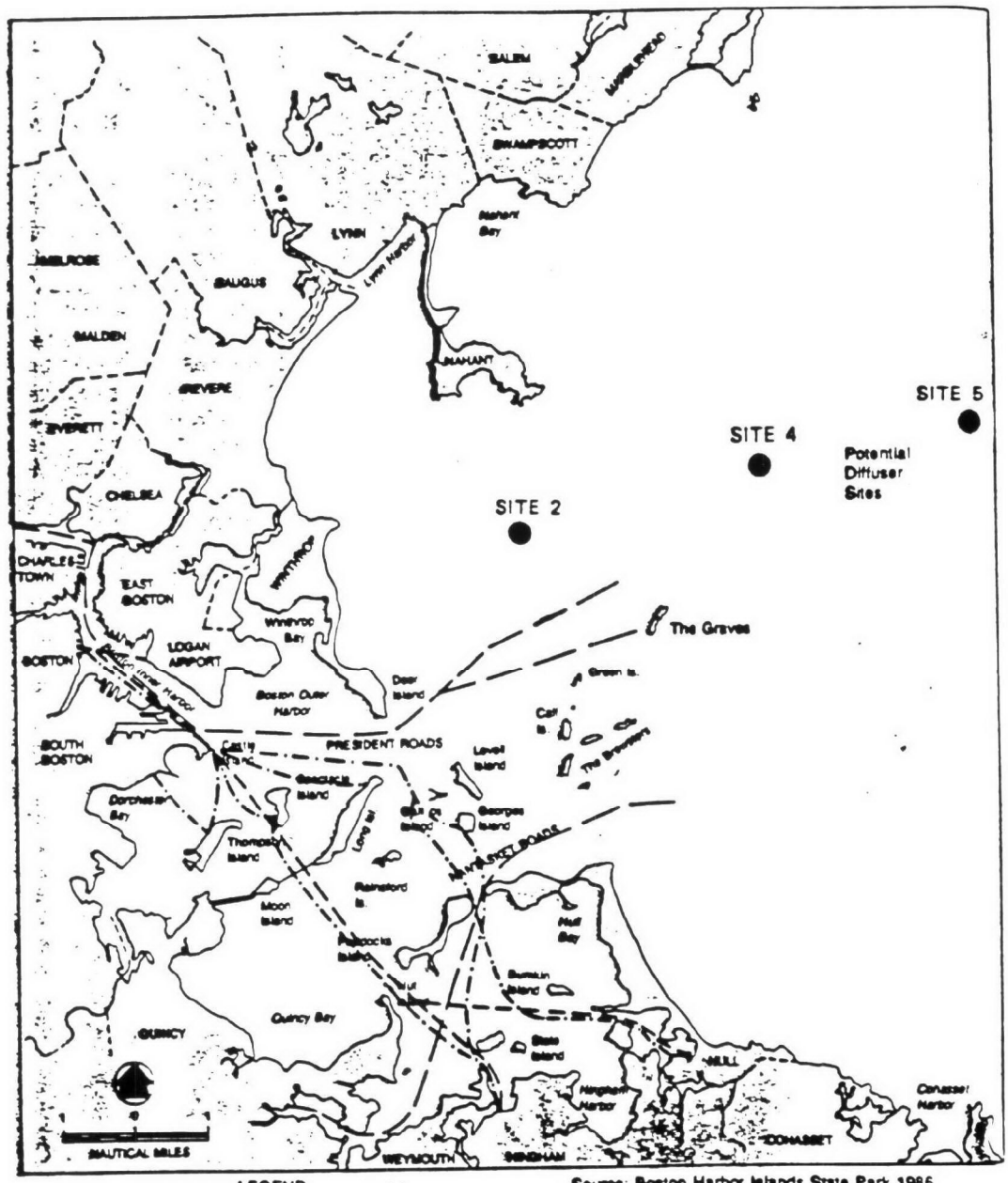


LEGEND

- Navigation Channels
- Anchorage #2
- Third Harbor Tunnel Dredging 1991 – 1992
- U.S. Army Corps of Engineers Improvement Dredging 1988 – 1995

Sources: NOAA Nautical Charts, USACOE, 1987
USACOE Project Maps, 1986
Federal Highway Admin., 1985
MWRA STFP VL, 1987

FIGURE 4.2.5.a. COMMERCIAL NAVIGATIONAL RESOURCES



LEGEND

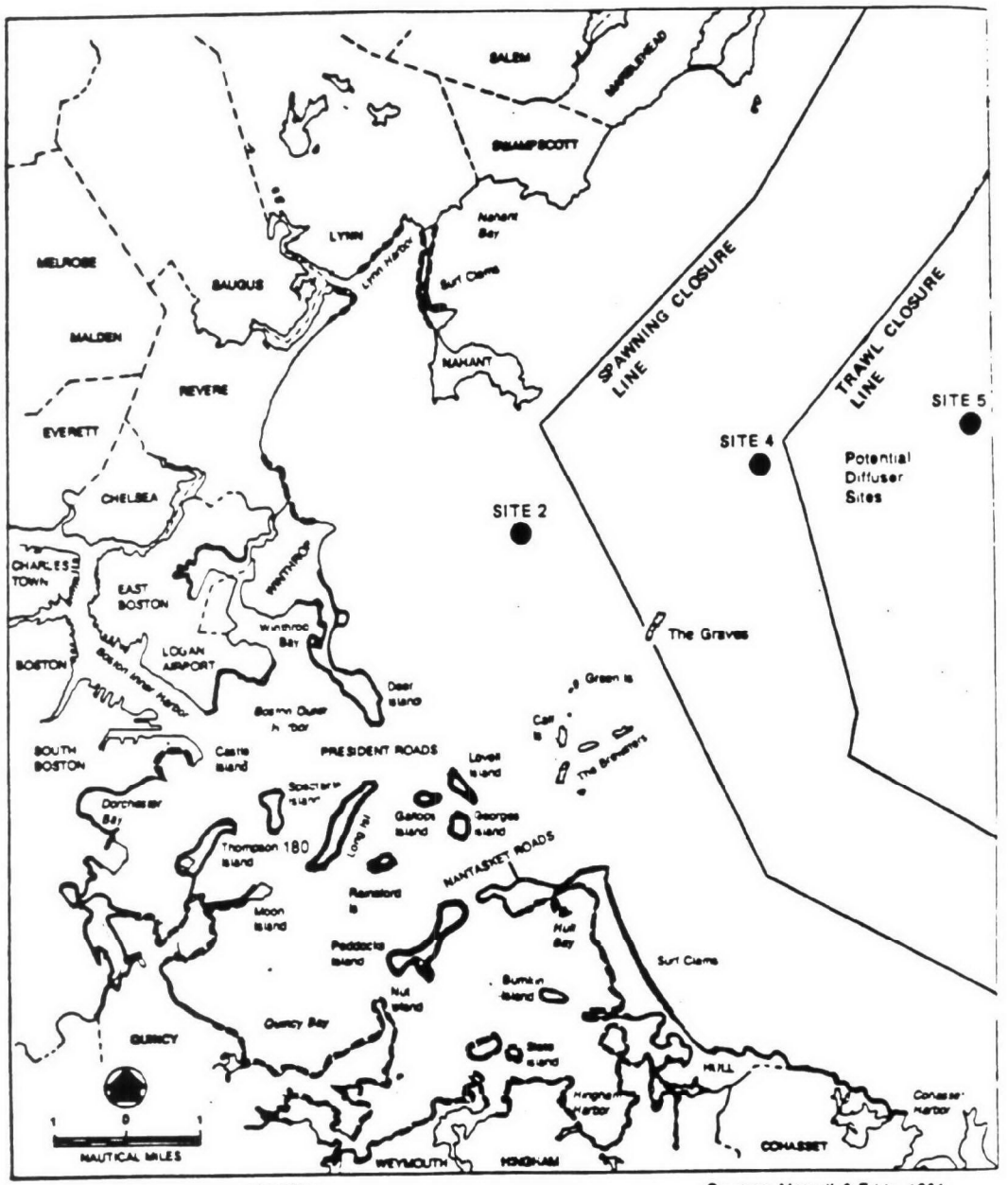
—— —— Commercial Vessels

—·—·— Boston Harbor Island State Park Ferries (Projected and Existing)

– – – – Commuter Service and Logan Shuttle

Source: Boston Harbor Islands State Park 1986 Master Plan, Mass Dept. of Environmental Management Massport, 1987 B, Boston Shipping Association, 1986

FIGURE 4.2.5.b. TYPICAL COMMERCIAL AND PASSENGER SHIP ROUTES



LEGEND

Shellfish Beds Closed to All Diggers (Closure Varies w/Conditions)

Shellfish Beds Restricted to Master Diggers

Finfish and Lobster Resources – Described in text (Section 4.2.5.3.)

Sources: Metcalf & Eddy, 1964
MWRA Vol. V App L, 1987
MWRA Vol V App B, 1987
MDMF, 1988

FIGURE 4.2.5.c. COMMERCIAL FISHING RESOURCES

FIGURE 4.2.5.d. BEACHES, SHORELINE PARKS, AND ISLAND PARKS

BEACHES INCLUDED ON FIGURE 4.2.5.d. (Page 4-51)

MARBLEHEAD

1. Riverhead Beach
2. Devereau Beach

SWAMPSCOTT

3. Phillips Beach
4. Whales Beach
5. Blaney Beach
6. King's Beach

NAHANT

7. Long Beach
8. Short Beach
9. Stony Beach
10. Fortysteps Beach
11. Canoe Beach
12. Joseph's Beach
13. Tudor Beach
14. Pond Beach
15. Bass Point Beaches
16. Black Rock Beach

REVERE

17. Revere Beach
18. Crescent Beach

WINTHROP

19. Short Beach
20. Halford Beach
21. Winthrop Beach
22. Yirrel Beach
23. Pico Beach
24. Donovan Beach

EAST BOSTON

25. Constitution Beach

SOUTH BOSTON

26. City Point Beach
27. M St. Beach
28. L St. Beach
29. Carson Beach

DORCHESTER

30. Malibu Beach
31. Tenean Beach

QUINCY

32. Harbourside Beach
33. Nickerson Beach
34. Orchard Beach
35. Wallaston Beach
36. Willows Beach
37. Perry Beach
38. Edgewater Beach
39. Baker Beach
40. Mound St. Beach
41. Avalon Beach

WEYMOUTH

42. Wessagussett Beach

HULL

43. Stony Beach
44. Nantasket Beach
45. Crescent Beach

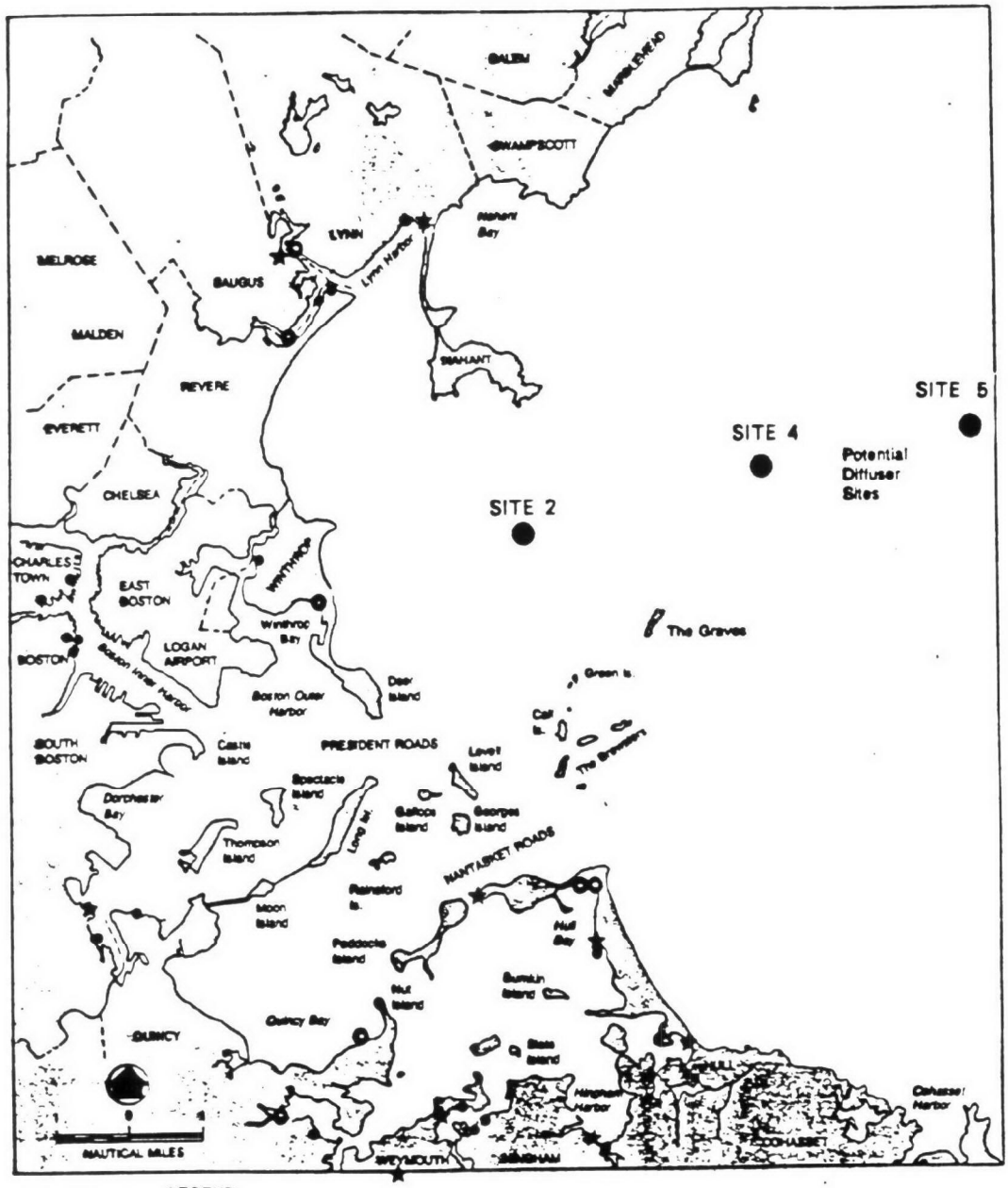
COHASSET

46. Black Rock Beach
47. Pleasant Beach
48. Bassings Beach

SCITUATE

49. No. Scituate Beach

NOTE: Numbers correspond to beach location of Figure 4.2.5.d.

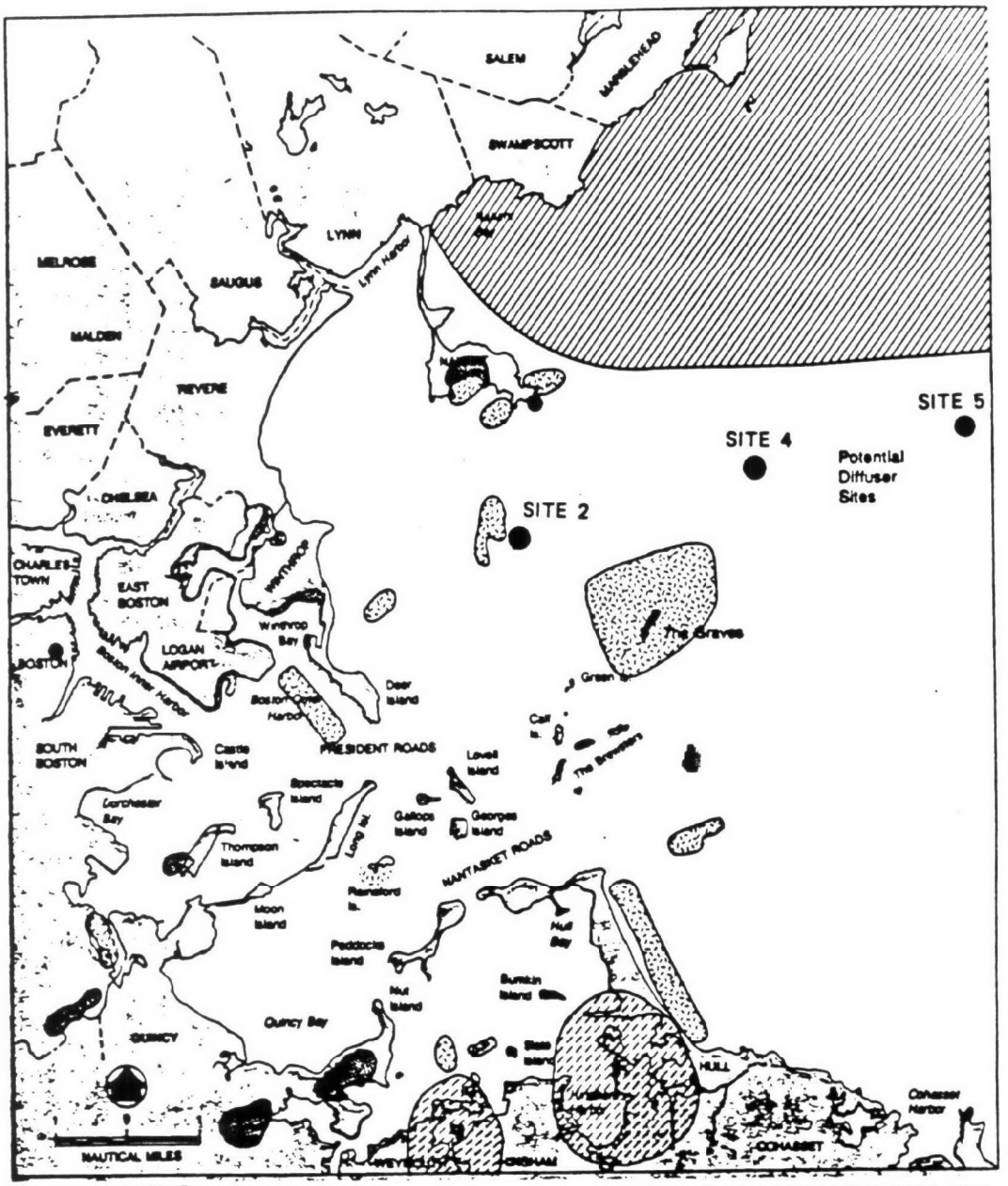


LEGEND

- Marinas w/more than 50 Slips or Moorings
- Boat Ramps
- Facilities w/more than 50 Slips or Moorings and Boat Ramps

Source: Boating Almanac 1986

FIGURE 4.2.5.e. MAJOR BOATING PUBLIC ACCESS POINTS



LEGEND

- Saltmarsh
- Significant Identified areas of Submerged Vegetation
- Areas of Critical Environmental Concern
- South Essex Ocean Sanctuary
- Marine Research Facilities

Sources: MWRA Vol. V, APP.L, 1987
BARR, 1987

(Shellfish Beds Shown on Figure D.3.c)
(Bathing Beaches Shown on Figure D.3.d.)

FIGURE 4.2.5.f. SENSITIVE HARBOR RESOURCES

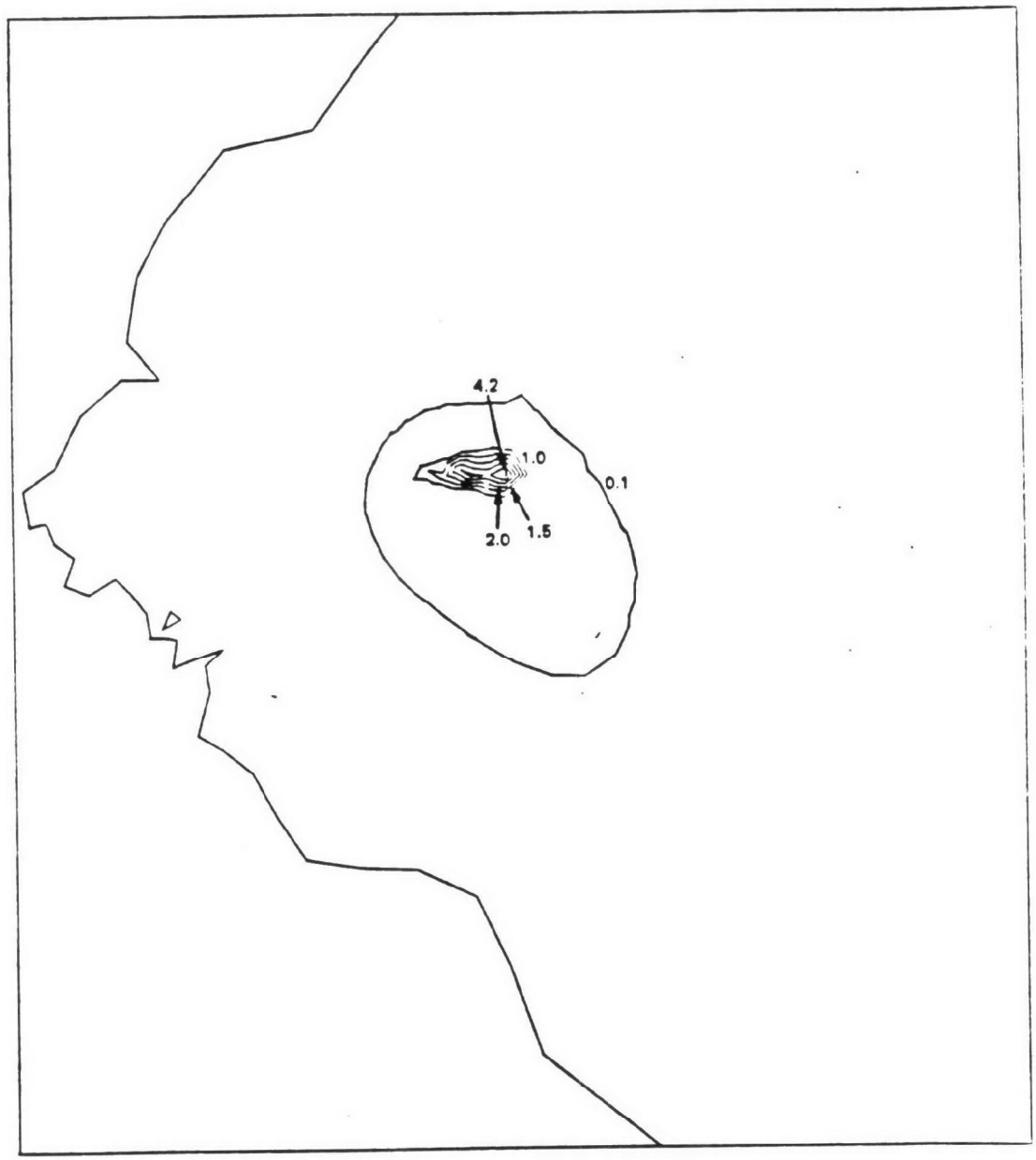
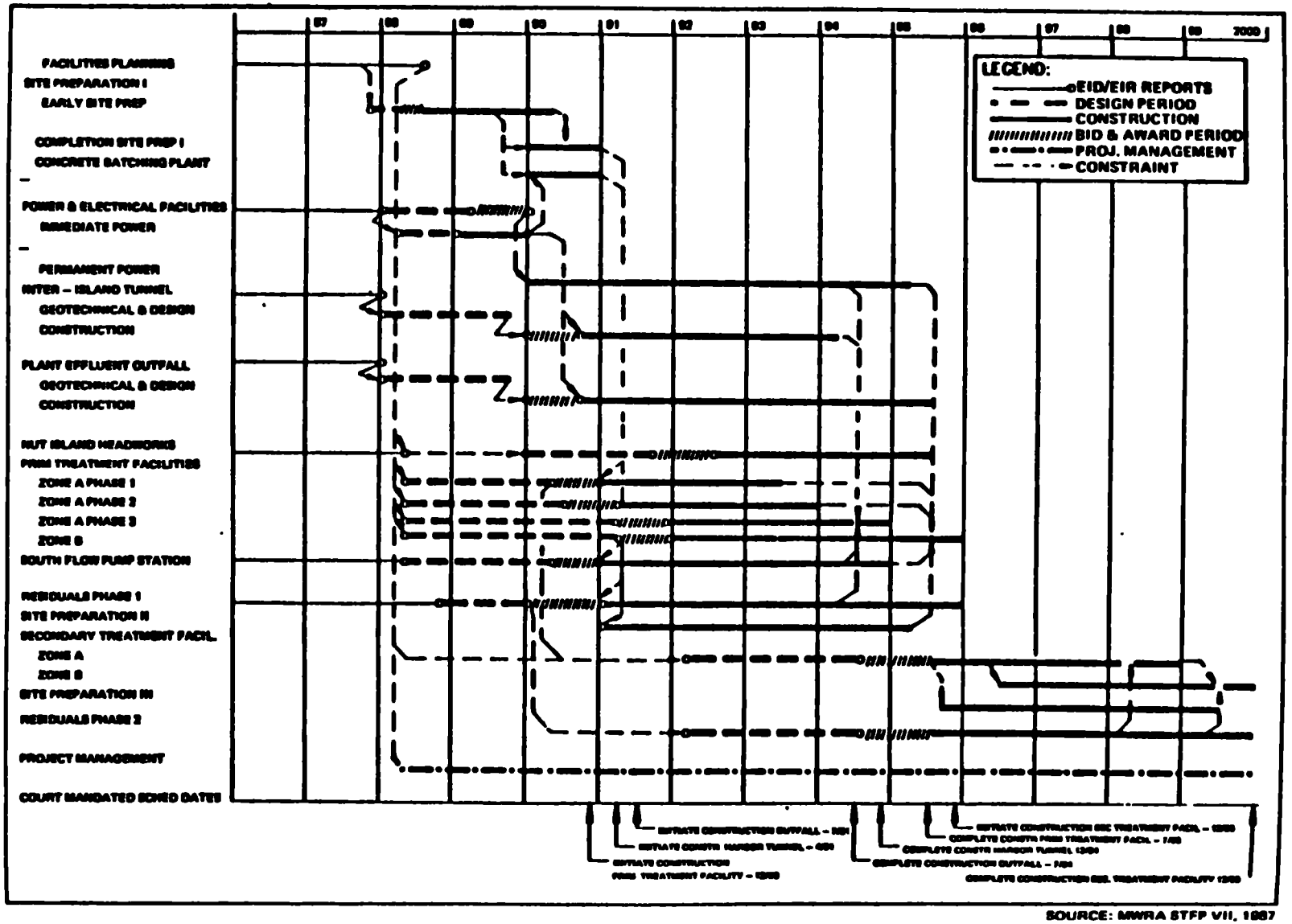


FIGURE 5.1.1.h. ELA PREDICTED SEDIMENTATION RATES, SITE 5, PRIMARY TREATMENT, STRATIFIED CONDITIONS ($g/m^2/day$)



SOURCE: MWRA STFP VII, 1987

FIGURE 6.1a. PROJECT TIME FRAME

5.2 VOLUME II CORRECTIONS

5.2.1 Text Changes

Page A-44. Second paragraph, "K = 10^{-6} m/sec" changed to "K = 5 x 10^{-6} m/sec."

Page A-74. The following was added at the end of the first paragraph "Recent evaluation by MWRA's consultant, CDM, indicates that the low DOs measured in September 1988 may be tainted by instrument malfunction. This would render the assumed ambient DO during fall resuspension events (6.5 mg/l) that much more conservatively low."

Page A-81. First paragraph, second sentence changed from "...were estimated from measurements far from known sources (A.2.2.3)." to read "...were estimated from measurements far from known sources (Section A.2.2.5)."

Page A-82. First paragraph, third sentence changed from "Because the highest nearfield dilutions...." to read "Because the lowest nearfield dilutions...."

Page A-86. The following was added at the end of the first paragraph "For these calculations, the background constituent concentrations corresponding to stratified ambient conditions were used, leading to conservatively high estimates of long-term average conditions."

Page B-17. First paragraph, last sentence changed from "...an influent PCB concentration of 0.005 mg/l was used...." to read "...an influent PCB concentration of 0.0005 mg/l was used...."

Page C-22. Third paragraph, third sentence changed from "...which coincided with incursions of colder water occurred twice." to read "...which coincided with incursions of colder water occurred four times."

Page G-23. New section added -

G.4.11. MASSACHUSETTS UNDERWATER ARCHAEOLOGY ACT

The Board of Underwater Archaeological Resources is the only agency/persons allowed under this Act to authorize and supervise removal and salvaging of underwater resources considered to be or to potentially be of an historical or educational value.

Excavation is allowed after a permit is granted by the Board, which consists of representatives of the Massachusetts Historic Commission, and is restricted to the confines of Massachusetts' territorial waters.

5.2.2 Table Changes

Page A-30. Table A.2.5. Saltwater Aquatic Life and Human Health Water Quality Criteria

(Numbers in bold were added or corrected)

Page A-40. Table A.3.1. Constituents Loadings

(Column headings in bold were corrected)

Page A-64. Table A.3.7. Maximum Dissolved Oxygen Deficits

(Footnote - units in bold were corrected)

Page A-83. Table A.3.13. Aquatic Life Toxicity Criteria Compliance for Site 2

(Numbers in bold were added or corrected)

Page A-84. Table A.3.14. Aquatic Life Toxicity Criteria Compliance for Site 4

(Column heading in bold was corrected)

Page A-85. Table A.3.15. Aquatic Life Toxicity Criteria Compliance for Site 5

(Numbers in bold were added or corrected)

Page A-87. Table A.3.16. Human Health Criteria Compliance for Site 2

(Numbers in bold were added or changed)

Page A-88. Table A.3.17. Human Health Criteria Compliance for Site 4

(Numbers in bold were added or changed)

Page A-89. Table A.3.18. Human Health Criteria Compliance for Site 5

(Numbers in bold were added or changed)

Page A-90. Table A.3.19. Summary of Predicted Water Quality Criteria Exceedances

(Numbers in bold were corrected)

TABLE A.2.5 SALTWATER AQUATIC LIFE AND HUMAN HEALTH WATER QUALITY CRITERIA

Chemical	CMC	CCC	Toxicity	Carcinogenicity 10^{-5}	Carcinogenicity 10^{-6}	Taste and Odor
VOLATILES						
benzene	5,100	700	--	400.	40.	--
bromomethane	12,000	6,400	--	157.	15.7	--
chloroform	--	--	--	157.	15.7	--
ethylbenzene	430	--	3,280	--	--	--
methyl chloride	12,000	6,400	--	157	15.7	--
styrene	430	--	3,280	--	--	--
tetrachloroethylene	10,200	450	--	88.5	8.85	--
ACID, BASE NEUTRALS						
anthracene	300	--	--	3.11	0.311	--
benz(a)anthracene	300	--	--	0.311	0.0311	--
benz(b)fluoranthene	300	--	--	0.311	0.0311	--
benz(k)fluoranthene	300	--	--	0.311	0.0311	--
benz(g,h,i)fluoranthene	300	--	--	0.311	0.0311	--
benz(a)pyrene	300	--	--	0.311	0.0311	--
bis(2-ethylhexyl)phthalate	2,944	3.4	--	500,000.	50,000.	--
butylbenzyl phthalate	2,944	3.4	--	--	--	--
chrysene	300	--	--	0.311	0.0311	--
dibenz(ah,h)anthracene	300	--	--	0.311	0.0311	--
3,3-dichlorobenzidine	--	--	--	0.2	0.02	--
2,4-dichlorophenol	--	--	3.090	--	--	0.3
di-n-octyl phthalate	2,944	3.4	--	1,540,000	154,000	--
fluorene	300	--	--	0.311	0.0311	--
hexachlorobenzene	160	129	--	0.0074	0.00074	--
indeno(1,2,3-cd)pyrene	300	--	--	0.311	0.0311	--
naphthalene	2,350	--	--	--	--	--
phenanthrene	300	--	--	0.311	0.0311	--
pyrene	300	--	--	0.311	0.0311	--
METALS						
arsenic	60	36	--	0.175	0.0175	--
beryllium	--	--	--	1.17	0.117	--
cadmium	43	9.3	--	--	--	--
chromium	1,100	50	--	--	--	--
copper	2.9	--	--	--	--	1,000

TABLE A.2.5 SALTWATER AQUATIC LIFE AND HUMAN HEALTH WATER QUALITY CRITERIA (Continued)

Chemical	CMC	CCC	Toxicity	Carcinogenicity 10^{-5}	Carcinogenicity 10^{-6}	Taste and Odor
METALS (continued)						
lead	140	5.6	--	--	--	--
mercury	2.1	0.025	0.146	--	--	--
nickel	75	8.3	--	1,000	100	--
selenium	410	54	--	--	--	--
silver	2.3	--	--	--	--	--
zinc	95	86	--	--	--	5,000
PESTICIDES						
aldrin	1.3	--	--	0.00079	0.000079	--
chlordane	0.18	0.004	--	0.0048	0.0048	--
dieldrin	0.71	0.0019	--	0.00076	0.000076	--
heptachlor	0.053	0.0036	--	0.0029	0.00029	--
toxaphene	0.21	0.0002	--	--	--	--
OTHER CHEMICALS						
PCBs	--	0.03	--	0.00079	0.000079	--

Source: From the EPA Gold Book as published in May, 1986, and updated in 1986 and again in May, 1987; all units are ug/l.

TABLE A.3.1 CONSTITUENTS LOADINGS

Constituents		Primary Effluent		Secondary Effluent	
Conventional Pollutants	(g/sec)	Low Ground-water	High Ground-water	Low Ground-water	High Ground-water
Carbonaceous BOD		2,915	3.145	374	858
Nitrogenous BOD		1,785	1,785	1,785	1,785
DO Deficit		139	278	139	278
Total Suspended Solids		1,150		363	
Nitrogen(3)		390	390	390	390
Flows(1)	(mgd)	377	657	390	670
	(m^3/s)	16.5	28.8	17.1	29.3

Toxic Chemicals	(mg/sec)	Primary Effluent		Secondary Effluent		
		Mean	Standard Deviation	Mean	Standard Deviation	High(2)
benzene		86.8	16.0	4.3	0.8	26.0
bromomethane		327.6	116.8	16.4	5.8	81.9
chloroform		117.1	54.0	11.7	5.4	58.5
ethylbenzene		175.8	79.4	8.8	4.0	52.7
methylene chloride		632.3	454.6	31.6	22.7	279.4
styrene		197.2	47.7	19.7	4.8	59.2
tetrachlorcethylene		324.2	189.9	32.4	19.0	97.3
trichloroethylene		183.3	97.4	11.5	6.1	68.7
bis(2-ethylhexyl)phthalate		411.3	121.1	41.1	12.1	205.6
butylbenzyl phthalate		334.7	149.3	16.7	7.5	100.4
di-n-octyl phthalate		345.7	129.7	34.6	13.0	103.7
fluorene		86.4	27.2	8.6	2.7	25.9
arsenic		30.0	9.3	20.0	6.2	24.0
cadmium		37.6	14.4	22.2	8.5	26.6
chromium		279.1	108.7	111.6	43.5	186.0
copper		1365.4	409.1	378.1	113.3	630.2
lead		197.2	86.2	157.0	68.6	109.6
mercury		20.4	25.7	6.5	8.2	7.8
nickel		353.1	157.9	282.5	126.3	290.8
selenium		251.9	237.9	139.9	132.1	167.9
silver		66.0	16.4	9.4	2.3	18.9
zinc		2731.0	3111.5	1092.4	1244.6	1365.5
aldrin		3.5	1.5	0.3	0.1	1.0
4.4'-DDT		0.85	0.29	0.09	0.03	0.252
dieldrin		0.37	0.15	0.04	0.02	0.11
heptachlor		4.0	0.03	0.44	0.003	1.32
polychlorinated biphenyls (PCBs)		16.7	4.3	1.3	0.3	4.7

(1) Average day, year 1999 for primary, 2020 for secondary.
(2) Reduced removal efficiency during storms.
(3) Other nutrients are not limiting.
Source: MWRA STFP III and V, A 1987.

TABLE A.3.7 MAXIMUM DISSOLVED OXYGEN DEFICITS (mg/l)[1]

Treatment	Stratification	Net Drift	Site 2	Site 4	Site 5
Primary	Unstratified	Average	0.91	0.63	0.21
		Worst	0.92	0.80	0.58
	Stratified	Average	4.15	1.56	0.39
		Worst	4.22	1.91	1.03
Secondary	Unstratified	Average	0.53	0.38	0.14
		Worst	0.54	0.48	0.35
	Stratified	Average	1.76	0.69	0.19
		Worst	1.81	0.87	0.46

(1) Averaged over area of approximately 1.5 km^2, representative of the mixing zone.

TABLE A.3.13 AQUATIC LIFE TOXICITY CRITERIA COMPLIANCE FOR SITE 2

CONSTITUENT	CONCENTRATION (ug/l)							
	Ambient Conc.	Other (1) Sources	Acute Toxicity			Chronic Toxicity		
			Primary	Secondary	CMC	Primary	Secondary	CCC
benzene		0.016	0.35	0.10	5100.00	0.34	0.10	700.00
bromomethane		0.001	1.26	0.24	12000.00	1.20	0.23	6400.00
chloroform		0.015	0.53	0.21		0.50	0.20	
ethylbenzene		0.003	0.77	0.18		0.72	0.17	
methylene chloride		0.004	3.08	1.33	12000.00	2.85	1.23	6400.00
styrene		0.022	0.80	0.21	430.00	0.77	0.20	
tetrachloroethylene		0.053	1.55	0.38	10200.00	1.44	0.36	450.00
trichloroethylene		0.015	0.84	0.25	2000.00	0.79	0.23	
bis(2-ethylhexyl)phthalate		0.002	1.53	0.60	2944.00	1.46	0.57	3.40
butylbenzyl phthalate		0.007	1.35	0.31	2944.00	1.27	0.29	3.40
di-n-octyl phthalate		0.002	1.34	0.31	2944.00	1.27	0.29	3.40
fluorene	0.0013		0.33	0.08	300.00	0.31	0.07	
arsenic	0.498	0.019	0.65	0.60	69.00	0.64	0.60	36.00
cadmium	0.006	0.049	0.22	0.15	43.00	0.21	0.15	9.30
chromium	0.316	0.074	1.63	1.04	1100.00	1.57	1.01	50.00
copper	0.074	0.184	6.08	2.43	2.90	5.87	2.34	
lead	0.091	0.466	1.45	1.27	140.00	1.41	1.23	5.60
mercury	0.004	0.007	0.136	0.051	2.100	0.124	0.047	0.025
nickel	0.604	0.203	2.41	2.09	75.00	2.34	2.03	8.30
selenium		0.273	1.66	1.04	410.00	1.55	0.98	54.00
silver		0.005	0.28	0.07	2.30	0.27	0.07	
zinc	0.810	0.949	17.84	8.19	95.00	16.38	7.67	86.00
aldrin			0.02	0.00	1.30	0.01	0.00	
4,4'-DDT			0.004	0.001	0.130	0.004	0.001	0.001
dieldrin			0.0017	0.0004	0.7100	0.0016	0.0004	0.0019
heptachlor			0.0127	0.0036	0.0530	0.0126	0.0036	0.0036
polychlorinated biphenyls	0.0073		0.074	0.022	10.000	0.071	0.022	0.030

(1) Refer to text for explanation

TABLE A.3.14 AQUATIC LIFE TOXICITY CRITERIA COMPLIANCE FOR SITE 4

CONSTITUENT	CONCENTRATIONS (ug/l)							
	Ambient Conc.	Other (1) Sources	Acute Toxicity			Acute Toxicity		
			Primary	Secondary	CMC	Primary	Secondary	CCC
benzene		0.011	0.21	0.05	5100.00	0.20	0.05	700.00
bromomethane		0.000	0.80	0.13	12000.00	0.72	0.11	6400.00
chloroform		0.010	0.33	0.11		0.29	0.10	
ethylbenzene		0.002	0.47	0.09		0.42	0.08	
methylene chloride		0.002	1.97	0.69	12000.00	1.69	0.59	6400.00
styrene		0.014	0.48	0.11	430.00	0.44	0.10	
tetrachloroethylene		0.035	0.98	0.21	10200.00	0.86	0.18	450.00
trichloroethylene		0.010	0.53	0.13	2000.00	0.46	0.11	
bis(2-ethylhexyl)phthalat		0.001	0.97	0.31	2944.00	0.88	0.28	3.40
butylbenzyl phthalate		0.004	0.87	0.16	2944.00	0.77	0.14	3.40
di-n-octyl phthalate		0.001	0.86	0.16	2944.00	0.77	0.14	3.40
fluorene			0.21	0.04	300.00	0.19	0.04	
arsenic	0.50	0.015	0.59	0.56	69.00	0.58	0.56	36.00
cadmium	0.01	0.035	0.14	0.10	43.00	0.13	0.09	9.30
chromium	0.32	0.054	1.11	0.69	1100.00	1.04	0.67	50.00
copper	0.07	0.136	3.66	1.27	2.90	3.36	1.19	
lead	0.09	0.336	0.97	0.86	140.00	0.91	0.81	5.60
mercury	0.004	0.005	0.092	0.035	2.100	0.078	0.031	0.025
nickel	0.60	0.144	1.72	1.52	75.00	1.61	1.44	8.30
selenium		0.199	1.09	0.70	410.00	0.96	0.62	54.00
silver		0.004	0.17	0.04	2.30	0.15	0.03	
zinc	0.81	0.697	12.06	5.73	95.00	10.44	5.08	86.00
aldrin		0.000	0.01	0.00	1.30	0.01	0.00	
4,4'-DDT			0.0022	0.0004	0.1300	0.0020	0.0004	0.0010
dieldrin			0.0010	0.0002	0.7100	0.0009	0.0002	0.0019
heptachlor			0.0081	0.0019	0.0530	0.0076	0.0017	0.0036
polychlorinated biphenyls	0.0073		0.0472	0.0147	10.0000	0.0439	0.0141	0.0300

(1) Refer to text for explanation

TABLE A.3.15 AQUATIC LIFE TOXICITY CRITERIA COMPLIANCE FOR SITE 5

CONSTITUENT	CONCENTRATIONS (ug/l)							
	Ambient Conc.	Other (1) Sources	Acute Toxicity			Chronic Toxicity		
			Primary	Secondary	CMC	Primary	Secondary	CCC
benzene		0.007	0.15	0.03	5100.00	0.14	0.03	700.00
bromomethane		0.000	0.60	0.08	12000.00	0.51	0.07	6400.00
chloroform		0.006	0.24	0.07		0.20	0.06	
ethylbenzene		0.001	0.35	0.06		0.29	0.05	
methylene chloride		0.001	1.48	0.43	12000.00	1.16	0.35	6400.00
styrene		0.009	0.35	0.07	430.00	0.31	0.06	
tetrachloroethylene		0.022	0.73	0.13	10200.00	0.58	0.11	450.00
trichloroethylene		0.006	0.39	0.08	2000.00	0.32	0.07	
bis(2-ethylhexyl)phthalat		0.001	0.73	0.20	2944.00	0.63	0.17	3.40
butylbenzyl phthalate		0.002	0.66	0.10	2944.00	0.54	0.09	3.40
di-n-octyl phthalate		0.000	0.65	0.10	2944.00	0.54	0.09	3.40
fluorene	0.001		0.16	0.03	300.00	0.13	0.02	
arsenic	0.498	0.011	0.56	0.55	69.00	0.56	0.54	36.00
cadmium	0.006	0.025	0.10	0.07	43.00	0.09	0.07	9.30
chromium	0.316	0.040	0.89	0.57	1100.00	0.80	0.55	50.00
copper	0.074	0.098	2.64	0.87	2.90	2.29	0.79	
lead	0.091	0.238	0.72	0.64	140.00	0.65	0.59	5.60
mercury	0.004	0.004	0.072	0.028	2.100	0.054	0.023	0.025
nickel	0.604	0.101	1.41	1.27	75.00	1.29	1.17	8.30
selenium		0.141	0.82	0.52	410.00	0.65	0.43	34.00
silver		0.003	0.12	0.02	2.30	0.10	0.02	
zinc	0.810	0.498	9.31	4.52	95.00	7.28	3.70	86.00
aldrin			0.01	0.00	1.30	0.01	0.00	
4,4'-DDT			0.0016	0.0003	0.1300	0.0013	0.0002	0.0010
dieldrin			0.0007	0.0001	0.7100	0.0006	0.0001	0.0019
heptachlor			0.0060	0.0012	0.0530	0.0054	0.0010	0.0036
polychlorinated biphenyls	0.0073		0.036	0.012	10.000	0.033	0.011	0.030

(1) Refer to text for explanation

TABLE A.3.16 HUMAN HEALTH CRITERIA COMPLIANCE FOR SITE 2

CONSTITUENT	CONCENTRATIONS (ug/l)						
	Ambient Conc.	Other (1) Sources	Primary	Secondary	Toxicity Criteria	Carcinogenicity 10^-5 Criteria	Carcinogenicity 10^-6 Criteria
benzene		0.016	0.28	0.03		400.00	40.00
bromomethane		0.001	0.88	0.05		157.00	15.70
chloroform		0.015	0.37	0.05		157.00	15.70
ethylbenzene		0.003	0.53	0.03	3280.00		
methylene chloride		0.004	1.90	0.13		157.00	15.70
styrene		0.022	0.61	0.08	3280.00		
tetrachloroethylene		0.053	1.03	0.16		88.50	8.85
trichloroethylene		0.015	0.57	0.05		807.00	80.70
bis(2-ethylhexyl)phthalat		0.002	1.11	0.12		500000.0	50000.0
butylbenzyl phthalate		0.007	0.91	0.06		0.00	0.00
di-n-octyl phthalate		0.002	0.93	0.10		1340000	134000
fluorene	0.001		0.233	0.026		0.311	0.0311
arsenic	0.498	0.019	0.614	0.582		0.175	0.0175
cadmium	0.006	0.049	0.18	0.13			
chromium	0.316	0.074	1.29	0.76			
copper	0.074	0.184	4.66	1.50			
lead	0.091	0.466	1.19	1.06			
mercury	0.004	0.007	0.077	0.032	0.146		
nickel	0.604	0.203	1.94	1.72		1000	100
selenium		0.273	1.08	0.73			
silver		0.005	0.22	0.04			
zinc	0.810	0.949	10.56	5.30			
aldrin			0.01052	0.00111		0.00079	0.000079
4,4'-DDT			0.00274	0.00029		0.00024	0.000024
dieldrin			0.00119	0.00013		0.00076	0.000076
heptachlor			0.01063	0.00125		0.00290	0.000290
polychlorinated biphenyls	0.00730		0.05747	0.01160		0.00079	0.000079

(1) Refer to text for explanation

TABLE A.3.17 HUMAN HEALTH CRITERIA COMPLIANCE FOR SITE 4

CONSTITUENT	CONCENTRATIONS (ug/l)						
	Ambient Conc.	Other (1) Sources	Primary	Secondary	Toxicity Criteria	Carcinogenicity 10^-5 Criteria	Carcinogenicity 10^-6 Criteria
benzene		0.011	0.13	0.02		400.00	40.00
bromomethane		0.000	0.42	0.02		157.00	15.70
chloroform		0.010	0.17	0.03		157.00	15.70
ethylbenzene		0.002	0.24	0.02	3280.00		
methylene chloride		0.002	0.86	0.06		157.00	15.70
styrene		0.014	0.28	0.04	3280.00	0.00	
tetrachloroethylene		0.035	0.48	0.08		88.50	8.85
trichloroethylene		0.010	0.26	0.03		807.00	80.70
bis(2-ethylhexyl)phthalat		0.001	0.52	0.06		500000.0	50000.0
butylbenzyl phthalate		0.004	0.43	0.03		0.00	
di-n-octyl phthalate		0.001	0.44	0.05		1540000	154000
fluorene	0.001	0.000	0.111	0.013		0.311	0.0311
arsenic	0.498	0.015	0.556	0.542		0.175	0.0175
cadmium	0.006	0.035	0.09	0.07			
chromium	0.316	0.054	0.77	0.53			
copper	0.074	0.136	2.15	0.76			
lead	0.091	0.336	0.71	0.65			
mercury	0.004	0.005	0.038	0.018	0.146		
nickel	0.604	0.144	1.25	1.15		1000	100
selenium	0.000	0.199	0.56	0.40			
silver	0.000	0.004	0.10	0.02			
zinc	0.810	0.697	5.39	3.07			
aldrin			0.00476	0.00050		0.00079	0.000079
4,4'-DDT			0.00121	0.00013		0.00024	0.000024
dieldrin			0.00053	0.00006		0.00076	0.000076
heptachlor			0.00502	0.00059		0.00290	0.000290
polychlorinated biphenyls	0.00730		0.03000	0.00924		0.00079	0.000079

(1) Refer to text for explanation

TABLE A.3.18 HUMAN HEALTH CRITERIA COMPLIANCE FOR SITE 5

CONSTITUENT	CONCENTRATIONS (ug/l)						
	Ambient Conc.	Other (1) Sources	Primary	Secondary	Toxicity Criteria	Carcinogenicity 10^-5 Criteria	Carcinogenicity 10^-6 Criteria
benzene		0.007	0.07	0.01		400.00	40.00
bromomethane		0.000	0.24	0.01		157.00	15.70
chloroform		0.006	0.09	0.02		157.00	15.70
ethylbenzene		0.001	0.13	0.01	3280.00		
methylene chloride		0.001	0.47	0.03		157.00	15.70
styrene		0.009	0.15	0.02	3280.00		
tetrachloroethylene		0.022	0.26	0.05		88.50	8.85
trichloroethylene		0.006	0.14	0.02		807.00	80.70
bis(2-ethylhexyl)phthalat		0.001	0.30	0.03		500000.00	50000.00
butylbenzyl phthalate		0.002	0.24	0.02			
di-n-octyl phthalate		0.000	0.25	0.03		1540000	154000
fluorene			0.063	0.008		0.311	0.0311
arsenic	0.498	0.011	0.531	0.524		0.175	0.0175
cadmium	0.006	0.025	0.06	0.05			
chromium	0.316	0.040	0.56	0.44			
copper	0.074	0.098	1.19	0.46			
lead	0.091	0.238	0.48	0.45			
mercury	0.004	0.004	0.02	0.01	0.146		
nickel	0.604	0.101	0.97	0.92		1000	100
selenium	0.000	0.141	0.33	0.25			
silver	0.000	0.003	0.05	0.01			
zinc	0.810	0.498	3.35	2.13			
aldrin			0.00258	0.00027		0.00079	0.000079
4,4'-DDT			0.00064	0.00007		0.00024	0.000024
dieldrin			0.00028	0.00003		0.00076	0.000076
heptachlor			0.00284	0.00033		0.00290	0.000290
polychlorinated biphenyls	0.00730		0.01959	0.00835		0.00079	0.000079

(1) Refer to text for explanation

TABLE A.3.19 SUMMARY OF PREDICTED WATER QUALITY CRITERIA EXCEEDANCES

Criterion Constituent	Ambient	CONCENTRATION/CRITERION RATIOS(1) Primary Site 2	Primary Site 4	Primary Site 5	Secondary Site 2	Secondary Site 4	Secondary Site 5
CMC							
copper		2.1	1.26				
CCC							
heptachlor		3.49	2.11	1.51	1.01		
4, 4'-DDT		3.55	1.99	1.34			
mercury		4.96	3.14	2.18	1.90	1.26	
PCBs		2.37	1.46	1.09			
Carcinogenicity							
(10^{-5} risk factor)							
aldrin		13.30	6.02	3.26	1.41		
4, 4'-DDT		11.40	5.04	2.65	1.21		
heptachlor		3.66	1.73				
dieldrin		1.57					
arsenic	2.85	3.51	3.17	3.04	3.32	3.09	2.99
PCBs	9 24	72.75	38.00	24.80	14.69	11.70	10.57
(10^{-6} risk factor)							
aldrin		133.1	60.23	32.11	14.08	6.35	3.43
4,4'-DDT		114.1	50.38	26.46	12.08	5.33	2.79
heptachlor		36.64	17.30	9.81	4.30	2.03	1.15
dieldrin		15.68	6.92	3.63	1.66		
flourene		7.50	3.56	2.04			
arsenic	28.45	35.07	31.75	30.37	33.25	30.95	30.84
PCBs	92.40	727.50	379.78	247.96	146.86	117.00	105.70

(1) $\frac{\text{Concentration}}{\text{Criterion}}$

5.2.3 Figure Changes

Page A-9. Figure A.2.2. Location if MWRA Current Meter Stations in Relation to Alternative Diffuser Sites was revised.

Page A-69. Figure A.3.8. ELA Predicted Sedimentation Rates, Site 5, Primary Treatment, Stratified Conditions was revised.

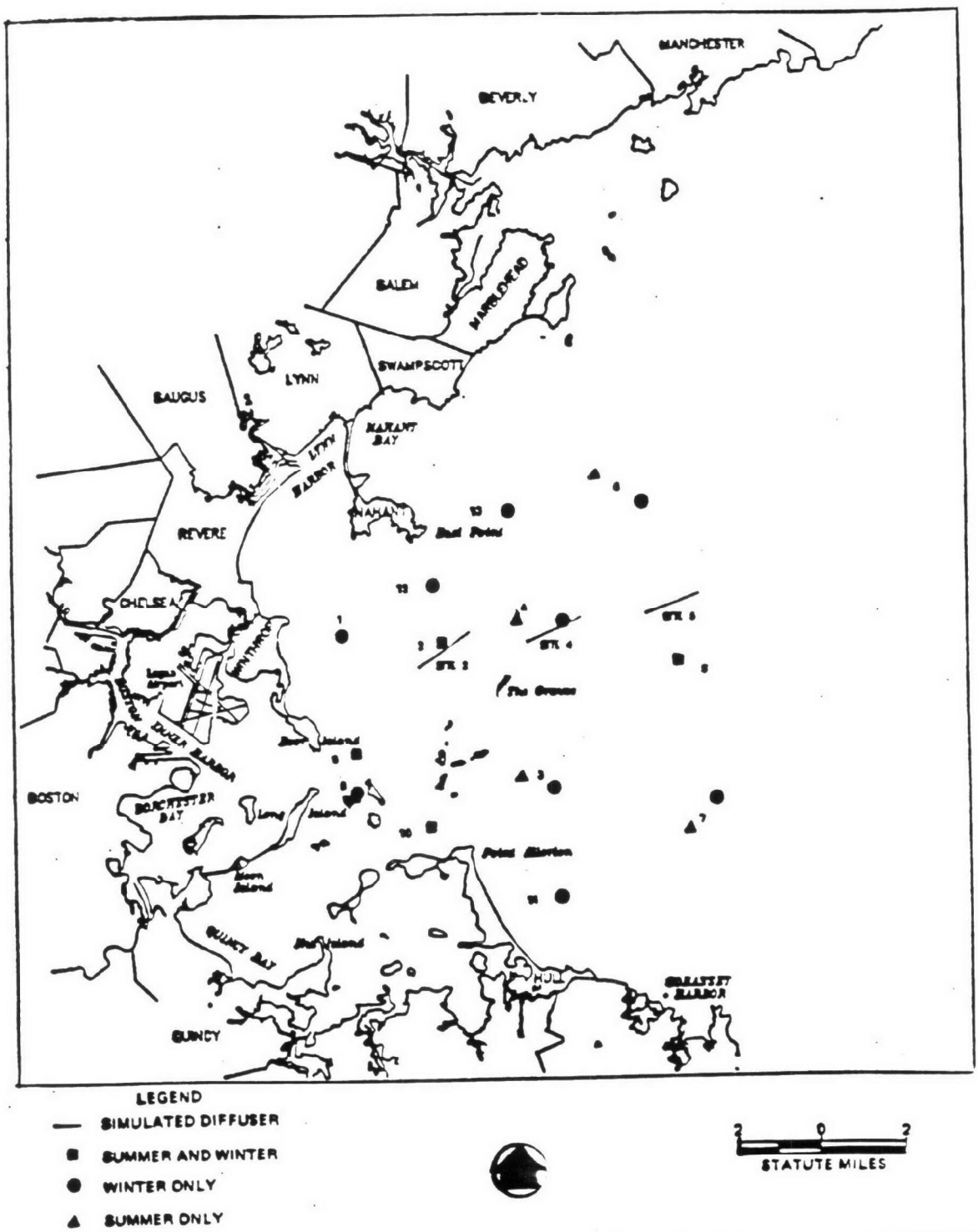


FIGURE A.2.2. LOCATION OF MWRA CURRENT METER STATIONS IN RELATION TO ALTERNATIVE DIFFUSER SITES

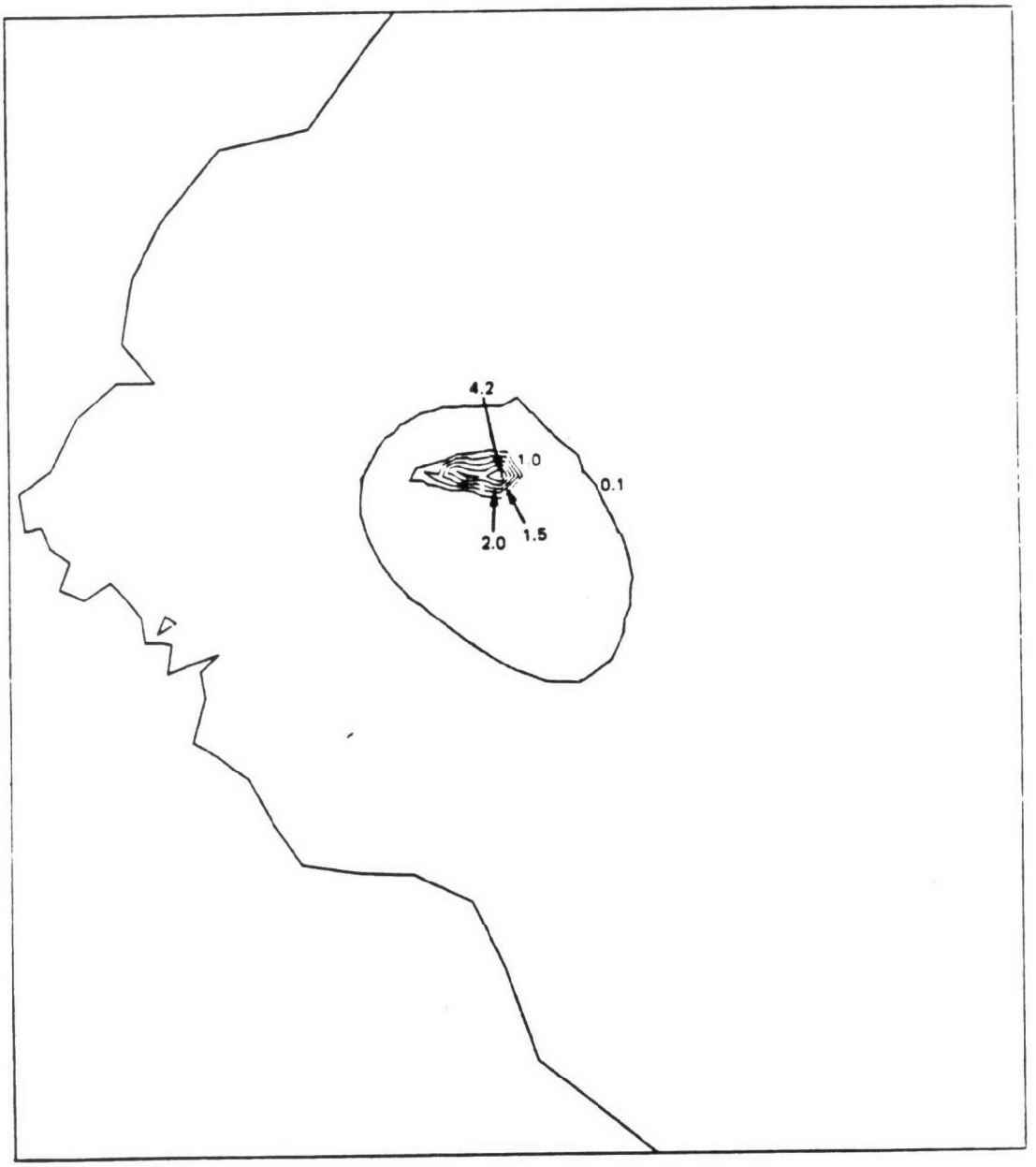


FIGURE A.3.8. ELA PREDICTED SEDIMENTATION RATES, SITE 5, PRIMARY TREATMENT, STRATIFIED CONDITIONS ($g/m^2/day$)

CHAPTER 6

REVIEW OF DRAFT SEIS RECOMMENDATIONS

6.1 INTRODUCTION

This chapter presents a review of the major issues on which EPA received new information or conducted additional analyses. Comments which were considered are discussed in Chapter 3. The Draft SEIS Recommendations are reexamined in light of the new analyses.

6.2 REVIEW OF NEW ISSUES

6.2.1 Beach Impact Assessment

In response to comments, an assessment of public health impacts on beaches (in terms of coliform and virus concentrations) was conducted for this Final SEIS. This analysis showed that even with less than full treatment, predicted coliform concentrations at the shoreline resulting from a discharge in the recommended outfall area will be well within state standards (Chapter 3, Issue #2 of this Final SEIS). The analysis of viral concentration showed that the predicted illness rate due to discharge of viruses from an outfall in the recommended location is well within EPA guidelines and is much lower than existing illness rates. Thus, no significant shoreline impacts are expected to occur as a result of the discharge from the recommended area and EPA's recommended outfall area is demonstrated to be an acceptable location in terms of shoreline impacts.

6.2.2 Site 6 - Maine Intermediate Water (MIW)

A major issue raised during the comment period was the potential impact of Maine Intermediate Water (MIW) on the siting of the outfall. It was suggested that siting the outfall further offshore (at Site 6) would result in the diffuser being located within MIW, which would restrict shore-ward transport of effluent. EPA conducted an analysis of MIW as discussed in Chapter 3 (Issue #1) of this Final SEIS, which shows that the recommended area, as all candidate outfall sites, is well within the area of winter MIW formation. As the summer progresses, the water column at all candidate sites warms and stratifies, and by late summer, the MIW is at least 10 miles and perhaps 30 miles beyond any potential outfall site (including Site 6). Thus, since all sites are within the MIW, it does not present a justification for siting the outfall further offshore.

6.2.3 Diffuser Design

Although the Draft SEIS indicated that the pipe diffuser had greater environmental impacts than the drilled riser diffuser due to the extensive dredging required for its construction, it did not contain a recommendation for diffuser design since not enough information was available on construction feasibility and costs of the alternative designs (drilled riser or pipe diffuser) to adequately compare the alternatives. A subsequent review of

construction technologies has revealed that the pipeline diffuser alternative appears less feasible because of uncertainties related to construction techniques and equipment in offshore situations. Thus, based on the greater environmental impacts of the pipe diffuser and the potential problems with construction feasibility, EPA prefers the drilled riser diffuser.

6.2.4 Accelerated Construction of Secondary Treatment Plant

Since release of the Draft SEIS, the issue of accelerating the schedule for construction of a portion of the secondary treatment plant has been raised. MWRA's accelerated construction plan now calls for completion of 25% of the secondary facilities around 1996, approximately 3 years earlier than the original plan for completion of all secondary facilities. The accelerated plan would, however, result in a delay in the completion of the primary treatment plant by approximately one year. EPA supports the concept of accelerated secondary treatment, and has determined that such a schedule does not alter the outfall siting decision. There are several issues related to the accelerated construction schedule which have not been adequately addressed, however; these are discussed in Chapter 4 of this Final SEIS.

6.2.5 Mitigation and Monitoring

Several commentors have requested a more detailed mitigation and monitoring program be presented by EPA. This is discussed in detail in Chapter 7.

6.2.6 Chlorine Toxicity

Since the issuance of the Draft SEIS, the MWRA released the results of their chlorine toxicity testing as part of the Final STFP (V, BB, 1988). The study indicated that for both primary and laboratory generated secondary effluents, chlorination (disinfection) could result in toxic impacts to marine organisms. EPA feels that these tests were not totally conclusive and therefore, as described in Chapter 7, recommends additional testing to determine the chlorination/dechlorination requirements. However, EPA believes that these whole effluent tests validate the conclusion in the Draft SEIS that no toxic impacts would occur at the recommended location.

6.3 SUMMARY OF MODIFICATIONS

EPA has reviewed all comments and any new information that has arisen since the issuance of the Draft SEIS. The new information and comments have resulted in no changes to the recommendations presented in the Draft SEIS for outfall diffuser location (Sites 4/5), outfall conduit design (deep rock tunnel) and inter-island conduit design (deep rock tunnel). Based on new information, EPA does now prefer the drilled riser diffuser design over the pipe diffuser, although should further investigations show that the drilled riser alternative is cost-prohibitive, EPA can accept a pipe diffuser (see Chapter 4 for more discussion). EPA will continue to review any new information that becomes available that could impact the recommendations contained in the Draft SEIS and this document.

CHAPTER 7

RECOMMENDED PLAN AND MITIGATION

7.1 RECOMMENDED PLAN

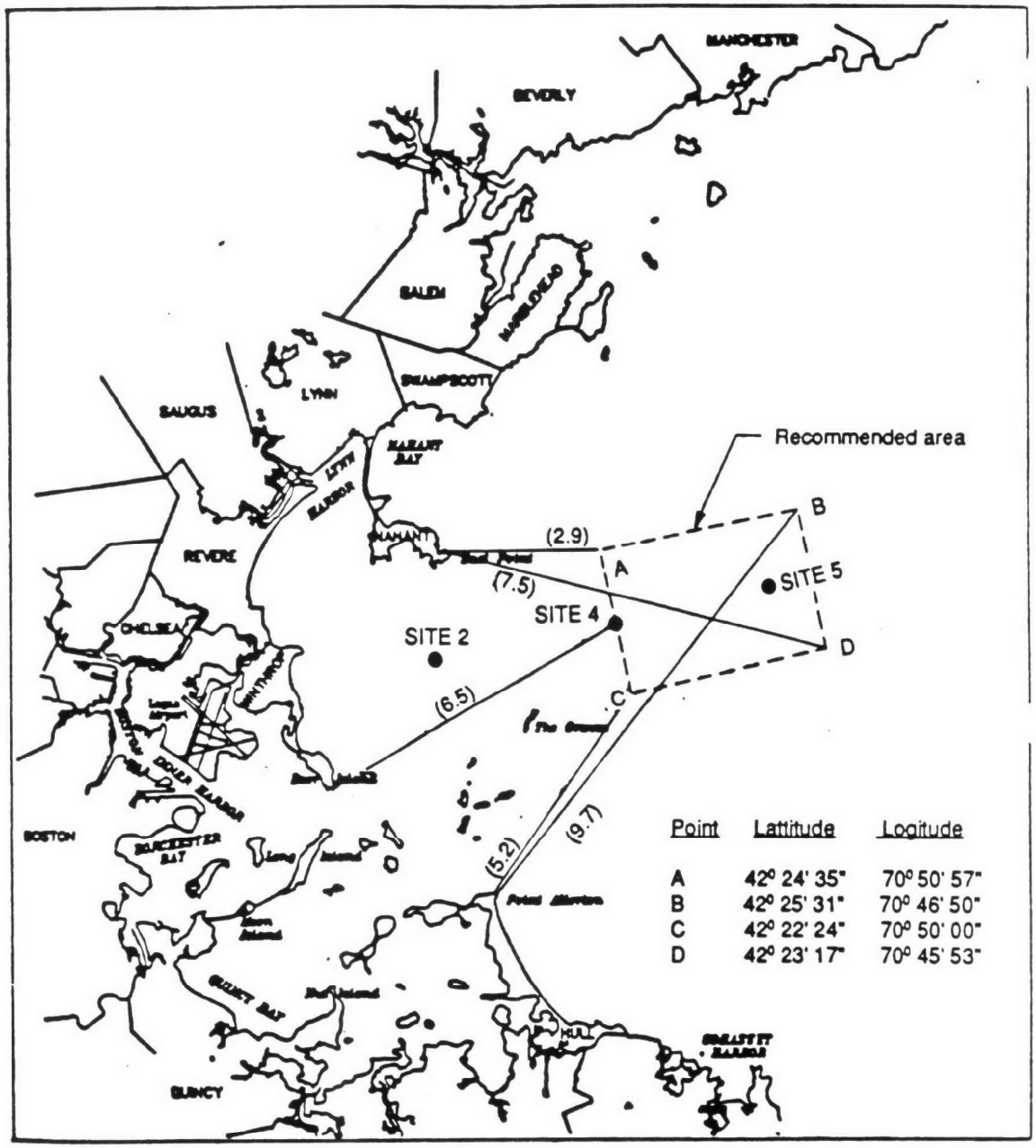
In this SEIS, four main decisions or recommendations were made with regard to the transport of wastewater. These decisions involved: 1) the recommended discharge location, 2) the recommended plan for outfall conduit construction, 3) the recommended plan for diffuser construction and 4) the recommended plan for inter-island conduit construction. The following is EPA's recommended plan.

7.1.1 Recommended Discharge Location

EPA studied three sites in considerable detail (Sites 2, 4 and 5; Figure 7.1) after an initial screening process to determine their potential acceptability as discharge locations. Based on predicted water quality, ecological, public health and harbor resources impacts as well as engineering considerations, EPA is recommending that the MWRA discharge (including all diffuser ports) be located in the area which lies totally within the rectangle shown on Figure 7.1. This area is bounded on the west by Site 4 and extends to the east of Site 5. The north and south boundaries are one diffuser length (6660 feet or 2000 meters) from the centerline that connects Sites 4 and 5. The north and south boundaries are to accommodate geotechnical considerations in this area. Figure 7.1 shows the latitude and longitude of the recommended area's coordinates as well as the distance in miles from this area to Nahant, Hull and Deer Island.

7.1.2 Recommended Plan for Outfall Conduit Construction

Two alternatives were examined for construction of the outfall conduit to convey effluent from Deer Island to the recommended discharge location: a deep rock tunnel and a pipeline. The pipeline conveyance was dropped from consideration during the initial screening due to significant environmental impacts resulting from dredging activities. The deep rock tunnel was then evaluated in detail by EPA. The tunnel includes a 30-foot by 15-foot rectangular vertical access shaft on Deer Island and a 25-foot finished inside diameter concrete lined tunnel connected to the access shaft. The length of the tunnel would be between 28,000 and 54,000 feet, depending upon the diffuser design and the discharge location. The vertical shaft would be excavated deep enough to allow for a 0.25 percent (or less) positive sloping tunnel and to assure a minimum of 60 feet of bedrock overlying the outfall tunnel. Impacts due to tunnel construction are expected to be minimal since most of the construction will take place underground, therefore, the recommended plan for construction for the effluent outfall conduit is the deep rock tunnel.



NOTE:
Distances in parethases are given in statute miles

FIGURE 7-1. RECOMMENDED OUTFALL DIFFUSER LOCATION

7.1.3 Recommended Plan for Diffuser Construction

Two diffuser construction alternatives to disperse effluent at the recommended discharge location were examined in EPA's detailed analysis. The first diffuser type is a pipeline situated within an excavated trench connected to the deep rock tunnel outfall by one to ten risers. Ports or nozzles would either be cast into or attached to the pipe. Each individual riser would connect the tunnel to a diffuser pipe. The second alternative is a drilled riser diffuser with approximately 80 risers each fitted with a multiport cap drilled through bedrock and connected to the outfall tunnel.

The drilled riser diffuser would result in the least marine ecosystem and harbor resources impacts. The major differences between the two diffuser alternatives are that the pipeline diffuser could present significant construction difficulties and would generate approximately 1.4 million cubic yards of material while the drilled riser would generate only 12,000 cubic yards of material and would be easier to construct. Dredged material from either diffuser alternative would be disposed of at the Foul Area Disposal Site. Based on the significant dredging impacts associated with the pipeline diffuser, and potential construction difficulties, the recommended plan is a drilled riser diffuser.

7.1.4 Inter-island Conveyance Structure

Wastewater entering the South System of the MWRA collection and treatment system will receive some initial treatment for removal of grit and bulk solids at the proposed headworks on Nut Island. The wastewater will then be transferred via an inter-island conveyance system to Deer Island for further treatment. Three inter-island conveyance structures were screened using a set of criteria identical to those used to screen potential outfall construction options. These three potential conveyance systems are a pipeline, a sunken tube and a deep rock tunnel. The pipeline and sunken tube alternatives were dropped from consideration during initial screening due to environmental impacts of dredging and costs; therefore, the deep rock tunnel was the only alternative to undergo detailed evaluation. The deep rock tunnel would consist of an 11 foot finished inside diameter deep rock tunnel from Nut Island to Deer Island. Vertical access shafts would be excavated on both islands. Excavation of the 24,800-ft-long tunnel would begin at the Deer Island shaft and eventually connect to Nut Island and slope positively towards Nut Island. Excavated materials would be removed through the Deer Island shaft. The tunnel would be lined with concrete sections. The impacts associated with the deep-rock tunnel are expected to be minimal and therefore, the recommended plan is the deep rock tunnel.

7.2 UNRESOLVED ISSUES

7.2.1 Exact Location of Outfall

The exact location of the effluent diffuser within the recommended area as well as the diffuser orientation within the recommended area must still be determined. This decision can be made when results of detailed geological investigations being conducted by MWRA become available. MWRA must demonstrate

that the water quality, marine ecosystem and shoreline impacts associated with the chosen location will be equal to or less than those predicted for Site 4.

7.2.2 Accelerated Secondary Treatment

EPA finds the concept of the proposed accelerated secondary treatment schedule to be acceptable if it is logistically achievable. MWRA must evaluate the potential impacts of the accelerated construction plan. However, since this accelerated secondary schedule may result in approximately a one year delay in the completion of full primary treatment and since the fate of effluent during that period is not known, MWRA will have to conduct a full evaluation of discharge alternatives for that period. When these determinations are made, EPA will review the evaluation and make a decision as to its acceptability.

7.3 MITIGATION

7.3.1 Massachusetts Bay and Boston Harbor Monitoring

The precise set of parameters to be monitored at the new outfall location have yet to be determined. An agency working group, in cooperation with the newly formed Massachusetts/Cape Cod Bay Citizens Advisory Group will review the existing data and make recommendations on the type and extent of monitoring program to be undertaken. When the precise location of the diffuser is decided after review of the geotechnical data, permanent sampling stations will be designated for the periodic collections of chemical and biological data. Several years of preoperational ecological sampling will be required to establish an adequate statistical baseline. Once the outfall is operational, results of periodic testing will be compared to the preoperational baseline to determine outfall impacts.

EPA is not here establishing the specific requirements for such a monitoring program in this SEIS, although it will be involved in developing the program in conjunction with other agencies and the citizen's group discussed above. However, EPA feels that an adequate monitoring program would include regular testing of the water column, sediment and tissues of ecologically sensitive and economically important marine organisms for those parameters identified in the Draft and Final SEIS as exceeding water quality criteria at the recommended outfall location. This is especially important for PCBs, as an accurate loading rate from the discharge into the marine environment is still unknown. It is also anticipated that the new federal discharge permit will require regular bioassay and bioaccumulation monitoring of the discharge to assess compliance with the permit and to monitor for long-term effects.

7.3.2 Identification and Control of Pollutants

Despite the fact that the removal efficiencies for the proposed Deer Island primary and secondary facilities were based on the best available information, there is uncertainty about the actual pollutant levels in the effluents. To insure that the analysis presented in the SEIS and the MWRA STFP is accurate, EPA requires that a pilot plant be built to simulate treatment expected in the new treatment plant. EPA also requires that a hydraulic model of the diffuser be used to better define and maximize the dilution characteristics at the

outfall location. The diffuser hydraulic model can also be used to develop final diffuser design specifications for maximum hydraulic efficiency and to ensure adequate purging of seawater from the diffuser.

Although EPA believes that the water quality criteria exceedances due to the proposed outfall will not result in significant adverse impacts to the marine ecosystem or public health, it believes that best efforts should be made to achieve total consistency with the criteria. Hence, results from the pilot plant operation and diffuser hydraulic modeling should be used to identify problem pollutants that could be reduced through source reduction or pretreatment. As a result of toxicity violations of MWRA's existing discharge permit EPA is now requiring MWRA to develop a Toxicity Reduction Evaluation (TRE) for the existing system. This TRE will address sources of pollutants which are currently causing the toxicity violations, which may be the same as those constituents for which EPA predicts potential criteria exceedances (especially because those criteria exceedances were based on existing influent data). Once problem pollutants are fully identified, appropriate action under the TRE would involve source control or pretreatment measures to minimize entry of those pollutants into the MWRA sewer system. If urban run-off or other non-point discharges are identified as sources of problem pollutants, best management practices would be implemented to minimize pollutants as required under the 1987 amendments to the Water Quality Act. EPA will continue to aid MWRA in developing a TRE program in the hope that appropriate action now will minimize future impacts.

7.3.3 Dechlorination

As discussed in Chapter 6 of this Final SEIS, bioassay testing has indicated that the proposed chlorine disinfection of primary and secondary effluents could result in toxicity to marine organisms. It is anticipated that some residual chlorine will decay during the long residence time of the outfall tunnel so that initial mixing may be adequate to negate these toxic effects. Further analysis by MWRA should be performed to test the toxicity of effluent after an appropriate simulated tunnel residence time. It is recommended that such testing be performed using effluents generated from the pilot plant (see above). However, EPA recommends that, unless MWRA can show through this additional testing that decay in the outfall tunnel and initial mixing will adequately reduce effluent toxicity, dechlorination facilities should be constructed on Deer Island.

7.3.4 Material Disposal

Disposal of material from outfall and inter-island tunnel construction should be closely coordinated with ongoing local construction projects to maximize beneficial use of this material and to minimize the volume of material which would have to be landfilled or otherwise disposed.

7.3.5 Construction Resources

Demand for scarce or unique construction resources by several major construction projects planned for the Boston region could potentially slow the pace of construction of the outfall and inter-island conduits. MWRA must

continue to develop an integrated construction management approach and should participate in the Governor's Office of Economic Development Task Force.

7.3.6 Diffuser Design

The diffuser should be designed to incorporate features which would minimize conflicts with fisherman dragging activities.

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APPENDIX A

COMMENT LETTERS

E.1

Action:
ROR ff
Due date
cc: L.1.
1/1

E1

THE COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS SENATE
STATE HOUSE BOSTON 02133

HON. FRANCIS D. DORIS
SUFFOLK ESSEX MIDDLESEX
DISTRICT
Room 518
Tel. 722-1650
Chairman
JOINT LEGISLATIVE COMMITTEE ON
FEDERAL FINANCIAL ASSISTANCE

Committees
Insurance
Vice Chairman
Ways and Means
Vice Chairman
Municipalities and Urban Affairs
Veterans and
Federal Relations

April 30, 1988

Mr. Michael R. Deland
Regional Administrator
U.S.EPA - Region 1
J.F.K. Federal Building
Boston, MA 02203

Dear Mr. Deland:

I am taking this opportunity to strongly support the proposed selection of Site 6 rather than Site 5 for the placement of the tunnelling pipe at the Outfall Location of the secondary treatment facility for Boston Harbor.

As I understand, the residents of all areas surrounding this location (Winthrop, Nahant, and Revere) have expressed their preference strongly. Their position I support. Selecting Site 6 makes sense in all cases, since it is relatively clear that selecting either sites 4 or sites 5 presents the possibility of sludge and debris returning to the beaches and communities mentioned above.

I would greatly appreciate receiving any of the information used to determine the appropriate selection of this outfall pipe and would appreciate being kept up-to-date relative to decisions being debated.

Many thanks.

Sincerely,

Francis D. Doris
SENATOR
Suffolk, Essex, Middlesex

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E2

Action: D
RER #:
Due date:
cc: L...
MO

The Commonwealth of Massachusetts

HOUSE OF REPRESENTATIVES
STATE HOUSE, BOSTON 02133
VICE CHAIRMAN, STATE ADMINISTRATION

ALFRED E. SACCHESE, JR.
[illegible]
[illegible]
[illegible]
TEL. [illegible]

Post Audit and Oversight
Personnel and Administration
Governor's Committee on
Physical Fitness and Sports
ROOM 109, STATE HOUSE
TEL. 722 2063

May 10, 1988

RECEIVED
MAY 13 88
OFFICE OF GOVERNMENT RELATIONS & ENVIRONMENTAL REVIEW

Michael Deland, Regional Administrator
Environmental Protection Agency
J. F. Kennedy Federal Building
Boston, MA 02203

Dear Mr. Deland:

I write on this occasion to urge you to select outfall location at Site 6 which is nine miles from Nahant. The area presently recommended for this large sewage outfall is dangerously close to our shorelines. It would make much more sense to use Site 6 which is a site, I believe, to be the most logical and most safe for our environment.

If you have any questions or concerns about my comments, or about my positions, please feel free to call me. But, I would hope that your office will recommend Site 6 for the outfall location for this sewage outfall.

Sincerely,

ALFRED E. SACCHESE, JR.
STATE REPRESENTATIVE

AES:th

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MAY 13 1988
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E3

Action: D
RER #:
Due date:
cc: L.I
MO

The Commonwealth of Massachusetts

SENATE MAJORITY LEADER
STATE HOUSE, BOSTON 02133

Senator Walter J. Boverini
1st Essex District
[illegible]
Tel. [illegible]

Senate Rules Committee
Ethics and Policy Committee
Ethics Reform Commission

May 16, 1988

Mr. Michael Deland
Regional Administrator
Environmental Protection Agency
J. F. Kennedy Building
Boston, MA 02203

Dear Mr. Deland:

I am writing this letter in strong support of the Nahant Board of Selectman's proposal that Site 6 -- the outfall location nine miles from Nahant, in Hull -- be further studied by the Massachusetts Water Resources Authority. Many of us who have been close to the issue over the last few years are convinced that further study would clearly show that Site 6 is a better location, not only for Boston Harbor, but the entire North Shore.

I am certain that any increase in the distance that the Site outfall is located would result in increased cost. But in the interest of our future generations, we feel that additional funding would be an investment in their health and welfare.

Once again, I urge you to do all in your power to insure that Site 6 be selected for the outfall.

Sincerely,

Walter J. Boverini
Senate Majority Leader

WJB/mcd

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E4

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MAY 1 1988
WATER MANAGEMENT DIVISION

E4

TOWN OF NAHANT, MASSACHUSETTS 01908

OFFICE OF THE

Board of Selectmen

BOARD OF HEALTH — PUBLIC WORKS DEPARTMENT
CEMETERY COMMISSIONERS

RICHARD J. LOMBARDI, CHAIRMAN
CHARLES A. ELY — SECRETARY
JAMES M. SCHLOSS

TELEPHONE (617) 581-0200

May 12, 1988

RECEIVED
MAY 16 1988
REGIONAL ADMINISTRATOR

Mr. Michael Deland, Regional Administrator
Environmental Protection Agency
J. F. Kennedy Building
Boston, MA 02203

Dear Mr. Deland:

The Nahant Board of Selectmen urges you to require that the Massachusetts Water Resources Authority (MWRA) study Site 6 — the outfall location nine miles from Nahant and Hull. We believe that a study of Site 6 would show clearly that it is a better location, one which would protect not only Boston Harbor but also Nahant and the North Shore.

I appreciated your meeting with us on April 15 at Congressman Mavroules office, along with William Coffey and Michael Manning. In particular, I appreciate your willingness to put current meters at Site 6. I thought it was a productive meeting, showing clearly the weight of scientific reasons for selection of Site 6.

What is needed now is a more complete study of Site 6, including not only current meters but also other oceanographic measurements, such as temperature and salinity profiles, as well as biological studies and geotechnical studies.

There may be arguments that there is insufficient time. These arguments are fallacious. The tunnel boring machine for the outfall has not yet been ordered, and it will be at least two years before the machine is delivered. There is time to study Site 6. An outfall at Site 6 would be a wise insurance policy, which would help insure that Massachusetts Bay is not polluted in the process of cleaning up Boston Harbor.

It is also urgent that accelerated secondary treatment be given to MWRA sewage. The rich lobstering, shell fishing, and fishing grounds on Nahant's shores and in Nahant waters can be protected only if the sewage of Boston and the other 42 cities and towns in the MWRA district is given secondary treatment before being discharged into Massachusetts Bay.

The Boston Harbor Wastewater Conveyance System Draft Supplemental Environmental Impact Statement (DSEIS) is inadequate and inaccurate in many ways. Please consider carefully the comments of the capable and well qualified Nahant scientists working on SWIM's comments on this document. Dr. Jon Witman and Dr. Kenneth P. Sebens, scientists at Northeastern University's Marine Science Center in Nahant, have written to Secretary James S. Hoyte imploring him to study Site 6. These are the scientists who know more than anyone else what is out at Sites 4, 4.5, 5, and 6. They have been there. Please do not dismiss their testimony lightly. Enclosed is a copy of their letter.

I would also like to mention that Nahant's mathematician, Dr. David Carter, has found many problems with the computer models. He has found that the MIT model shows that under certain conditions effluent would simply circle around site 4 rather than drifting off and being diluted. With a change of winds, this could cause a tremendous slug of pollution to hit Nahant. Please read his report with great care. In addition, consider the limitations of computer models: ecologists have found that every time they make a computer model, then test in the field, the computer model was wrong. Computers sound elegant, but with a complicated system they sometimes simplify to the point of being useless. A copy of Dr. Carter's testimony is attached.

The other problem I have to tell you about does not require a PhD in mathematics or biology to understand: the maps of commercial fishing resources and of parks and beaches (4.2.5 c and d) are totally inaccurate. Nahant has many small beaches, not on the map, and we have many parks. Egg Rock (the Henry Cabot Lodge Bird Sanctuary) is not on the map. We have lobsters, in fact one of the best lobster fisheries in the nation; the shellfish beds are all around Nahant (42.5 acres and they are all closed because of pollution. We want that pollution cleaned up. Your resource map does not even include finfish, another rich North Shore resource. Frankly, it is difficult to look at those EPA maps without anger. They seem to indicate the level of concern that the EPA has for Nahant and the resources of the North and South Shores.

I suspect that the mathematics and the resources mapping of your documents may be of equal quality. Certainly I do not see any reason for trusting one more than the other . Considering all the unknowns and all the errors, there is only one solution to safeguard Nahant and Massachusetts Bay: **BUILD THE OUTFALL TO SITE 6.**

Attached is a copy of a resolution passed unanimously at the Nahant Town Meeting on April 30, 1988. The Nahant Board of Selectmen fully supports this resolution and the goals of Nahant SWIM, Inc. (Safer Waters in Massachusetts).

Very truly yours,

BOARD OF SELECTMEN

Richard J. Lobkard
Chairman

cc: Congressman Nicholas Mavroules
Senator Walter Boverini
Representative Thomas McGee

E5

Robert F. Fiske
J. Christopher Callahan
John F. Burke (Chairman)
Thomas M. Doherty
Lawrence Giovannelli

Town of Swampscott

OFFICE OF THE

Board of Selectmen

ELIHU THOMSON ADMINISTRATION BUILDING
SWAMPSCOTT MASSACHUSETTS 01907-2896

E5

S. Josette Parisi
Administrative Assistant
595-1645

May 16, 1988

Mr. Michael Deland, Regional Administrator
Environmental Protection Agency
J F Kennedy Federal Building
Boston, MA 02203

Dear Mr. Deland:

Please help protect BOTH Boston Harbor AND Massachusetts Bay from pollution.

The area now recommended for the <u>largest sewage outfall in the world</u> is dangerously close to shore. Tidal currents could bring it onto our beaches, shellfish areas could remain closed forever, and fish and lobster diseases could increase. It does not make sense to clean up one area--Boston Harbor--by polluting another--Massachusetts Bay.

We urge you to require:

1. An outfall location at "Site 6"--nine miles from Marblehead, Swampscott, Nahant, Hull, Cohasset, and Scituate
2. Primary and secondary plants built simultaneously, so minimally treated sewage is not discharged into Massachusetts Bay
3. No degradation of the Massachusetts Water Quality Standards.

We look forward to your cooperation regarding this important matter.

RECEIVED - EPA
MAY 23 1988
WATER QUALITY BRANCH

Sincerely,

BOARD OF SELECTMEN

John F. Burke
Chairman

sjp

cc Senator Walter Boverini
Representative Lawrence Alexander

E6

E6

Jacqueline Kahn 5-16-88

GEORGE V COLELLA
Mayor

THE CITY OF
REVERE, MASSACHUSETTS
—
OFFICE OF THE MAYOR
CITY HALL

May 10, 1988

Michael Deland, Regional Administrator
Environmental Protection Agency
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Dear Mr. Deland:

Attached please find copy of a statement, by me, delivered at an informational meeting before the U.S. Environmental Protection Agency - Region I, relative to the Supplemental Environmental Impact Statement for the Boston Harbor Wastewater Conveyance Systems.

The statement will serve as the position of the City of Revere during this comment period; and so noted for the record.

Your attention to this matter will be greatly appreciated.

Very truly yours,

George V. Colella
Mayor

GVC/eg

Certified Mail Receipt # P 699 176 854

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STATEMENT
OF
THE HONORABLE GEORGE V. COLELLA

MAYOR OF THE CITY OF REVERE

BEFORE THE
U.S. ENVIRONMENTAL PROTECTION AGENCY - REGION 1
APRIL 19, 1988

BEACHMONT SCHOOL
15 EVERARD STREET.
REVERE, MASSACHUSETTS

RELATIVE TO:

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE
BOSTON HARBOR WASTEWATER CONVEYANCE SYSTEMS

Thank you for allowing me the opportunity of commenting on the Boston Harbor Wastewater Conveyance System Draft Supplemental Environmental Impact Statement.

It is indeed fitting that we meet tonight here in Revere on the two hundred and thirteenth anniversary of the great events that sparked the beginning of the American Revolution for independence.

Two hundred and thirteen years ago last evening the person for whom this community is named Paul Revere embarked upon an historic mission to spread the alarm of the impending British movement into Lexington and Concord.

Also on that historic evening, the sexton of the old North Church, Robert Newman, hung a lantern in the steeple of the Old North Church to indicate the route of the British plan of attack.

If Paul Revere and Robert Newman were alive this evening, Newman would have to hang three lanterns in the church steeple to warn of the MWRA's sludge disposal plan of attack upon thus community by both land as well as sea and Paul Revere would have to warn our inhabitants that the EPA and the MWRA are coming.

While the historical illusions may be whimsical the threat of the EPA's and the MWRA's sewerage and sludge disposal plans are of grave concern to all of the residents of the City of Revere.

The residents of the City of Revere are concerned about the MWRA's plans to locate a sludge residuals disposal site at Rowe's Quarry on the Northern boundary of our community and we have been working diligently to convince all appropriate governmental agencies of the environmental inappropriateness of that site.

The residents of the City of Revere are concerned about the MWRA's plans to locate parking facilities in our community for the 600 to 900 automobiles of the construction workers who will be constructing the Deer Island Sewerage treatment facility. The traffic impact on Revere caused by this parking facility could compound our already difficult traffic congestion problems.

I am here tonight to register the opposition of the people of the City of Revere to the U.S. Environmental Protection Agency's recommendation of a site 2.6 miles off Nahant's East Point in Massachusetts Bay at the confluence of Broadsound and Revere Beach as the site for the MWRA's sewerage outfall facility.

The people of the City of Revere are shocked and dismayed by the EPA's recommendations to locate the world's largest sewerage discharge facility so close to the shoreline of the nation's first public beach and the Metropolitan Boston Area's most actively used recreation areas, Revere Beach.

I find it hard to believe that the EPA could select a location so close to the shorelines of Revere, Winthrop, Nahant, Swampscott and Marblehead to discharge the sewage of 43 Greater Boston Cities and Towns.

At the site recommended by the EPA, Five Hundred Million gallons of waste will be dumped every day. During storms, one billion, two hundred and twenty three million gallons of waste will be discharged at this site.

To add insult to injury, during the initial period of operations between 1994 and 1995, five hundred million gallons of untreated waste will be dumped off of Revere Beach each day supplemented only by a common ordinary chlorine additive.

Local environmental groups have conducted tests at the EPA's designated sewerage discharge site and the evidence thus far indicates that discharged sewerage materials would reach the shoreline by means of the tidal currents.

Everyone in this room this evening is committed to the noble objective of cleaning up Boston Harbor and we recognize the difficult task that both the EPA and the MWRA have in attempting to achieve that objective.

However, I honestly feel that the recommendation of the EPA to select a discharge site in Massachusetts Bay at a location so near to the shoreline of the North Shore, Cleans Up Boston Harbor at the expense of Massachusetts Bay.

My greatest fear is that Boston Harbor will be cleaned up but Revere Beach, Winthrop Beach and the Beaches of Nahant, Lynn, Swampscott and Marblehead will be polluted and degraded and will become unusable as public recreational areas.

I have reviewed a document entitled <u>The Sapphire Necklace prepared</u> by Nahant Swim Incorporated, which, as I am sure you are aware, is a proposal for the discharge of the MWRA district's sewerage at a site further out to sea than both the EPA's and the MWRA's preferred discharge sites. I have also reviewed Swim's position paper on <u>Accelerating the MWRA Schedule</u> prepared by Kevin Jangaard and Robert Vanderslice and I endorse their proposal with respect to the location of the sewerage outfall and the schedule of construction of primary and secondary treatment

FACILITIES TO TREAT THE SEWERAGE WHICH WILL BE DISCHARGED AT THE MWRA OUTFALL.

I STRONGLY URGE THE EPA AND THE MWRA TO DESIGNATE SITE 6, THE FURTHEST OFF SHORE SITE AS THE BEST POSSIBLE LOCATION FOR THE WORLD'S LARGEST SINGLE DIAMETER SEWERAGE OUTFALL DISCHARGE.

I URGE THE MWRA TO CONSTRUCT BOTH THE PRIMARY AND SECONDARY TREATMENT PLANTS AT THE SAME TIME OR AS CLOSE TO THE SAME TIME AS POSSIBLE TO PREVENT THE DISCHARGE OF UNTREATED WASTE OFF OUR SHORELINES.

AND FINALLY, I URGE BOTH THE EPA AND THE MWRA NOT TO ATTEMPT TO LOWER THE MASSACHUSETTS STATE WATER QUALITY STANDARDS.

I APPRECIATE THE AMOUNT OF TIME THAT YOU HAVE GIVEN ME TO PLACE THE POSITION OF THE CITY OF REVERE ON THE RECORD.

THANK YOU.

E7

OFFICE OF
Board of Selectmen
ABBOT HALL
MARBLEHEAD MASSACHUSETTS 01945

E7

May 31, 1988

Mr. Michael Deland, Regional Administrator
Environmental Protection Agency
J. F. Kennedy Federal Building
Boston, MA 02203

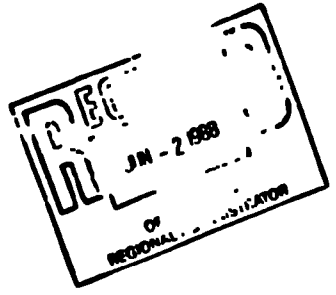
Dear Mr. Deland:

At a meeting of the Board of Selectmen held on Wednesday, May 25, 1988, it was voted to forward to the Environmental Protection Agency copy of the Resolution regarding the outfall for Boston Harbor adopted on May 11, 1988, by the Board of Selectmen.

Very truly yours,

Joan von Sternberg
Administrative Assistant

JvS:ec
Enc.



OFFICE OF

Board of Selectmen

TELEPHONE 631-4056

ABBOT HALL

MARBLEHEAD, MASSACHUSETTS 01945

May 11, 1988

RESOLUTION

WHEREAS: The area now recommended by the Environmental Protection Agency and the Massachusetts Water Resources Authority for the largest sewage outfall in the world is dangerously close to the Town of Marblehead; and

WHEREAS: Tidal currents could bring the sewage effluent of 43 cities and towns in Greater Boston to Marblehead beaches; and

WHEREAS: Fish, shellfish, and lobster resources could be damaged; and

WHEREAS: Neither Devereux Beach and the other beaches of Marblehead nor the lobster and shellfish resources of Marblehead are included in the "resources maps" of the Environmental Protection Agency; and

WHEREAS: It doesn't make sense to clean up one area -- Boston Harbor -- by polluting another -- Massachusetts Bay; and

WHEREAS: The Town of Marblehead is determined to protect its shores and the ecology of Massachusetts Bay,

NOW BE IT THEREFORE RESOLVED: That the Town of Marblehead will work for, and will ask its state and federal elected and appointed officials to work for:

1) An outfall location at "Site 6" - nine miles from Marblehead, Swampscott, Nahant, Hull, Cohasset, and Scituate

2) Primary and secondary plants built simultaneously, so minimally treated sewage is not discharged into Massachusetts Bay

3) No lowering of the Massachusetts Water Quality Standards.

Arnold Alexander

Arnold Alexander, Chairman
Board of Selectmen
Town of Marblehead

G1

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

G1

CENED-OD-R-88-87-912

May 11, 1988

David Tomey
Water Quality Branch
Environmental Protection Agency
Region 1
J.F. Kennedy Building
Boston, MA 02203-2211

Dear Mr. Tomey:

We have reviewed the Draft Supplemental Environmental Impact Statement (DSEIS) for the Massachusetts Water Resources Authority's (MWRA) proposed wastewater treatment plant tunnels and outfall. Our review as a cooperating agency has focused on ensuring that the SEIS can be adopted for our regulatory purposes.

The data and analysis presented in the DSEIS appear to be sufficient to support a decision for placement of the diffuser anywhere between Sites 4 and 5. However, for our regulatory review, it will be necessary for a specific diffuser location to be selected and for it to be designated where that structure will begin and end.

Current indecisiveness over type of diffuser is a major question that needs to be addressed, as sufficient data and analysis of dredging and disposal impacts for the pipeline diffuser alternative is not evident in the DSEIS.

Disposal location(s) for excavated material from the proposed outfall tunnel not being identified at this time is of concern, as the alternative outfall locations render between 770,000 and 1,860,000 c.y. of material. Preferred disposal sites should be identified as part of the outfall siting process.

In defining monitoring and mitigation commitments, flow diagrams could be used to illustrate the decisions and actions to be taken should unacceptable environmental conditions result. Clearcut thresholds and specific actions should be identified.

It is important to note that if excavated material, which we consider solid waste, is to be disposed of at Spectacle Island or any other Section 404 areas, the memorandum of agreement with EPA regarding solid waste states that we cannot accept an application until local and state approvals are issued.

Specific comments on the DSEIS are attached.

Should you have any questions regarding our comments, please contact Karen Adams at 647-8492.

Sincerely,

David N. Killoy, P.E., C.P.G.
Section Chief
Regulatory Branch
Operations Division

1. From a technical point-of-view, we believe the applicant has made a serious effort to address the pertinent issues. There are however areas of uncertainty which should be addressed. Those issues which we believe can be addressed with the available data base are noted and should be incorporated in the final EIS. Those issues which cannot be answered in a reasonable time frame should be incorporated into a monitoring program with clearly defined mitigation efforts conditional on the results of the monitoring program.

2. Potential impacts on physical and chemical characteristics of the aquatic ecosystem.

Sediments. The outfall is likely to lead to increased concentrations of pollutants associated with particles in the area near the outfall. Under stratified conditions (perceived to be the worst case), sedimentation rates within the mixing zone range from 2.6 to 12.6 g/m2/day with primary and 0.3 to 2.2 g/m2/day with secondary, depending on the distance from the outfall.

The applicant has provided estimates of the concentrations of chemical constituents in the effluent and flow rates. This provides enough information to make reasonable estimates of the flux of material into Mass Bay (MWRA, 8TFP III and V, Appendix A). The use of partitioning coefficients and sorption models to estimate the affinity of chemical constituents to particles seems to be a reasonable approach.

We accept the arguments made by EPA that the initial distribution of suspended solids and the toxics associated with these particles can be modelled using TEA-ML and ELA in a manner similar to dissolved constituents (pages 3-23 through 3-34). Given this information and background sedimentation rates of 0.05 cm/yr, we agree that estimates of the chemical loadings to the sediment can be made. However, the possibility that sediment transport may reconcentrate newly settled material should be addressed. The fact that Bothner (1987) found an area in Boston Harbor that has an apparent sedimentation rate of 2.0 cm/year suggests that lateral transport of localized deposition is occurring (pages 4-27 and 4-28).

Suspended Solids/ Turbidity. There are no estimates of the suspended solids concentrations expected in the water column with either primary or secondary treatment. This must be addressed. The amount of solids being discharged from the effluent each day has been estimated by the MWRA to be 99,360 kg/day for primary treatment and 31,363 kg/day for secondary treatment (Table 3.1.1.a). Estimates are given that 40% to 50% of the suspended solids will remain in suspension under primary and secondary respectively (i.e. have settling velocities less than 1 cm/1000 sec). Given the settling velocity and the hydrographic data, these estimates could be made using the TEA and ELA models. If the analysis was done by the MWRA it should be cited in this report.

This information is essential to assess the impacts that suspended solids are likely to have on light penetration and the rate of photosynthesis.

Water Quality. We have made a decision to defer to EPA's recognized expertise in the modelling of water quality. We do not believe there will be any significant changes in water clarity, color, odor or taste. However we have noted some problems with the interpretation of water quality results. EPA suggests that site 5 has lower ambient nutrient concentrations and therefore a greater capacity to assimilate nutrient inputs to the water column (see page 5-47). We acknowledge that the concentrations of nitrogen will probably be less at site 5 (F2) than at Site 2 (F1). However we disagree that this alone makes site 5 a better site to recieve effluent. The data seems to indicate that primary production and nutrients are more tightly coupled at station 5. The impacts may therefore be greater at station 5 than at station 2.

Given the amount of time and resources the applicant has done a fairly good job. However, it must be acknowledged that the effects of an effluent cannot be assessed totally by short term (48-hour) incubations.

> "... the nutrient experiments did not assess the continuous delivery of elevated nutrients simulating effluent discharge, which is the expected in situ situation. Rather, the experiments evaluated acute exposure during which nutrients rapidly decreased, rather than chronic exposure during which the phytoplankton were subjected to continuously high nutrient levels." (MWRA, Volume V, Appendix I).

As there is a great deal of uncertainty in the predictions of no significant impact on primary production and species composition, we believe that some measure of primary production (e.g. standing stock of Chlorophyll a) should be monitored to assess the operational impacts of the outfall. Second, we believe that conditions should be set in mitigation to decrease nutrient loadings should these initial predictions prove false.

Dissolved Oxygen. The processes of reaeration, carbonaceous and nitrogenous BOD decay and sediment oxygen demand were used as parameters to calculate dissolved oxygen deficits. We believe that a major component has been left out of the model and that is the organic carbon associated with sinking phytoplankton. A secondary outfall in Mass Bay will enhance primary production. The flux of organic carbon to the sediments will be increased. This build up of organic carbon will increase the biological oxygen demand of the sediment, and could potentially initiate anoxic events especially in depositional areas of Massachusetts Bay such as Stellwagen Basin and Wilkinson Basin.

3. ential impacts on biological characteristics of the aquatic ecosystem

Marine Organisms. The literature describing sedimentation effects on benthos are generally expressed in terms of cm/yr. EPA estimated that the material coming out of the outfall would be 80% organic material (density 1.06 gm/cm3) and 20% inorganic material (density 2.65 gm/cm3). This equates to a mean density for effluent solids of 1.4 gm/cm3 (page 9-16). This results in depositional rates on the order of 0.07 to 0.33 cm/yr for primary and 0.01 to 0.06 cm/yr for secondary, depending on the distance from the outfall. The material will be extremely fine material. The substrate in the area around sites 4, 4.5, and 5 is extremely heterogenous (Figure 4.2.4.b). Substrate types include areas with homogeneous pebble and cobble bottoms that are covered with sand, homogenous pebble and cobble bottoms that are covered with silty sediment, and heterogeneous areas of sand interspersed with areas of cobbles and pebbles. There is a diverse benthic fauna with suspension feeding and deposit feeding polychaetes. There will be habitat loss and mass mortality of benthic populations in the immediate area of the diffuser. Suspension feeding organisms are particularly sensitive to siltation effects. This will result in a shift in community structure from the present assemblage to one dominated by opportunistic deposit feeding polychaetes. These burial rates predicted within the zone of impact are within the tolerances of many deposit feeding organisms. The impacts of this physical burial on the biological community in the mixing zone (4 km2 area) are adequately addressed by the applicant (Section 5.1.3.2 page 5-52).

We agree that fish which feed by sight will generally avoid the area of the plume. As noted by the applicant, there will be degradation in the area near the outfall. High sedimentation and turbidities will make the area unsuitable for filter feeders.

The effects of organic enrichment, sediment toxicity, nutrient enrichment, water column toxicity and dissolved oxygen deficits on marine organisms are dealt with in sufficient detail individually. However, the cumulative effects of these impacts are difficult to assess. Given this uncertainty, we would recommend monitoring efforts to assess the operational impacts on these resources, and recommend that mitigation measures be established (e.g. increase in source reduction requirements) should significant effects become apparent.

Threatened and Endangered Species. The section on threatened and endangered species seems to be adequate. Our only concern would be the potential effect of the outfall on whale populations should Stellwagen Basin become the ultimate depositary for suspended solids and contaminated sediments from Boston Harbor. We recommend further consultation and coordination with NMFS as the process continues.

Wildlife. Wildlife issues (i.e. the effects of the operation on marine mammals, seabirds, turtles) are dealt with in sufficient detail in this EIS.

4. Potential impacts on special aquatic sites

Sanctuaries and/or Refuges. We would like to see an evaluation of the potential effects of the outfall on the South Essex Ocean Sanctuary and the Areas of Critical Environmental Concern in the Saugus River and Weir River.

Wetlands. The effect of the outfall on salt marshes in the area (e.g. Nahant, Winthrop, Weymouth) should be assessed in this report.

Mud Flats. The effects of the project on the mudflats in the area should be adressed. One possible mechanism to achieve this would be to use the results of the transient plume model to predict concentrations at the shorelines with significant mudflat resources.

Vegetated Shallows. The applicant has identified an area of significant submerged vegetation in the area around the Graves near station 4. The vegetation in this area should be described and the effects of the outfall on this habitat should be assessed in the EIS.

The applicant should consider the effects of submerged vegetation on the local circulation patterns. Vegetation in the area may trap material in suspension. The effects of the vegetation on the distribution of pollutants should therefore be addressed.

5. Potential effects on human use characteristics

Recreational and Commercial Fisheries. The lobster fishery is an important commercial resource in the area that will be impacted by the project. The impacts of the project on the lobster fishery cannot be fully assessed without information on their distribution in the winter months. The potential impacts to the lobster fishery should be reported in the EIS.

Using the available data collected by the MWRA and the literature on the effects of pollutants on fish species, the applicant has done a reasonable job on predicting the effects of the outfall on the fishery. Given the uncertainty in estimates of fish populations and preferred habitats in Boston Harbor and the uncertainty in understanding the effects of multiple pollutants on parameters affecting fish populations (e.g. recruitment, larval development, reproduction), we recommend that populations be monitored closely. Secondly, we feel it is in the public interest to continue efforts to assess the level of contamination in edible fish tissue.

Water-Related Recreation. The effects of the project on water-related recreation should be assessed. There is a general perception that the project will clean-up Boston Harbor, that the shellfish beds will be re-opened and the beaches will be safe for swimming. While we recognize that the Inner Harbor will be cleaner, we feel that it is important that a realistic analysis of the future conditions of the Harbor under secondary treatment be included in the EIS. Predictions of viral contamination and fecal coliforms from the far-field modelling could potentially be used in this analysis.

Aesthetics. The aesthetic impacts of the operation should be assessed in the EIS.

6. Evaluation and Testing

General Evaluation of Dredged or Fill Material. Before any dredging permit is approved for material to be disposed of at FADS the Corps is likely to require chemical testing in the area to be dredged. In addition the Corps of Engineers is likely to require bioaccumulation and bioassay testing. The applicant has done an adequate job describing the biotic community in the area to be dredged. Additional information on the sediment grain size composition of the area may be required.

Material destined for upland fill will have to be identified and described in some detail, as will the proposed location(s) for disposal.

7. Actions to minimize adverse effects.

The dredging activity associated with the pipe-diffuser alternative would generate approximately 1.4 million cubic yards of dredged material. We would require that dredging windows be enacted around dredging activity for the pipe-diffuser to protect the flounder and lobster fishery.

We would not require dredging windows around the dredging activity associated with the drilled riser diffuser alternative because of the small size of dredging operations and the protracted schedule (50 cubic yards every 1 to 2 weeks for four to five years).

Given the uncertainty in predicting impacts we feel it is necessary to monit__ phytoplankton abundances (Chlorophyll a), dissolved oxygen concentrations, and toxic levels in fish caught in the area. We would hope that there be some operational flexibility built into the process should the best predictions turn out to be wrong. One way to do this would be to require the MWRA to strengthen its source reduction program should monitoring indicate significant deterioration of the resource.

We have consistently commented on the need to understand sediment transport processes in Boston Harbor in siting the outfall. We still believe that such information is site dependent and critical to predicting the impacts of the outfall. We still feel that there are significant uncertainties regarding transport processes. We would like to see some monitoring of the important shoreline areas (e.g. bathing beaches), and would like to see some mitigation actions conditioned in a final EIS should there be an impact to these areas.

BOSTON WASTEWATER CONVEYANCE DSEIS

COMMENTS

HISTORIC AND ARCHAEOLOGICAL RESOURCES

APRIL 22, 1988

1. Appendix B: B.3.9

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended requires that the head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking, prior to the approval of expenditure of Federal funds or issuance of a permit, take into account the effect of the undertaking on any district, building, structure or object that is listed on or eligible for inclusion in the National Register of Historic Places. Section 106 also requires that the President's Advisory Council on Historic Preservation be given a reasonable opportunity to comment with regard to the undertaking.

The Advisory Council's regulations, Protection of Historic Properties (36 CFR 800), outline procedures for Federal Agencies to follow to comply with Section 106. This includes coordination with the State Historic Preservation Officer (SHPO). In Massachusetts, the SHPO is at the Massachusetts Historic Commission.

2. B.4 State Laws: Should include:

Massachusetts Underwater Archaeology Act (Chapter 989 Acts of 1973).

This Act established the Board of Underwater Archaeological Resources to oversee the removal and salvage of underwater resources that have historical and educational value. No recovery of underwater archaeological resources shall be made except in compliance with provisions of the Board. A permit from the Board is needed before any excavation can take place in Massachusetts' territorial waters. Representatives of the Massachusetts Historic Commission sit on the Board.

3. Volume 1: 4.2.5.6 Marine Archaeology

A. A statement about prehistoric potential, or lack thereof, for the tunnel and outfall area should be included in the text.

B. The archaeological resources report completed in December of 1987 (MWRA, STFP V, FF) discussed resources in relation to Massachusetts State laws which considers that shipwrecks 100 years old or worth more than $5000 to be under the jurisdiction of the Massachusetts Board of Underwater Archaeological Resources. These resources also fall under the National Historic Preservation Act of 1966. The Federal Act requires that shipwrecks which meet at least one of the criteria for eligibility for inclusion in the National Register and are generally older than 50 years be taken into account before a Federal undertaking can be authorized. The requirements of both State and Federal statutes will need to be satisfied before a Corps of Engineers permit can be issued.

C. What is the schedule for completing the needed underwater surveys of the diffuser locations? The literature search completed to date was unable to determine conclusively whether or not historic properties are located in the outfall sites.

4. 5.1.5.5 Cultural and Archaeological Resources

Indirect impacts to historic properties should be considered and discussed. For example, how far from the diffuser would a shipwreck need to be in order for there to be "no effect"? Would any of the fragile archaeological sites at the shoreline of the harbor islands be affected? Should monitoring of shipwreck sites be proposed if any are found adjacent to a diffuser location?

5. 6.2.3 Disposal of Excavated and Dredged Material

If upland disposal is selected, the site selection would need to be reviewed by the Massachusetts State Historic Preservation Officer.

(1)

COASTAL ZONE MANAGEMENT

The Commonwealth of Massachusetts **G2**
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

MEMORANDUM

TO: RONALD G. MANFREDONIA, CHIEF, WATER QUALITY BRANCH, US EPA

FROM: RICHARD P. DELANEY, DIRECTOR, MCZM

DATE: MAY 9, 1988

RE: MCZM COMMENTS ON DRAFT SEIS FOR THE BOSTON HARBOR WASTEWATER CONVEYANCE SYSTEM

MCZM has reviewed the Draft SEIS for the Boston Harbor Wastewater Conveyance System and would like to make the following comments.

The analysis of alternatives for the diffuser construction and for the interisland and effluent conveyances appears to be adequate. MCZM agrees with the recommendations that are contained in the Draft SEIS, for these portions of the project.

The review of alternatives for the outfall location however, does not appear to be sufficiently complete, and MCZM has a number of concerns. The Draft SEIS recommends the area between Site 8 and Site 9, as the location for the outfall terminus, but it is not clear whether the recommendation is that the entire diffuser system should be within this boundary or that just the midpoint of the diffuser should fall in this zone. It is also not clear to MCZM that the differences between Sites 8 and 9 are "insignificant", as claimed in the analysis. This conclusion contrasts with the review information that was included in the FEIR, which was prepared by the MWRA. Therefore, the reasons for the differences in the recommendations should be fully explained. MCZM notes that the data that was presented in the Draft SEIS indicate that Site 8 has the highest background concentration of contaminants in the sediments and the highest simulated concentrations for a discharge, at that location. The data also suggests that a significantly larger area of the marine ecosystem would be both degraded and changed, at Site 8, compared to Site 9, as measured in the effects on the benthic community and in the organic and nutrient enrichment of the site area. The maps identifying the effects of "primary-treated only" discharge, emphasizes the differences between the two sites. The Draft SEIS also states that the sharpest increase in dilution occurs between Sites 8 and 9, and it also emphasizes the differences between the two sites.

While not necessarily disagreeing with the decision to exclude Site 6 from a more detailed analysis, MCZM feels that the Draft SEIS does not address some very legitimate concerns that were raised by the citizen's groups, when Site 6 was proposed for inclusion in the analysis. It is not at all clear, that an outfall at Site 6 would require a pump station. The engineering proposal, to elevate Deer Island for the purpose of gaining additional head, on the discharge, in order to eliminate the requirement for a pump station needs to be considered. The elevation of Deer Island also has the advantage of providing a location for the disposal of excavate and for additional protection, from possible storm damage and the effects of sea level rise. The coordination and quantitative analysis of the disposal needs for excavated and dredged material have not been addressed for all of the major public works projects in the metropolitan Boston area and such analyses clearly needs to be done.

The reason for excluding Site 6 from a detailed consideration, appeared to be based on cost considerations. It was suggested that it would be a better use of financial resources, to invest further, in source control and pretreatment programs. MCZM strongly endorses the development of source control and pretreatment programs, but we ask how this would be accomplished and what mechanisms are in place to ensure that this will occur. The SEIS should recognize, that a plan of action or possible methods, need to be formulated, to ensure that toxics and nutrient loadings to the marine environment are reduced. The structural solution, of building a more distant outfall has the advantage that greater dilution will be achieved, and while that is not necessarily, the best long term solution, it will achieve the desired result. If a balancing of other mechanisms, to achieve the same result, at a lower cost is used, then they need to be identified and carefully described in the document, in order to support the claim that Site 6 does not deserve further consideration.

It was also noted, that the Draft SEIS contained numerous deficiencies in its efforts to identify resource areas, such as bathing beaches and shellfish beds in the vicinity of the proposed outfall locations. Figures 4.2.5 c and d, in particular are inaccurate in their designation of fisheries and recreational resources.

RFD/JPS/ds

13

PHILIP G. COATES
DIRECTOR

The Commonwealth of Massachusetts
Division of Marine Fisheries
Leverett Saltonstall State Office Building
100 Cambridge Street
Boston, Massachusetts 02202

727-3193

G3

May 31, 1988

Mr. Ronald Manhedania, Chief
Water Quality Branch
U.S. Environmental Protection Agency
Region 1
J.F.K. Federal Building
Boston, MA 02203-2211

Dear Mr. Manhedania:

The Division has reviewed the Draft Supplemental Environmental Impact Statement, Boston Harbor Waste Water Conveyance System and has two major questions.

First, in view of EPA's very conservative approach to risk assessments on PCB's as referenced by the Quincy Bay Risk Assessment on fish and shellfish, it is illogical to assume no potential unacceptable public health risks exist after relocation of the discharge. This is particularly important since ambient water quality criteria for PCB's are already exceeded in proposed outfall areas.

Secondly, we question what possible mitigation remedies could be executed in the event that public health exceedances occur at the new outfall site. The discharge could not be relocated but the fishing industry recreational and commercial would suffer serious consequences without remedy as has occured in New Bedford Harbor and may occur in Quincy Bay. This is critical since future water quality criteria and standards will be more stringent. Any possible mitigation measures should be fully explained.

Finally, we believe that it is incumbent on EPA to require the MWRA to perform comprehensive pre and post outfall relocation studies to fully protect the living marine resources.

Sincerely,

W. Leigh Bridges
Assistant Director

WLB/dlg
cc: Philip Coates

G4

Given G4

MASSACHUSETTS WATER RESOURCES AUTHORITY
Charlestown Navy Yard
100 First Avenue
Boston, Massachusetts 02129

Telephone: (617) 242 6000

May 27, 1988

Board of Directors
Anne S. Howe, Chairman
Paul V. Anderson
John J. Carroll
Richard J. Cook
Lawrence M. Dewey
Anthony V. Fiumbo
Charles Lyons
Samuel B. Magill
Margaret A. Riley
Walter J. Ryan, Jr.
Jonathan J. Townsley

Executive Director
Paul F. Levy

Michael Deland
Regional Administrator
USEPA
JFK Federal Building
Boston, MA 02203

RE: Draft Supplemental Environmental Impact Statement -
Boston Harbor Wastewater Conveyance System

Dear Mr. Deland:

The MWRA has reviewed the above document and our detailed comments are attached for your consideration. We appreciate the opportunity to have worked with your staff and consultants during the development of the DSEIS.

As you know our Secondary Facilities Plan was prepared on a schedule essentially concurrent with your DSEIS. We were fortunate to be faced with this situation, because it allowed your document to complement, rather than duplicate, our data and analysis. In addition, your project team's availability in this timeframe for critical review of our draft material led to a superior product from our perspective.

The release of the DSEIS and the MWRA Board acceptance of our Final Facilities Plan (May 25, 1988) are two significant milestones in the Boston Harbor Cleanup Program. We look forward to a continuing positive relationship on the program as it moves into the design phase. We also look forward to progressive discussions of our respective roles on any Mass Bay water quality initiatives.

Sincerely yours,

Paul F. Levy
Executive Director

enc: enclosure
James Hoyte, EOEA
Daniel Greenbaum, DEQE
Steve Davis, NEPA

PFL/mt:16-585

MWRA's Comments on Boston Harbor Wastewater Conveyance System - Draft Supplemental Environmental Impact Statement

Page 1-5, Court Dates

An April, 1994 completion date for the inter-island conveyance system is indicated. The court completion date is December, 1994.

The dates in this table are "Target Dates" at this time, not Court Milestones.

Page 3-5, Section 3.2.1.4

"...pumping would be required at Site 6 versus gravity flow operation at Sites 2, 4, and 5."

As we have endeavored to make clear, there is no sharp line of demarcation between an outfall length where gravity discharge is possible and lengths where pumping is required. Questions of riser height, frequency/availability of adequate purge water, allowable minimum speeds in the tunnel, WWTP hydraulic elevation, and the requirement that the design maximum flow be dischargeable through the outfall even under very brief extraordinary tide conditions all enter the pump vs. gravity decision. These must be addressed in the next phase of design, upon receipt of geophysical/geotechnical data. The FEIR/FEID includes a discussion of this point.

Page 4-9

Figure 4.2.1.c misrepresents the relative locations of the transect survey locations to the outfall sites. For example, Station T15 is at Site 5.

Page 4-20, Dissolved Oxygen Measurements

Since the draft STFP, quality control procedures for the measurement and processing of DO data have been investigated, and it was determined that the quality of some of the sets of DO data was questionable. Two of these data sets are cited in the draft SEIS: (1) measurements made at Station 3 from March through June 7, 1987; and (2) measurements made at all meters from about September 23 through October 20, 1987. These data sets should not be used as the basis of analysis.

In October the continuous DO meters began to give questionable results. These meters had never been used, before this study, in the marine environment. Large swings in the calibration (2 mg/l) were seen between deployments, so the data were thrown out. There are no better DO data for October, although transects were done in September and in November.

Also, DO measured concentrations cited in SEIS for September 1986 appear to be mis-stated. A transect survey on September 14 indicates a moderate pycnocline at 14 m depth. DO measurements below this depth in Broad Sound range from 5.45 to 6.35 mg/l.

Page 4-23, Toxic Chemicals

Arsenic and PCBs exceed the 10^{-5} and 10^{-6} carcinogenicity criteria in the ambient. These criteria, and the ambient levels, are shown in Table 5.1.1.i, p. 5-26. They should be included in Table 4.2.2.d.

Page 4-33, Figure 4.2.4.a

This figure, which shows the MWRA sampling locations, needs revision. Please refer to the FEIR/FEID, Volume V, Appendix B, for accurate sampling locations.

Page 4-38, Section 4.2.4.1.2, Evidence of Stress

Differences in species composition may be due primarily to differences in substrate between offshore and nearshore areas, rather than levels of PAHs and metals since, with the exception of Site 2.5, levels of contaminants in the sediments appear to appear to be fairly uniform.

Page 4-39, Section 4.2.4.2, and Page C-22

The incursions of colder, more nutrient-rich water were observed at Station P1 (Site 2) on four cruises conducted for the Secondary Treatment Facilities Planning Project, not twice.

Page 4-45, Section 4.1.4.6

Change "petral" to "petrel".

Page 4-54, Figure 4.2.5.f, Sensitive Harbor Resources

Based on a reconnaissance visit to the Orient Heights Beach area of Winthrop which was made to evaluate impacts associated with off-island utility supply, no extensive saltmarsh areas were observed. This revises the indication shown on the referenced figure.

Page 5-3, DO in Effluent

The assumption that the DO in the effluent is zero is highly conservative, especially considering that the effluent will be conveyed via an energy dissipation structure to the outfall tunnel.

Page 5-21

The table caption should say "... the predicted concentration of copper is 2.1 times ..."

Pages 5-28 and 5-29, Table 5.1.2.a

Column headings need to be realigned to refer to "Background Concentration" and "Maximum Simulated Concentration."

Pages 5-45 through 5-51, Section 5.1.3.1.3

For the DSEIS, treatment plant influent nitrogen loadings were used to evaluate impacts on receiving water quality. While this may appear to be a conservative approach, it assumes no difference in the forms of nitrogen between primary and secondary effluents. The fact that the secondary effluent may contain twice as much ammonia may influence phytoplankton functioning in a different manner at the candidate sites, as described in the FEIR/FEID. This possibility needs to be dealt with in the SEIS.

Page 5-54 Arsenic Carcinogenicity Standard

The arsenic carcinogenicity standard is not appropriately used for salt water. Arsenic is a carcinogen in its trivalent form when it occurs in drinking water. In fish flesh, there is no evidence that arsenic is a carcinogen. Clean oceanic seawater far exceeds the carcinogenicity criteria. In addition, the natural concentrations of arsenic in fish far exceed the carcinogenicity standard. Tuna contains arsenic at an average concentration of 0.85 ppm (FDA, 1982) -- more than 1000 times greater than the 0.77 ppb allowed in fish at a cancer risk of 10^{-6} (0.0175 ppb x 44 (EPA BCF) = 0.77 ppb). Other coastal fish contain 1-15 ppm of arsenic (EPA, 1980).

EPA, 1980. Ambient Water Quality Criteria for Arsenic.

U.S. Food and Drug Administration, 1982. Compliance Program Report of Findings, FY79 Pesticides and Metals in Fish Program. FDA 7305.007, Washington, DC.

Page 5-55 Bioaccumulation and PCB/PAH concentrations

In predicting compliance with carcinogenicity-based criteria, the DSEIS should consider the bioaccumulation experiments described in Appendix X of Volume V of the FEIR/FEID. The water quality criteria extrapolate from a large set of national data while Appendix X considers worst case bioaccumulation in local organisms positioned at the edge of the mixing zone. These experiments showed that mussels exposed in the mixing zone of Nut Island primary effluent were not significantly elevated for PAHs, PCBs and chlorinated pesticides compared to control animals.

In addition, the predicted PCB concentrations overstate the water column levels of PCBs since our sampling program was unable to detect PCBs at 0.5-1. ppb. Similarly, the concentrations of chlorinated pesticides were also below detection limits.

Page 5-57, Paragraph 2

Please provide the methodology for the derivation of 0.5 mg/l nitrogen as an indicator of degraded plankton systems. It is not clear from Oviatt et al. 1986, or 1987, where this number comes from.

Page 5-59

Constructability - Although tunnel construction itself in general should not be affected by weather, the tunnel work crews, supplies, and spoils disposal activities may be. You may want to amplify the statement.

Page 5-62, Section 5.3.1.4

Tunnel construction, not the diffuser construction, is indicated to be on the critical path. This is not true for all sites, however. Refer to the FEIR/FEID, Appendix E, Figure E-26. The schedule for Site 4.5 indicates that the diffuser is on the critical path; for Site 5, the tunnel is on the critical path. The differences between the implementation schedules for tunnel and diffuser segments at these sites are small, such that both segments are of essentially equal importance relative to construction scheduling.

Page 5-64, Section 5.3.2.3

Ocean construction of the pipeline could result in more than just weather "delay" due to temporary work stoppage in inclement weather. This type of construction has the potential to entail significant risks to personnel safety and equipment. Refer to the project's response to EPA's February 19, 1988 comments on Appendix E to Volume V of the draft EIR/EID, which describes a 17 month work stoppage to San Francisco's outfall construction resulting from a weather disaster.

Page 6-2

Please check the source for the Boston Inner Harbor CSO/ Stormwater figure of 7.0 mgd - it seems low. Also it is not clear what the boundary conditions are for this figure. Do they simply match the 1982 MDC Inner Harbor CSO Report? Does the Long Island Hospital/Conference Center still have a separate discharge in the middle of the Inner Harbor - any impact?

Page 6-3, Figure 6.1.a

The figure indicates completion of the South Flow Pump Station in mid-1993. Refer to the FEIR/FEID, Volume III, Figure 11.2-1, which indicates completion of the pump station in December, 1994.

Page 6-5, Section 6.2.4

Text indicates the need for reconciliation of truck traffic estimates for the tunnel and outfall construction as presented in Volumes III and V of the FEIR/FEID and Volumes 8 and 9 of the On-Shore Water Transportation FEIR/FEID. Reconciliation of truck traffic estimates has been provided in the appropriate sections of Volumes III and V in the FEIR/FEID, and in the response to MDWPC comment on Volume VII of the DEIR/DEID, which compares the truck traffic estimates prepared for these two projects.

Page 6-9

Typo - second line the year "1000" should be "1999".

Page 6-12

The removal rates shown for secondary treatment (28% BOD, 56% TSS) appear to be in error. Please clarify.

Page 6-15 and 6-16

The typesetting on these tables is all out of alignment making review difficult. Please correct.

Page 7-2, Table 7.1.1a

Under commercial fishing criteria, Site 2 is weighed equally. MWRA studies have shown Site 2 to be considerably more productive than Site 4 and 5. Also, Site 2 is on the edge of the winter flounder spawning area.

Page 7-8

Costs are presented throughout the report in various forms or combinations of shaft, diffuser and tunnel segments. This approach could be confusing to the reader. It may be helpful to outline all component costs in Chapter 3 to avoid the need to review Appendix E. Cross-checking of the costs would then be greatly simplified.

Page 7-13

The actual coordinates of the "recommended location" box would be useful for clarity.

For the most part the section on mitigation seems reasonable; however, some comments are in order.

The MWRA has supported and continues to support programs to aid in our understanding of Massachusetts Bay. A large percentage of our facilities planning budget was dedicated to marine field studies and related activities (e.g. modeling). Although some of this work was reimbursable under the MWPC grant program, a sizable portion was not - so the investment was solely that of the MWRA.

As currently worded the program is quite comprehensive and as such also quite expensive. Our concurrence with such a recommendation has to be linked to a commitment from both State and Federal agencies for technical and financial resources to assist in this effort.

The obligations of the Federal/State agencies under the Clean Water Act in the area of water quality planning must be separated from the obligations of the MWRA under the NPDES or NEPA programs.

Therefore, although we agree with the concept, the mechanics for implementation need further discussion.

The balance of the mitigation measures seem reasonable with the exception of the requirement for a physical model.

Concurrence with the requirement for a physical model of the diffuser alternative warrants further discussion. There is concern whether the objectives of such an exercise may actually be better and more economically met by further computer modeling supported by some additional field data. Physical modeling activities in the past have sometimes mushroomed to unreasonable levels especially given the current state of the alternative of computer-based modeling. Replication of an ocean environment in a physical model is not a minor endeavor.

Page 9-19, Section 9.4.10

Text indicates that "All outfall alternatives can be constructed prior to start-up of the new primary treatment plant." Note that this must be qualified on the basis of the tunnel advance rate which is assumed: The FEIR/FEID determined an advance rate of 70 feet/day; the preceding statement is correct within this context. However, the DSEIS has used a tunneling advance range of 50 to 70 feet/day. If an advance rate of 50 feet/day is assumed, the construction schedule for outfall Site 5 would be increased by approximately 11 months, and the completion date would be in 1996, after the new primary treatment plant is completed using the current Court Schedule and Base Plan.

Page A-17

"Instantaneous directions, which also affect initial dilution, are best gauged through the magnitude-direction scatter plots, which are reproduced... for Stations 2, 4 and 5 for the month August, 1987... The August results are shown here because this period of the year leads to the lowest nearfield dilutions. The plots clearly show a bimodality of current directions due to the tidal effects (primarily east- west). This factor is important for the orientation of the diffuser, as increased nearfield dilutions can be obtained when the diffuser is oriented perpendicular to the dominant current direction."

On Page A-49, there is a repeated reference to bimodality, approximately east-west, plus the comment " ... that another consideration in the selection of a diffuser orientation is to have the ports at the same elevation, to insure a uniform flow distribution among all the ports. This would suggest that a preferred orientation is along the depth contours, which tend to be north-south in the diffuser site areas. An average orientation close to 90° [to the current direction?] therefore appears achievable and desirable." MWRA's discussion of diffuser orientation appears on Page D-6 of Appendix D to Volume V of the FEIR/FEID. There is broad agreement between the MWRA discussion and EPA's, except for one point:

Bimodality can be seen in the scatter plots, even at Site 5. However, the currents are predominantly tidal and therefore rotate with time, the locus of the current vector tracing out the tidal ellipse. The instantaneous current is therefore no more often in one direction that another, although it is stronger in the east-west direction. Therefore, it is misleading to say that an "average orientation" close to 90° to the direction of the strongest currents is achievable.

Other considerations permitting, one likes to orient a diffuser perpendicular to predominant instantaneous current direction. This is not a strict requirement, however, since added diffuser length can entirely compensate for "imperfect" orientation (and may cost far less to construct than an outfall tunnel with a sharp bend to attain a particular diffuser orientation). The MWRA's position is, and remains, that seeking a diffuser alignment perpendicular to the bimodal current direction is desirable, but not the point of dominating considerations of bottom topography and subsoil/constructibility considerations.

Page A-56

The limitations of the method of modelling the lower layer should be discussed in the SEIS. The extent of the lower layer is determined by decreasing nodal depths to include only those beneath a 15 meter deep pycnocline (p. A-56 of the SEIS). In fact, the density data indicate that the pycnocline is not parallel to the water surface, but shoals near the coast. On average, the pycnocline depth varies spatially from 10 meters or less at Site 2 to 16 meters or more at Site 4. In the two-layer model, the lower layer at Site 2 is only about six meters thick; consequently, dilutions will be underpredicted. This results in predicted background build-upe of contaminants (p. A-62) and maximum dissolved oxygen deficits (p. A-64) which are too high. In addition, as the shore is approached, the stratification becomes weaker and the plume would be less likely to be trapped. The results of the stratified model, while useful, must be interpreted cautiously, especially near the inshore boundary of the grid.

Page A-57

The bottom friction factor of 0.1 used to calibrate TEA to semi-diurnal tidal simulation appears unrealistically high. In the FEIR, a bottom friction factor of 0.005 was used, which is what would be expected physically. In the SEIS, the friction factor was varied so that the model would accurately reproduce the observed tidal currents. Page 4-17 of Appendix J shows that the model is more sensitive to the tilt than to the exact representation of the tides. The lack of sensitivity to friction is due to the fact that mass transport models are dominated by dispersion.

Page A-59, Page A-60 and Page A-61

It is unclear how "average" concentrations were computed. Why does applying a 10 cm Boundary tilt and running the model to steady-state result in average concentrations? Why does tilt in either direction gives the same result? Also, it is confusing that the figures (A.3.3 and A.3.4) do not correspond to the background buildup concentrations listed in Table A.3.6; it would be helpful to have example figures showing these residual concentrations.

Page A-71

The ambient fall DO concentration of 6.5 mg/l seems to be based on the data from October, 1987, described on pages A-29 and A-32, Section A.2.2.2. As noted above, these data are questionable and should not be used as a basis for analysis.

Page A-73 and A-74

It is confusing to have a figure showing a particular Transient Plume Model run (Figure A.3.10) made using a particular set of current observations, and a table (Table A.3.8) which shows the maximum concentrations for all sets of current data. There should be a more detailed explanation in the text of the source of the data in Table A.3.8. It is not clear what conditions result in the maximum shoreline concentrations given in the table. Perhaps a graphical representation of the various scenarios resulting in the maximum at each shoreline point would be helpful.

Also, the text should explain that these maximum concentrations may occur over a very small part of the shoreline. Using Figure A.3.10, for example, the average concentration at the Nahant shoreline would be about 50 percent lower than the maximum value, which occurs at East Point.

Page A-74

It is not our belief that DO values in the lower layer would not be reduced by BOD exertion from the effluent. Under the scenario of a weak pycnocline, the ocean waters will be somewhat mixed and BOD in the effluent would be available to be exerted in the lower layer, albeit perhaps to a lesser degree that in the upper layer.

Page A-74

What is the basis of the statement that "the thickness of the lower layer would be about 3 m at Site 2."? We know of no data that support this statement.

Page A-81

The reference to Section A.2.2.3 should be Section A.2.2.5.

Page A-82

In line 6, the word "highest" should be changed to "lowest".

Page A-90

Table A.3.19 shows an exceedance of the CCC for heptachlor at Site 4 for secondary effluent. This does not appear to be supported by data given in Table A.3.14.

Page A-90

The heading over the last set of columns in Table A.3.14 should be "chronic toxicity", not "acute toxicity."

Page D-30, Figure D.3.f, Sensitive Harbor Resources

Figure needs revision for saltmarsh at Orient Heights in Winthrop, as noted above.

Page F-50

Text indicates that the tunnel lining will be of precast concrete sections. The STFP has indicated the likelihood of this; however, the use of cast-in-place lining has not been ruled out.

The STFP team is unaware of any experience with constructing a single 28± feet diameter riser in a similar offshore environment. Therefore, for the single riser alternative, it is recommended that marine contractors, experienced with "similar projects," be involved with developing the design, cost, and schedule.

Page H-18

EPA indicates zinc is inhibitory to biological process in concentrations of 0.08 to 10 mg/l and that the influent concentration of zinc to the secondary treatment facilities of 0.13 mg/l is at the lower limit of inhibitory concentrations.

Zinc is not normally expected to be inhibitory at the concentrations indicated by EPA. According to Interaction of Heavy Metals and Biological Sewage Treatment Processes, Public Health Service Publication No. 99-WP-22 May, 1965, zinc is fed continuously to activated sludge in concentrations ranging from 2.5 to 20 mg/l reduced BOD removal efficiency by about 2 percent. Zinc levels of 160 mg/l lasting for four hours caused serious reduction in efficiencies for one day with plant recovery to normal removal levels within 40 hours. The publication concluded that the aeration phase of biological treatment can tolerate nickel, copper, chromium, and zinc up to a total heavy metal concentration of 10 mg/l, either singly or in combination, with about a 5 percent reduction in overall treatment efficiency.

Page H-27

EPA states that the extremely high peak flows and loads that the recommended treatment plant will be required to treat results in a highly stressed system under peak flow and load conditions. EPA also states that due to space constraints, the pure oxygen activated sludge system will be flow and load stressed at peak day loadings.

The MWRA disagrees with both of these statements.

Sustained flows and loadings were directly taken into account in the sizing of the recommended primary and secondary treatment facilities. The primary and secondary clarifiers were sized based on projected peak hydraulic conditions. Average day overflow rates as reported in the facilities plan were calculated directly from clarifier areas provided for peak conditions. The average values were only presented to allow regulatory review with common design parameters.

The secondary clarifiers were sized to allow settlement of the design MLSS at peak flow with a factor of safety of 1.4 with SVIs of 150. The oxygen aeration system was sized based on peak organic loads. A detailed analysis of the recommended system, factoring in recycle capacity, maintenance of minimum sludge blankets (1-ft) in the final clarifiers during non-storm conditions, and solids loadings on the clarifiers based on MLSS with good and poor settling characteristics, indicated that the recommended system would be capable of maintaining the F/M within 0.75-1.5 depending upon the settleability of the MLSS, under all flow and loading conditions.

Thus, the recommended facilities are most likely capable of producing secondary effluents of less than 30 mg/l TSS and BOD under all flow and loading conditions. However, the assessing the impacts of up to 190 mgd of storm flows receiving only primary treatment, the secondary effluent was assumed to be 40 mg/l for conservatism. Under these conditions, the daily limits of 50 mg/l BOD and TSS will be met and the Deer Island facilities could accept peak hydraulic and organic loads for up to four days per week while still meeting the average weekly BOD and TSS provisions of the discharge permit of 45 mg/l. Statistically, five subsequent days of the peak design flow of 1270 mgd, including allowances for CSO pump-back, is expected once every 10-11 years. Under the more likely scenario of the secondary portion of the plant producing a 30 mg/l (or better) effluent, the plant could accept 1270 mgd flow and peak loads for a full week and still produce an overall effluent in full compliance with the NPDES permit.

The clarifiers for the activated sludge alternatives were sized using project initial settling velocities and allowable solids loading limits established from solids flux curves derived from these settling velocities. The settling velocities were based on a statistical analysis by others of data from batch settling tests on 46 separate activated sludge samples with SVI's ranging from 36 to 402 ml/g (Daigger and Roper, Journal Water Pollution Control Federation, Volume 57, No. 8, pp. 859-866, August 1985). In assessing the adequacy of the clarifiers for solids loadings, variations in sludge settleability (SVI's from 100 to 200) and return sludge concentrations (6,000 to 12,000 mg/l underflow concentrations) were considered. For all flow conditions, envelope limitations of achievable MLSS levels were determined for the above variations in settleability and underflows. The limitations were based on allowable solids loadings, recycle flow capacity, and/or assumed blanket depths depending upon the flow. The analysis and resultant envelopes indicated that the proposed aeration and clarifier sizes are capable of providing high quality secondary levels of treatment under all expected flow and loading ranges.

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CONSERVATION COMMISSION
NAHANT, MASSACHUSETTS 01908

May 9, 1988

Mr. Michael Deland
Regional Administrator
Environmental Protection Agency
J. F. Kennedy Federal Building
Boston, Massachusetts 02203

Dear Mr. Deland:

An outfall location at "Site 6" is necessary to protect Boston Harbor, the North Shore, the South Shore, the Boston Harbor Islands and the richest lobstering, shellfishing, and fishing grounds of Massachusetts Bay. Of equal importance is accelerated secondary treatment, which would prevent polluted water from being discharged into an area now clean. Without secondary treatment, the antidegradation provisions of both Massachusetts and federal law would be violated.

The Nahant Conservation Commission is particularly concerned about the marine fisheries of Nahant shores and Nahant waters. According to the Massachusetts Marine Fisheries "Assessment at Mid-Decade," some of the productive shellfish areas between Manchester on the North Shore and Hingham on the South Shore are open. Some shellfish beds are restricted, but in seven communities, including Nahant, no shellfish beds are open.

In Nahant, this means that 42.5 acres of potentially productive shellfish beds cannot be used by our citizens. We would like to see these shellfish beds open again, and we have started to do our share by beginning construction of the joint Nahant-Saugus-Lynn secondary sewage treatment plant. Now we are faced with the spectre of a tunnel the size of the Callahan tunnel bringing an average of 500,000,000 gallons per day of minimally treated sewage as close as 2.9 miles from Nahant. This is outrageous!

The same comments apply to our fishing and lobstering industry. Too often we find diseased lobsters and finfish. In fact, some of the statistics used for "Boston Harbor" in the Coast Alliance and Conservation Law Foundation report "Contamination of New England's Fish and Shellfish" actually came from Lynn Harbor, which is adjacent to Nahant to the south. This is the report which called Boston Harbor "the most polluted harbor in the country." We want our waters cleaned up, not made dirtier.

We are also concerned about the nuisance alga, Prhialilla littoralis, which causes an odor so unpleasant that large stretches of beaches in Nahant, Lynn, and Swampscott are generally unusable. With the excess nutrients of a sewage outfall near Nahant, this problem will be exacerbated. The state Final Environmental Impact Report and the federal Draft Supplementary Environmental Impact Statement do not address this problem except in the vaguest of terms; in fact it seems from these documents that the EPA and MWRA do not really understand the algae problem.

It is not fair to clean up Boston by polluting its small but beautiful neighbor, Nahant.

Sincerely yours,

Eugene Canty, Chairman
Nahant Conservation Commission

G6

BOSTON
REDEVELOPMENT
AUTHORITY

Raymond L. Flynn
Mayor

Stephen Coyle
Director

One La Salle Square
Boston, MA 02201
617 722 4300

§ 12 78

U.S. Environmental Protection Agency
Region I
J.F.K. Federal Building
Boston, Massachusetts 02203

Re: Boston Harbor Wastewater Conveyance System
Draft Supplemental Environmental Impact Statement

Dear Sir or Madame:

The Boston Redevelopment Authority has reviewed the Draft Supplemental Environmental Impact Statement for the Boston Harbor Wastewater Conveyance System and offers the following comments.

The proposed project which is the subject of the Supplemental EIS consists of three elements:

1. construction and operation of an effluent diffuser in Massachusetts Bay to provide dispersion of treated effluent from an upgraded Deer Island wastewater treatment plant;

2. construction and operation of a conduit to transport the treated effluent from Deer Island to the diffuser site; and

3. construction and operation of a new conduit to deliver wastewater from Nut Island to the Deer Island secondary treatment plant.

This project is a component of the new secondary wastewater treatment facilities proposed to be constructed at Deer Island. The new facilities at Deer Island are designed to eliminate the discharge of inadequately treated wastewater and sewage sludge into Boston Harbor and thus improve the Harbor's water quality and environmental conditions.

Based on a review of feasible alternatives and their environmental consequences, the EPA has recommended a deep rock tunnel as the environmentally preferable conveyance system for both the inter-island conduit and the outfall conduit, individually drilled risers for the diffuser design, and an effluent outfall terminus located in the region of Massachusetts Bay between approximately 6.6 and 9.4 miles east-northeast of

Deer Island. This recommended location for the diffusers encompasses the area bounded by candidate outfall site 4 on the landward side and the vicinity of site 5 on the seaward side.

Upon review of the environmental impact evaluation contained in the Supplemental EIS, we concur with the recommendations of the EPA for a deep rock tunnel construction for the inter-island and outfall conduits, the design of individually drilled risers for the diffuser system, and the location of the outfall terminus. It is evident from the EIS that the deep rock tunnels, since they would be bored entirely from Deer Island and would not involve any dredging or excavation on the sea bottom, would result in the least environmental impacts and therefore are the preferable alternative for the conduits. With regard to the siting of the effluent outfall, the EIS indicates that the environmental benefits at site 5 are slightly better than at site 4, although generally they are similar and without any great differences. Therefore, if the same environmental benefits can be attained at a location close to site 4 as at site 5, the EPA should consider the closer-in site as the terminus of the outfall in order to minimize the financial burden on the rate-payers.

Concerning the information presented in the Supplemental EIS, we do have a number of questions and concerns which should be addressed in the Final EIS document.

- On page 5-44, a brief mention is made regarding a potential risk of damage to a pipeline-type diffuser by earthquakes since it could cross geological faults in the bedrock. However, nowhere else in the EIS is there any mention of earthquake risks to either the outfall conduit or the inter-island conveyance conduit. The Final EIS should evaluate the potential for earthquake damage to both of these conduits and the environmental consequences that would result. Should such damage occur, what would be the alternatives for repair, if any, and what would be the impact should repair not be possible?

- The EIS indicates that the diffusers could interfere with commercial fishing and restrict the types of gear which could be used (page 5-56). Obviously, trawling would be affected in the area where the diffusers are located. The Final EIS should provide more detailed information on the extent and type of restrictions which the diffusers would impose on commercial fishing. The Final EIS also should indicate whether the diffusers themselves could be damaged or otherwise affected by fishing operations and should describe the impacts which would result.

- Figure 4.2.5.f (also Figure F.2.d of Appendix F) indicates the presence of a "significant identified area of submerged vegetation" in the vicinity of candidate outfall sites 2.5 and 4. Since the eastern portion of this area is located within the recommended zone for the treatment plant discharge, the Final EIS should evaluate the impact on the vegetation of placing the outfall terminus within this area. The EIS also should indicate whether the specific location of the diffusers would be restricted by the presence of this area of sensitive harbor resources.

- In addition, Figure 4.2.5.f and the discussion of sensitive resources on page 4-52 should indicate that the Commonwealth has accepted the nomination of Belle Isle Marsh/Revere Beach/Saugus Marshes as an Area of Critical Environmental Concern (Broad Sound ACEC) and currently is in the process of considering its designation. The impact an outfall location near candidate site 4 would have on this ACEC should be examined in the Final EIS.

- The discussion of noise impact during the construction period seems to consider only noise that would be generated by the operation of the construction machinery. During the construction, the access shafts and the tunnels themselves will need to be ventilated to remove gases, dust, and carbon dioxide. The exhaust vents would be located above ground. Noise generated by these ventilation systems and the impact on adjacent residential areas also should be analyzed.

- Figure 6.1.a (Project Time Frame) does not reflect the most current MWRA project schedule as contained in the Secondary Treatment Facilities Plan nor is there any recognition in the document of the MWRA proposed accelerated construction schedule which would provide for 25% secondary treatment by 1996. According to the Facilities Plan, this alternative construction plan would provide the benefit of improved effluent quality during the years 1996 to 1999 in comparison to the base plan, since the plant would discharge a mixture of primary and secondary effluent rather than just primary effluent. The Final EIS, therefore, should include a discussion of the impacts of the accelerated schedule as compared to the base construction schedule.

- The text on page 5-23 indicates that for primary discharge the dissolved oxygen standard (6.0 mg/l) would be violated at Site 2 during resuspension events for both stratified and unstratified conditions. However, Table 5.1.1.h does not indicate a violation for unstratified condition, the minimum DO concentration shown as being 6.5 mg/l. This discrepancy should be resolved in the Final EIS. Also, in Table 5.1.1.i the PCB value of 1.70 for Site 4 in the Carcinogenicity section appears to be in error.

The Supplemental EIS points out that the current wastewater discharges from the Deer and Nut Island treatment plants are the major source of pollution causing environmental stress in Boston Harbor. With improved treatment and relocation of the discharge to the recommended location, water and sediment quality, the ecology of the Harbor, and its recreational and fishing values

will improve significantly. For this to happen, the construction of the conduits, as well as the treatment plant itself, must proceed as expeditiously as possible. We urge the EPA to complete the necessary environmental reviews and permitting processes without unnecessary delay in order that new facilities may proceed on schedule.

I trust that our comments will be helpful in the continuing review of this vital project to clean up Boston Harbor and that they will help guide the EPA in its future decisions as the project further develops.

Sincerely,

Paul Kelcia
Assistant Director for
Engineering and Design Services

cc: Daniel E. O'Brien, P.E.
Acting Director, Engineering Division
Massachusetts Water Resources Authority

G7

On Robert F Jamieson, Chairman
Raymond P Hayden, Vice Chairman
Gerald A Clay
Philip F Hodgdon Jr
Susan Finigan Brinkerhoff

TOWN OF MARBLEHEAD
OFFICE OF
Recreation and Park Commission
10 SCHOOL STREET
MARBLEHEAD MASSACHUSETTS 01945
TELEPHONE 631-2000

G7

May 24, 1988

Mr. Michael Deland, Regional Administrator
Environmental Protection Agency
J. F. Kennedy Federal Building
Boston, Massachusetts 02203

Dear Mr. Deland:

At the last regular meeting of the Recreation and Park Commission, the Board requested you be informed of our concern for the proposed location of the Boston Sewage Outfall with respect to Devereux Beach which is maintained by this department in Marblehead.

Devereux Beach is very heavily used by residents and non-residents during the year for many forms of recreation. The department usually sells about four thousand resident permits for cars which allow unlimited use for residents and charges a daily rate for non-residents allowing for an additional twelve to fifteen thousand cars per summer.

Please keep us informed of meetings and reports which may be reason for us to attend or review to comment on regarding your study and plans for the proposed outfall as it may affect the beach.

For the Commission,

Sincerely,

R. T. Hamond
Superintendent

RTH/hs

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MAY 25 1988
REGION I
OFFICE OF THE
REGIONAL ADMINISTRATOR

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HALE AND DORR
COUNSELLORS AT LAW
60 STATE STREET
BOSTON, MASSACHUSETTS 02109

April 20, 1988

David Toomey
United States Environmental
Protection Agency --
Region 1 WQE-1900 C
JFK Federal Building
Boston, Massachusetts 02203

Re: Draft Environmental Impact Statement on the Boston Harbor Sewage Treatment Plant

Dear Mr. Toomey:

On behalf of the towns of Hull, Cohasset, Scituate, Hingham and Marshfield and Save Our Beaches, Inc., we submitted the following documents to the Commonwealth of Massachusetts as comments on the Massachusetts Water Resources Authority's Draft Environmental Impact Report on its proposed sewage treatment plant. I believe that these comments are equally relevant to the hearing on the Environmental Impact Statement being conducted by your office.

Sincerely,

Michael Kendall

/jac

HALE AND DORR
COUNSELLORS AT LAW
60 STATE STREET
BOSTON, MASSACHUSETTS 02109

January 20, 1988

Mr. James Hoyte
Secretary of the Executive Office
of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

Re: Review of the Environmental Impact Report of the Massachusetts Water Resources Authority's Draft Secondary Treatment Facilities Plan, MEPA, No. 6136

Dear Secretary Hoyte:

On behalf of the Towns of Hull, Cohasset, Scituate, Marshfield and Hingham and Save Our Beaches, Inc.[1] (collectively, "the South Shore"), we are submitting this letter and the enclosed report of Dr. David G. Aubrey as comments on the MWRA's Draft Environmental Impact Report ("DEIR") for its Secondary Treatment Facilities Plan. While we have focused our comments on volume 5, which examines the impact of the effluent outfall pipe, many of the issues we raise relate to other volumes of the DEIR, particularly volume 3, which examines the environmental impact of the treatment plant.

As documented in Dr. Aubrey's report, the DEIR has several major deficiencies and omissions in its scope, methodology and analysis. Because of these flaws, the DEIR cannot substantiate its conclusions on the environmental impact of the proposed outfall pipe. It has not adequately demonstrated that the proposed outfall sites would meet Massachusetts Water Quality Standards or Federal Water Quality Criteria. Given that the MWRA's treatment plant is the single most significant environmental project in the history of the Commonwealth, we believe that the deficiencies in the DEIR are unacceptable and it is incumbent upon the Secretary of the Executive Office of Environmental Affairs ("Secretary") to ensure that the MWRA resolves these problems before it attempts to submit a Final EIR for review under M.G.L. c. 30, §61, the Massachusetts

[1] Save Our Beaches, Inc. is a South Shore citizens' group concerned with the health of Massachusetts Bay.

Environmental Policy Act ("MEPA"). We urge the Secretary to find pursuant to 301 CMR 11.08(4) that the DEIR does not "adequately and properly compl[y] with the provisions" of MEPA and 301 CMR 11.00 et seq. The MWRA should submit a Revised Draft EIR that remedies these deficiencies.

We are particularly concerned about these flaws because the review process for the DEIR has been flawed, and this has interfered with the ability of the public and the Secretary to comment on the DEIR.

. I. The Review Process for the DEIR Has Not Complied with MEPA Regulations.

As part of the MEPA review of the DEIR, the MWRA made volume 5 available for comment in late November, 1987, which was the start of the period for the public review and comments on the DEIR. However, the MWRA did not make available at that time the 33 technical appendices to volume 5. The MWRA made these appendices available during mid and late December, 1987.

In order to provide in depth comments on volume 5, a party must have adequate time to review the appendices. The report itself merely contains conclusions that cannot be tested without reference to the data in the appendices. The scope and complexity of the project are so great that the MWRA should have maximized the amount of time available to the public and the Technical Advisory Group ("TAG") to review the appendices. Now, because of this late release of the appendices, neither the public nor the TAG have had 30 days to review the appendices, as envisioned under MEPA. I understand that the Environmental Protection Agency has delayed its EIS review in order to ensure that the appendices are available before its review starts.

I also understand that the Secretary has extended the deadline by which the TAG has to submit its comments on the DEIR from January 20, 1988 to January 27, 1988 and that the Secretary will issue his decision on the DEIR on January 27, 1988. The fact that the Secretary granted this extension indicates his belief that the TAG, and the public, have not had adequate time to review the appendices.

We do not see how the Secretary can render a fully informed decision on the DEIR, if interested parties and the TAG will be submitting comments up to the day of the decision on January 27. The unavailability of the TAG's comments has hindered the public's critiques as well. The DEIR is so complex technically that no party can assemble the number of diverse experts required to thoroughly review the DEIR.

In the past, interested parties have relied on the TAG for technical advice. By delaying the release of the technical appendices until December, 1987, the MWRA has effectively prevented

many groups, including the South Shore, from integrating the TAG's work into their own comments.

Finally, we also want to alert you to the appearance of a conflict in the review process. The Secretary is the final decision maker in reviewing the Draft and Final EIRs. The Secretary, however, also serves as Chairman of the MWRA.

II. Deficiencies in the DEIR

Dr. Aubrey's attached report critiques volume 5. It demonstrates that volume 5 has such serious deficiencies that it cannot substantiate the DEIR's conclusions about initial dilutions, long term fate and toxicity of the effluent, or the effluent's impact on the biology of Massachusetts Bay. Among these deficiencies, the DEIR:

- fails to model and observe the impact of surface gravity waves,
- does not properly calculate sedimentation and it fails to study particulate resuspension,
- lacks critically needed data on the behavior of the Bay during the winter,
- ignores any site more than 6 miles from the shoreline, and
- studies the outfall's impact for a 25 year period, even though it will be in operation for at least a century.

Dr. Aubrey details the corrective actions that the Secretary should require the MWRA to undertake before it submits a Revised Draft EIR. We will not repeat Dr. Aubrey's recommendations in this letter; we simply ask that your office give them full consideration and require the MWRA to carry all of them out.

During the past year the MWRA has often publicly rationalized certain of its decisions by citing the time pressure imposed by the federal court's compliance schedule. That the federal court is anxious to remedy the pollution in the Harbor cannot, and should not, be read to suggest that the Secretary should relax MEPA safeguards for protecting the environment. The MWRA is building an outfall pipe that the Commonwealth will use for more than a century and its impact on Massachusetts Bay will be felt for a longer time. Thus, even if the MWRA must ask the court to reschedule certain deadlines in order to give the MWRA time to remedy the DEIR's failings, this delay is a minimal one when viewed in light of the length of time that the MWRA will operate the outfall pipe and the outfall's environmental impact.

Long before the MWRA released the DEIR, interested parties had informed it about some of the deficiencies cited by Dr. Aubrey's report. During 1987, members of the TAG, municipal officials on the South Shore, and community groups such as Save Our Beaches, and Hahant SWIM, Inc. called these problems to the MWRA's attention. These interested parties discussed the need for data gathered during the winter months and the importance of studying a site further out into Massachusetts Bay beyond Site 5.

The MWRA at first only intended to study five near shore sites and one slightly deeper site. After it had started its investigations, the MWRA included Site 5. Throughout this period, the MWRA knew that the Environmental Protection Agency ("EPA") had already rejected Site 5 for disposal of primary effluent on March 29, 1985, when the Metropolitan District Commission ("MDC"), the MWRA's predecessor, applied for a 301(h) waiver.[2]

A site that was unacceptable two years ago is now the best site that the MWRA has proposed. This results from the DEIR only studying locations between the rejected 301(h) site and the shoreline.[3] In light of the EPA's rejection of the MDC's request for a 301(h) waiver, the MWRA was on notice of the need to study a site further out than site 5.

The MWRA attempts to rationalize the narrow range of sites by stating that the environmental benefits of moving the outfall

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2 Occasionally, this denial is explained as resulting from the MDC's failure to bear its burden of proof, and not as an affirmative finding that primary treatment would pollute the Bay at unacceptable levels. However, the EPA's March 29, 1985 decision at pp. 4-5 states that the discharge of primary treatment at site 5 would violate the Massachusetts water quality standard for dissolved oxygen and "adversely impacts the ecosystem and beneficial uses of the receiving waters and will not comply with the requirements of section 301(h) and 40 CFR Part 125, Subpart G".

3 The EPA's decision on the MDC's application for a 301(h) waiver is relevant to the MWRA's proposed treatment plant, even though the MDC proposed to dispose of effluent receiving only primary treatment and the MWRA plans to build a secondary treatment plant. The MWRA intends to dispose of primary effluent through the pipe for at least five years, and possibly longer if the secondary treatment plant is delayed, or if the outfall pipe becomes operational before the new primary plant is operational and the MWRA disposes of effluent from the older plants through the pipe. Also, whenever rainwater run-off creates a sewage flow that exceeds the capacity of the secondary plant, the facility will release a mixture of secondary and primary effluent. Finally, it is quite possible that the plant may have operational problems that effect the quality of the effluent.

terminals beyond site 5 do not justify the additional cost. The MWRA cannot judge whether environmental benefits are cost justified until it knows what the benefits are. And the costs may not be that great. The MWRA concedes that it can build an outfall pipe of up to 60,000 feet -- 6,000 feet longer than required for site 5 -- without needing an additional pumping station. (See Appendix E, p. 69). The MWRA bases its cost analysis on a 25 year basis, even though it readily concedes that it will use the outfall pipe for at least a century.

Thus, the Revised Draft EIR must examine the feasibility of locating the terminus of the outfall pipe at a location further from shore than site 5, possibly site "6" which is discussed at length in the submission of Hahant SWIM, Inc.

The DEIR ignored two other subjects, both of which it must address before satisfying the MEPA requirements. As required under 301 CMR 11.07(4), the DEIR must discuss alternatives to the MWRA's proposed project. Originally the MWRA proposed constructing the diffuser as a perpendicular tunnel located at the end of the outfall pipe. During the months of discussion leading up to the release of the DEIR in November, 1987, the MWRA had led the public to believe that it would construct such a diffuser. Now, apparently to reduce costs, the MWRA proposes eliminating the perpendicular pipe, and constructing the diffuser along the last 6,600 feet of the outfall pipe. For each site, this would result in a release of effluent significantly closer to shore than would occur under the MWRA's original plan. The DEIR should consider the benefits of the alternative, perpendicular diffuser design.

Also, the DEIR fails to discuss measures that could mitigate the negative effects of the outfall pipe, as required under 301 CMR 11.07(7). The Revised DEIR should study the benefits of limiting the quantity of effluent flowing through the pipe, eliminating chlorine from the effluent, pretreatment screening, prohibiting the MWRA from providing sewage services to communities that presently do not receive such services, and other measures that would lessen the outfall's harmful impact on the Bay.

The MWRA has failed to adequately study the impact that the outfall pipe will have on the environment of Massachusetts Bay. M.G.L. c. 30, §61 and 301 CMR §11.10 require that the MWRA prove that it has undertaken all feasible measures to avoid or minimize impact to the environment. If the Final EIR fails to study any site beyond the site rejected for the 301(h) waiver, and fails to adequately study the impact of the effluent on the Bay, the MWRA will not be able to demonstrate compliance with M.G.L. c. 30, §61.

The MWRA concedes, and we agree, that, generally speaking, the further out into the Bay that the outfall pipe discharges effluent, the less harmful its impact will be on the environment. Because the MWRA has failed to adequately demonstrate the outfall's environmental impact, we believe there should be a

presumption that the MWRA must locate the outfall pipe at a site beyond the location for which the 301(h) waiver was denied. The MWRA should only be allowed to rebut this presumption by complying with MEPA and demonstrating that the environmental impact of a site nearer to shore "minimize[s] damage to the environment".

Sincerely,

Paul G. Wallach

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ANALYSIS OF VOLUME 5 (PLUS APPENDICES)
DRAFT ENVIRONMENTAL IMPACT REPORT
SEWER OUTFALL SITING
MASSACHUSETTS WATER RESOURCE AUTHORITIES

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18 JANUARY 1988

I have reviewed portions of the Draft Environmental Impact Report (DEIR) for the Sewer Outfall siting proposed by the Massachusetts Water Resource Authorities. I have concentrated on volume V of the DEIR, "Secondary Treatment Facilities Plan, Effluent Outfall." In addition, I have reviewed a significant number of appendices for the DEIR, as indicated in my Appendix 1. For this review, I concentrated on the physical and geological oceanographic aspects of the project, while assessing to a lesser degree the biological and chemical aspects of the DEIR. Given the scope of my involvement as requested by the South Shore Towns and Save our Beaches, Inc., and the restricted time frame available for my review, no new numerical calculations or field measurements were incorporated as part of this study. Rather, the study was restricted to a review of the methodology, observations, and interpretations of the data provided in the DEIR, as well as consideration of other data available for this site (obtained by myself and other oceanographers).

For your information, I enclose as Appendix 2 my curriculum vitae.

OVERVIEW AND BACKGROUND

In this discussion, I outline several critical areas of omission within the DEIR that place in question the scientific basis for drawing many of the conclusions and recommendations of the DEIR regarding environmental impact. The fundamental importance of some of these neglected processes (including effects of surface waves, seasonal variability, and sedimentation/resuspension) cannot be overemphasized, because it fails to study these factors, the DEIR has an incomplete scientific basis for its assessment of initial dilutions, long-term fate, and toxicity of the effluent. Before a defensible selection of an effluent discharge site can be made, significant additional observational and modeling work is required. Once that additional analysis is completed, the EIR should be subject to a second thorough review to assure the completeness of the analysis.

The siting of a future outfall is a critical issue, since effluent from one of the nation's largest cities will be discharged directly into the Bay at this site for the next century or so. For a minimum of five years, and likely longer given the judicial, regulatory, and permitting processes, primary-treated effluent will flow directly into the Bay at this site. Following that indeterminate period of time when primary effluent is discharged, effluent having undergone secondary treatment will be discharged into the site, for a period of a century or so. During this time, a wide variety of chemicals will be discharged into the shallow coastal ocean, an environment having an assimilative capacity that is incompletely understood. While we have identified a long list of chemicals having adverse impacts on the ecosystem that we have proven or shown with some scientific basis, the list of chemicals whose effects we do not understand is likely much longer. These chemicals all will

be discharged for a long period of time into the shallow ocean; recovery from heavy loading will be impossible once the material enters the ocean, leading to possible long-term adverse effects that we can only hypothesize crudely at this time. Thus we must be particularly cautious -- not overly optimistic -- in interpreting the DEIR.

A new secondary treatment facility for Boston's sewage is essential, a fact that must be balanced against environmental uncertainties. The present unhealthy and unjustifiable dumping of nearly raw sewage into shallow waters of Boston Harbor must be stopped as soon as possible. However, the urgency of the matter is not such that we should rush headlong and make mistakes in selecting the next site; we must be careful not to repeat our past mistakes. While a new effluent discharge site is essential, we must take the time now before undertaking this extensive, costly operation to be as certain as possible (with as low a level of doubt as we can get) to site the new effluent outfall in a position having minimal impact on the marine and terrestrial ecosystems (including man). Although initial costs might be higher if the most environmentally sensible outfall location is selected, these costs can be amortized over the duration of the project (which might be more than a century, rather than 25 years). Once constructed, moving the outfall will not be done simply if a design flaw is detected. The past history of Boston's sewage management practices attests to the tremendous inertia in this system.

In many respects the DEIR appears to be a well-thought out document. Although appreciable effort seems to have been expended in the definition of the scope of the project, the specific objectives to be addressed, and the individuals and companies selected for the work, there are major gaps in the DEIR that must be addressed before any definitive selection of an outfall site can be made.

Some substantive omissions of considerable importance must be addressed and clarified before the DEIR is accepted. The potential importance of these substantive omissions is so large as to place in doubt some conclusions regarding selection of an outfall siting and the expected concentrations and sedimentation rates of the effluent materials. Other omissions are less substantial, but still should be remedied.

MAJOR ISSUES THAT MUST BE ADDRESSED-SUMMARY

As a preview, the major issues that have been neglected and that must be addressed before conclusions on environmental assessment of outfall siting can be made are listed below. These will be discussed in greater detail in a later section of the report. All bear on the proper interpretation of available data and the selection of a candidate outfall site. Any site selection made now would be premature, given the potential importance of the omissions. Assessments of circulation, mixing, sedimentation, water column and benthic accumulations and concentrations of dissolved and particulate materials (including contaminants), and hence impacts on the environment cannot be defended scientifically at this point, given the present large gaps existing in our knowledge of the physical environment.

1) Failure to model and observe surface gravity wave forcing for circulation, sedimentation, and mixing calculations. Surface waves are a dominant, controlling factor in shallow coastal ocean processes, whose effects have been neglected but must be included in all modeling calculations.

2) Nearly total omission of sedimentation and particulate resuspension calculations. This omission is particularly critical since many of the chemical species within the effluent may attach to sediment particles and be carried with the sediments. Since sedimentation and particulate resuspension are neglected largely in the DEIR, calculations of chemical accumulations and mixing lack sufficient scientific basis.

3) Inadequate temporal coverage for current meter and light transmission observations. No winter data are reported on in the DEIR for the permanent sites (4.5 and 5). Lack of observation precludes proper modeling of winter storm and circulation patterns.

4) Inadequate observation and specification of the open boundary condition for the numerical modeling. The boundary conditions across the Massachusetts Bay/Atlantic Ocean boundary drive much of the circulation within Massachusetts Bay. Incomplete specification of this boundary condition can produce gross errors in circulation predictions, and hence incorrect estimates of dispersion.

5) Use of a two dimensional numerical circulation model neglects the vertical structure of storm-generated flow documented within Massachusetts Bay. Whereas the two-dimensional model may predict zero net flow at a point, in fact there might be flow at the surface in one direction, and flow near the bottom in exactly the opposite direction.

6) The circulation models neglect the dynamic contributions of the freshwater discharge on general circulation. During maximum discharge, the outfall will generate a discharge one-quarter the average freshwater discharge of the Merrimack River and twenty times the freshwater discharge of the Charles River. During average discharge conditions, the outfall will generate 10% the average freshwater discharge of the Merrimack River and twice the freshwater discharge of the Charles River. Such a large inflow of water near an outfall will cause changes in circulation that must be modeled to predict fate of contaminants. The existing models have not examined this effect.

7) No sites deeper than site 5 were considered in the DEIR. This omission makes it difficult to specify a best site for effluent discharge from an environmental standpoint. Whereas site 5 may be optimal of the sites considered, the DEIR did not examine the reasonable possibilities for discharge siting.

8) Proper scientific and engineering method was not followed in the DEIR. Proper methodology would dictate that a broad regional study be performed to define the general oceanographic characteristics of the area, from which a few candidate sites could be identified. A more intensive monitoring and observance effort would take place at these potential discharge sites identified from the initial investigation. The weakness in methodology decreases the likelihood that the most appropriate sites are identified objectively, and increases the likelihood that site selection will rely too heavily on preconceived notions of site suitability. As it now stands, sites 4.5 and 5 have few observations compared with other sites, partly because they were identified late in the DEIR process. Consequently, measurements at these recommended sites are inadequate to draw certain important conclusions regarding effluent fate.

9) The present DEIR discusses the potential impacts of the discharge resulting from five years of primary treatment (likely an underestimate, based on historical bases) plus twenty years of discharge of effluent undergoing secondary treatment. Since the facility will be in operation for many decades, perhaps approaching a century, longer term impacts should be addressed.

SECONDARY ISSUES THAT SHOULD BE ADDRESSED

A few of the secondary concerns that should be addressed include:

1) The maps throughout the environmental review are not in a common format. The locations of potential outfall sites are not given in most maps, so the relationship between the data and the outfall location becomes obvious only after considerable effort.

2) Some data are missing from the various data reports. For instance, in Appendix G, Physical Oceanographic Field Data, many plots are missing. The lack of plots can imply either the work was not performed (contrary to descriptions in the text), or the plots were omitted inadvertently. Tracking down the various missing plots consumes much time.

3) Selection of which results to highlight in summaries is arbitrary. A different slant to the summary could be obtained by including a more representative selection of scientific analyses and results.

4) The feasibility and necessity for stripping chlorine from the effluent before discharge should be addressed.

5) The scientific basis for deciding that either the Criteria Continuous Concentration (CCC) or the Criteria for Maximum Concentration (CMC) is the appropriate basis for meeting water quality standards is unclear, given the lack of consideration of adhesion of chemicals to sediment particles.

6) The Dissolved Oxygen standard of the Commonwealth should be applied on a local basis, and should not be averaged over depth or space. A single measurement violating the standard should be interpreted as a failure to follow the standard. The proper interpretation of the DO standard is not made clear in the DEIR.

DISCUSSION OF MAJOR DEFICIENCIES

In this section, the major deficiencies identified above are discussed in more detail. The scientific basis is provided to substantiate the claims of their importance.

1) Surface gravity waves

Surface gravity waves, or wind waves, are a dominant component of the energy budget in the ocean. The energy density in these surface waves far exceeds that of most other water motions. These waves occur on time scales of seconds, causing intense mixing within the water column and on the bottom of the ocean. As such a dominant element in coastal ocean processes, they must be a primary component of any observational and modeling program. The present DEIR completely neglects the presence and importance of surface gravity waves. The observational program provided no measurements of these important processes, and the current meters used in the program were not appropriate under conditions of large waves (jeopardizing the results of current measurements). The modeling efforts also neglected the impacts of the surface waves, using instead long-wave models to calculate mixing and dispersion. Even the deepest sites are prone to sediment resuspension due to waves, so this effect cannot be neglected.

Surface waves are essential for determining initial mixing of effluent on the shelf. The impacts of waves will be to increase the mixing of some materials, particularly dissolved constituents. Waves will impact the height to which the effluent will rise in the water column, partly through their control of stratification in the water column.

Surface waves create strong shear stresses on the bottom, resuspending sediments much more easily. Since contaminants may adhere to sediments, surface wave mixing will make sediments more available for ambient currents to transport the sediments in different directions. Without surface waves, it is difficult to move bottom sediment. With surface waves, sediment transport is facilitated greatly.

Under appropriate conditions of long wave period and appropriate heights, waves by themselves can cause a transport of sediment towards the shore. Waves of appropriate period and height have been documented in Massachusetts Bay and Cape Cod Bay, so this effect must be analyzed and quantified to examine whether onshore transport by waves presents an environmental hazard to coastal communities and ecosystems.

At a minimum, the following compilations, observations, and analyses should be undertaken:

a) A summary of all available wave data for this area.

b) Year-long measurement of directional wave spectra for the candidate outfall site(s). Use of high quality, well-proven hardware and software are essential.

c) A short-wave numerical model must be included to describe surface wave shoaling, refraction, diffraction, reflection, and other transformations between the candidate site(s) and the shore.

d) The long-wave numerical model (TEA-NL) must incorporate important short wave effects such as wave impacts on bottom stress and gradients in wave radiation stress.

e) The mixing/dispersion model (ELA) must incorporate explicitly wave effects on dispersion and mixing.

2) Sedimentation and resuspension

Detailed analysis of sedimentation and resuspension processes is omitted from the DEIR. Only cursory, qualitative discussions and calculations of these effects have been presented in the context of other considerations; no effort was expended to examine the sedimentation problem in its own right. Effluent constituents will tend to adhere to sediment particles within the water column and accumulate in bottom sediments. In addition, adhesion and cohesion will occur as the effluent mixes with the water column. Whenever fresh and saltwater mix, flocculation occurs for clay minerals. The co-existence of clay minerals with suspended and dissolved chemicals increases the "stripping" of chemicals from the water column, enhancing sedimentation. Similarly, biological activity in the water column will enhance stripping of chemicals from the water column. Such sedimentation processes will increase the likelihood of increasing localized concentrations of chemicals in the bottom sediments, with potential adverse effects on the local biota. No modeling of these processes exists in the DEIR, a omission that must be remedied.

Sediment on the bottom gets resuspended periodically during storms, as has been shown by numerous investigators and cited in the DEIR. If chemicals have adhered to the clay particles as is likely, the resuspension may mobilize (physically or chemically) the chemicals once again and release them for transport to other parts of the environment. The resuspension process is an important one for determining the ultimate fate of effluent constituents.

The DEIR asserts that lack of large accumulations of sediment combined with high concentrations of boulders and gravel near site 5 indicate an erosional area. Neglected in this logic is a consideration of what sediment may be available for transport in this area, the origin of the coarse material (likely glacial), and a distinction between non-depositional environments versus erosional environments. Site 5 may be non-depositional due to lack of adequate sediment source, but it is not necessarily erosional. Observations cited in the DEIR suggest a possible seasonal cycle to resuspension in the study region. If this is true, sediment may be deposited on rocks and boulders during calm conditions, and resuspended during storms. The resuspended material may leave the rocks, but it might still deposit in the spaces between the rocks. Sampling density was inadequate to determine if this occurred. Consequently, designation of the site as an erosional one is misleading and possibly incorrect; available data do not permit us to conclude whether the site is erosional, non-depositional, or depositional.

At a minimum, the DEIR must be expanded to include:

a) Detailed sediment sampling for grain size analysis within areas of coarse sediments.

b) Chemical dating to examine sedimentation rates, taking into account the presence of gravels and other coarse materials.

c) Modeling of the "stripping" potential of clays and other sediment particles on various effluent constituents, and possible accumulation in areas of sedimentation.

d) Calculations of resuspension potential for sediments in the outfall region.

3) Inadequate temporal coverage for observations

Current meter, light transmission, dissolved oxygen, and other pertinent data required for modeling of potential effluent impacts are missing for the critical winter months. The lack of high quality data during this period (most critical data identified in the EIR scoping were not acquired due to loss of over 75% of the current meters deployed during the winter period; no winter measurements were made near sites 4.5 and 5) make modeling of future impacts conjectural. Winter storms play a major role in circulation, resuspension, and transport of suspended and dissolved materials. Without these data, which coincide with major rains pumping storm drain discharge into the ocean, impacts cannot be assessed properly. Existing observations in nearby areas (some cited in the DEIR) document the importance of these types of storms on circulation patterns and sediment distributions.

In order to remedy these shortcomings, the following data are essential:

a) Current meter, temperature, light transmission, dissolved oxygen, salinity, and other pertinent data acquired within and adjacent to the potential outfall site(s) on a seasonal basis (at least two months per season).

b) Models must be rerun to include a variety of different types of "events" to examine the winter storm response of Massachusetts Bay. These model runs should include a variety of "events" rather than the single event now examined in the DEIR.

4) Open boundary condition problem

The circulation models are run assuming a simple open boundary condition for the seaward boundary. Just as the conditions that exist for flow at a coast must be specified (no flow through the coast), so the conditions must be specified for flow at the open boundary that is forcing the flow within the Bay. For instance, the Bay tidal circulation is generated by specifying how the tidal elevation varies along the open boundary. If a non-uniform elevation were placed along this boundary, then the currents would change significantly within the Bay.

For the modeling of storms and wind stress contained within the report, an assumption was made that the sea surface height along the boundary varied in a linear fashion, an assumption not supported by direct field measurement. In order to obtain credible results from the modeling, the boundary conditions must be specified in a defensible manner. Since no adequate measurements were taken during the DEIR program, the circulation estimates must be interpreted as general guidance not related to specific local circulation conditions. The circulation models form the basis for all other estimates of dilution and concentrations; hence with an uncertain circulation model, the other calculations must be interpreted only qualitatively. Quantification of actual chemical and nutrient loading is risky given limited existing model verification.

To remedy this deficiency, a specific field program must address the open boundary problem, as found for other studies of Massachusetts Bay (such as for the Bay of Fundy program). The following measurements will be required as a minimum:

a) Measurements of sea surface height along the open boundary, on a sufficiently dense network to resolve large-scale gradients.

b) Measurements of currents at selected points along the boundary (possibly at fewer locations than sea-surface is measured), to verify the model further.

c) These measurements must be made for a variety of weather conditions to assure good representation of actual circulation patterns for a variety of conditions.

d) Sensitivity analyses must be run using the model to determine how uncertainties in knowing the open boundary conditions affect the circulation and dilution results.

5) Two-dimensional modeling

A dominant mode of circulation hypothesized for Massachusetts by past investigators involves flows that vary with depth. Flow near the surface may be in one direction, while deeper flows may be in the exact opposite direction. A two-dimensional model cannot reproduce these circulation patterns; in fact, for this case a two-dimensional model might estimate zero net flow. If the dispersion is to be determined correctly, the vertical variation of flow must be modeled properly. Such modeling is essential if one is to rely on the DEIR to estimate patterns of sedimentation and particulate and dissolved solids transport.

The following recommendation is made to alleviate this shortcoming:

a) A three-dimensional (coupled or un-coupled) model should be run to determine the impacts of vertical structure in the circulation responding to wind and tidal forcing.

6) Contributions of freshwater discharge on Bay circulation

The DEIR has cited evidence of the significant influence of freshwater inflow (primarily from the Merrimack River) on circulation patterns in Massachusetts Bay. Such influence has been documented by a variety of researchers in the past. Presently a significant volume of fresh water is being discharged into Boston Harbor out into the Bay as a result of effluent discharge.

Estimates of freshwater discharge to the proposed effluent outfall range from a low of 300 mgd to a high value of 1270 mgd, with an average of approximately 550 mgd. The low value represents a discharge greater than the Charles River contribution at the present time. The high value represents 25% of the average daily discharge of the Merrimack River (the largest river in Massachusetts) into Massachusetts Bay! The mean daily discharge estimated for the effluent is approximately 10% of the daily mean discharge of the Merrimack, and five times the mean discharge of the Charles River. Just as these rivers impact the circulation in the Bay, the effluent discharge can be expected to have an impact on circulation. Such impacts were not considered in the modeling studies.

There are two primary impacts of this localized, high rate of discharge. First, the dilution of such discharge, which is going to be between 100 and 200 times, will require a constant supply of saltwater to feed this dilution. A likely source of this dilution water will come from bottom flow towards the diffuser pipe. This bottom flow will disrupt the normal circulation in the area and perhaps increase local accumulation or erosion of effluents. The second impact is that this large mass of freshwater may exert a more expanded dynamical control on larger-scale circulation within the Bay. The numerical models did not investigate the potential impact of horizontal density gradients on resultant circulation within the Bay.

To address these issues, the following additional components are suggested:

a) Modeling of the dynamical impacts of concentrated buoyant freshwater discharges into the Bay, to examine vertical mixing patterns induced by such discharge and to determine how these dilution processes would be fed with salt water.

b) Modeling of the large-scale dynamics of this dilution source on the Bay circulation as a whole, to investigate how the larger-scale circulation might be changed by the limited areal extent of the diffuser discharge.

c) Modeling of the impacts of such dynamical effects on dilution, sediment transport, resuspension, and toxic accumulations.

7) Deepwater sites

Site 5 was added as a potential disposal site after the EIR investigations were underway, presumably with the knowledge that a deeper site would have smaller environmental impacts. No

sites deeper than site 5 were considered during the EIR process, in spite of the finding that calculations and estimates of environmental hazards showed a reduction as deeper water was approached. This lack of completeness was justified by an unclear reference about reduced incremental benefits. In my opinion, the environmental issues should be addressed independently of in depth cost reviews. If a deeper water site appears to be most advantageous environmentally, then such a statement should be made and the site selection should proceed with that environmental input. Cost considerations then might dictate the eventual choice, but at least the environmental issues will be clear when such a study is made.

To address this concern, the following suggestion is made:

a) A deeper water site should be investigated.

b) Environmental impacts at the deepwater site should be compared with shallower sites.

c) A recommendation based purely on environmental considerations should be made, to balance against other decision making issues.

8) Study procedures

A study of this complexity should be undertaken, starting from a large space scale and focusing down to a smaller scale once site options are defined. The smaller spatial scale studies should address specific processes at the local areas identified from the broader scale investigation. For instance, if site 5 were the one selected based on a broad areal review, relevant environmental parameters should be measured at that exact spot for the required period of time. Such a procedure was not followed in this case, particularly since the candidate sites recommended were not originally designated sites.

Although it may be late to follow such procedures here, the following recommendation should be considered:

a) For all candidate sites, specific environmental parameters (currents, light transmission, salinity, temperature, etc.) should be measured at the sites to obtain seasonal coverage.

9) Duration of treatment discharge

The DEIR considers the impacts of discharging five years of effluent treated only with primary treatment and twenty years of effluent treated at a secondary level. In fact, the discharge of primary sewage may extend for longer than five years, given the history of most sewage issues (particularly in Boston Harbor). The environmental impacts of such a prolonged discharge should be examined. Second, the sewer system likely will be in service for longer than twenty years, and discharge will be accumulating for perhaps up to a century. The DEIR should consider these impacts as well.

Specific recommendations for the DEIR to address the treatment of longer term discharges to Massachusetts Bay include:

a) Quantify the impact of discharging primary treatment effluent into the candidate site(s) for periods of 5, 10, 15, and 20 years.

b) Quantify the impact of discharging secondary treatment effluent into the candidate site(s) for 50 and 100 years.

SUMMARY

The draft environmental impact report (DEIR) addresses many issues pertinent to environmental assessment of candidate effluent outfall sites. However, a series of critical omissions identified in this report reduces the applicability of the study, and removes the scientific basis for some of the conclusions and recommendations. Before a final selection of an effluent outfall site is made, these nine environmental issues raised above must be addressed. Although the likelihood of each issue changing the conclusions of the DEIR has not been proven through this limited review, all issues are substantive and have the potential for changing the environmental impacts of the project. Following completion of more modeling and observations, the new EIR should be subject to thorough review to assure that the deficiencies in the modeling have been addressed adequately.

David G. Aubrey, PhD.

· APPENDIX 1

LIST OF APPENDICES REVIEWED FROM EFFLUENT OUTFALL DEIR

A. PHYSICAL OCEANOGRAPHY

B. CHEMICAL AND BIOLOGICAL OCEANOGRAPHY

D. CONCEPTUAL DIFFUSER DESIGN

E. ENGINEERING ANALYSIS OF ALTERNATIVE OUTFALL SYSTEMS

F. OFFSHORE GEOTECHNICAL STUDIES AND CRITERIA

G. PHYSICAL OCEANOGRAPHY FIELD DATA

H. NEAR AND FAR FIELD MODELING

I. OCEAN SURVEYS DATA REPORT

L. RESOURCE MAPPING

M. WATER QUALITY AND CHEMISTRY

N. ROV SURVEY I

O. ROV SURVEY II

P. REMOTS SURVEY I

Q. REMOTS SURVEY II

R. SEDIMENT GRAIN SIZE REPORT

S. BENTHIC CHEMISTRY SAMPLING

T. BENTHIC BIOLOGY SAMPLING

U. FISH AND EPIBENTHIC SHELLFISH

Y. NUTRIENT CHEMISTRY

Z. PRIMARY PRODUCTIVITY

AA. EFFLUENT TOXICITY REPORT I

DD. SCOPES OF WORK

EE. QA PLANS

P2

P2

May 1, 1988

Michael Deland, Regional Administrator
Environmental Protection Agency
JF Kennedy Federal Building
Boston, MA 02203

Dear Mr Deland:

The area now recommended for the largest sewage outfall in the world is dangerously close to shore. Tidal currents could pollute beaches, shellfish areas and pick up disease. It does not make sense to clean up Boston Harbor by polluting Massachusetts Bay.

Please Choose site 6 - 9 miles from Nantasket, Hingham, Hull, Nahant, Cohasset, Scituate and Duxbury.

Please build primary/secondary plants simultaneously so that no chemically treated sewage is discharged into Massachusetts Bay.

Sincerely,

Phyllis Haven Brown
17 Lacy Street
Needham 02192

P3

P3

Michael Deland, Regional Administrator
Environmental Protection Agency
John F. Kennedy Federal Bldg.
Boston, MA 02203

Dear Mr. Deland: May 6, 1988

Please help protect both Boston Harbor and Massachusetts Bay from pollution.

The area now recommended for the <u>largest sewage outfall in the world</u> is dangerously close to shore. Tidal currents could bring it onto North Shore beaches, shellfish areas could remain closed forever, and fish and lobster diseases could increase. It doesn't make any sense to clean up one area, Boston Harbor, by polluting another, Massachusetts Bay.

We urge you to require:

1) An outfall location at "Site 6" which is 9 miles from Marblehead, Swampscott, Nahant, Hull, Cohasset, and Scituate

2) Primary and secondary treatment plants be built simultaneously, so minimally treated sewage is not discharged into Mass. Bay.

3) No degradation of the Massachusetts Water Quality Standards.

Sincerely,

REGEIVED
MAY 18 1988
REGION I
OFFICE OF THE
REGIONAL ADMINISTRATOR

P4

P4

May 8, 1988

Michael Deland, Regional Administrator
Environmental Protection Agency
JFK Federal Building
Boston, MA 02203

Dear Mr. Deland:

We are concerned about the plans for the proposed sewage outfall for the Greater Boston Sewerage District. The areas now under proposal are dangerously close to the shores of the North Shore and we feel it would result in much pollution. It would in addition to polluting the fine beaches and being a health hazard, also bring disease to the fish and lobster that we now consume. It just does not make sense to try to clean up one area that is now being polluted (Boston Harbor), and transfer that pollution to our fine areas namely the North Shore.

Because of the above possible danger, we urge you to argue, propose, and insist:

1. An outfall at "Site 6" - Nine miles from Nahant, Marblehead, Swampscott, and also South Shore towns be used!
2. Primary and secondary sewage and treatment plants be built simultaneously, so minimally treated sewage is not discharged into Massachusetts Bay!
3. No degradation of the Massachusetts Water Quality Standards.

Sincerely yours,

Joseph E. Gardner Rachel Gardner

Joseph E. Gardner
Rachel Gardner

22 Lale Shore Road
Lynn, MA 01904

. 11 1988
REGION I
OFFICE OF THE
REGIONAL ADMINISTRATOR

P5

P5

9/9/88

Michael Deland, Regional Administrator
Environmental Protection Agency
J.F.Kennedy Federal Building
Boston
Ma. 02203

Dear Mr. Deland:

Regarding the Boston sewer outfall siting, we urge you to require that it be 9 miles from the Massachusetts shoreline. We have little faith that a secondary treatment plant will be on line continuously once it's built. That leads us to anticipate 500 million gallons of minimally treated sewage will issue from the outfall at times for years to come. We are not usually in favor of saddling our children with payments when they're adults for commitments that we adults enter into today, but in the case of a longer outfall, it seems perfectly justified to increase indebtedness. Whatever the costs, present or deferred, that outfall needs to be 9 miles off shore for continued protection of Massachusetts Bay.
In the case of court-ordered schedules, it seems reasonable to anticipate that , if the outfall pipe proceeds to a site nearer land on schedule, Judge Mazzone could grant a time extension to reach site 6 based on the work already accomplished. We then take the view that site 6 is feasible without fines or penalties.

Sincerely,

Charlotte and Leslie Moore
25 Phillips Road
Nahant, Ma. 01908

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1 3 1988
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P6

EDWARD H. HOLL, II
16 ESSEX STREET
SWAMPSCOTT, MA 01907

P6

May 9, 1988

Michael Deland Regional Administrator
Environmental Protection Agency
JF Kennedy Federal Building
Boston MA 02203

Dear Mr Deland

Please help protect BOTH Boston Harbor AND Massachusetts Bay from pollution

The area now recommended for the largest sewage outfall in the world is dangerously close to shore Tidal currents could bring it onto our beaches, shellfish areas could remain closed forever and fish and lobster diseases could increase It doesn t make sense to clean up one area - Boston Harbor - by polluting another - Massachusetts Bay

I urge you to require

1) An outfall location at "Site 6" - nine miles from Marblehead, Swampscott Nahant Hull Cohasset and Scituate

2) Primary and secondary sewage plants built simultaneously, so minimally treated sewage is not discharged into Massachusetts Bay

3) No degradition of the Massachusetts Water Quality Standards

Please help to effectuate the above in order to further protect our shoreline The additional costs born now will be a good investment for the future

Sincerely Yours,

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1 3 1988
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P7

rec'd 5/10/88

P7

DANIEL C. COTTON
97 ELM STREET
CHELSEA, MASSACHUSETTS 02150

May 9-1988

Michael Deland, Regional Administrator
Environmental Protection Agency
J.F. Kennedy Federal Bldg
Boston, Mass 02203

Dear Mr Deland.

As a long time resident deeply involved in Chelsea's affairs I am concerned that the outfall presently recommended by your department for sewage created by inland Communities endangers the shellfishing areas and beaches along the coast of ours and neighboring towns.

I recognize the urgency and applaud the program for cleaning up Boston Harbor, but I do urge yours and your departments serious consideration of what is termed Site 6 - The admittedly heavy addition to the already heavy cost pales when compared to the price our shore communities may be obliged to pay in the decades ahead.

I thank you for your consideration

Sincerely
Daniel C Cotton

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MAY 1 1988
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REGIONAL ADMINISTRATOR

P8

4 Colonial Road
Revere, Ma.
02151

Michael Deland
Regional Administrator
Environmental Protection Agency
John F. Kennedy Federal Building
Cambridge St., Government Center
Boston, Ma. 02203

May 9, 1988

Dear Mr. Deland:

I am writing to you in my capacity as school committeeman and citizen of Revere, Ma., and I strongly urge you to select site # 6 the location of the Sewage Outfall Pipe.

Site # 6 would allow for adequate shoreline protection for the adjacent communities, wildlife, marine fisheries, and all of the recreational uses of the coastal areas of Suffolk and Essex Counties.

It must be considered that the expenditures we may have to disburse in the future could be more than those we could expend at this time to properly locate the outfall pipe at the seaward most position.

Thank you for your consideration.

Sincerely,
James R. Rose
School Committeeman
City of Revere, Ma.

Copy: Congressman Markey
SWIM
CCSA
File

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MAY 13 1988
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REGIONAL ADMINISTRATOR

P9

P9

May 10, 1988

Dan McDonald
45 Chatham Street
Lynn, MA 01902

Michael Deland, Regional Administrator
Environmental Protection Agency
J.F. Kennedy Building
Boston, MA 02203

Dear Mr. Deland:

I urge you not to pollute one body of water for the sake of cleaning an already polluted body of water. Please help protect both Boston Harbor and Massachusetts Bay from pollution!

I live a few blocks from King's Beach in Lynn. I have a great deal of respect for the sea: its beauty, its ample resources, its recreation and its power. I wish to treat it with the respect it deserves. Therefore it is imperative that the following steps be taken:

1. That a primary and secondary sewage treatment plant be built simultaneously, so minimally treated sewage is not discharged into Massachusetts Bay;

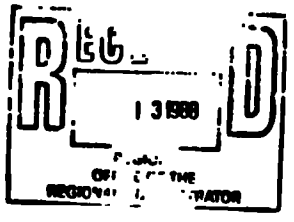
2. That the outfall pipes in Massachusetts Bay go into operation only after the secondary treatment plant is completed, assuring that properly treated sewage is being discharged;

3. That the outfall location be at "site 6" the most far sighted location; and

4. That the degradation of Massachusetts water quality standards not be tolerated.

Sincerely,

Dan McDonald



P10

New England Offices
18 Pray St
Amherst, MA 01002
(413) 549-7400

155A South St
Boston MA 02111
(617) 423-0081

Clean Water Action Project

P10

Rec'd 5/16/88

May 10, 1988

Michael Deland
Regional Administrator
EPA
JFK Building
Boston, MA 02203

Dear Administrator Deland:

Clean Water Action is writing to you in support of positioning the Massachusetts Water Resource Authority's (MWRA) sewage outfall pipe at Site No. 6.

Clean Water Action is very concerned that any location closer to the shoreline would jeopardize the future quality of Massachusetts Bay and the adjacent waters. If these waters are polluted so will the currently productive lobster and fishing grounds become unsafe to harvest-destroying a livelihood and visitors' thrill to eat fresh fish.

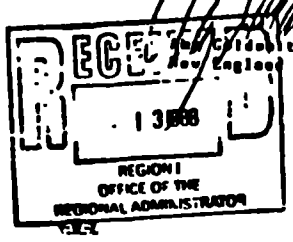
Clean Water Action supports the efforts of SWIM on the North Shore and Save our Beaches on the South Shore to locate the outfall pipe at Site No. 6. We urge you to seriously evaluate the documents submitted to you by these organizations and make a determination that Site No. 6 is the best outfall alternative for the Massachusetts Bay and Harbor.

If Clean Water Action can be of further assistance on this issue, please do not hesitate to contact us at our Boston Office. We would appreciate a response to our request for Site No. 6.

Sincerely,

[illegible] Elizabeth
New England Director

CC: SWIM
SAve Our Beaches



P11

P11

P12

P12

niely

11 May 1988

Lt. Gov. Evelyn Murphy
Room 259, State House
Boston, Mass. 02133

Michael Deland, Regional Administrator
Environmental Protection Agency
JFK Federal Building
Boston, Mass. 02203

Please help protect both Boston Harbor and Massachusetts Bay from pollution.

The area now recommended for the largest sewage outfall in the world is dangerously close to shore. Tidal currents could bring it onto North Shore beaches, shellfish areas could remain closed forever, and fish and lobster diseases could increase. It doesn't make any sense to clean up Boston Harbor by polluting Massachusetts Bay.

We urge you to require:

(1) An outfall location at "Site 6" - nine miles from Marblehead, Swampscott, Nahant, Hull, Cohasset, and Scituate.

(2) Primary and secondary plants to be built simultaneously, so minimally treated sewage is not discharged into Massachusetts Bay.

(3) No degradation of the Massachusetts water quality standards.

Sincerely,

Mr. and Mrs. Lewis Livingston
68 Wharf St.
Hanover, Mass. 02339

Site 6 is nine miles from three fourths of the proposed 9 miles

Site 6 is outside tidal currents that can bring effluent to shore

Site 6 avoids a deep bedrock trench that would require a deeper outfall tunnel

Michael Deland, Regional Administrator
Environmental Protection Agency
John F. Kennedy Federal Bldg.
Boston, MA 02203

Dear Mr. Deland: May 16, 1988

Please help protect both Boston Harbor and Massachusetts Bay from pollution.

The area now recommended for the largest sewage outfall in the world is dangerously close to shore. Tidal currents could bring it onto North Shore beaches, shellfish areas could remain closed forever, and fish and lobster diseases could increase. It doesn't make any sense to clean up one area, Boston Harbor, by polluting another, Massachusetts Bay.

We urge you to require:

1) An outfall location at "Site 6" which is 9 miles from Marblehead, Swampscott, Nahant, Hull, Cohasset, and Scituate

2) Primary and secondary treatment plants be built simultaneously, so minimally treated sewage is not discharged into Mass. Bay.

3) No degradation of the Massachusetts Water Quality Standards.

Sincerely,

RECEIVED - EPA
MAY 2 1988
WATER MANAGEMENT DIVISION

Concerned citizen!

P13

P13

Coalition
On
Alternative
Sewage
Treatment

MAY 23 1988

WATER QUALITY BRANCH

May 17, 1988

Michael Deland, Regional Administrator
Environmental Protection Agency
J. F. Kennedy Building
Boston, MA 02202

Dear Mr. Deland:

The location of the largest sewage discharge in the world should only be decided after the most thorough studies of potential impacts on recreation and fisheries resources.

It is our understanding that the MWRA discharge has been approved by EPA for a site which may possibly be as close as three miles from Nahant, and that the EIR in supporting this decision has omitted important information regarding fisheries and also the number and location of North Shore beaches, including Devereaux Beach in Marblehead.

Devereaux Beach, which is Marblehead's only large public beach is directly downwind of the proposed site in the summertime when southerly winds prevail. This beach, as well as the Swampscott and Lynn beaches lie in a shallow shoreline depression which tends to trap debris and hold it there. The Director of Marblehead's Recreation and Parks Department, which maintains Devereaux Beach tells me that washed up debris is a big problem. We are concerned that gross objects from the treatment plant will be a disgusting problem on the beach if winds and currents act together, not to mention the invisible effluent from primary treatment.

We are also concerned that this primary effluent may so enrich our waters that conditions for the increase in algal blooms such as occur at Lynn (and to a lesser extent at Swampscott) may render both beach and shoreline unusable due to odors of decay.

We support SWIM's position that Site 6 would be a far safer location for the discharge; that the additional expense would be worth the safety of deeper water and more favorable currents.

Sincerely yours,

cc: Paul Levy, MWRA
Daniel S. Greenbaum, Comm., DEQE
Rep. Nicholas Mavroules

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MAY 18 1988
REGION 1
OFFICE OF THE
REGIONAL ADMINISTRATOR

P14

P14

Dear Mr. Deland.

Please help protect both Boston Harbor and Massachusetts Bay from pollution.

We are now recommended to the largest sewage outfall in the world is dangerously close to shore. Tidal currents could bring it onto our beaches, shellfish areas could remain closed forever, and fish and lobster diseases could increase. It doesn't make sense to clean up one area - Boston Harbor - by polluting another - Massachusetts Bay.

I urge you to require:

1. An outfall location of "Site 6" - nine miles from Marblehead, Swampscott, Nahant, Hull, Cohasset and Scituate.
2. Primary and secondary plants be built simultaneously, so minimally treated sewage is not discharged into Massachusetts Bay.
3. No degradation of the Massachusetts water quality standards

Sincerely yours,

Nahant SV **P15**
Safer Waters

May 18, 1988

Mr. Michael Deland
Regional Administrator
Environmental Protection Agency
J. F. Kennedy Building
Boston, MA 02203

Dear Mr. Deland:

Enclosed is Part I of SWIM's comments on the Draft Supplementary Environmental Impact Statement for the Boston Harbor Wastewater Conveyance System. We are submitting our MEPA comments as formal comment, as well as other material. Also submitted as formal comment on the DSEIS is a copy of "The Sapphire Necklace" and a copy of SWIM's report on accelerated secondary treatment (the letter of March 8 to Secretary James S. Hoyte re Residuals Management Facilities Plan.)

I was pleased to hear that Paul Levy has said to you that he would put current meters at Site Six. I hope the meters will soon be in place.

Sincerely yours,

Polly Bradley

Polly Bradley, President
Nahant SWIM, Inc.

Please answer all issues in "The Sapphire Necklace" in the FSEIR.

SWIM, c/o Northeastern University Marine Science Center, East Point, Nahant, MA 01908
Phone: (617) 581-0075 or (617) 581-1434

SWIM - Nahant Citizens Committee for Safer Water in Massachusetts

c/o Northeastern University Marine Science Center, East Point, Nahant, MA 01908

March 8, 1988

The Honorable James S. Hoyte,
Secretary of Environmental Affairs
Commonwealth of Massachusetts
100 Cambridge Street
Boston, MA 02202

Re: Residuals Management Facilities Plan

Dear Mr. Hoyte:

The enclosed position paper contains comments on the scope of studies for the Massachusetts Water Resources Authority "Residuals Management Facilities Plan/Environmental Impact Report," the MWRA "Draft Responses to Comments on Site Screening and Candidate Options Identification," and the recommended Deer Island Facilities contained in the "Secondary Treatment Facilities Plan."

This paper explores from a new and different angle the possibility of building primary and secondary treatment plants simultaneously. At the same time, it explores ways to solve some of the problems of residuals management. SWIM urges you to require that the MWRA include a study of this proposal in its scope of work, in order to protect BOTH Boston Harbor AND Massachusetts Bay from pollution.

Secretary Hoyte, in your Draft Environmental Impact Report certificate of January 27, you defended the segmentation of the overall sewage treatment program into these separate plans in the belief that this process would result in the earliest implementation. Based upon our review of both the Residuals Management and Secondary Treatment Plans, SWIM believes that a combined plan, with accelerated construction of secondary treatment facilities on Deer Island and residuals treatment facilities on Spectacle Island, will produce significant advantages.

These advantages include:

- A cleaner harbor and bay by 1995.
- An estimated cost savings of 1.8 billion dollars
- A residuals plan which will have greater public acceptance.
- A Deer Island facilities plan which will have a less adverse impact on Winthrop and other coastal communities.
- An improved plan which is superior to the current court ordered plan.

The five year period in which the MWRA proposes to dump partially treated effluent into Massachusetts Bay (in violation of Federal and Commonwealth environmental standards) and the outfall location are of equal concern to SHIN. Please give careful consideration to our proposal, as it has substantial benefits for the bay communities and the communities within the MWRA district.

Very truly yours,

Polly Bradley

Polly Bradley, President
Hobart SHIN, Incorporated

cc: Paul Levy, MWRA
Michael Deland, EPA
Richard Delaney, CZM
S. Russell Sylva, DEQE
Hobart Board of Selectmen
Dr. Kenneth Sobeck, Northeastern

Date: March 8, 1988

POSITION PAPER ON ACCELERATING MWRA SCHEDULE

by Kevin Jaggaard and Robert Vanderslice

I. INTRODUCTION

There are two areas of particular concern to SHIN. One is the location of the outfall. The other concern is the five-year period in which the MWRA proposes to use the outfall for disposal of effluent which has only primary treatment.

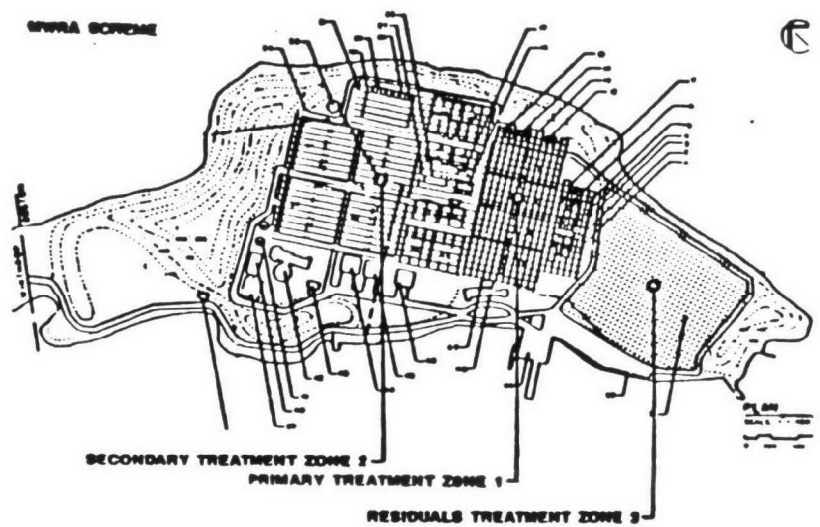
The MWRA may find itself in the position that the outfall cannot be used until the secondary treatment system is complete due to serious legal problems, including degradation of the Massachusetts State Surface Water Quality Standards, violation of the antidegradation requirements of the Clean Water Act, violation of its National Pollutant Discharge Elimination System Permit by not removing 85 percent of biological oxygen demand and total suspended solids, and violation of the National Environmental Policy Act by segmentation of the review process and not evaluating cumulative impact before decisions are made.

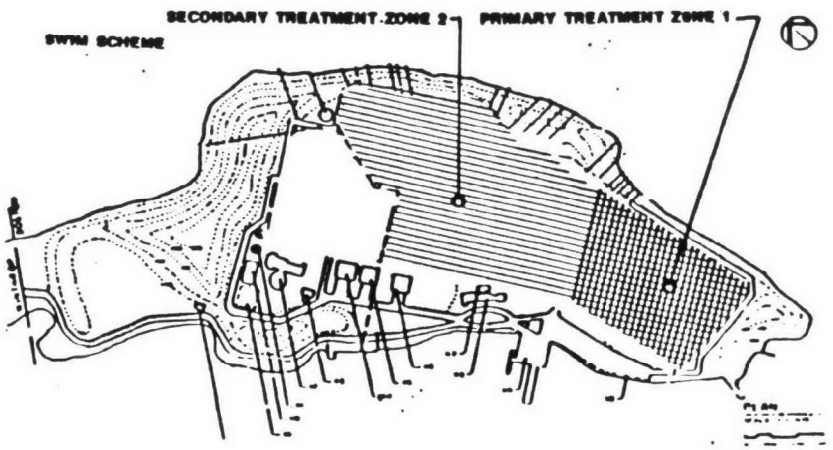
SWIM proposes concurrent construction of the primary and secondary treatment system on Deer Island and the residuals management system on Spectacle Island. The segmentation of the Secondary Treatment Facilities Plan and the Residuals Management Facilities Plan has resulted in a 30 acre portion of Deer Island being reserved for residuals management facilities, while the Residuals Management Facilities Plan contains highly ranked options with no residuals treatment on Deer Island. The most significant advantage of moving residuals treatment from Deer Island is that it allows sufficient space for simultaneous construction of the primary and secondary treatment facilities. The most significant aspect of locating the residuals treatment on Spectacle Island is that it has the least impact on coastal communities while allowing the use of the treatment technology most preferred by the MWRA.

II. DEER ISLAND FACILITIES

In the Long Term Scheduling Order the major reasons given for not building the primary and secondary treatment facilities at the same time are that there will be insufficient space on Deer Island until the Prison is relocated and the existing treatment plant must remain operating until the new facility is built.

The proposed facilities for Deer Island occupy three major areas. They are the 20-28 acre Primary Treatment Area (Zone 1), 40-46 acre Secondary Treatment Area (Zone 2) and 24-30 acre Residuals Processing Area (Zone 3). These can be seen on the accompanying plan. If the residuals processing is located completely off Deer Island the 24 to 30 acres in Zone 3 would be available for other uses.





On the accompanying plan, the area of Deer Island to the left of the dashed line is occupied by the prison and the existing primary treatment plant, which must continue operations until the new treatment facilities are in place. It can be seen that the acreage reserved for residuals is equal to area of the existing treatment plant and prison. It can also be seen that the area to the right of the dashed line is sufficient to contain the primary and secondary treatment facilities. Obviously, if the residuals are treated elsewhere there will be sufficient space for construction of both primary and secondary systems before the prison and existing plant are shut down.

II. SPECTACLE ISLAND FACILITIES

The 24 to 30 acre residuals area on Deer Island is one of nine potential sites under consideration by the MWRA for a residuals management facility. Nearby Spectacle Island has 75 acres which are also being considered by the MWRA as a site for composting and combustion facility for residuals.

SWIM proposes that the MWRA consider assigning the proposed residuals area on Deer Island to an expanded site for the combined primary and secondary facility and locating the residuals area on Spectacle Island.

Spectacle Island is one of the highest ranked sites for residuals processing by means of composting and/or combustion in the Draft Report on Candidate Options Identification. This report recommends composting of the primary sludge, combustion of the secondary sludge and land fill disposal of grit, screenings and ash. In the 6S-01 and 6S-02 options contained in this Report, raw sewage would be transported by pipeline to Spectacle Island for dewatering and processing. The raw primary sludge would be composted and the raw secondary sludge would be combusted. Compost and ash would be transported by truck on ferry to the coastal sites. There would be no residuals facilities on Deer Island in these schemes.

In support of the Spectacle Island option consider the following criteria formulated by Black & Veatch:

- Composting of raw primary sludge and combusting of raw secondary sludge are the preferred technological alternatives.

- The total estimated area requirement including digestion, composting and miscellaneous areas for dewatering, thickening, materials handling and storage for primary and secondary sludge on Deer Island are 35 acres, which exceeds the available area. The composting of raw primary sludge and combusting of raw secondary sludge on Deer Island is not recommended due to area limitations and on-water transportation system impacts.

- Combustion facilities will be given to preference to autogenous burn conditions (no supplemental fuel) using raw sludge. Raw sludge has a higher energy value than digested sludge and will reduce subsequent dewatering requirements prior to combustion.

- Direct truck transport of residuals from Deer Island to an inland site is not recommended.

- Transport of raw sludge from a coastal site to an inland site by vehicle is not recommended.

- If raw sludge is transported off of Deer Island it is preferred that transport is accomplished by pipeline. If pipeline transport is to be utilized, sludge will be transported as an unthickened liquid. Therefore no thickening facilities would be required on Deer Island.

- A six month emergency sludge storage area is required in case of system breakdown.

Spectacle Island from a technological and community impact point of view, is superior to other sites in that:

- It is only 1.5 nautical miles from Deer Island which allows for a short raw sludge pipeline, sufficient area for composing primary sludge, efficient autogenous combustion of secondary sludge and sufficient space for emergency sludge storage.

- Treatment of sludge on Spectacle Island would result in the least amount of ferry, barge and truck traffic at the coastal transfer site compared to the other alternatives, including the partial residuals treatment alternatives on Deer Island. The other highly ranked alternatives use an inland site for residuals treatment. Truck and boat traffic to transport thickened sludge to an inland site for composting and combustion would be substantially greater than with the Spectacle Island site alternative.

III. FINANCIAL CONSIDERATIONS

Building the secondary, primary and residuals treatment facilities at the same time would save approximately $200 million in inflation and $400 million in interest during the construction period. This additional $600 million cost of the MWRA plan would be financed by MWRA bonds, or by other means, and these financing costs could be an additional $800 million. Therefore, the SWIM proposal could save approximately $1.4 billion.

These cost estimates were generated using MWRA guidelines for cost evaluation, construction cost estimates and schedules contained in the Secondary Treatment Facilities Plan, with the exception of the cost for the Residual Treatment Facilities. Since this cost was unavailable from the MWRA a cost was used based on recent residuals treatment plant costs. Tables 1 and 2 provide additional detail.

IV. CONCLUSION

SMIH strongly recommends that a combined option be evaluated which includes the building of secondary treatment facilities concurrent with primary treatment facilities and placement of residuals treatment facilities on Spectacle Island.

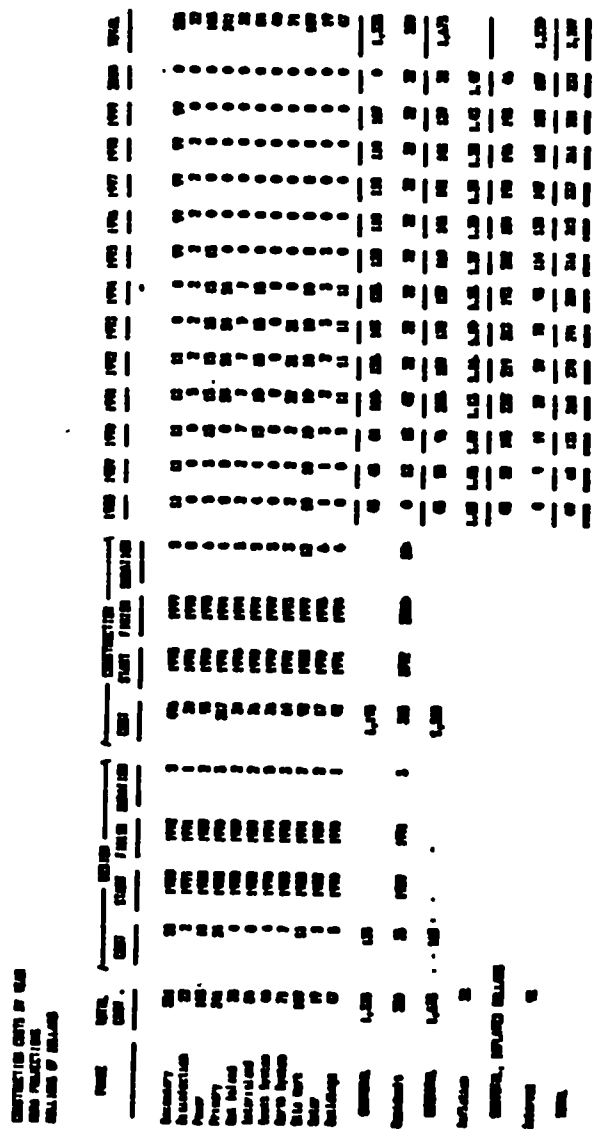
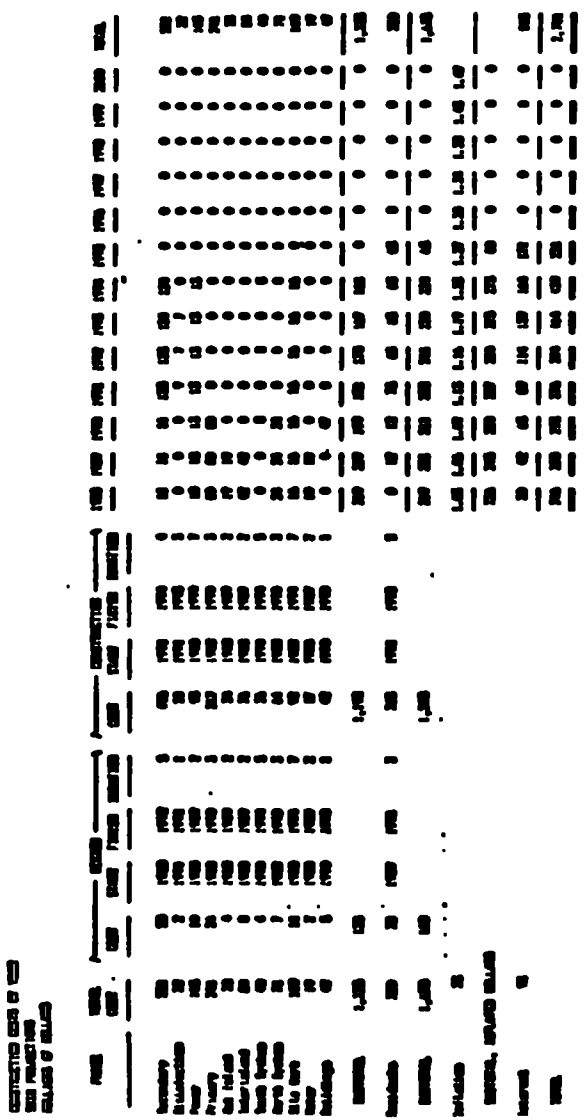


TABLE 2.



From Rob Ginsberg
Re: HWRA vs EPA

Geotechnical Geometry

The HWRA circle + the EPA rectangle are essentially identical when we caught the HWRA fudging things by saying that 4.5 – 5 was the goal for the termini of the outfall, the EPA kindly made them honest by pulling the whole damn thing into line. Even John Gall says 5.5 is too bad.

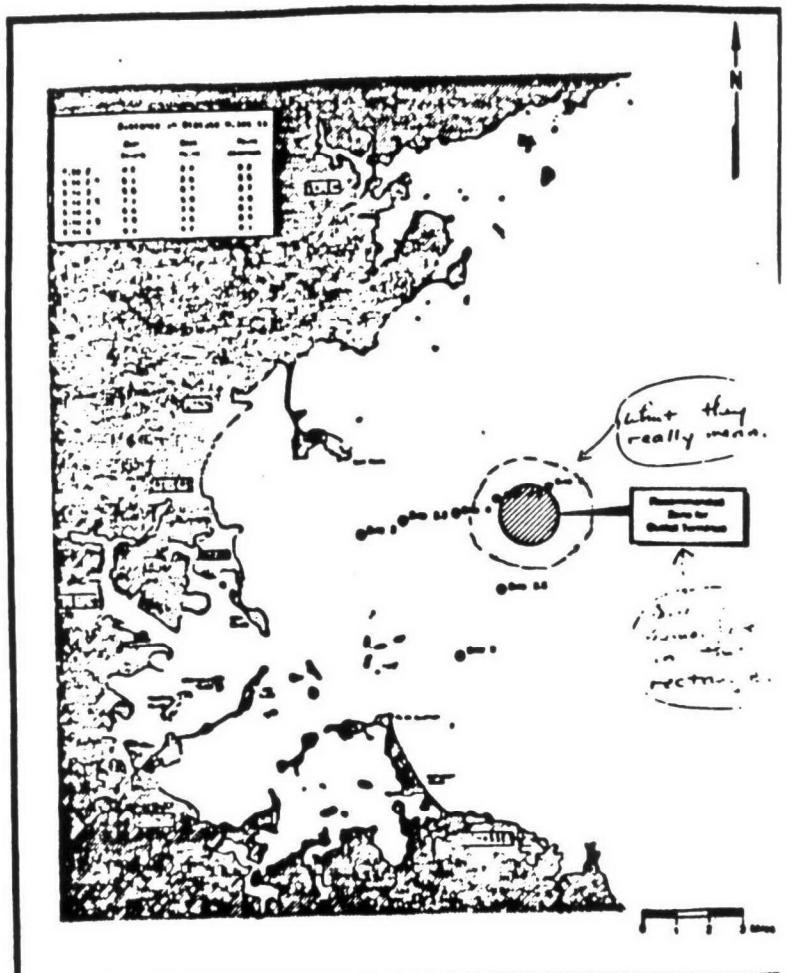
Attached for comparison are the EPA + the HWRA maps.

— — — —

Swim had a scary talk w/ the geologists – who said in a technicalese I cannot fully reproduce, "the tunnel can be constructed w.o.f. low hardness if it traverses fine geological formations," which I unerringly translated to mean, "the shorter the better."

If you tell the geologists anything – the rectangle is OK, they're just going to build the shortest possible tunnel.

The circle + rectangle do allow almost enough room to study the trajectory to S.t. 6. A mile further south, + Site 6 can be reached via points C–D (see EPA map-handout 9/9/88-attached).



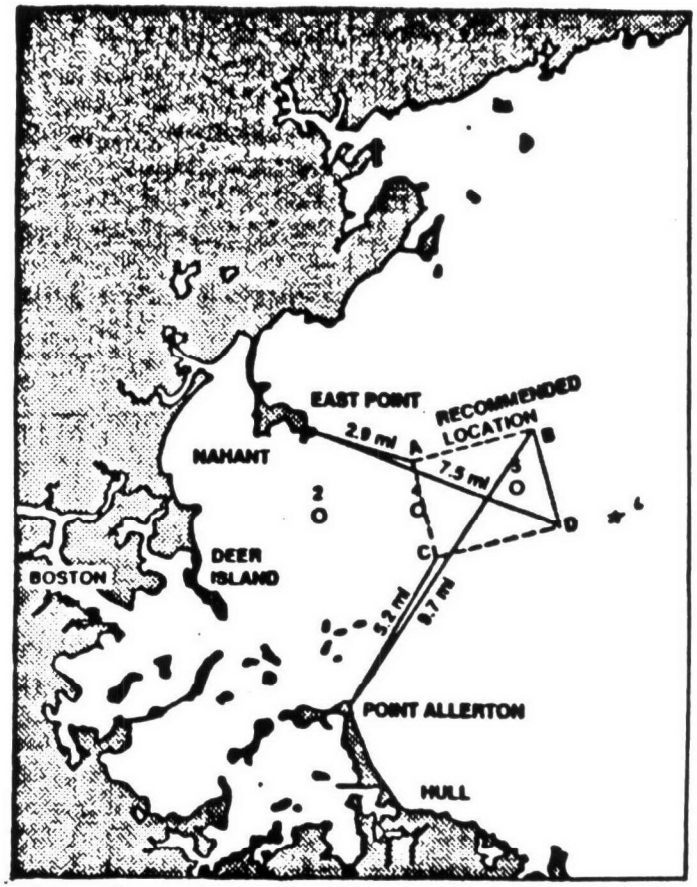
MASSACHUSETTS WATER RESOURCES AUTHORITY

FIGURE 1.3-1
RECOMMENDED OUTFALL LOCATION

MWRA Handout at Dudley Meeting, November 23, 1987

(Environmental Protection Agency handout
April 19, 1988 Public Meeting, Revere)

RECOMMENDED LOCATION OF THE DEER ISLAND WWTP DISCHARGE



To Chairman
From Ely Bradley
Re: MWRA #6136

The Algae

Have you ever driven along Lynn Shore Drive on a beautiful summer day?

Have you ever smelled the algae — the reverse of beautiful?

The smell hangs over the houses; it drifts along the beach; drivers close their windows & children flee. The beach is unusable.

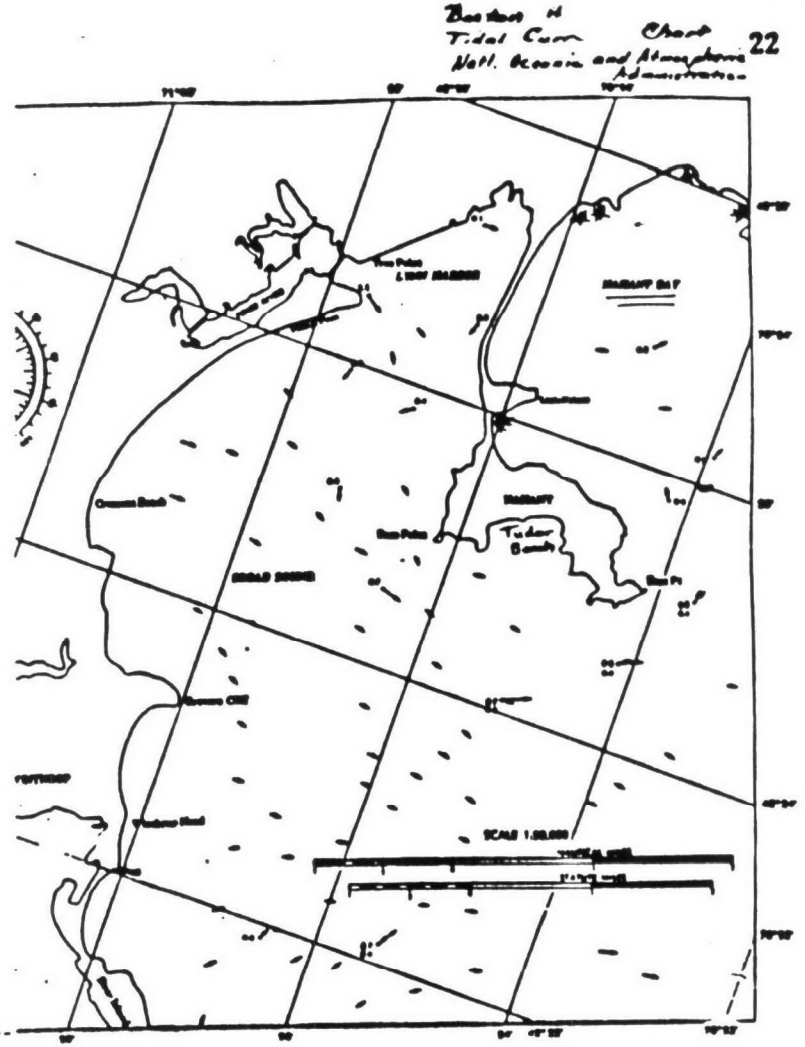
Nutrients from Massachusetts Bay help fertilize the algae near.

Note the tidal current chart (attached). Think of the ZID (zone of initial dilution) of an MWRA outfall at Site 4. Imagine --- algae (*Pylaiella littoralis*).

See the circulation pattern in Nahant Bay (attached). Imagine effluent & algae --- trapped.

Imagine Nahantars, Lynners, Swampscottites, all the people of Greater Boston who use Lynn — Nahant — King's Beach ---

trapped!



* Some favorite collecting spots for the algae.
It lives FREE-FLOATING and reproduces FREE-FLOATING in the

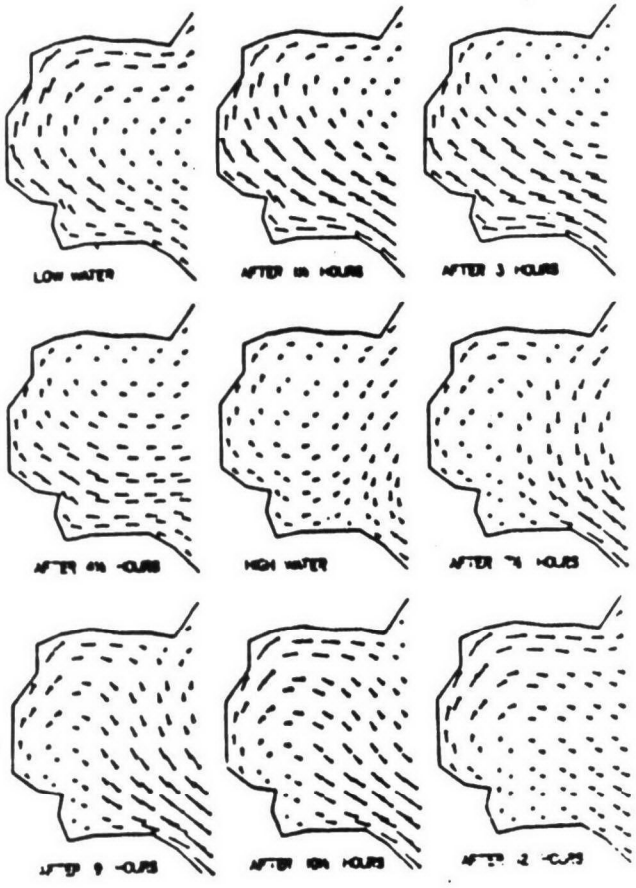


Figure 20. Computed One-Layer Circulation Pattern in Wahant Bay - Southwest Wind at 20 Knots.

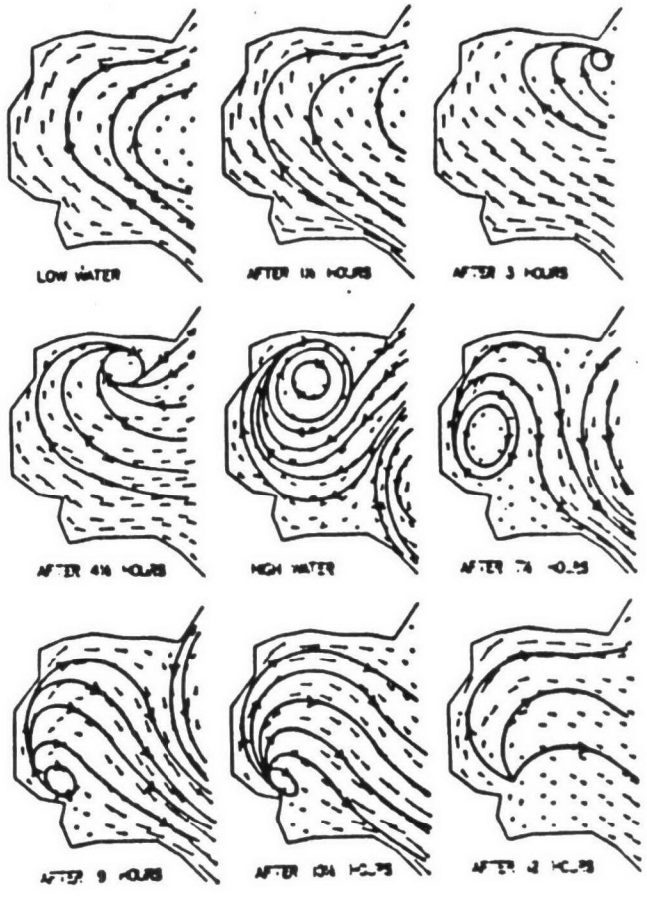


Figure 21. Computed One-Layer Circulation Patterns in Wahant Bay Showing Flow Streamlines Converging into a Gyre - Southwest Wind at 20 Knots.

...om Hancock (1980)

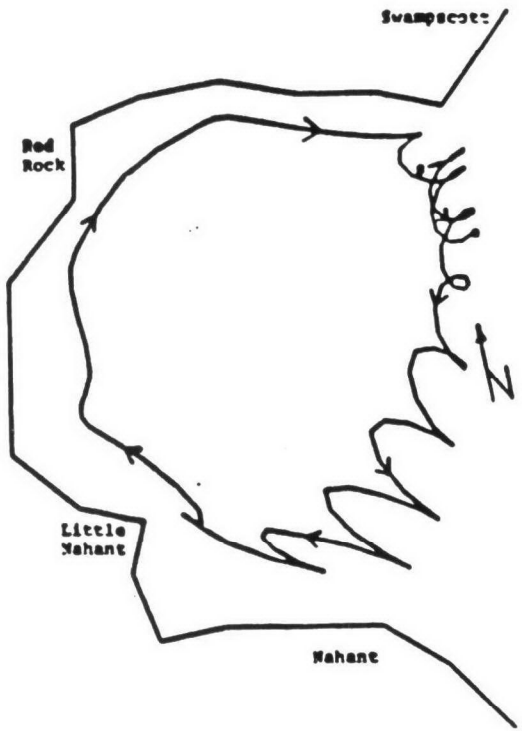


Figure 22. Computed Particle Path for a Release at the Swampscott Treatment Plant Outfall - Southwest Wind at 20 Knots. Residence Time = 1 week.

To: Dan Shpardon
From: Polly Bradley
Re: MEPA #6192

5/1/89

Turkish Mussel Pilaf

I cannot tell you how delicious the recipe is A delicate blend of spices — the rice — the mussels fresh + tender from the rocks of an unpolluted Tudor Beach —

First, a swim in the clean waters at the Beach — then, when one is really hungry, a mouth-watering plate of Turkish Mussel Pilaf.

On that wonderful day when the shellfish beds of Nahant are once again OPEN, you are invited to Nahant for a swim (if we are not too feeble) and lunch (never too feeble).

All you have to do is help clean up the waters of Massachusetts Bay.

Not to be discriminatory: any individual who actually reads through these MEPA comments + gets this far is invited to this select + tiny party. Write to Polly Bradley, SWIM, % Northeastern University Marine Science Center, East Point, Nahant MA 01908. Your invitation will arrive in the mail when the Nahant shellfish beds open.

My daughter Cynthia has promised to cook if I am too feeble and/or dead. You may pass on the promise of an invitation to your children in your will.

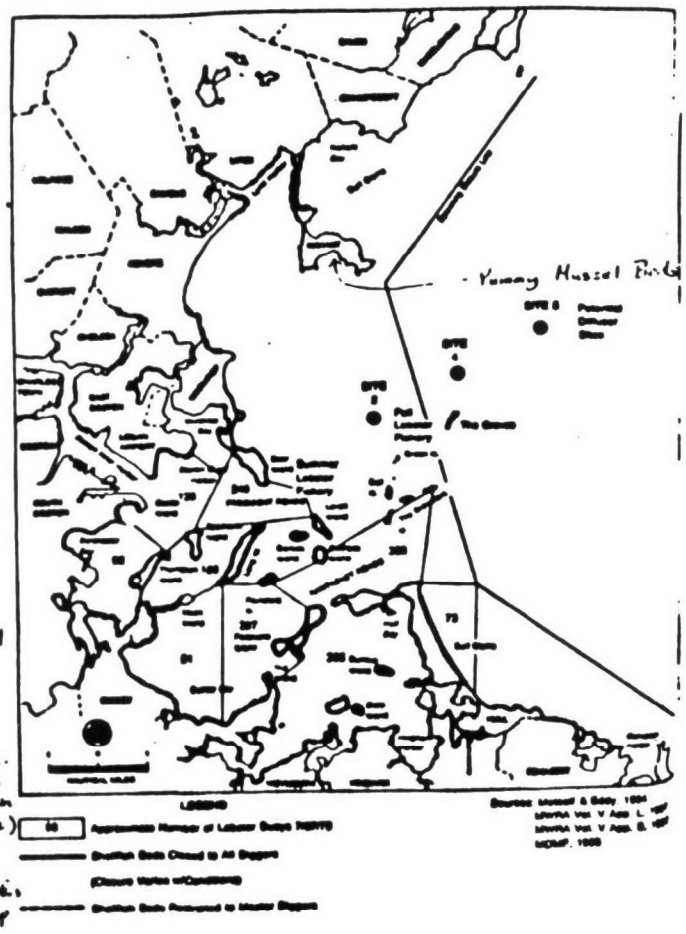


FIGURE 4.2.5-c. COMMERCIAL FISHING RESOURCES

1988
From EPA Draft
Supplemental Environmental Impact 4-50
Statement - Boston Harbor Wastewater Conveyance System

FIGURE 4.2.5-d. BEACHES, SHORELINE PARKS, AND ISLAND PARKS

1988 - EPA Draft SEIS
Boston Harbor Wastewater
Conveyance System

Assessment of N.H. Seaside*
Mass. Marine Fisheries
Mass. Dept of Fisheries, Wildlife,
& Environmental Law Enforcement
November, 1975

Table 9. Status of productive shellfish areas in [illegible] Harbor*

	Productive	Open	Closed	Restricted
SOUTH SHORE				
Salisbury	200.0	0	200.0	0
Newburyport	170.0	0	[illegible]	[illegible]
Newbury	210.0	[illegible]	[illegible]	[illegible]
Rowley	[illegible]	[illegible]	0	0
Ipswich	893.0	[illegible]	0	[illegible]
Essex	240.7	240.7	0	0
Gloucester	600.2	[illegible]	37.9	[illegible]
Manchester	18.7	0	18.7	0
Beverly	87.0	0	87.0	0
Danvers	90.0	0	90.0	0
Salem	218.5	0	181.3	37.1
Marblehead	94.0	0	0.0	94.0
Nahant	42.5	0	42.5	0
Lynn	90.0	0	90.0	0
Saugus	229.1	0	229.1	0
Revere	[illegible]	0	[illegible]	22.0
	3,810.0	2,410.0	1,378.5	210.3
NORTH SHORE				
	Productive	Open	Closed	Restricted
Revere	[illegible]	0	[illegible]	[illegible]
Winthrop	19.3	0	19.3	0
Quincy	[illegible]	0	[illegible]	496.0
Hull	330.0	0	[illegible]	330.0
Braintree	42.0	0	0	42.0
Weymouth	996.0	0	0.0	320.0
Hingham	244.0	0	13.0	111.0
Winthrop	[illegible]	[illegible]	[illegible]	[illegible]
	4,090.0	0	2,230.0	2,864.0
Total		2,410.0	3,608.5	3,074.0
Grand Total			9,092.5	

Why we want clean water

Information will answer a few questions and raise a few more.

The Sapphire Necklace

PROPOSAL FOR EVALUATION OF SITE 6

NINE MILES FROM NAHANT AND HULL

December 16, 1987

Nahant SWIM, Incorporated

Safer Water in Massachusetts

"Let's create the Sapphire Necklace -- a safer Massachusetts Bay.

And Boston Harbor will be the Star Sapphire."

Nahant SWIM, Incorporated
Safer Water in Massachusetts
c/o Northeastern University
Marine Science Center
East Point, Nahant, MA 01908

Polly Bradley, President (617) 581-0075
William J. Coffey, Chairman of the Board (617) 581-1828

SWIM - Nahant Citizens Committee for Safer Water in Massachusetts

c/o Northeastern University Marine Science Center, East Point, Nahant, MA 01908

December 16, 1987

Mr. Paul Levy, Executive Director
Massachusetts Water Resources Authority
Charlestown Navy Yard
100 First Avenue
Boston, MA 02129

Dear Mr. Levy:

Let's create the Sapphire Necklace -- a safe Massachusetts Bay. And Boston Harbor will be the Star Sapphire.

One hundred years ago the Emerald Necklace, Boston's park system, was designed by Frederick Law Olmsted, who was two hundred years ahead of his time. Olmsted also designed Lynn Shore Drive, Brookline's park system, World's End in Hingham, and other parks that help make Greater Boston a beautiful place to live.

In our time we have a chance, a one-time chance, to create a Sapphire Necklace stretching from Gloucester, Beverly, Marblehead, Lynn and Nahant -- past the Boston Harbor Islands -- and on to Hull, Cohasset, Scituate, Marshfield and Hingham. Let's have the wisdom Olmsted had. Let's make Massachusetts Bay the Sapphire Necklace, with Boston Harbor the Star Sapphire.

Enclosed is Nahant's Proposal for Evaluation of Site 6, explaining why a study of Site 6 -- nine miles from Nahant and Hull -- is essential. Still to come is a report on the dive that the Northeastern University Marine Science Center is making to the zone of Site 6.

Site 5 flunked its 301(h) test for discharge of primary effluent when its application for a 301(h) waiver of secondary treatment was turned down on March 29, 1985, by the Environmental Protection Agency. Now, by considering only the site that failed and sites that are worse, and by grading on the curve, Site 5 gets an "A" and Site 2 and 3 get an "F." The only reason Site 5 is considered excellent is that it is the "best" of the outrageous sites considered. As has been pointed out to the MWRA on numerous occasions, a better site should be studied for comparison.

Here are some of SWIM's findings:

1. Site 6 can be reached by gravity, without adding an expensive pumping station, if the Deer Island Sewage Treatment Facility is built about two feet higher than is presently planned.

2. By going to Site 6, it is possible to build the outfall tunnel much shallower -- at 350 feet below sea level instead of 410 feet or deeper. Between Deer Island and the site now proposed there is a deep bedrock trench which can be avoided in the direction of Site 6.

3. By going to Site 6, the diffuser will send out effluent at an average depth of 150 feet, as compared to an average depth of 90 to 100 feet at the zone now being considered by the MWRA.

4. By going to Site 6, the outfall can be well within the Gulf of Maine Intermediate Water -- the deep water layer -- not just in an area marginally at its edge.

5. Both Site 8.9 and Site 5 are depositional: near Site 5 about 60 percent of the bottom is sediment between and on top of cobble.

6. The reasons are still valid for the 301(h) denial of permission to discharge primary effluent at Site 5 for a five-year period.

7. Extending the outfall will be only 2 percent of the construction costs and will cost each person in the district about $1.25 a year over an 11-year period, a total of $13.79 each.

The outfall will last a century or more. It may outlast five sewage treatment plants, if each sewage treatment plant is assumed to have a useful life of 20 years, the design period of the proposed Deer Island plant. If any one of those plants has maintenance problems, or is not completed on schedule, or cannot treat some of the toxics coming out of the system, the additional outfall length will more than pay for itself in environmental protection.

Northeastern is planning its dive to Zone 6 within the next few days. Can our scientific and technical committee meet with you and the Board of Directors soon after the dive to discuss our findings and show you the photographs taken on the dive?

Thank you very much for giving SWIM the opportunity to present this proposal for evaluation of Site 6 to you. We hope you will consider it carefully, and get opinions from engineers and scientists who are neither proponents nor opponents of the present plan. We think that if you do, our information will stand by itself.

Let's leave a legacy like that of Frederick Law Olmsted -- a Sapphire Necklace to match the Emerald Necklace. Let's save BOTH Boston Harbor AND Massachusetts Bay.

Sincerely yours,

Polly Bradley

Polly Bradley, President
Nahant SWIM, Incorporated

THE SAPPHIRE NECKLACE

PROPOSAL FOR EVALUATION OF SITE 6 — NINE MILES FROM HARAFT AND NULL

TABLE OF CONTENTS

Covering Letter to Paul Levy from SWIM.....2
by Polly Bradley

Introduction: Proposal for Evaluation of Site 6.....6
by Kevin Jaggard

Outfall Hydraulics at Sites 9 and 6.....11
by Dr. Michael P. Manning

Bedrock Geology, Tunnel, and Diffuser.....13
by Dr. William H. Dennen

Impacts of Sewage at Site 9.....19

Scientific Study of Sites 9 and 6.....32
Comments to the Technical Advisory Group, Executive Office of Environmental Affairs, by Dr. Kenneth P. Sebens
Excerpts from report, Rocky Subtidal Ecology, by Kenneth P. Sebens, Jon D. Witman, Nancy Macolish, and Betsy Brown

Gulf of Maine Intermediate Water.....80
Maine Intermediate Water (manuscript excerpt)
by Dr. Jon D. Witman

Denial of 301(h) Waiver.....88
by Polly Bradley
Summary of Findings - March 29, 1983 - from EPA Decision Document Denying Boston 301(h) Waiver

Legal Considerations.....95
by Michael J. Meagher, Esq.

Economic Considerations.....99
by Kevin Jaggard and Robert Vanderslice

Financial Projections, Site 6.....99
by Robert Vanderslice

Other Considerations.....80

Background Letters and Documents.....81

Biographical Notes.....75

DIVE AT SITE 6.....TO COME

FIGURES AND TABLES

Map of Site 6 (Fig. 1).....10

Geological Map of Boston Harbor and Massachusetts Bay (Fig. 2).....16

Bedrock Surface (Fig. 3).....17

Section A-3 (Fig. 4).....18

Section A-6 (Fig. 5).....18

Cost per Mile as Outfall Lengthens (Table A).....50

Construction Costs and Schedules (Table B).....51

Cost for Extending the Tunnel to Site 6 (Table C).....52

Financial Projections.....54

I. Summary comparison of Revenue Requirements.....55

II. Detailed comparison of Revenue Requirements.....56

III. Income on Reserve Deposits.....57

IV. Debt Service Costs.....58

V. Notes and Assumptions.....59

PROPOSAL FOR EVALUATION OF SITE 6

by Kevin Jungaard

Sites 4.5 and 5 were proposed by the MWRA consultants as the most favorable of the sites being considered. At best, a diffuser built outwards from Site 5 may be marginally acceptable. Site 5, which is the farthest site from shore under consideration, was previously denied a five-year waiver for use as an outfall for primary treated effluent. The MWRA plans to use Site 4.5 or 5 for this purpose for a five-year period before a secondary treatment plant is constructed. How can this be done unless the water quality standards are degraded to meet the levels which can be achieved at these locations? An additional site, further out than the site previously rejected by the EPA, must be considered in order to provide a comparison between marginal sites and one which has the potential for meeting all criteria.

This site, tentatively identified as Site 6, is a zone some nine miles from both Nahant and Hull. Site 6 is at a sufficient distance from Site 4.5 and 5 to have substantially different qualities. Sites 4.5 and 5 are very similar. Their diffuser locations are both at an average depth between 90 and 95 feet below mean level; they are both within the area defined by the Commonwealth as being the most productive location for lobstering; they are in waters easily accessible to recreational scuba divers and fishermen; they both will be subject to surfacing of the effluent plume and they are probably still within the range of tidal effects and local currents (See Figure 1).

Site 6, which is 2 miles farther from Deer Island than Site 5, has quite different characteristics. It is in an area with water depths ranging from 190 to 770 feet below mean level. This depth will provide substantially more dilution and mixing of the effluent and the Zone of Initial Dilution would be 22 percent smaller in diameter than at Site 4.5 and 5. The increase in depth will have a substantial impact in increasing dilution factors, which will be very important in meeting heavy metal and PCB criteria.

Site 6 would not be on the border of the Massachusetts Bay large-scale circulation patterns, as would Site 4.5 and 5. The bottom at Site 6 would be within the colder Maine Intermediate Water, located at a depth below 75 to 100 feet, which would keep more of the plume in the deeper water and transport it further from shore. The portion of the plume which will surface will probably move southeasterly rather than be influenced by tidal effects. Site 6 would require a tunnel approximately 2 miles longer than Site 5, and 4.5 would require a tunnel approximately 2 miles shorter. A tunnel to Site 6 is 2 miles in the right direction, not merely because it is longer, but because it is substantially better.

There have been several financial arguments put forth against evaluating Site 6. When they are put in context of the overall project impact on the region, the cost is a drop in the bucket. The cost of the additional two miles between Site 5 and 6 is about 2 percent of the proposed Secondary Treatment Facilities Plan.

The costs of not going to Site 6 could be enormous if there are delays because an unsuitable location is chosen, then must be denied.

Volume V (Effluent Outfall) states on page 7-25 that the MWRA is "constructing an outfall to meet the needs of a community for a century." However, the planning period of the Deer Island Sewage Treatment Facility is only twenty years. The outfall will last much longer than the sewage treatment plant, and there may be problems with maintaining or replacing the plant. And outfall at Site 6 would offer the North and South Shores and the Boston Harbor Islands some protection for the next century.

The construction schedule for Sites 8.5 and 5 uses an estimated rate of progress of 70 feet per day for the tunnel boring. There is little available geotechnical information to determine the type of conditions which will be found along the route of the outfall. If Roxbury Conglomerate is found rather than Cambridge Argillite, this rate could be less. Sites 8.5 and 5 are on the same heading and would intersect the same strata. There will no doubt be areas which will require much slower conventional tunneling. The extent of these areas is not known. It would be prudent to evaluate a different heading such as the Site 6 heading during the geotechnical studies.

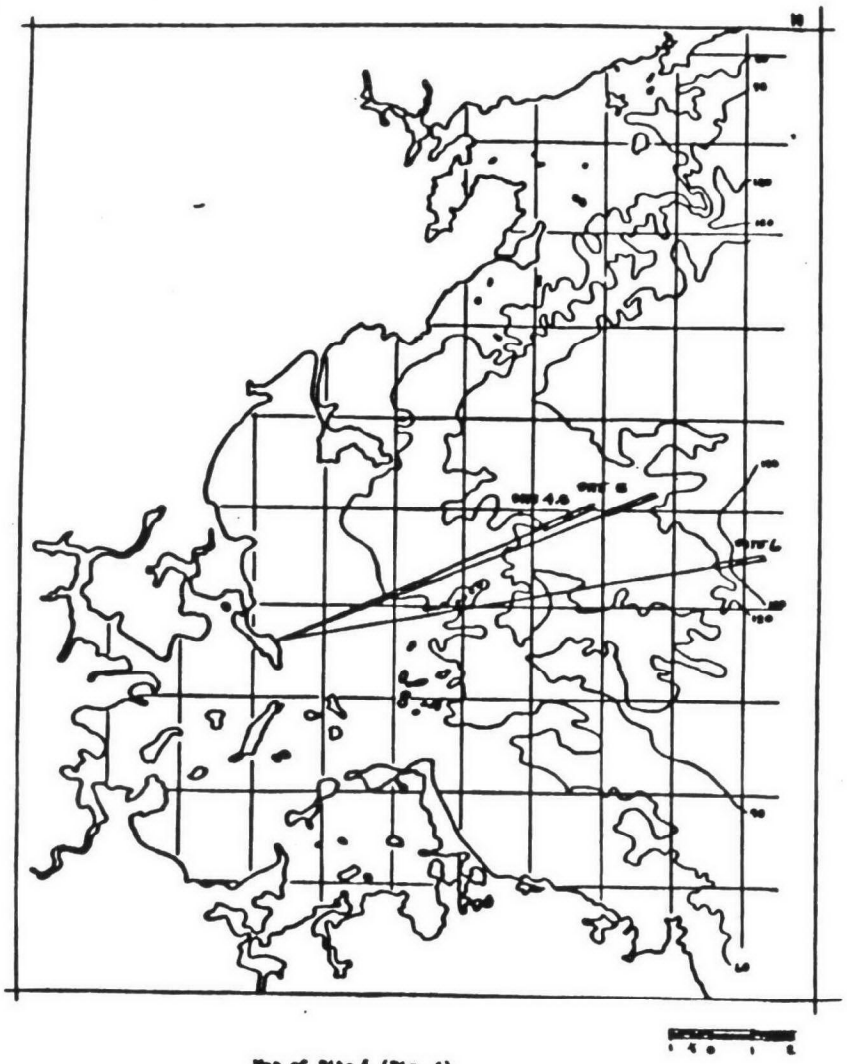
When Site 6 is compared to the other sites, the engineering evaluation should reflect at least the same level of ingenuity as has been seen in the studies so far. For example, in opposition to evaluating Site 6, it has been said that a pumping station would be required due to the longer length. This may be based on using the same static head as planned for the other sites. . The MWRA should evaluate what would be required to provide gravity flow for Site 6. The currently planned treatment facilities have a proposed graded elevation of 125 MDCSD[9], even though the major portion of Deer Island is at elevation 180 or higher. If the facilities are located at a higher elevation, the early site preparation costs and schedule could be reduced, while providing gravity flow to Site 6.

Site 6 should be evaluated for the feasibility of using multiple tunnel drifts, which could reduce construction time and cost. On the proposed heading towards Site 8.5 and 5, there are no islands which could be used for a second access shaft. It is customary in tunnel construction to use multiple headings, when possible, to reduce construction time. Also, the ability to have multiple headings has the benefit of allowing multiple construction contracts. Multiple construction contracts can provide a better bidding climate and reduce construction time and inflation, resulting in a smaller construction cost. The heading to Site 6 from Deer Island passes by the Graves. This collection of small islands may have the potential for locating a second access shaft.

These are a few suggestions which may prove feasible. What we are basically asking is that Site 6 receive the same level of consideration as the other sites in determining the best location for the outfall.

---

[9] MDCSD, or Metropolitan District Commission Standard Datum, adds 105 feet to the actual elevation.



Map of Site 6 (Fig. 1)

OUTFALL HYDRAULICS AT SITES 5 AND 6

by Dr. Michael P. Mansing

The presently recommended plan for construction of the outfall from the MWRA Deer Island facility calls for a 400-foot deep access shaft, a transport tunnel up to 9.5 miles long, with the final 1.25 miles containing 80 drilled risers with multiported diffuser caps. At present, the only arguments against considering sites farther out are related to cost and engineering limitations on the gravity flow of the effluent.

The present cost arguments against Site 6, for example, come from a combination of these arguments. That is, the cost of the outfall is often stated to be doubly costly, since it would add not only $50 million for the tunnel extension, but also require a pumping station costing an additional $150 million. These arguments are less than compelling, however, when closely scrutinized. The first question to address is whether a gravity flow outfall to Site 6 indeed is not achievable. The main component for the gravity flow is the elevation of the secondary effluent discharge point at 121 MDC3D. This corresponds to 16 feet above sea level. This available head is dissipated by frictional losses as the effluent flows through the outfall. An analysis of the components of the head loss shows that one percent of the loss occurs in the access shaft, nine percent occurs in the diffuser, and 90 percent occurs in the transport tunnel. Since the losses in the transport tunnel are directly proportional to the tunnel length, the increase in the head required for a gravity flow to Site 6 rather than Site 5 is 22% directly related to the site distances from Deer Island. This added head thus corresponds to a 22% increase in 90% of the original elevation difference - 1.8 feet.

Thus, the MWRA has other alternatives to the construction of an effluent pumping station which is routinely stated to be an adverse impact of an extended outfall. One alternative would be to simply raise the primary and secondary plant elevations by 1.0 feet. The increased elevation is entirely possible using spoils from the tunnel construction which must be disposed of in any event. The only engineering requirements would be to add an additional 1.0 feet of pumping head capacity to the inlet pumping stations. Since this is a modification of the design for a pumping station already planned, no new pumping station need be constructed.

The only cost increase related to the outfall extension to Site 6 would be the additional cost of tunneling - $50 million for a tunnel two miles longer to Site 6. The benefits to be derived from this extension are due to the increased initial dilution from the deeper diffuser and to avoiding the trench in the bedrock around Site 9 as shown in the bedrock profile of Dr. William H. Dennen.

BEDROCK GEOLOGY, TUNNEL AND DIFFUSER

by Dr. William H. Dennen

Of all the components of the planned MWRA sewage disposal system, only the tunnel(s) and diffuser will be unavailable for repair, renovation, or replacement once placed in service. It is vital, therefore, that they be properly designed and constructed in the first place.

The lithology and structure of the bedrock beneath Boston Harbor and Massachusetts Bay, including the proposed tunnel line and diffuser sites, are essentially unknown. However, it may reasonably be assumed that the siltstone (Cambridge Argillite) and siliceous conglomerate (Roxbury Conglomerate) which floor the Boston Basin extend seaward for an unknown distance but at least to the Hull - Nahant line. Regional geophysical maps (Bouguer gravity and aeromagnetic, Kane et al, 1977) give no indication of major lithologic change for at least ten miles seaward from Deer Island.

Of more importance in tunnel excavation than rock type, however, are the nature and spacing of fractures in the rock, since they generate areas of mechanical weakness and possible water infiltration. Geologic mapping of the bedrock in and around the Boston Basin (Billings, en. 1930), eastern Massachusetts (Emerson et al, 1917), Cape Ann (Dennen, 1981), and others show eastern Massachusetts to be a highly faulted terrane. Even within a given geologic unit, e.g. Cambridge Argillite, the rock will certainly not be homogeneous but filled with discontinuities in the way of bedding planes, dikes, joints, fractures, and fracture zones. On a large scale, it is highly likely that tunneling will encounter differing lithologies and small, if not large, faults. Engineering anticipation of these features is essential.

The location of the optimum line of tunneling seaward from Deer Island to some yet to be selected diffuser site will require intensive core drilling, since there is no present geologic reason to select one diffuser site or tunnel line over another. To gather essential data, four holes spaced at 0.1 mile astride a proposed tunnel line each 0.25 mile are suggested as minimal sampling.

Examination of figure 4 of U.S. Geological Survey Map MF-1923 (Oldale and Rich, 1987), a portion of which is attached, shows a bedrock topography exhibiting anomalous and unexplained features, specifically the trench (stippled) and closed depressions trending NW-SE. It is unlikely that these features have resulted from normal depositional or erosional processes. Speculatively, they may represent the position of listric faults which are well known in offshore sediments elsewhere in the world. A tunnel driven from Deer Island to either site 5 or 6 must pass beneath the trench (see cross-sections attached). The greatest thickness of rock cover will be along the line A-6 and the least along line A-5. A dog-legged tunnel, A-B-5, taking advantage of the greatest rock thickness, makes the total distance of A-5 nearly that of A-6. Taking 60 feet as the minimum thickness of solid rock necessary for tunnel integrity, a tunnel on line A-5 will require an access shaft approximately 410 feet deep, while that for line A-6 would be approximately 350 feet below mean sea level, a difference of about 60 feet.

Significant residual rock stress is not anticipated, but early testing by overcoring of selected core holes and strain gauge measurements in the early stages of tunneling should be performed. Rock mechanical testing of cored samples taken at a spacing to be determined by lithologic differences must be carried out. An evaluation of seismic risk should be obtained from a competent source.

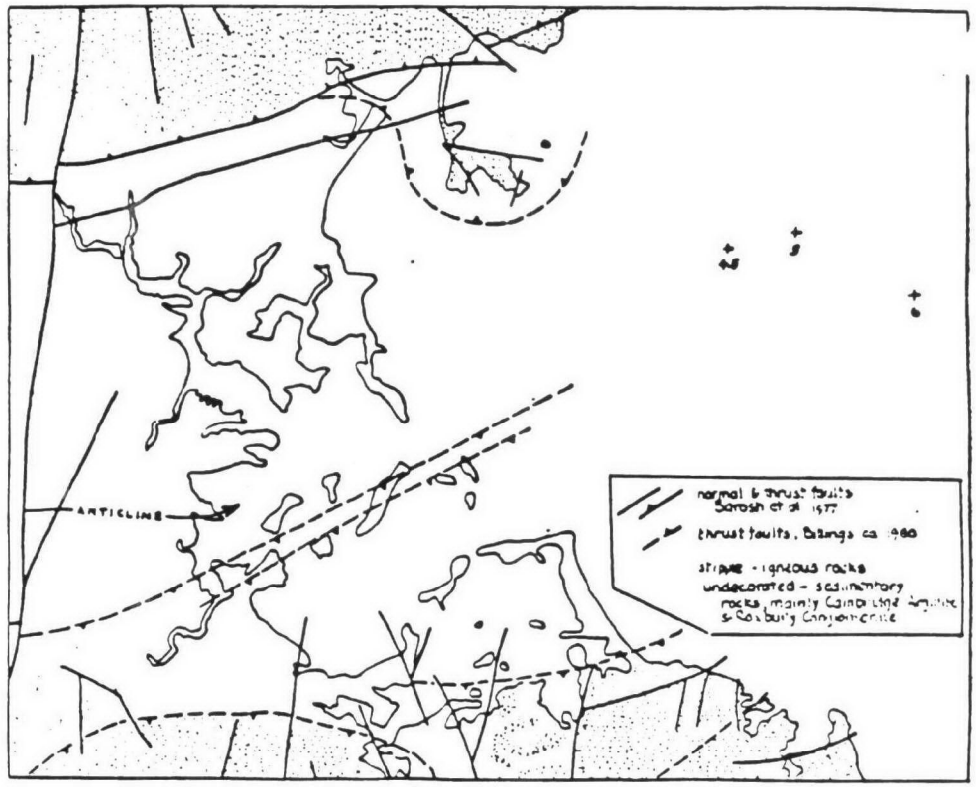
References

Barosh, P., Pahey, R.J., and Pease, M.H. Jr., 1977. Preliminary compilation of the Bedrock Geology of the Land Area of the Boston 2° Sheet. New England Seismotectonic Study Report, Boston Observatory.

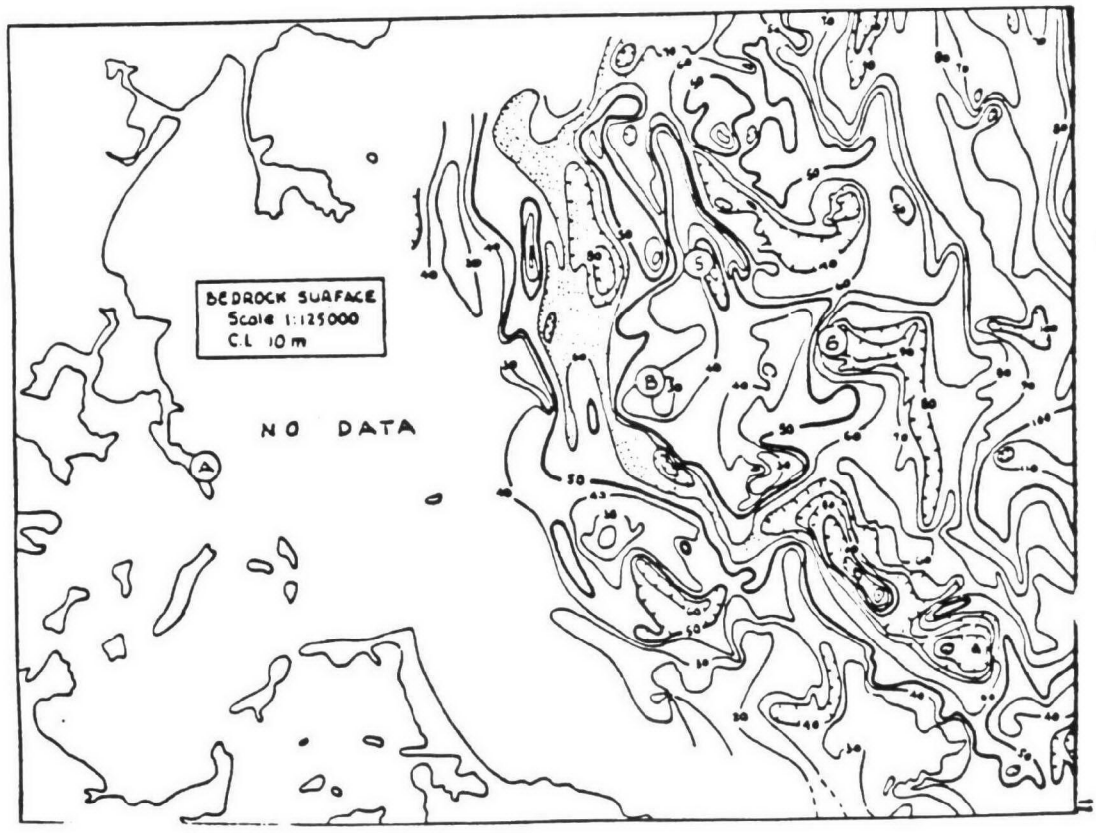
Billings, M.P., ed. 1980. Bedrock Geology of the Boston Basin. Preprint.

Pease, M.H., 1981. Bedrock Geology of the Cape Ann Area, Massachusetts. Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, NUREG/CR-1868, 21, 25.

Oldale, R.N., and Rich, J., 1987. Maps and Seismic Profiles Showing Geology of the Inner Continental Shelf, Massachusetts Bay, Massachusetts. U.S. Geological Survey Map MF-1923.



Geological Map of Boston Harbor and Massachusetts Bay (Fig. 2)



SECTION A-5 (Fig. 4)

DEER ISLAND

SECTION A-6 (Fig. 5)

Horizontal scale 1:125000
Vertical scale 1" = 100 m

SCIENTIFIC STUDIES AT SITES 5 AND 6

Scientific studies support MDEP's request for a study of Site 6. This section indicates problems with Sites 4.5 and 5 and advantages of Site 6.

Included as part of this section are:

1. Comments to the Technical Advisory Group, Massachusetts Executive Office of Environmental Affairs, by Kenneth P. Sebens
2. Excerpts from report, Rocky Subtidal Ecology, by Kenneth P. Sebens, Jon D. Witman, Nancy Nowicki, and Betsy Brown

It should be pointed out that there is a tremendous difference between Site 4.5, which is depositional, and Site 5, which is more rocky. However, it is misleading to label Site 5 as simply "rocky". In the zone of Site 5 Northeastern University found large patches of soft sediment that have not been analyzed for texture and metals. In this general area, about 60 percent is sediment between and on top of cobbles. Table 7.4-2 indicates that Site 5 is "rocky". Taking Site 5 as a zone, rather than a point, this is not correct.

Comments on: Volume V (outfall siting)

To: Technical Advisory Group
Massachusetts Executive Office of Environmental Affairs

From: Kenneth P. Bohane (TAG member)
Marine Science Center
Northeastern University, Nahant MA 01908

Sites 8.5 and 9 form boundaries of the area that was found acceptable as an effluent outfall site by the MWRA's consultants. All other sites were considered too close to shore and thus unacceptable, including Site 8, which appears to be a depositional area. Yet, site 8.5 is only 2000 feet further from shore than Site 8, and the diffuser could easily begin at or before Site 8.5 according to the proposal. Site 9 was the most distant site studied, even though it had already been rejected as a site for a primary outfall as proposed in the Application for a Waiver of Secondary Treatment (1988).

I am concerned that we have no idea, from the present study, of the potential benefits of locating the new outfall further out into Massachusetts Bay. The technical information gathered to date indicates that Site 9 is just on the border between the inshore tidally influenced shallow regions, and the offshore regions influenced primarily by the currents of Massachusetts Bay. Site 9 also appears to be just barely deep enough to have a very different bottom water layer, which is only 10 to 20 feet thick at this depth. What would be the benefit of locating the outfall diffuser openings within a 60-70 foot near-bottom layer of this water? This should tend to entrain the effluent plume to a greater extent and to let it move offshore within the deeper layer.

Because the consultants have recommended a site that is right on the border between these two different flow regions, I find it imperative that the MWRA conduct studies comparing Site 9 to at least one site further out, two miles or more, at a depth of 150 feet or greater. This would be substantially different than the sites already studied and would explore the possible benefits of the added dilution, stratification, and better position relative to currents. If such a study shows marginal added benefit, and substantial extra cost, this could validate Site 9 as the appropriate choice. However, if costs are only incrementally higher but dilution and transport benefits are great, the farther site should be chosen.

Whatever the result, I also strongly suggest that a permanent monitoring program be put in place immediately, including the proposed sites and sites up to several miles away in each compass direction. Given the inherent variability in biological and physical phenomena, it is extremely important to have a baseline from which to measure change. A five-year study of bottom sites in and around the proposed outfall area could be carried out before the outfall becomes active. This is just barely long enough for adequate baseline data. A one or two year study just before the outfall goes into service is not adequate. I hope that, maybe as part of an overall Massachusetts Bay Program, this baseline study can begin in 1988. Study of an alternate outfall site two miles seaward of Site 9 could, in fact, also serve as part of this baseline if Site 9 were to be ultimately used.

The following are specific comments on Volume V (outfall siting):

1. A further study of the area around Site 9, and a further site 2 miles seaward, should be conducted immediately to further characterize the area in terms of bottom types, topography, benthic species, and possible marine artifacts including shipwrecks (p. 8-9). The detailed study area could be a swath from Site 8.5 to a site 2 miles seaward of Site 9.

2. On page 6-19, the report states that the tidal excursion is 2-3 km at offshore sites. This would bring the effluent plume from Sites 8.5-5 over Site 8, a depositional area, in one tidal excursion and farther shoreward over several tidal cycles.

3. On page 6-19, the report notes that currents vary with depth according to drogue studies. Models used to examine effluent dilution and transport currently lack the ability to incorporate such layering and three dimensional structure.

4. Three distinct flow regimes are defined (p. 6-20) with only sites 8.5, 5, and 3.5 in the outermost (less tidally-dominated) flow. However, Site 8 is in the second region of tidally dominated flow. The proximity of Site 8 and 8.5 thus indicates that Sites 8.5 and 5 are really just barely into the general Massachusetts Bay circulation and that onshore transport could easily bring the effluent plume back into the tidally-dominated flow region.

5. The pycnocline depth at Site 5 (p. 6-21) was found to be 25 m maximum. We observed a temperature and turbidity discontinuity as deep as 30 m, which I expect coincides with the pycnocline. Therefore, the bottom layer at Site 5 may be only a few meters deep and thus have little entrainment effect on the plume. A deeper site will have a much thicker bottom layer of cold Maine Intermediate Water (normally below 30-40 m in the Gulf of Maine), which could entrain the plume better (p. 6-22) and let it move offshore. Wind-driven water movement (p. 6-22) drives the upper water layer shoreward, so entrainment in a deeper layer offshore is desirable.

6. Net residual transport (p. 6-21) was determined to occur toward the local shoreline (by drogue data). Which sites were referred to? This may apply to all sites and makes consideration of a further site very important. Also, Broad Sound is identified as a "recirculation cell", meaning that if the effluent moves shoreward from Sites 8.5 to 5, it will stay in that region for a considerable period.

7. Resuspension potential diminishes with depth, yet significant resuspension still occurs at 30 m (Sites 8.5, 5, p. 6-22). Resuspension at a borderline site where the plume can be driven shoreward is likely to redistribute contaminated sediments into Broad Sound where they can collect in depositional areas. Sites farther offshore will have the least resuspension and greater likelihood of offshore sediment transport.

8. Oxygen depletion is discounted (p. 6-23), yet near-bottom oxygen concentrations already are below 6 ppm frequently, as noted in earlier sections of this study. Organic loading near the bottom will certainly cause increased oxygen consumption and longer periods of low oxygen concentration at sites near the outfall.

9. High nutrient concentrations already occur in Broad Sound (p. 6-24) and presumably in adjacent Hahant Bay. Effluent discharge from other sources such as the Lynn and Swampscott treatment plants will continue. The effect of nutrients from the new outfall on the nuisance alga Prisinalia litteralis in Nahant Bay has not been considered in Volume V, however.

10. "Offshore sites have a greater capacity to assimilate nutrients without adverse impact" (p. 6-28). "The further offshore the outfall is, the more

likely the discharge will be transported away from coastal resources" (p. 6-29). "The difference among zones has a large impact on outfall site selection" (p. 7-6). These quotes from the report support the idea that Sites 8.5 and 9, just barely into the offshore zone, may not be far enough from shore. Site 8.5 is only 2000 feet from Site 8, and Site 9 is 11,000 feet from Site 8. The diffuser will be 6600 feet long, and thus spans much of the area between 8.5 and 9 as now designed. There should be some analysis of a site that is clearly out of the tidally-influenced nearshore zone.

11. Table 7.0-2 illustrates that Sites 8.5 and 9 are not clearly in a different zone from the closer sites. By "avoidance of adverse sedimentation" Site 8.5 is rated worse than 3.5 or 9, yet both 3.5 and 9 contain sediment areas as well as rock. These have not been analyzed (parts b, c, d, e) for metals, PAHs, PCBs, or grain size.

By "avoidance of areas of important habitat" sites 9 and 3.5 are better than 8.5, but by "ability to protect local species from adverse stress" all are rated only "good". Clearly a further site should be studied as a comparison.

ROCKY SUBTIDAL ECOLOGY

(Excerpts from Draft Report to Camp Dresser and McKee, October 1, 1987; Marine Ecology and Water Quality Field Studies for Outfall Siting Deer Island Secondary Treatment Facilities Plan)

by Kenneth P. Sebens and Jon D. Witman, Northeastern University and Nancy MacIolek and Betsy Brown, Battelle Ocean Sciences

4.0 Discussion

General Characteristics

...In summary, the shallower [Transect G, Site 3.5] of the two transects studied comprises a group of species found from the low intertidal zone to approximately 20 m in coastal habitats, and a second group of species found in deeper colder habitats throughout the Gulf of Maine. This area appears to be a moderately suitable habitat for suspension feeders growing on rock surfaces; it also supports a number of large invertebrate predators and is frequented by several species of bottom-dwelling or bottom-feeding fish.

The Outer Transect H [Site 9] is about 6 m deeper than Transect G [Site 3.5] and consists of a large flat plain of pebble interspersed with patches of soft sediment (mud, sand) with a few small scattered boulders....In comparison to the shallower area, this transect had fewer mobile species, and these occurred in lower densities....

* * *

...The additional 6 m depth [between Site 3.5 and Site 9] means that the bottom fauna is in a zone of lower temperature in the summer, with a distinct thermal discontinuity occurring at around 20 m depth. This stratification was

evident on all dives from April to August, when the bottom water temperature was 8-9°C. This bottom layer also afforded exceptionally high visibility, up to 20 m horizontally. There was no evidence of a similar stratification at the Transect B (Site 3.5) stations, where visibility at the bottom was usually less than 10 m. If sufficiently stratified, the water column of the deeper Transect B might hold the effluent plume below the surface with subsequent movement along the bottom. The direction the plume would take would depend on the prevailing current patterns at the time....

GULF OF MAINE INTERMEDIATE WATER

This section on Gulf of Maine Intermediate Water shows the stratification that develops at about 30 to 40 meters depth over much of the Gulf of Maine, including Massachusetts Bay, during the summer months when the water is thermally stratified. An outfall in the zone of Site 6 would put the effluent well into this deeper water, which would be expected to entrain the plume, keeping more of the effluent in deeper water.

At Site 5, there is frequent onshore transport in the upper layer and a very thin lower layer. The effluent will essentially blast through the lower layer and rise to the upper layer at Sites 4.5 or 5, whereas at Site 6 part of the plume will be entrained below the pycnocline and will be less likely to move into the tidally-influenced near-shore region. The tidal excursion in the area of Sites 4.5 and 5 is about 2 to 3 kilometers, which would be expected to bring the effluent frequently in towards Site 4, an unacceptable location for effluent discharge.

The average depth of Massachusetts Bay in the zone near Sites 4.5 and 5 is about 90 just over 100 feet, whereas the average depth at Site 6 is about 150 feet. This means that a diffuser at Site 6 would be well into the Maine Intermediate Water, rather than in a marginal location at the edge, where tidal currents would still have a large effect and where most of the effluent would rise to the surface layer above the Gulf of Maine Intermediate Water layer.

Included as part of this section is "Maine Intermediate Water," an excerpt from a manuscript in preparation, by Dr. Jon D. Witman of Northeastern University Marine Science Center.

MAINE INTERMEDIATE WATER

by Dr. Joe D. Wilson

(Excerpt from a Manuscript in Preparation)

The Gulf of Maine is a semi-enclosed body of water along the northeast continental shelf between the U.S. and Canada. Its deep basins (>300 m), deep water access to slope water through the Northeast Channel, and seasonal cycle of thermal stratification and convective overturn all contribute to the formation of three distinct water masses during the warmer half of the year (Bigelow, 1927; Hopkins and Garfield 1979). Maine Surface Water (MSW) resides above the seasonal thermocline-pycnocline and is characterized by warmer, fresher, and hence less dense water which typically extends from the surface to 30-40 m and as deep as 50 m over the central basin. Maine Intermediate Water (MIW), which represents a temperature minimum, is produced during winter through intense cooling and becomes isolated from the surface upon the formation of Maine Surface Water. Maine Intermediate Water may extend to as deep as 140 to 170 m over the basins and resides above Maine Bottom Water (MBW). Maine Bottom Water is warmer but more saline and hence denser than Maine Intermediate Water and is formed by the influx of slope water into the Gulf of Maine through the Northeast Channel. These three water masses become obscured close to shore (<10 km) and over Georges Bank where vertical mixing by winds and especially tides produces a vertically well-mixed water column.

The vertical distributions of particulate matter appear to be closely associated with the hydrographic structure, and there are three distinct particular maximum layers which are well developed by summer. The first

particulate maximum is represented by the subsurface chlorophyll maximum (SCM) layer (Townsend et al. 1984; Townsend and Cammen, 1985; Spinrad, 1986), which in the Gulf of Maine is a phytoplankton biomass maximum. The particulate maximum layer is often closely associated with the thermocline at the lower boundary of the Maine Surface Water and the upper edge of the Maine Intermediate Water. Although there is some controversy in the literature surrounding the role of these layers in the nutrition of the zooplankton, there appears to be a close association between the subsurface chlorophyll maximum layer and the vertical distribution of copepod nauplii in these waters (Townsend et al., 1984). Temperature profiles taken at various times during the summer show that the upper boundary of the Maine Intermediate Water (identified by 6° isotherm) occurred at 30-40 m at the Isles of Shoals, Jeffreys Ledge, and Cashes Ledge....

References

Bigelow, H.B. 1927. Physical oceanography of the Gulf of Maine. U. S. Department of Commerce Bureau Fisheries Bulletin 40: 511-1027.

Hopkins, T.S. and N. Garfield. 1979. Gulf of Maine Intermediate Water. Journal of Marine Research 37: 103-139.

Spinrad, R.W. 1986. Optical characteristics of the water masses of the Gulf of Maine. Journal of Geophysical Research.

Townsend, D.W., T.L. Cucci, and T. Loruan. 1984. Subsurface chlorophyll maxima and the vertical distribution of zooplankton in the Gulf of Maine. Journal of Plankton Research 6: 795-802.

Townsend, D.W., and L.M. Cammen. 1985. A deep protozoan maximum in the Gulf of Maine. Marine Ecology Progress Series 24: 177-182.

DENIAL OF 301(h) WAIVER

by Polly Bradley

Attached as a part of MWRA's report is the Summary of Findings from the March 29, 1985, Environmental Protection Agency Decision Document denying Boston's 301(h) waiver. There is no reason to believe that the current plan for a discharge at Site 5 makes any change in these findings: primary effluent discharged at the 301(h) waiver site is still "expected to violate the Commonwealth of Massachusetts' water quality standard for dissolved oxygen during summer resuspension events," will "interfere with protection and propagation of a balanced indigenous population of marine life and may not allow for recreational activities," and "may impact other point and nonpoint sources to the north and west."

The 301(h) waiver application was for a five-year period: the 301(h) waiver denial was based on water quality violations for five years at the 301(h) waiver site, six miles from Nahant. Therefore it is obvious that discharging primary treated sewage at this site <u>or almost</u> for five years <u>or more</u> could not be done without degrading water quality and violating the Clean Water Act. Yet this very site -- Site 5 -- was the furthest out of sites studied, giving no basis for comparison with a more suitable location.

From Environmental Protection Agency Decision Document
Deeping Boston 301(h) Waiver

2. Summary of Findings

Based upon review of the data, references, and empirical evidence furnished in the application, the Applicant's response to EPA's request for additional information, and the technical review report, the 301(h) Task Force makes the following findings with regard to compliance with the statutory and regulatory criteria:

- The proposed discharge is expected to violate the Commonwealth of Massachusetts' water quality standard for dissolved oxygen during summer resuspension events, but is not expected to violate the Commonwealth's standard for suspended solids. [Section 301(h)(1), 40 CFR 125.60].
- The proposed discharge is expected to interfere with the protection and propagation of a balanced, indigenous population of marine life and may not allow for recreational activities. The proposed discharge will not adversely impact public water supplies. [Section 301(h)(2), 40 CFR 125.61].
- The Applicant has established a system for monitoring the impact of its discharge. [Section 301(h)(3), 40 CFR 125.62]. This program contains deficiencies as discussed in the technical review report (TRR, III-F-1,2).
- The proposed discharge may impact other point and nonpoint sources to the north and west. [Section 301(h)(4), 40 CFR 125.63].
- The Applicant has developed a program to enforce all applicable pretreatment requirements. [Section 301(h)(5), 40 CFR 125.64]. This program has been submitted to the EPA Regional Office and approved under the pretreatment regulations, 40 CFR Part 403. A recent EPA audit shows that the program has not been adequately administered and enforced.
- The Applicant has proposed a schedule of activities intended to limit the entrance of toxic pollutants[1] from nonindustrial sources into the treatment works. [Section 301(h)(6), 40 CFR 125.64]. This schedule of activities contains deficiencies, as discussed in the technical review report (TRR, III-H-6).
- There may be new or substantially increased discharges of pollutants in the effluent from the proposed discharge above that specified in the permit. [Section 301(h)(7), 40 CFR 125.65].

[1] "Toxics" or "toxic pollutants" as used throughout this document refers to both toxic pollutants as defined in 40 CFR 125.58(u) and pesticides as defined in 40 CFR 125.58(m).

LEGAL CONSIDERATIONS

by Michael J. Meagher, Esq.

This section examines some of the grounds for legal challenge that would result if Sites 8.5 or 9 were chosen for the placement of the Massachusetts Water Resources Authority ocean outfall. This section also analyzes why the characteristics of Site 6 may make it the only site among those being considered that could meet these legal challenges. The conclusion of this section is that because Site 6 is the only site that may meet these legal challenges, it should receive careful and complete evaluation.

1. Compliance with Environmental Statutes

The recently released consultant's report indicates that neither Site 8.5 nor Site 9 complies with the Massachusetts Clean Water Act or the Federal Clean Water Act because effluent limitations will be exceeded. The preliminary evidence available concerning Site 6 indicates that many more, if not all of these effluent criteria would be met because of the greater dilution that would occur at Site 6. As discussed in other sections, the greater dilution would be a function of both the much greater depth of the water column and the more vigorous circulation that would take place at Site 6.

The selection of Site 6 would also be prudent because the greater dilution and the greater distance from lobster and commercial fish habitats and from bathing and recreational areas would provide an additional margin of safety. As new toxic substances are developed and as more substances are found to be toxic, it makes sense to allow for a sufficient margin of safety to allow for both these occurrences.

Even if one were to disregard the potential impact on public health, the choice of a prudent outfall site could also save substantial amounts of money. Constructing an outfall at Site 6 initially is only a fraction of the cost that would result if the outfall were constructed at Sites 4.5 or 5 and was later required to be moved out to Site 6 because of more stringent effluent limitations.

2. Inadequate Examination of Environmental Impacts

The construction of the new sewage facilities on Deer Island for Boston and its surrounding cities and towns consists of many interrelated components. By the time that construction commences on any of these components, the environmental impacts of each component should have been examined. However, at no point during the process will the cumulative impact of all the components be examined.

The examination of the cumulative impacts of the entire process is required under both the regulations implementing the Massachusetts Environmental Policy Act and under the regulations implementing Section 304 of the Clean Water Act. At this point, it is clear that the examination of such cumulative impacts would result in significant delays in the proposed construction schedule. If it became clear that a prudent and cautious choice was made in the selection of an outfall site, the environmental impacts, including cumulative impacts would be lessened and, therefore, the need to examine such impacts would be lessened as well. However, if a site were chosen that had questionable environmental impacts, the need to examine cumulative impacts would be heightened.

3. Public Nuisance and Trespass

In addition to the statutory concerns that could be affected by site selection, there are implications under common law as well. The territorial waters and shorelines of the Towns of Hubert and other North or South Shore communities could be polluted by effluent coming from an outfall site located too close to shore. The evidence developed by the MWRA's consultant indicates that the pollutants discharged from Site 4.5 and 5 will reach North Shore territorial waters and shorelines. While some pollution could possibly still result if Site 6 were chosen as the outfall site, the preliminary evidence available indicates that such pollution would be negligible.

For the reasons cited above, it is recommended that Site 6 be studied as a potential outfall site.

ECONOMIC CONSIDERATIONS

by Kevin Jaegaard and Robert Vanderslice

The value of extending the outfall to Site 6 is based on providing a safer location for the dispersal of the effluent. This is important to the ecology of Massachusetts Bay and to the economic and recreational needs of the region. Although the outfall will be constructed and paid for in the next few decades, it will probably continue to serve the MWRA district more than a century from today. Determining its location is probably the most important decision that the MWRA will make during this time frame.

An outfall to Site 6 would be an inexpensive insurance policy against environmental damage to the economic investment in and along Massachusetts Bay. This investment includes the shorefront property values on the North and South Shores, which are worth billions.

Commercial and recreational fishing is a major economic factor in the Bay. Almost 90 percent of the $80 million annual lobster harvest in Massachusetts is caught between Manchester and Scituate in less than 120 feet of water (Data from Division of Marine Fisheries). The Bay is an important resource which supports the many shorefront businesses dependent on recreational boating.

A reason given by the MWRA for not extending the outfall further is that it will cost too much. When the associated construction costs and the financing are evaluated, it can be seen that there will be little impact on the ratepayer. The Draft Reports of the Secondary Treatment Facilities Plan were reviewed and evaluated to determine the cost and completion time of the outfall and to aid in estimating a construction cost for Site 6. This was not fruitful, as there appear to be inconsistencies. We are bringing the following

points to the attention of the MWRA so they may either be explained or corrected in the Final Reports:

- The construction cost chart on Volume V, page 7-3, when compared to tunnel lengths, shows an unusual range of costs per mile. Instead of an expected gradual cost increase as the length of the outfall increases, the following costs per mile occur:

TABLE A

COST PER MILE AS OUTFALL LENGTHENS

	Increase in Length	Cost Increase	Cost per Mile
Site 2 to 2.5	1.1 mi	$36M	$33M
Site 2.5 to 3.0	0.7 mi	$21M	$30M
Site 3.0 to 4.0	0.9 mi	$40M	$44M
Site 4.0 to 3.5	0.5 mi	$1M	$2M
Site 3.5 to 4.5	0.7 mi	$12M	$17M
Site 4.5 to 5.0[a]	2.6 mi	$80M	$30M

[a] If the location of Site 5 is at 70°07'16" Long. and 42°25'10" Lat. (location provided by the MWRA) then:

Site 4.5 to 5.0	3.1 mi	$80	$26M

- The construction costs and schedule vary in different portions of the report. Consider the following:

TABLE B

CONSTRUCTION COSTS AND SCHEDULE

Report Section	Construction Cost[a]	Start/Finish	Duration
Vol. V Site 8.5	$380 million	9/90 - 11/98	51 months
Site 5	$459 million	9/90 - 9/95	55 months
Vol. VII Fig. 1.8.1-1	--	9/90 - 7/96	46 months
Vol. VII Table 7.2-1	$425 M (construction)	FY90 - FY96	60 to 72 months
	$65 M (engineering and construction mgmt.		
	$490 million		

[a]. The construction costs are in 1987 dollars, including engineering and construction management.

The construction costs cannot be predicted with accuracy until completion of the geotechnical analysis. The type of rock and location of faults and other conditions will have a major impact on tunneling rate and cost. Since the data made available is contradictory and subject to major revision, only the broadest "ball park" assumptions are made to illustrate the cost increase of extending the outfall two miles further than Site 5. The MWRA

present worth costs include construction, engineering and contingencies. The following is the estimated present worth cost for extending the tunnel to Site 6:

TABLE C

COST FOR EXTENDING THE TUNNEL TO SITE 6

		1987 dollars
Construction Costs. 2 miles x $20 million/mile		$40 million
Engineering and Construction Management (15 percent)		$6
Subtotal		$46
Contingency (20 percent)		$9
	TOTAL	$55 million
	SAY	$60 million

Since the financial analysis in Volume VII is already using a cost which is $30 million more than the Site 5 estimate contained in Volume V, addition of $60 million to the $2.919 billion current value cost should be sufficient to illustrate the financial impact of Site 6.

The effect of inflation, availability of Federal grants and financing costs as predicted by the MWRA have been used to estimate the cost of extending the outfall to Site 6.

The extension of the outfall will increase the project cost by less than 2 percent.

SWEN has prepared a financial projection of the impact of Site 6 on the revenue requirements of the MWRA. As can be seen in Table I of this projection (located at the end of this section), the revenue impact is negligible. There

would be a 3 percent increase in FY1991 which would taper down to 1 percent by FY 1995 and may actually decrease after FY2001 due to interest on the Debt Service Reserve exceeding costs.

The impact on the users in the MWRA District will also be minimal. The cost per individual decreases from a maximum of $2.50 in FY 1991 by about 25 cents a year until FY 2001 -- a total of $13.79 over 11 years.

These financial projections are based on an assumption that there will be no Federal or State subsidies. The Federal Water Quality Act of 1987 provides for a transition to state/local funding between 1988 and 1994, with a $8.4 billion nationwide grant program to capitalize state Revolving Loan Funds. It is highly probable that the $13.79 per person would be substantially reduced.

It is clear that the value of Site 6 in terms of economic and environmental benefit far outweighs its cost.

FINANCIAL PROJECTIONS

SITE 6

DECEMBER 11, 1987

CONTENTS

I. SUMMARY COMPARISON OF REVENUE REQUIREMENTS

II. DETAILED COMPARISON OF REVENUE REQUIREMENTS

III. INCREASE IN REVENUE REQUIRED

IV. DEBT SERVICE COSTS

V. NOTES AND ASSUMPTIONS

[illegible]

	[illegible]
Rate 1 - [illegible] Projections	[illegible]
Rate 2 - [illegible] Projections	[illegible]
Revenue Shortfall	[illegible]
Percent change	[illegible]
Per individual tax dollars	[illegible]

[illegible]

	[illegible]
Rate 1 - [illegible] Projections	
Base Revenue Costs	[illegible]
Operating Costs	[illegible]
Income on Reserve Funds	[illegible]
Revenue Requirements	[illegible]
Rate 2 - [illegible] Projections	
Base Revenue Costs	[illegible]
Operating Costs	[illegible]
Income on Reserve Funds	[illegible]
Revenue Requirements	[illegible]
Change	
Base Revenue Costs	[illegible]
Operating Costs	[illegible]
Income on Reserve Funds	[illegible]
Revenue Requirements	[illegible]

III. [illegible]
[illegible]
Thousands of Dollars

	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	FY [illegible]	Reference
Sub 1 - [illegible] Provisions																	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Note 1
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Sub 2 - [illegible] Provisions																	
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IV. [illegible] COSTS
ADDITIONAL COST OF SITE A
Thousands of Dollars

Construction Cost	000,000
Percent of Premium	00
Amount to Finance	70,000
Annual Principal and Interest	00,000

9. [illegible] AND ASSUMPTIONS
[illegible] AND DEBT PROJECTIONS

1. MWRA projections are as prepared by the MWRA in Volume VII, "Institutional Considerations", dated November 15, 1987. These projections use the following financial assumptions:

   - MWRA bond term in years, 30 years
   - MWRA bond annual interest rate, 9%
   - Percent of bond proceeds available to MWRA, 85%
   - Annual interest rate earned on reserve funds, 9%

2. DEIR projections assume additional construction costs of $80,000,000 paid in 1991 to extend the outfall to Site 6. DEIR uses the same financial assumptions as the MWRA (assumption 1).

3. The decrease in revenue requirements beginning in year 2002 is due to the assumptions of the MWRA regarding interest earned on Debt Service Reserve Deposits.

   - The MWRA assumes that interest earned on Debt Service Reserve Deposits reduces revenue requirements in the year earned.
   - The balance of Debt Service Reserve Deposits increases each year as the MWRA deposits debt service costs into the Reserve.
   - In later years, the interest earned on Debt Service Reserve Deposits may exceed debt service costs in that year.

OTHER CONSIDERATIONS

Although Hahant SWIM, Incorporated, has focused particularly on urgent outfall issues because of Hahant's vulnerable location jutting out into Massachusetts Bay, we recognize that unless all parts of this complex project are planned and executed in an environmentally sound manner, the effluent coming from the outfall will not be clean. Therefore we are also deeply concerned with adequate pretreatment, monitoring, residuals, combined sewer overflows, reduction of fresh water inflow into salt water, and such water quality issues as meeting dissolved oxygen standards and meeting the requirements of the NPDES permit.

SWIM requests that construction of the secondary treatment plant be speeded up so that the project will not degrade a clean area.

SWIM requests that primary effluent not be released from the outfall. This would violate the antidegradation provisions of the Clean Water Act.

SWIM requests that the MWRA support our motion to intervene in the Boston Harbor court case.

Because the North and South Shore and Massachusetts Bay are gravely threatened by pollution if the cleanup is only partially successful, and because all residents of Greater Boston benefit from the cultural and other amenities of the City of Boston, the City of Cambridge, and other communities within the sewage district of the Massachusetts Water Resources Authority, Hahant SWIM strongly supports the MWRA's search for state and federal financial solutions.

BACKGROUND LETTERS AND DOCUMENTS

Included as part of SWIM's testimony for the December 16, 1987, hearing and as background information are the following letters and documents:

1. SWIM's comment to MEPA (The Massachusetts Environmental Policy Act Unit) on Volume II of the Massachusetts Water Resources Authority Sewage Treatment Facilities Plan. It points out some of the major non-outfall issues that must be addressed before adequately treated effluent can be sent out of the sewage outfall.

2. Letter to Anthony Fletcher, Chairman of the Subcommittee on Facilities and Operations of the Massachusetts Water Resources Authority, from William J. Cuffey, Chairman of the Board of Directors of SWIM, concerning scientific study of Site 6.

3. Letter to Steve Davis, Director of the Massachusetts Environmental Policy Act Unit, from Polly Bradley, President of SWIM, concerning the MEPA process.

4. Letter to Volunteers from SWIM (Insert).

5. Press release announcing Nahant SWIM's motion to intervene in the Boston Harbor cleanup case.

6. Brief history of SWIM

7. Statement of support from the South Shore's SAVE OUR BEACHES.

8. POLLUTERS: TAKE WARNING! A description of the Nahant Bay/Broad Sound Water Quality Monitoring Program sponsored by the Northeastern University Marine Science Center and the Massachusetts Audubon Society. Citizens from Revere, Lynn, Nahant, and Swampscott participate in this program, which is a part of a larger citizens program which monitors water quality from Gloucester around Boston Harbor to the South Shore.

SWIM - Nahant Citizens Committee for Safer Water in Massachusetts

c/o Northeastern University Marine Science Center, East Point, Nahant, MA 01908

December 9, 1987

Mr. David Shepardson
Massachusetts Environmental Policy Act Unit
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

Re: MEPA #1360, MWRA Volume II, Facilities Plan Background

Dear Mr. Shepardson:

Here is SWIM's comment on Volume II of the Seven Deadly Volumes.

I would like to point out that the "one year six hour storm" will happen at least four times a year (according to DEQE) and perhaps a dozen times a year (according to concerned Quincy citizens). Engineers and English majors agree that this is weird. Apparently the South System is not being designed to handle more than this misnamed "one year six hour storm."

I understand that the plant is being designed to treat the amount of wastewater the influent pipes are big enough to hold (1,227,000,000 gallons), rather than to treat all the wastewater the 43 cities and towns produce (2 billion gallons or more in storms.) What will happen upstream?

The plant is not being designed to give secondary treatment even to all of the 1,227,000,000 gallons of influent. It will give secondary treatment to about a billion gallons and primary treatment to the next quarter of a billion gallons. The next three quarters of a million gallons will overflow in Quincy, Everett, Boston, etc. No wonder South System citizens, in particular, are worried about underdesign of the system.

Meanwhile, Nahant is worried about that mixture of primary and secondary, which will not meet NPDES permit requirements. Even if the secondary plant is built on time, even if it works, Massachusetts Bay will be getting semi-treated water from the underdesigned treatment plant.

Additional comments are attached for your holiday reading pleasure. Good luck -- and forget all this long enough to have a Merry Christmas!

Sincerely yours,

Polly Bradley

Polly Bradley, President
Nahant SWIM

cc: James S. Hoyte, EOEA
Michael Deland, EPA
Paul Levy, MWRA
Richard Delaney, CZM
Steve Lipman, DEQE
Peter Shelley, CLF
Dr. Kenneth Sebens, Northeastern University
Board of Selectmen, Nahant

FLOWS AND LOADS

The Massachusetts 1985 census figures indicate that presently the population of the 43 MWRA member communities is 2.47 million people. Volume V estimates that 35 years from now this figure will increase to only 2.15 million people; that is only 80,000 additional residents. While this dubiously low increase is considered by the MWRA in Volume V, the possible addition of neighboring communities is not considered significant enough for inclusion in the MWRA estimate (Volume II, page 8-1).

The neighboring communities which are adjacent to the current service area but not presently serviced by publicly owned treatment works are Lynnfield, North Reading, Carlisle, Lincoln, Weston, Southboro, Hollision, Sherborn, Dover, Sharon, Easton, and Harvard. According to the Massachusetts 1985 Census, these communities are home to 110,000 residents. Just including the present populations of these communities more than doubles the MWRA's estimates for the service area population increase and increases the daily flows at the outfall site by 7 million gallons.

It should be noted that once the new treatment works are in place and substantial costs are incurred, the MWRA will have a very real incentive to increase the user base and thus decrease user fees.

FLOWS AND LOADS FOR THE LIFE OF THE OUTFALL

The MWRA says that it is "constructing an outfall to meet the needs of a community for a century" (Vol. V, page 7-25), yet only a 25-year time period is considered in dealing with flows and loads. What about the 75 years after year 2020, the design period of the plant? Children and grandchildren of Boston residents will still be living here, and even some of us may be rocking along still, but will the plant be replaced? Will even a primary plant be working? On the basis of experience (the Clean Water Act of 1972 required secondary treatment by 1977), we have serious doubts. Moreover, with the effluent sent out into Massachusetts Bay and with Boston Harbor cleaned up, it is doubtful that there will be enough political pressure in Boston to rebuild the plant.

PREVENTION OF OVERLOADING OF THE SYSTEM

SMIN suggests additional attention to:

1. Infiltration and Inflow (I/I) reduction.
2. Solving problems of Combined Sewer Overflows (CSO's).
3. Sewer metering and monitoring (MWRA?).
4. SATELLITE TREATMENT PLANTS

SATELLITE TREATMENT PLANTS

Construction of small treatment plants in outlying suburbs should be a major part of the MWRA plan. This would do more than anything to help solve all the problems mentioned in my covering letter - more flow than the system can handle, inadequate treatment by the Deer Island plant, general underdesign, etc. Moreover, these plants can come on line quickly, much more quickly than the Deer Island plant. (Construction of the Lynn-Saugus-Nahant secondary plant, treating some 25 to 30 million gallons per day, has not yet begun, but will be completed by 1990 — NINE YEARS before the Deer Island plant is scheduled for completion!)

Please include as part of this testimony the enclosed letter of October 7, 1987, to Paul Levy from SWIM. It outlines some of the many advantages to be gained by building satellite treatment plants.

SWIM - Nahant Citizens Committee for Safer Water in Massachusetts
c/o Northeastern University
Marine Science and Maritime Studies Center
East Point, Nahant, MA 01908
October 7, 1987

Mr. Paul Levy, Executive Director
Massachusetts Water Resources Authority
Charlestown Navy Yard
100 First Avenue
Boston, MA 02129

Dear Mr. Levy:

When Paul Paquin of EMAI called to Nahant for the North Shore Town Meeting, he commented on the quantity of fresh (not necessarily clean, but certainly non-salty) water that would be transferred from the rivers and groundwater, where it belongs, to the ocean, where it does not belong. I'd like to elaborate a little.

The flow of the proposed Deer Island Sewage Treatment Plant will be equal to the combined flows of the Charles, Mopeenet, and Mystic Rivers. In an undisturbed ecosystem, fresh water would, after use, replenish the groundwater supply and help retain the salt balance of the estuary (Boston Harbor). Instead, the current MWRA plan calls for sending this fresh water out into Massachusetts Bay, where it will disturb the natural salt balance of the ocean ecosystem.

Meanwhile, the MWRA sewage treatment plant is not being designed to treat all the sewage. During storm conditions when the flow is over about a billion gallons a day, primary and secondary effluent will be mixed and the conditions of the National Pollutant Discharge Elimination System (NPDES) Permit will not be met. Moreover, the three pipes going into the plant will hold only 1.7 billion gallons a day, so there is the problem of holding extra storm water somewhere upstream in the system.

I suggest that the MWRA build satellite treatment plants sufficient to prevent sewage and Combined Sewage Overflow (CSO) loads of over a billion gallons a day. This would have several excellent results:

1. Fresh water could be returned to upstream ecosystems, replenishing the rivers and hence the groundwater system.

2. The Boston Harbor estuary would be flushed out by this water, making it cleaner, and the harbor ecosystem would retain a mix of salt and fresh water suitable for estuarine plants and animals.

3. The sewage treatment plant would treat the billion gallons of water from a medium sized storm, and it would not be necessary to send partially treated water into Massachusetts Bay or ask for a change in the NPDES permit.

4. The Massachusetts Bay would not receive as great a surge of non-salty water into its salt-water ecosystem, and cleaner water would come out of the MWRA outfall, protecting the ecology of the bay, the health of the fisheries, and the beaches and shore.

I request that you and your staff give serious consideration to this suggestion.

Sincerely yours,

Polly Bradley, President
Nahant SWIM

SWIM - Nahant Citizens Committee for Safer Water in Massachusetts
c/o Northeastern University
Marine Science Center
Nahant Point, Nahant, MA 01908
November 7, 1987

Mr. Anthony Fletcher, Chairman
Subcommittee on Facilities and Operations
Massachusetts Water Resources Authority
100 First Avenue
Boston, Massachusetts 02129

Dear Mr. Fletcher:

SWIM very much appreciates having the opportunity to make a presentation last Wednesday, with Save Our Beaches, before the MWRA Board of Directors Subcommittee on Facilities and Operations. We feel that the channels of communication set up can only be beneficial to the entire cleanup process, and we hope that SWIM can be helpful to you in that process. Whatever our differences on detail may be, we share that tremendous goal...getting rid of pollution for BOTH Boston Harbor AND Massachusetts Bay.

We are delighted to have the opportunity to send you information and data in favor of a study of Site 6, nine miles from both Nahant and Hull. SWIM's technical and scientific group is meeting this coming week to gather together our data and prepare a position paper, and we will get that to you and Mr. Levy as quickly as possible. We think we can make an extremely strong case for Site 6, as well as explaining why many of the reasons for denial of the 301(h) waiver for Site 5 are still valid.

SWIM is also putting together its proposal for expediting construction of the MWRA secondary treatment facility, and we hope to make that proposal to you soon after we send you the information concerning Site 6.

In the meantime, I am sending you some of SWIM's recent correspondence with regard to the continuing close watch we keep on Lynn Water & Sewer's plans for the Lynn-Saugus-Nahant sewage treatment facilities. (You may recall that at your meeting the question arose as to whether SWIM was giving equal energy to working for a better plan and longer outfall for Lynn, Swampscott, and Salem.) Also enclosed is recent correspondence concerning South Essex Sewage District and Swampscott. We have strongly supported secondary treatment and long outfalls for all sewage treatment plants.

SWIM was first formed in 1986 to work in favor of secondary treatment and a longer outfall for the Lynn-Saugus-Nahant project. Lynn was asking for a 301(h) waiver, with plans for putting their outfall 8.3 miles "out to sea" where the only nearby land was "mostly rocks and mud flats, little used for recreation." That translated out to 1.3 miles straight south of Nahant. As you can imagine, Nahant was furious. But from the very beginning we have emphasized scientific evidence and technical expertise rather than noise and anger. After making our best case for a denial of Lynn's 301(h) waiver application, we also worked on denial of 301(h) waivers for SESD, Swampscott, and Salem.

Since then we have been active throughout the process. As you know, there are certain times when public participation is most possible, and this summer we spent a tremendous amount of time and energy trying to get a Citizens Advisory Committee formed and an Environmental Impact Report/Environmental Impact Statement written on the Lynn Water & Sewer secondary treatment facilities plan. One of the major reasons we wanted this done is that the outfall, only six-tenths of a mile from Nahant, is inadequate even for discharge of secondary effluent. There are many other reasons as well, as you can see from the correspondence.

SWIM garnered support from Mass. Audubon, Northeastern University, the Saugus Action Volunteers for the Environment (SAVE), Congressman Mavroules (we had a special meeting with him in July on this topic), and of course Nahant officials and citizens, but in spite of our best efforts we were unsuccessful, and the project is going forward without a CAC or EIR/EIS. SWIM was very upset, as you will see from Polly Bradley's letters of August 27 to Steve Davis, Director of the NEPA Unit, and Mark Stein, Assistant Regional Counsel for the EPA.

You will see from the enclosed information that the Nahant Conservation Commission hired the firm of McGregor, Shea, and Dalimer to make a Compliance Review on the Lynn Water & Sewer project. For the time being, however, our strategy is not to take LW&S to court but to get Nahant representatives on a CAC being formed to deal with LW&S Combined Sewage Overflows, and to try to get the scope of that CAC enlarged to consider outfall and other issues as well. A copy of our letter nominating a SWIM member for this committee is included; you might note the request for enlarging the scope of work for the CAC.

SWIM helped to set up the Nahant Bay/Broad Sound Water Quality Monitoring Program, which is sponsored by the Massachusetts Audubon Society and Northeastern University's Marine Science Center here in Nahant. The local monitoring program is a part of the larger citizens monitoring program from Gloucester to Boston Harbor. Together these programs will tell the citizens and scientists if there is pollution from SESD, Swampscott, Lynn, or Boston. We fully expect that Lynn's outfall near Nahant will not comply with the Massachusetts Surface Water Quality Standards even after the secondary treatment plant is completed in 1990, and we will take whatever action is necessary to protect our shores and the waters and ecology of Lynn Harbor and Massachusetts Bay.

Again, many thanks for your kindness and consideration last Wednesday. It was an extremely valuable discussion.

Sincerely yours,

William J. Coffey

William J. Coffey
Chairman of the Board

SWIM - Nahant Citizens Committee for Safer Water in Massachusetts

c/o Northeastern University
Marine Science and Maritime Studies Center
East Point, Nahant, MA 01908

August 27, 1987

Mr. Steve Davis, Director
Massachusetts Environmental Policy Act Unit
100 Cambridge Street
Boston, MA 02202

Dear Steve:

May SWIM have a copy of the record of the meeting August 13 between MEPA, Lynn Water & Sewer, SWIM, and Mass. Audubon? We want a copy of Mr. Casey's comments about what a wonderful location (.6 mile from Nahant) they'd chosen and how no pollution ever gets to shore from there. I wish I had thought in the shock of the moment to demand documentation of that incredible statement. Nahanters just don't swim on that corner of our peninsula.

SWIM was very disappointed that no Environmental Impact Report will be required for Lynn's segmented secondary treatment project with potential cumulative impacts...for a controversial project whose Environmental Notification Form claimed no impact on coastal wetlands/beaches, tidelands, or fisheries/wildlife...in a harbor little studied, but full of toxics from the old shoe industry and tanneries, the electric light and motor factories...for a shallow outfall, possibly leaking...a project needing public disclosure...

That morning when we met with you I decided to just run through some of the problems SWIM has discovered with the MWRA plan...figuring that if the MWRA is getting away with those things, probably Lynn is, too. Sure enough, the Massachusetts Surface Water Quality Standards are also being degraded (from 6 mg/l minimum to 5 mg/l minimum, according to Glen Haas) without scientific justification, public comment, or EPA approval...sure enough, secondary treatment will not be given to all sewage during (or after) storms...and I never got a clear answer as to whether the NPDES permit would be complied with. I don't know whether you realize that the MWRA intends to seek a weakening of its NPDES permit rather than comply with the requirements of the Clean Water Act for 85% removal of Biological Oxygen Demand and Total Suspended Solids.

It seems that if the Lynn project didn't require an EIR, surely hardly anything does. Though our faith in the process is much diminished, nonetheless we have commented on the next Boston (MWRA) MEPA document, and I suppose we'll wade our way through this fall's endless paper from MWRA (an EIR should be required for cutting half the Maine forest). Meanwhile I wish you and your staff luck coping with that same pile of paper...and beg you not to let things slide by because a project, any old project, is better than nothing at all.

The quality of life, the health of the fisheries, the value of the seaside property, the safety of recreation, the beauty of Nahant, Hull, and other cities and towns up and down the North and South shores depend on the decisions that you and other environmental officials make in the next few months.

Sincerely yours,

Polly Bradley

Polly Bradley, President, SWIM

581-0075

* PRESS RELEASE * PRESS RELEASE * PRESS RELEASE * PRESS RELEASE *

SWIM - Nahant Citizens Committee for Safer Water in Massachusetts

c/o Northeastern University Marine Science Center, East Point, Nahant, MA 01908

FOR RELEASE FRIDAY, OCTOBER 16, 1987
Contact: Polly Bradley (617) 581-0075 or
Michael Meagher (617) 227-8420; (617) 581-9859

NAHANT SWIM MOVES TO INTERVENE

IN BOSTON HARBOR CLEANUP CASE

Nahant SWIM filed a motion today in U. S. District Court (Boston) to intervene in the Boston Harbor cleanup case under Judge David Mazzone.

The Massachusetts Water Resources Authority (MWRA) is under court order to clean up Boston Harbor. The court-mandated schedule calls for a sewage outfall to be built by 1990, but for secondary treatment not to be completed until 1999. The MWRA plans to build the largest diameter sewage outfall in the world to send the partially treated sewage of 43 communities out into Massachusetts Bay.

SWIM believes that the court schedule does not allow time to build a sewage outfall long enough to protect the shore and that the schedule will permit polluted water to be discharged into Massachusetts Bay. SWIM supports speeding up construction of Boston's secondary treatment plant.

"Both Boston Harbor and Massachusetts Bay must be protected from pollution," said Polly Bradley, President of Nahant SWIM (Safer Water in Massachusetts). "This is not a case of not-in-my-backyard. Boston's outfall can be built in a safe area, where it will not pollute the North Shore, the South Shore, or the Boston Harbor Islands. It doesn't have to pollute anyone."

Michael J. Meagher of Hinckley, Allen, Snyder & Comen, attorneys for SWIM, explained, "Intervention simply means SWIM will have a chance to represent the interests of Massachusetts Bay. Quincy and Winthrop have already intervened in this case. In many ways they have been speaking for Boston Harbor; SWIM must speak for Massachusetts Bay."

The court schedule requires tentative selection of a location for Boston's sewage outfall in November, after a six-month study of possible sites. SAVE supports the Technical Advisory Group in its call for at least a year's scientific study of the currents, chemistry, wave action, sediment distribution, biology and ecology of Massachusetts Bay. The Technical Advisory Group has been appointed to provide scientific advice to the MWRA and the Executive Office of Environmental Affairs.

In addition, SAVE wants the MWRA to study an outfall location farther out than is now being studied, past the area turned down for discharge of primary treatment several years ago.

Sant week a coalition of five South Shore towns -- Hull, Scituate, Cohasset, Marshfield, and Hingham -- plans to file a similar motion to intervene in the Boston Harbor court case. "We do not want Boston's sewage to pollute either the South Shore or the North Shore," said David Kallen, President of Save Our Beaches in Hull.

"SAVE is opposed to any action which would sacrifice the water quality of Massachusetts Bay in order to clean up Boston Harbor," Meagher said. "We want to make sure that Boston Harbor's problems are not simply transferred to Massachusetts Bay."

# # # # #

BRIEF HISTORY OF SAVE

Sahant SAVE (Safer Water in Massachusetts) has followed sewage and pollution issues closely since 1980. We worked successfully for denial of 301(h) applications for waiver of secondary treatment by Boston, Hampcentt, South Essex Sewage District (Salem) and the joint Lynn-Saugus-Sahant sewage system.

Our scientists and engineers add technical expertise to our strong following of citizens from the North Shore. Sahant SAVE on the North Shore and Save Our Beaches on the South Shore represent citizens of about 20 communities. In addition, Nantasket Beach, Revere Beach, and Lynn-Sahant Beach are used by millions of sunseekers from all over eastern Massachusetts.

Sahant SAVE plans to stay involved until the year 1999 and beyond. We will let the Massachusetts Water Resources Authority know when we disagree with them, and we will give them enthusiastic support when their plans and projects will protect BOTH Boston Harbor AND Massachusetts Bay. In the long run, both the controversy and the congratulations will help attain our mutual goal -- Safer Water in Massachusetts.

"Let's make Massachusetts Bay the Sapphire Necklace --
and Boston Harbor the Star Sapphire."

SAVE OUR BEACHES, INC.

P.O. BOX 540, HULL, MASSACHUSETTS 02045

December 15. 1987

Paul Levy. Executive Director
Massachusetts Water Resources Authority
Charlestown Navy Yard
100 First Avenue
Boston. MA 02129

Dear Mr. Levy:

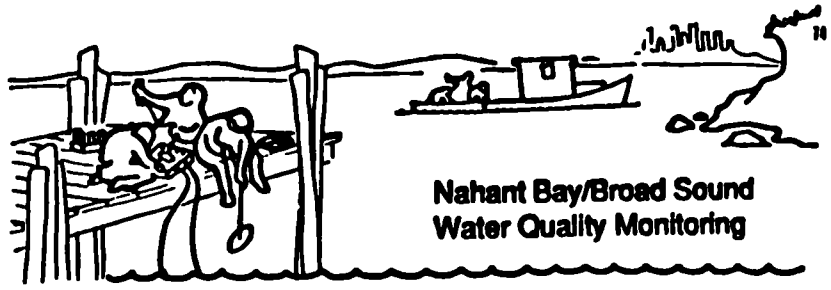
Save Our Beaches is a South Shore citizens group based in Hull. Massachusetts. We were organized in May of 1987 in response to the MWRA proposal to site its sewage outfall pipe near the coast of Hull. It was our position then, as it remains now, that the clean-up of Boston Harbor need not result in the degradation of Massachusetts Bay or any of its coastal areas.

We have worked in cooperation with SWIM of Nahant to promote an environmentally appropriate siting of the outfall. We were relieved when Camp. Dresser and McKee recommended that the outfall be sited in "off-shore" waters. We are not satisfied. however. with the selection of the area between sites 4.5 and 5 for the outfall terminus. This site will not provide adequate insurance against degradation of Massachusetts Bay .

The MWRA challenged SWIM to substantiate its claim that site 6 was a justifiably better alternative. The attached materials overwhelmingly evidence the strength of their position. Save Our Beaches wholeheartedly endorses the SWIM proposal. We urge the MWRA to give it due consideration.

Very truly yours.

David A. Kallen
President.
Save Our Beaches



Nahant Bay/Broad Sound Water Quality Monitoring

November, 1987

POLLUTERS: TAKE WARNING!

High boots and swimming shorts...high boots and rainsuits...high boots and storm jackets...the citizen volunteers of the Nahant Bay/Broad Sound Water Quality Monitoring Program are out there in all kinds of weather, testing the waters. For the next decade we'll out there faithfully with the outgoing tide, and sometimes after big storms we may throw in an extra session for good measuring.

The Nahant Bay/Broad Sound program fills in the gap between the Salem/Beverly Monitoring Program to the North and the Boston Harbor Monitoring Program to the south. It is the newest of the citizen monitoring programs: the first monitoring session was in September, 1987. The program is sponsored by the Massachusetts Audubon Society and the Northeastern University Marine Science Center in East Point, Nahant.

As Boston, Lynn, Swampscott, and Salem build (or do not build) their secondary sewage treatment plants, we'll know who's polluting and who isn't, where the waters are becoming cleaner and where they are becoming dirtier.

What are we testing? Dissolved oxygen, temperature and salinity. Our three measures can tell us a lot about the health of the waters. Dissolved oxygen tells us whether ocean animals can breathe safely. Temperature and salinity levels are critical to marine life, affect the level of dissolved oxygen, and show us when combined sewer overflows are polluting the water. Eventually we may add other tests, such as turbidity and coliform count.

We have a good time monitoring, fair weather or foul. It's a challenge, and the ever-changing ocean makes each day beautiful. But most of all, we have the satisfaction of knowing that we're doing a vital job to fight pollution and to help create a better environment for our children and grandchildren.

If you'd like to join the Nahant Bay/Broad Sound Water Quality Monitoring Program, write us a letter or give us a call.

Nahant Bay/Broad Sound Water Quality Monitoring Program
Sponsored by the Massachusetts Audubon Society and
Northeastern University Marine Science and Maritime Studies Center
Address: c/o Northeastern University Marine Lab
East Point, Nahant, MA 01908
Phone: Karen Brooks, 581-0924; Peggy Butler, 599-8722

BIOGRAPHICAL NOTES

William B. Dennen, visiting scientist at the Department of Geology of Salem State College, is retired Chairman of the Department of Geology at the University of Kentucky. Dr. Dennen was Associate Professor of Geology at the Massachusetts Institute of Technology and Director of the Cabot Spectrographic Laboratory at MIT. His undergraduate and graduate work were done at MIT. He has written 48 refereed journal articles and his map publications include the U. S. Geological Survey Open File Bedrock Geology Maps of the Ipswich, Marblehead North, Gloucester, and Rockport Quadrangles, Massachusetts. Dr. Dennen is the author of Principles of Mineralogy (New York: The Ronald Press, 1959) and coauthor of Geology and Engineering (Dubuque: William C. Brown, 1985) and Principles of Mineralogy, 2nd Ed. (Dubuque: William C. Brown, 1988).

Kevin Jaggaard, A.I.A., is the Chief Project Manager for the Boston Office of STV/Sverdrup, Stevenson, Valum & Knecht, Engineers and Planners. He is an architect registered in three states and is a graduate of Pratt Institute. He was a member of the Port Authority of New York and New Jersey Committee on the Future Transportation Task Force. He has managed engineering design projects with construction values up to $120 million and feasibility studies for transportation projects, including tunneling projects, with estimated construction costs of up to $300 million.

Dr. Michael P. Manning is chief executive officer of Tahmet Corporation and has operated as an independent consultant with Bahnet Engineering. A graduate of Notre Dame University, he received his PhD in Chemical Engineering from the Massachusetts Institute of Technology. He is a registered professional engineer and vice-chairman of the Board of Registration of Professional Engineers. Dr. Manning serves on the Environmental Protection Agency's Grant Review Panel in the areas of environmental engineering and pollution control processes. He is also Chairman of the Advisory and Finance Committee of the Town of Bahnet.

Michael J. Meagher, Esq., is an attorney specializing in environmental law with the Boston, MA and Providence, RI law firm of Hinckley, Allen, Snyder & Comen. He is a graduate of Boston University's College of Liberal Arts and its School of Law. His experience includes litigation of hazardous waste (Superfund) and wetlands cases, as well as licensing of water-to-energy facilities and private sewage treatment plants. Mr. Meagher represents SWIM in its Motion to Intervene in the ongoing Boston Harbor litigation in U.S. District Court.

Dr. Kenneth Sebens, Director of Northeastern University Marine Science and Maritime Studies Center in Bahnet, is a specialist in marine ecology. He was graduated from the University of Connecticut and received his PhD in Zoology from the University of Washington. He comes to his present position at Northeastern's Marine Lab from Harvard University, where he was an Associate Professor in the Department of Organismic and Evolutionary Biology. He serves on the Citizens Advisory Committee of South Essex Sewage District and the Technical Advisory Group of the Massachusetts Executive Office of Environmental Affairs.

Robert Vanderslice, CPA, is a consultant with an international public accounting and consulting firm. A graduate of the University of Delaware, he received his Masters in Business Administration from Lehigh University. He has extensive experience in preparing and evaluating financial projections. Mr. Vanderslice is a member of the Finance and Advisory Committee of the Town of Bahnet.

Dr. Jon D. Witman is Assistant Professor of Biology at Northeastern University. He did his undergraduate work at Franklin and Marshall in Pennsylvania; University of Otago in New Zealand, and University of New Hampshire, where he was graduated. He received his PhD from the University of New Hampshire and did postdoctoral research at Northeastern University Marine Science and Maritime Studies Center in Bahnet. Dr. Witman specializes in invertebrate zoology and the ecology of the Gulf of Maine benthos.

* * *

Polly Bradley, President of Bahnet SWIM Incorporated (Safer Water in Massachusetts), is a Harvard-Radcliffe graduate. For 14 years she wrote a weekly environmental column, "Backyard Frontier," which was sent to newspapers in New England by the Massachusetts Audubon Society and other New England environmental groups. She was Associate Editor of the New England Environmental Network News and has served as Chairman of the Bahnet Conservation Commission and as Bahnet representative to the Metropolitan Area Planning Council. Mrs. Bradley is a former Associate Editor of The Writer magazine and book publishers and was a reporter for the Daily Oklahoman and Oklahoma City Times newspapers.

William J. Coffey, Chairman of the Board of SWIM, is a consultant for the state specializing in housing and economic development. His background includes experience as Administrator and Development Manager of Commercial Revitalization, Capital Improvements, and the Neighborhood Commercial Development Bank Program for the City of Boston. He was Chief of the Rehousing and Leased Housing program with the Boston Redevelopment Authority. He has consulted with the Commonwealth in economic development, specifically with the Department of Community Affairs (DCA), the Massachusetts Bay Transportation Authority (MBTA), the Executive Office of Community Development (EOCD), and several Community Development Corporations. Mr. Coffey has served on several City of Boston committees, including the Model Cities Subcommittee on Finance, the City Relocation Committee and the Fair Housing Committee.

P16 P16

the boston harbor associates
for a clean, alive and accessible Boston Harbor

[illegible]

May 18, 1988

Mr. Michael Deland
US Environmental Protection Agency
John F. Kennedy Federal Building
Boston, MA 02203-2211

Ref: Boston Harbor
Wastewater Conveyance
System - Draft SEIS

Dear Mr. Deland:

The Boston Harbor Associates (TBHA) is a non-profit membership organization composed of individuals, corporations and other organizations. It seeks balanced use of Boston Harbor by making it clean, alive and accessible. TBHA has participated on the MWRA Facilities Plan Advisory Committee, commented on the Facilities Plan documents, and has long been an advocate for a cleaner harbor.

Acceptable or Beneficial ?

The Draft Supplemental Environmental Impact Statement (DSEIS) on the Boston Harbor Wastewater Conveyance System prepared by US EPA Region I "considers the environmental acceptability of alternative locations for wastewater conveyance and outfall systems for the new wastewater treatment facilities for Boston Harbor" (Executive Summary, Page 0). In doing so, it answers the wrong question.

The MWRA is engaged in a multi-billion dollar effort to reduce the impact of sewage on the harbor environment. The costs will place severe burdens on sewage rate payers, who will see their bills double and triple in the next few years. The question is not one of "acceptability" but of benefits.

This DSEIS should be able to document for the public the visible, smellable, feelable improvements that this project will deliver. If no such improvements can be forecast with reasonable certainty, the report should say so. This would allow Congress, the Federal Courts, the US EPA, MWRA and the public to begin the

search for technologies that will do the clean-up job.

Threshold Criteria.

The data and analysis presented in the draft evaluates the relocation of an effluent outfall against a long list of criteria. But these criteria were developed primarily to set a threshold on how intrusive a human activity can be on the natural environment. For example, they provide a framework for discussing the impact of a new manufacturing plant on a region.

The DSEIS concludes that by spending many billions of dollars, the MWRA will do no serious harm. It meets threshold criteria. That conclusion seems well supported by the data presented and, generally, is consistent with the conclusions reached by the MWRA in its Facilities Plan.

How bad is "no action"?

Sewage production is not a matter of choice. The choice is in how we collect, process and dispose of it. And TBHA believes that the purpose of this project is to improve our disposal methods.

Despite the lack of documentation in either the DSEIS or MWRA's Facilities Plan, many observers have faith that a modern primary treatment plant, a connection with Nut Island, and a longer outfall pipe will improve the harbor's environment. The DSEIS provides an opportunity to confirm at least the benefits of releasing the effluent in Massachusetts Bay rather than in President Roads as is done now.

Occasionally, as in TABLE F.2.a, the DSEIS compares the proposed action to a "no action" alternative. This allows the public to evaluate whether more criteria are met by making the improvements being proposed. Unfortunately, such comparisons are sporadic. Even in the same appendix, the table for secondary treatment constituents (TABLE F.2.c) excludes data for the current outfall site.

Without such data, the problems with the current disposal system are undocumented. This seriously weakens the case for spending large sums on this project.

Report presentation.

Efforts to make what is basically a technical report accessible to the informed public have not succeeded. The following examples demonstrate the problems:

1. TABLE 6.4.4.a thru f. The headings on these tables and the description of them on page 6-9 are confusing. Tables a and b by their headings seem to differ in the flow levels (average vs. maximum). The text says that one (which?) has "less than adequate disinfection". (Should readers assume that at flows of 1270 mgd that disinfection will be inadequate?)

Tables c through f give little hint in their headings or footnotes that, as the text says, some include mixture with primary effluent and one assumes a power outage!

In a document 2.5 inches thick, the one paragraph that discusses these significant tables seems inadequate.

2. TABLE 1. Executive Summary. This table summarizes how various outfall alternatives measure up against certain criteria. As discussed above, its usefulness is reduced by the exclusion of the current outfall site.

Interpretation of the figures is difficult. What is a good number? High for dissolved oxygen and hours to shore; low for cost and percent effluent at shore? Some numbers concern exceeding a threshold of acceptability (aquatic life criteria) others may have no threshold (water column enrichment degraded).

3. TABLE 7.1.1.b. This table expands upon TABLE 1 in the executive summary. It includes a column of references to other sections of the document. These references should be checked for accuracy.

The references lead readers to considerable material that is duplicated in both Volume I and Volume II. For example, the Massachusetts Surface Water Quality Standards are discussed in Chapter 5.1.1.0.1 and Appendix A.3.0.1. Except for slight differences in paragraph breaks, the wording in these two places is identical! The main volume and appendix sections on US EPA Aquatic Life Water Quality Criteria are also

substantially identical.

This table and TABLE 1, which is a condensation, imply problems which the text discounts. For example, dissolved oxygen for primary effluent at site 5 is shown to be 5.7 mg/l. This is below the minimum standard set by the state. However, the discussion on page 5-23 states that, over the five years that primary effluent would be discharged, "it is likely that such an event will never be experienced."

For the next criteria, Aquatic Life, the table does not show that acute toxicity (CMC) levels will be met by both primary or secondary effluent at site 5 (see TABLE A.3.19). The number of exceedances is given only for chronic (CCC) toxicity. From the information provided, primary effluent appears to be a worse pollutant. However, in discussing the calculation of chronic toxicity (CCC), the appendix (A-82) says, "The procedure used ... is conservative i.e. will result in a overprediciton of non-compliance, since the 4 days of exceedance may not be consecutive , as required by the criterion."

Conclusion.

US EPA had an opportunity with this document to inform the public of the benefits of the vast project that it has required this region to launch. Having rejected applications in 1983 and 1985 for a waiver of the secondary wastewater treatment, it owes the Boston area a more readable and complete document supporting its insistence the Boston spend money on secondary treatment.

Yours truly,

Daniel B. Curli, III

DBC:pc

cc: George Hacomber

P17

P17

May 10,1988
Newton Corner

Mr. David Tomey
USA EPA - Region I
WQE - Room 1900c
JFK Federal Building
Boston,Mass 02203

Subject: Comments on proposed outfall

Dear Sir,

The EPA 'Fact Sheet' and the SEIS have serious flaws that should be remedied before any outfall is built.

1. The 'no action' option was not investigated for the outfall, but for the treatment plant (refer to SEIS, Vol II,F-3), and was summarily dismissed without any backup, in spite of the fact that the proposed secondary effluent might well improve the harbor by flushing. No basic data was obtained, because no inner harbor tests were made at sites where the present effluent might be expected to prevail (ibid,C-44).

2. The public health criteria cannot be substantiated. The Comparison table in the Summary handout shows 2 or 4 constituents exceeding limits. The 2 components are not site determinative. If the other 2 are PCB's and DDT, the report states 'surveys could not detect any PCB's', and DDT, being a banned insecticide, is probably decreasing rapidly. More and better data is badly needed before a decision is made.

3. The dissolved oxygen for site 2, secondary treatment, is considered marginal at 5.9, but at the existing site, where the loading is far worse, the least value was 6.2 (p.A-29). Why go all the way out to site 2 or more for DO?

4. The sedimentation comparison considered neither the density or the biodegradability of the secondary sludge, which is the sole solid constituent in the effluent, by definition. The density probably makes no difference in the sizes in question, but the biological difference between the two is the difference between sand and mulch.

5. Certainly the water column and probably the sediments will be changed. Ever see a fisherman chumming for fish? The question is not whether material will be added to the ocean, but whether the ocean will be able to handle it.

6. The design of the proposed outfall, considered as a tunnel and a series of risers might be feasible, but has anyone ever tried to build or operate such a system? Brooks (Vol.V, App.D) casts serious doubts about the operability, while no one has taken the diffuser design along far enough to see if it will do its job and resist both reverse flow and dredger's trawls. For lack of any concrete substantiation, I give the present design, if ever built, an operating life of ten years, tops.

7. Why does the EPA have a double standard in regard to outfalls? For Boston, an outfall design, including diffuser, must lie at least 4 miles from Nahant, while the Lynn-Nahant outfall, with the same effluent, needs no diffuser and is only about 1 mile from Nahant. I say the same effluent because, for both effluents, tests showed no PCB's, but a value was assumed for Boston (p.A-41) and 0 for Nahant (p.A-79), while for arsenic the concentrations are essentially the same, in ug/l. Not only that, but consider the Merrimack, where approximately 10% of the river's flow is domestic waste, there are no diffusers, but there are two municipal drinking water intakes.

My motives in all this are to tell the truth in matters where I have some expertise and to get the harbor cleaned up. The proposed outfall is too expensive and the justification for it too shaky to decide on it now.

Thucydides said it well, 2000 years ago:
> Their judgement was based more on wishful thinking than on sound calculation of probabilities; for the usual thing among men is that when they want something they will, without any reflection, leave that to hope, while they will employ the full force of reason in rejecting what they find unpalatable.

Yours very truly,

Lawrence A Schaefer,PE

P18

TO: Environmental Protection Agency DATE: May 18, 1988

FROM: Philip D. Harini
32 Seaview Ave.
Malden, MA 02148

SUBJECT: Comments on MWRA Secondary Treatment Facilities Plan
Volume III - Treatment Plant
Volume V - Effluent Outfall

VOLUME III - TREATMENT PLANT

The option of ozone disinfection of the effluent was eliminated based on it being "a questionable disinfectant for secondary effluents which exceed 30 mg/l TSS and BOD, such as those effluents that occur during maximum flow conditions at Deer Island" (Sec. 1 0). This statement is not properly supported by any factual information. In fact, it is stated later in Volume III that "There is no available information on the use of ozone for disinfecting primary effluent" (Sec. 8.0).

The use of chlorine on such wastewaters is known to be problematic despite its wide acceptance. Certain organic compounds react with chlorine to form compounds which have low bactericidal potential, but which still appear as combined available residual. The formation of chloramines from ammonia and the distribution of hypochlorous acid versus hypochlorite ion are very dependent on wastewater pH. Bactericidal action of combined available chlorine is significantly less than that of free chlorine residual To assure adequate disinfection, chlorination well beyond the breakpoint is desired in order to obtain a free available chlorine residual. This would make dechlorination necessary.

Some organic compounds react with chlorine to form toxic compounds that can have long-term adverse effects on marine life in the waters to which they are discharged These chlorinated organic compounds will not be removed by the dechlorination process. The conclusion can therefore be made that the recommended use of sodium hypochlorite with dechlorination will be troublesome for primary effluent in terms of effective disinfection and formation of toxic compounds.

By comparison, ozone is generally considered to be a very effective disinfectant that is not affected by interfering organics and ammonia and is not dependent on pH. Ozone leaves no harmful residual, and provides added aeration to the wastewater immediately prior to discharge The capital cost of ozonation equipment is undoubtably higher than for sodium hypochlorite, but the definite environmental advantages must be considered. This issue must receive further study. The statements refuting ozone disinfection in the facilities plan must be further supported before they should be accepted

VOLUME V - EFFLUENT OUTFALL

The rating process used in the facilities plan has determined that the only acceptable alternative is an outfall terminus at the outermost Site 5. This is based on the description of the site as rocky and erosional with circulation patterns that are primarily influenced by the north-south currents of Massachusetts Bay in that region, and the avoidance of areas of important habitat The evaluation shows that all other sites considered would be a serious compromise It is clear that the outfall diffuser must begin at Site 5 and extend outward from that point.

It is also noted that the legitimate concerns of the Hahant SWIM organization, as expressed in their report "The Sapphire Necklace" have not been properly addressed by the MWRA or the EPA to date The SWIM report raises many issues that deserve full consideration before the outfall issue can be settled. The testing performed by the MWRA is not sufficient to evaluate the Site 6 option at this time. As a minimum, a field investigation program including physical, chemical, and biological studies must be performed for Site 6.

P19

Mr. Michael Deland, Regional Administrator
Environmental Protection Agency
J. F. Kennedy Federal Building
Boston, MA. 02203

P19

Dear Mr. Deland:

Please help protect BOTH Boston Harbor AND Massachusetts Bay from pollution.

The area now recommended for the largest sewage outfall in the world is dangerously close to shore. Tidal currents could bring it onto North Shore beaches, shellfish areas could remain closed forever, and fish and lobster diseases could increase. It doesn't make sense to clean up one area -- Boston Harbor -- by polluting another -- Massachusetts Bay.

I urge you to require:

1) An outfall location at "Site 6" - nine miles from Marblehead, Swampscott, Nahant, Hull, Cohasset, and Scituate.

2) Primary and secondary plants built simultaneously, so minimally treated sewage is not discharged into Massachusetts Bay.

3) No degradation of the Massachusetts Water Quality Standards.

4) Study the impact of the discharged effluents on the coastal environment during the common occurence of the Northeast storm event.

RECEIVED
MAY 19 1988
REGIONAL
OFFICE OF THE
REGIONAL ADMINISTRATOR

Sincerely,

Maria A. Welch
7 Harmony Circle
Marblehead, MA.
01945

P20

P20

5/19/88

Dear Mr. Deland,

Please help protect both Boston Harbor and Massachusetts Bay from pollution.

The area now recommended for the largest sewage outfall in the world is dangerously close to shore. Tidal currents could bring it into North Shore beaches, shellfish areas could remain closed forever.

I urge you to require 1) An outfall location at "Site 6" - 9 miles from Marblehead, Nahant and Hull, 2) Primary and secondary plants built simultaneously so minimally treated sewage is not discharged into Mass. Bay and 3) No degradation of the Massachusetts Water Quality Standards.

Sincerely yours,

Philippa Borgia
7 Astor Circle
Marblehead, MA 01945

P21

May 24, 1988

Deer Island
Please protect both Boston Harbor and Massachusetts Bay from pollution.
I urge you to require:
1) An outfall location at "Site 6" - nine miles from Marblehead, Swampscott, Nahant, Hull, Chatham, and Scituate.
2) Primary and secondary plants built simultaneously, so minimally treated sewage is not discharged into Massachusetts Bay
3) No degradation of the Massachusetts Water Quality Standards.

Sincerely yours,
Megan LaCault
3 Flagg Rd
Westford, MA 01886

P22

SAUGUS ACTION VOLUNTEERS FOR THE ENVIRONMENT

Saugus, Massachusetts 01906

May 19, 1988

Mr. David Tomey
U.S. EPA - Region 1
WQE - Room 1900C
JFK Federal Building
Boston, MA 02203

Dear Mr. Tomey:

Since no one was able to represent the Saugus Action Volunteers for the Environment (SAVE) at the hearing on May 18, 1988, on the Boston Harbor Wastewater Conveyance System Draft Supplemental Environmental Impact Statement, because of conflicting local meetings, we are making the following written statement within the period specified in your agency's April "Fact Sheet."

SAVE is an environmental organization which is now celebrating its fifteenth anniversary in Saugus. Throughout our history, we have not only supported local environmental efforts, but regional and national ones as well. At the present time, our members are agreed that nothing is more important to the State of Massachusetts, environmentally, than a safe, speedy clean-up of our now nationally infamous Boston Harbor.

For many months, we have followed the development of plans to implement the impending clean-up, and have constantly remained in touch with the members of the organization known as SMBN (Nahant Citizens Committee for Safer Water in Massachusetts), whose research into all matters concerning the Boston Harbor clean-up we believe has been thorough and well-informed. We therefore back that organization completely in its recommendations to the EPA on this important project.

In particular, however, we make the following recommendations to your agency:

1) That the outfall be located at what is now well-known as Site 6;

2) That no sludge landfill be located at the Rowe Quarry, which is much too close to the Saugus-Rivers Marshes, the last large salt marsh left near Boston, now being proposed for ACEC designation;

3) That primary and secondary treatment plants, in connection with the clean-up, be built simultaneously, so that minimally-treated sewage is not discharged into Massachusetts Bay,

4) That the final plans result in no degradation of the Massachusetts Water Quality Standards.

Although Saugus has no beaches to be protected from the effluent which might be washed our way if the outfall is not sited with extreme care, our marshes are not only important to many bird species and other wildlife, but are an economic necessity to our large fleet of fishermen and lobstermen as the nursery of the fish and shellfish they hope to catch.

We hope you will consider our recommendations carefully in making your own recommendations regarding the Boston Harbor Wastewater Conveyance System.

Sincerely yours,

Ellen Burns

Ellen Burns, President
30 Cliff Road, Saugus MA 01906

P27

Crabs and Lobsters Are Dying Near Ocean Dump

P23

Mr. Michael Deland, Regional Administrator
E.P.A.
J.F.Kennedy Building
Boston, MA 02203

REGI... ...ATOR

Dear Mr. Deland: 25 May 1988

I am a marine biologist and coordinate the marine education programs for Northeastern University. I am also a concerned citizen who would like to voice an appeal for Site 6 as the most appropriate site location under consideration for the sewage outfall in Massachusetts Bay. It simply does not make any sense to try and clean up Boston Harbor by polluting Massachusetts Bay. The site presently being considered is dangerously close to the coast and threatens our shores, our marine resources, our local seafood, and our health. Imagine our children swimming on beaches polluted by sewage because the wind and currents drove the sewage ashore!

I urge you to recommend that Site 6, which is located 9 miles from our towns on the Northshore, be chosen as the outfall location. It is so important that both primary and secondary treatment plants be built simultaneously to lessen the impact to the shores once the discharge begins.

Please use your position of influence in this extremely important concern for the future of our coastal communities and pledge that there will be no degradation of the water quality along our shores. This is a most urgent and pressing decision and I hope you will support the most environmentally sound decision as the impact will be with us for many many years.

Sincerely,

Morgan Hardwick-Witman

Morgan Hardwick-Witman
Marine Education, Coordinator

I Enclosed a copy of front page article from NY Times on ocean sewage dumping & lobsters & crabs dying

P21

RALPH M. PARSONS LABORATORY
DEPARTMENT OF CIVIL ENGINEERING, BLDG. 48-
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CAMBRIDGE, MASSACHUSETTS 02139

P24

308

May 25, 1988

Hydrodynamics and Coastal Engineering
Hydrology and Water Resource Systems
Aquatic Science and Environmental Engineering

Phone: (617) 253 2726
Telex: 921(67) MITCAM

Mr. David Tomey
U.S. EPA-Region I
WQE-Room 1900C
JFK Federal Building
Boston, MA 02203

Dear Mr. Tomey:

The enclosed is my written public comment on the Boston Harbor Wastewater Conveyance System Draft Supplemental Environment Impact Statement, 1988. This written commentary is intended to replace the oral comments that I made at the public hearing on May 18, 1988.

Sincerely yours,

Donald R. F. Harleman
Ford Professor of Engineering

DRFH:lo
Enclosure

A Commentary

on

U. S. Environmental Protection Agency's

Draft Supplemental Environmental Impact Statement (SEIS)

on Boston Harbor Wastewater Conveyance System

April 1988

by

Dr. Donald R. F. Harleman
Ford Professor of Engineering

Department of Civil Engineering
Massachusetts Institute of Technology
Cambridge, MA

May 25, 1988

1. Introduction

The U.S. EPA, Region I is to be congratulated for providing in the April 1988, Draft Supplemental Environmental Impact Statement (SEIS) on Boston Harbor Wastewater Conveyance System the technical information on the environmental impacts of effluents in Boston Harbor from both primary and secondary treatment under identical ocean outfall conditions. This opportunity arose, fortuitously, because of the construction time-table that provides for operation of the nine-mile ocean outfall, diffuser and the new primary treatment plant beginning in 1995; whereas, the new secondary treatment stage is not scheduled to go into operation until 1999. EPA explicitly considers the environmental impacts of the primary effluent only during the period 1995-1999. EPA also considers the environmental impacts of secondary effluent starting in 1999 but never makes the obvious comparison of the two treatment levels as options. Apparently, the excuse for ignoring this opportunity is that EPA requires both a primary and a secondary treatment plant be in operation by 1999. EPA has studiously imposed the regulatory uniformity of secondary treatment as a substitute for a general environmental assessment of various options for cleaning up Boston Harbor. The background for EPA's regulatory decision is concisely stated as follows:

> "The Clean Water Act requires that wastewater treatment plants be constructed which will provide 'secondary' treatment unless EPA, under strict statutory guidance, grants a waiver, under Section 301(h) of the Clean Water Act, permitting a less 'primary' degree of treatment with a deep ocean discharge. EPA has twice denied the MDC/MWRA request for such a waiver but final rights of appeal have not expired. EPA believes it is highly unlikely any such appeal, even if pursued, would prevail on the merits, or that the discharge of primary effluent into Massachusetts Bay would ultimately be permitted over the opposition of the Governor and other officials."[1]

The present leadership of EPA, MWRA and the Office of the Secretary of Environmental Affairs of the Commonwealth have refused to discuss the question of whether there will be any environmental benefit of increasing

[1] Massachusetts Water Resources Authority. Secondary Treatment Facilities Plan, Volume V, Effluent Outfall, Final Report, March 31, 1988. Footnote, p3-37.

the treatment of the effluent from the nine-mile ocean outfall from the primary to the secondary level. The basis for this refusal is the claim that the issue has been settled by EPA's 1985 denial of the secondary treatment waiver. What they have forgotten, or do not know, is that the waiver application was flawed from the outset by EPA's prejudice in favor of uniform secondary treatment. I quote from the rules and regulations establishing EPA's criteria for applying for the waiver of the secondary treatment requirement for discharges into marine waters:

> "Since the enactment of the 1972 amendments and the promulgation of EPA's secondary treatment regulations, a number of municipalities ... argued to both Congress and the EPA that secondary treatment is not necessary to protect the marine environment or to assure the attainment and maintenance of water quality in ocean waters. Those same municipalities contended that secondary treatment traditionally has been defined in terms of pollutant parameters and levels of pollutant reduction which are important for freshwater ecology where the discharge of oxygen-demanding waste and sedimentation of suspended solids results in distinct environmental degradation, but which have little significance for oceanic and saline estuarine waters where wastes are rapidly assimilated and dispersed by strong currents and tidal action. ... On this basis, these municipalities have maintained that they should be exempted from the Act's secondary treatment requirements, and the associated capital, maintenance and operating costs."[2]

EPA's bias against primary treatment is shown by the following:

> "EPA ... considers that primary treatment alone, with minimal suspended solids removed - even with a source control program - is environmentally inadequate for most municipal marine discharges. Thus a section 301(h) applicant seeking a modification based on only primary treatment will bear a particularly heavy burden in demonstrating to EPA that such treatment is sufficient to protect marine waters."[3]

The most interesting section of the waiver rules and regulations is the following EPA response to public comments on the proposed regulations:

> "One commenter proposed that the demonstration required under this section be based on a comparison of the impact of the applicant's

[2] EPA. Modification of Secondary Treatment Requirements for Discharges into Marine Waters. Federal Register Volume 44, No. 117, June 15, 1979. p.34784.

[3] EPA. Ibid., p 34797.

less-than-secondary discharge with a secondary effluent. EPA disagrees. Consistent with the Act (the Clean Water Act), its legislative history, and other sections of these regulations, the regulations promulgated today, like the proposed regulations, require the assessment under Section 301(h)(2) to be made on the basis of the actual or projected impact of the applicant's discharge, not in comparison to the impact of a secondary discharge."[4]

I can paraphrase this by saying that EPA, in not considering a comparison of the environmental impacts of primary and secondary effluent through the same ocean outfall, did not wish to be confused by the facts. In the years since the MDC submitted the waiver application in 1979 and the EPA's second denial in 1985, EPA was able to prevent this logical comparison. Even more damaging is the fact that EPA, in denying the waiver, applied water quality criteria that were much more restrictive than those used in the present environmental impact statement. Had the same water quality criteria been applied to the effluent from the secondary treatment plant, it too would have failed the EPA waiver test.

2. Environmental Impact Criteria

The EPA SEIS, published in April 1988, considers the consequences of primary effluent discharged through a 6800 ft. multi-port diffuser at the end of an ocean outfall during the interim period 1995-1999 and secondary effluent beginning in 1999 for various outfall lengths. It is the purpose of this commentary to make the comparison of the two treatment levels, as options, for site 5 which is approximately nine miles out in the ocean from the present Deer Island outfall in about 100 feet depth. Site 5 is within the area recommended by EPA and MWRA for the diffuser location.

The SEIS presents in Table 1[5], a comparison of the data for worst case conditions regarding each of the criteria for evaluating the compliance of primary and secondary effluents. A modification of this table is presented in Table DH-1. The only difference between Table DH-1 and EPA's Table 1 is

[4] EPA. Modification of Secondary Treatment Requirements for Dischargers into Marine Waters. Federal Register Volume 44, No. 117. June 15, 1979. p34806.

[5] Table 1. Outfall Site Comparison, EPA. SEIS. Executive Summary.

Table DH-1

Comparison of Primary and Secondary Effluents

for Ocean Outfall at Site 5*

CRITERIA measure	SECONDARY	PRIMARY
Water Quality Standards		
min. DO (mg/l)	6.4	8.7 (sediment resusp.)
Aquatic Life Criteria		
number exceeding	0	4 (pesticides (2) + PCB, mercury)
Public Health Criteria		
number exceeding 10^{-5} risk	2 (arsenic, PCB)	4 (pesticides (2) + arsenic, PCB)
Sediment Enrichment		
km^2 degraded	0	0.05**
km^2 changed	3	12
Sediment Toxicity		
km^2 of effect	0	2
PCB area > .1 ppm	4	10

* adapted from Table 1: Boston Harbor Wastewater Conveyance System. Executive Summary. EPA Draft SEIS. April 1988.

** This is incorrectly given as 1 km^2 in Table 1 of the SEIS. The correct value of 0.05 km^2 is given on page 5-38 of SEIS. Volume 1.

that data for the shorter outfalls (Sites 2 and 4) are omitted. In addition, criteria which showed no difference between primary and secondary effluents at Site 5 are omitted.

The criteria may be grouped in three categories:

1. Water quality dissolved oxygen standards for conventional pollutants.
2. Aquatic life and public health criteria for non-conventional pollutants.
3. Sediment enrichment and sediment toxicity for non-conventional pollutants.

The SEIS indicates that "impacts [of interim primary discharge] at Sites 4 and 5 are comparatively small and similar to each other and more importantly, they are reversible and therefore acceptable over the five-year period."[6]

On the face of it, the above statement would seem to be an endorsement of primary effluent, especially since secondary treatment waivers, if granted, require extensive monitoring to insure compliance and must be renewed at five-year intervals.

The worst case data summarized in Table DR-1 shows the primary effluent in a less favorable light in comparison with secondary; however, it is relatively easy to use the data contained in the EPA SEIS to analyze whether these differences are in fact environmentally significant.

2.a Settling Velocities for Effluent Solids

The EPA's evaluation of primary and secondary effluents for three of the five criteria in Table DR-1 (water quality, sediment enrichment and sediment toxicity) are heavily influenced by their assumption of the distribution of discharged solids fall velocities for primary and secondary effluents. Table DR-2 compares the fall velocity distributions used in the recent effluent modeling studies by EPA (1988) and MWRA (1988). For secondary effluents, EPA and MWRA are in total agreement for the percentage of solids having fall velocities in the range of 0.1 to 0.0001 cm/sec. EPA and MWRA disagree for the primary effluent. The significant difference

[6] EPA. SEIS. Executive Summary. p8.

Table DR-2

Comparison of Discharged Solids

Fall Velocity Distributions Used by EPA and MWRA

	Percent of Total Solids Settled			
	EPA[7]		MWRA[8]	
Fall Velocity cm/sec	Primary	Secondary	Primary	Secondary
0.1	5%	0%	0%	0%
0.01	20%	16%	20%	16%
0.001	35%	34%	30%	34%
≤.0001[9]	40%	50%	50%	50%

[7] EPA SEIS Volume I, 1988 p 5-5.

[8] Massachusetts Water Resources Authority. Secondary Treatment Facilities Plan, Volume V, Effluent Outfall, Final Report, March 31, 1988 Appendix A 1988 p3-62.

[9] Solids in this range do not settle.

being that EPA assumes that 5% of the primary effluent solids have fall velocities of 0.1 cm/sec, whereas MWRA assumes 0% for this category, i.e. all particles have smaller fall velocities. EPA gives three references[10] to justify its fall velocity distribution for the primary effluent. Only the first reference, EPA (1982b)[11], which recommends fall velocities <u>when settling tests are not performed</u> gives any support for the 5% fall velocity of 0.1 cm/sec. The second reference, Cardoni, et al (1986)[12], conducted tests at Metcalf and Eddy on both sludge and primary effluent from Deer Island. Their extrapolation of the primary effluent test results to field conditions (Figure 8) shows that all fall velocities are less than 0.1 cm/sec. There is no valid argument that the higher fall velocities are a result of flocculation after discharge from the diffuser. The suspended solids concentration in the primary effluent is 65 mg/l, assuming a diffuser dilution of the order of 150, the concentration of suspended solids at the edge of the near-field would be 0.4 mg/l. This is only 10% of the average ambient suspended solids concentration of 4.5 mg/l.[13] Flocculation is not effective at these low concentrations. The third reference is the MWRA STFP report[14] which assumes no particles in the 0.1 cm/sec range.

The fact that EPA has overestimated the high fall velocity range for the primary effluent is further verified by calculating the overflow rate of the primary clarifier proposed for the new Deer Island primary treatment plant. The annual average treatment plant flow rate is 480 mgd and the surface area of the new primary clarifier is 636,800 ft². This is an overflow rate of 754 gal/day-ft² or 0.035 cm/sec. According to generally

[10] EPA 301(h). Volume I. 1988. p5-5.

[11] United States Environmental Protection Agency. <u>Revised Section 301(h) Technical Support Document</u>. Government Printing Office, U.S. EPA. Washington, D.C. 1982b

[12] Cardoni, J. J., D. R. Bingham, and N. D. Baratta. <u>Determining Settling Velocities in Seawater</u>, presented at the Water Pollution Control Federation Conference. 1986.

[13] EPA. 301(h). Volume II. 1988. p A-36.

[14] Massachusetts Water Resources Authority. <u>Secondary Treatment Facilities Plan, Volume V, Effluent Outfall, Final Report</u>, March 31, 1988.

accepted primary clarifier theory[15], all particles having fall velocities greater than .035 cm/sec are removed. (Even at the peak flow rate of 1270 mgd., particles having fall velocities of 0.1 cm/sec will be removed.) It is therefore concluded that EPA's inclusion of 5% of solids having fall velocities of 0.1 cm/sec cannot be supported by the facts. The effect of this small difference on maximum sediment deposition rates is large, as shown in Table DN-3. The fact that EPA's maximum sediment deposition rate is six times larger than MWRA's is primarily due to EPA's higher fall velocity distribution. It is interesting to observe that EPA's DO deficit due to sediment resuspension is also six times larger than MWRA's for the same reason.

2.b <u>Water Quality Standard - Minimum Dissolved Oxygen</u> (See Table DN-1.)

EPA's worst case DO impact for a primary effluent is identified in Table DN-1 as 5.7 mg/l in contrast to 6.4 mg/l for secondary effluent. Inasmuch as the Commonwealth standard for DO is 6.0 mg/l, this would appear to be a significant "black-mark" against primary effluent. However, EPA's bias in favor of secondary treatment again comes to the fore in setting the minimum ambient DO at the outfall site. As shown in Table DN-3, MWRA (1988) states that the minimum ambient DO is 7.5 mg/l, whereas EPA sets it at 6.5 mg/l. EPA's violation of the DO standard is calculated by subtracting the inflated resuspension DO deficit of 0.8 mg/l from the ambient of 6.5 to yield 5.7 mg/l (see Table DN-1).

The final blow to EPA's claim that the primary effluent will violate the DO standard is contained in the following quotation which describes the worst case scenario that EPA constructed for the crucial sediment resuspension event:

> "The smallest minimum DO concentration is generally obtained for primary effluent, in stratified, worst net drift conditions, after a resuspension event. These values can be obtained only once per year, at the end of the summer and assume the following combination of events: no resuspension event during 90 days in the summer, followed by a 10 day period of zero net drift, followed by a resuspension event. Given the limited expected duration of primary

[15] Metcalf & Eddy, Inc. <u>Wastewater Engineering Treatment: Treatment, Disposal, Reuse</u>. 2nd Ed. McGraw-Hill. 1979. p 206.

Table DH-3

Comparison of Sediment Deposition Rates and
Sediment Resuspension DO Deficits for
Primary Effluent at Site 8.

	EPA	MWRA
max. sediment deposition rate (g/m^2 -day)	1.9 (SEIS, p A-77)	0.34 (STFF, V.A. p8-29)
DO deficit due to sediment resuspension (mg/l)	0.8 (SEIS, p8-22)	0.14 (STFF, V.A. p8-108)
min. ambient DO (mg/l)	6.8 (SEIS, p8-22)	7.8 (STFF, V.A. p8-108)

discharge, it is likely that such an event will never be experienced."[16]

2.c Aquatic Life Criteria (See Table DH-1.)

The aquatic life criteria are based on a screening of toxic effects of more than 50 non-conventional pollutants. Of these, four failed the test for the primary effluent. Of the four, two are pesticides and one is PCB, none of which are presently detected in the influent to the Nut and Deer Islands treatment plants. The one remaining, mercury, was predicted by MWRA to exceed criteria for both primary and secondary effluents.[17]

2.d Public Health Criteria (See Table DH-1.)

The public health criteria are less significant than the aquatic life criteria. Arsenic and PCB fail the criteria for both primary and secondary effluents, the remaining two that fail for primary only are the same pesticides that are not presently detected in the Boston influents.

2.e Sediment Enrichment and Sediment Toxicity (See Table DH-1.)

The differences in primary and secondary effluents for sediment enrichment and sediment toxicity are insignificant. EPA's values are biased against the primary effluent because of the inclusion of the higher particle fall velocities for the primary effluent.

3. Conclusions

My conclusion, based on the analysis of EPA's SEIS, is that there is no difference in environmental impacts for the Site 8 ocean outfall between primary and secondary effluents that could justify the construction of the secondary treatment stage.

We must now consider the fact that whatever enters a treatment plant leaves the treatment plant, either as effluent through the ocean outfall or as sludge. The EPA SEIS conveniently considers only the environmental

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[16] EPA. SEIS. Vol. I. 1988. p 8-23.

[17] MWRA. STFF, Vol. V., 1988. p8-22 and p8-31.

impacts of the effluent. Given that the impacts on Massachusetts Bay, whether of primary or secondary effluents, are not significantly different, we are forced to consider the fact that the addition of the secondary treatment stage will generate twice as much sludge[18] and that this presents an additional major political, social, and economic land disposal problem. It is obvious that the overall land/water environmental impact of the secondary treatment facility is negative.

My question to the EPA is: How can you justify the expenditure of more than a billion dollars of Massachusetts tax-payer's money on a secondary treatment stage and its associated sludge disposal facility?

This question cannot be satisfactorily answered by stating that it was settled by the EPA's denial of the secondary treatment waiver in 1985. The waiver application never allowed a comparison of primary and secondary effluent through the same ocean outfall. In addition, different but more restrictive criteria were used for that denial.

EPA's Summary of Findings included only one quantitative measure that led to their denial of the secondary treatment waiver:

> "The proposed discharge [of primary effluent] is expected to violate the Commonwealth of Massachusetts' water quality standard for dissolved oxygen during summer resuspension events, but is not expected to violate the Commonwealth's standard for suspended solids."[19]

In order to justify its denial of the waiver on the basis of a DO standard violation, EPA Region I requested its national waiver review contractor[20] to assess impacts against a hypothetical ambient DO profile. This profile was obtained by selecting the worst DO levels at each depth

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[18] MWRA. STFP, Vol. III, 1988. pII-48.

[19] EPA. Region I. Analysis of the Revised Section 301(h) Application of the MDC, Boston, MA. Signed by Michael Deland, March 29, 1985. Summary of Findings. p 4.

[20] Tetra Tech, Inc., Addenda to the Technical Review of Boston's Deer Island and Nut Island Sewage Treatment Plants Section 301(h) Application for Modification of Secondary Treatment Requirements for Discharge into Marine Waters for U.S. Environmental Protection Agency, March 1985.

regardless of the date or location at which the measurements were made. The DO measurements made near the outfall site in the summer of 1978 were the lowest and these were chosen to construct the hypothetical "ambient" DO profile in the following manner:

> "Using the worst case 1978 profile, with the associated ambient bottom dissolved oxygen concentration of 6.2 mg/l over the bottom 10.5 meters [and] the vertical average ambient dissolved oxygen concentration for the top 25.5 meters of the profile of 6.0 mg/l...."[21]

Thus, the weighted average hypothetical "ambient" DO for the entire 36 meter water column was calculated to be 6.06 mg.l! With this ambient DO both the primary and secondary effluents would violate the standard of 6.0 mg/l. This approach is technically unsound and inconsistent with waiver review methodology used by EPA in evaluating other waiver applications nationwide. It should be noted that the Boston's original waiver application was for an average flow of 485 mgd, and a 9.2 mile ocean outfall having a 6900 ft. diffuser, essentially the same as the facility described in the 1988 EPA SKELS and MWRA STFP documents.

The fact that EPA is presently operating under the secondary treatment mandate in no way relieves it of the responsibility to assess the environmental and economic consequences of its actions. Between now and 1995, the scheduled time for beginning the construction of the secondary treatment stage, there is ample time for mandates to be changed provided that there are compelling reasons to do so.

Fortunately, EPA has left the door open for the appeal of the waiver. If EPA will not recognize the folly of insisting on secondary treatment, then MWRA, armed with the available evidence, should enter the open door and exercise its right of appeal. The money saved by eliminating the unnecessary secondary treatment stage can be better spent in solving the combined sewer overflow problem in the inner harbor and by improving the control of toxic and hazardous materials at their sources.

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[21] EPA. Region I. Analysis of the Revised Section 301(h) Application of the MDC, Boston, MA. Signed by Michael Deland, March 29, 1985. Summary of Findings. p 17.

The Commonwealth of Massachusetts
University of Massachusetts/Boston
Harbor Campus
Boston, Massachusetts 02125-3393

P25

May 26, 1981

Mr. David Tomey
U.S. EPA-Region I
WQE - Room 1904C
JFK Federal Building
Boston, MA 02203

Dear Mr. Tomey:

After reading the Boston Harbor Wastewater Conveyance System (Volumes I and II), Draft Supplemental Environmental Impact Statement, I feel it conveys the impression of arbitrariness in choosing the most acceptable site for the outfall. This may be remedied by editorial work, but as it now stands, from the perspective of an "impartial" outside observer, the document does not make a convincing case for the location of an outfall at Site 4 as opposed to some location between Site 2 and Site 4. More likely, the arbitrariness can be attributed to the lack of evidence that any form of risk management was conducted. Given the uncertainty of the scientific data used to determine the effects of each site on the Harbor, such an analysis would seem mandatory.

In particular, all sites inland of Site 4 are eliminated because after Site 4 there is a "large decrease in predicted background build-up of contaminants" (p. 3-5) and nearfield dilution is increased. Yet no valuation of this decrease in background build-up or increase in nearfield dilution is attempted despite the large increase in cost of extending the outfall to this point.

In Section 7.1.2.1, on page 7-6, it is stated: "Discharge at any of the proposed sites is predicted to have minimal shoreline impacts and all sites will represent a significant improvement over existing conditions." It is then added that Sites 4 and 5 provide extra protection, but in light of the previous statement this would not seem to be worth much. Yet on page 7-9 it is stated: "Pollutants in the effluent could travel to shoreline receptors in less than one tidal cycle (under extreme shoreward wind events), resulting in levels of effluent at the shore over twice that expected from either Site 4 or Site 5 under the same conditions." This is listed as one of the three (unless) concerns with Site 2. Again, however, based on the statement on page 7-6 and what appears to be an unlikely occurrence, this does not seem to be very important. However, how is the reader supposed to know? No valuation is given for this level of effluent which reflects the likely damage or probability of occurrence.

-2-

The only serious difference between Site 2 and Sites 4&5 which is cited in Section 7 is the much larger phytoplankton production which may occur at Site 2. Therefore, given the impression the document now leaves, the threat of this additional phytoplankton production must be worth the $113 million additional cost of building a tunnel from Site 2 to Site 4. Yet this is never explicitly stated or calculated under a risk management framework.

The other distinction among the sites is the interim impact before secondary treatment begins. Again, Site 2 has more serious impacts than the other two, yet on page 7-12 these are not put into a probability/risk management framework nor are they evaluated.

Finally, in Appendix F, Section F.2.1.2.2, where dilution criteria are used to evaluate the different sites, only in the case of stratified conditions is there no dilution increase for background contaminants with 60-day half lives between Sites 2 and 4. However, this seems to be the basis for ignoring all possible sites between these two points -- that no differences will occur in the categories used for criteria between Sites 2 and 4. This is not clear from the document and given the increasing cost per foot of the outfall, needs to be more clearly laid out.

In summary, it is not clear from the document that the criteria used to eliminate Site 6 - - "...does not produce significantly improved water quality, practical difference in public health risk, or decreased impact on the marine ecosystem. The only justification for extending the boundary past Site 5 is to increase initial and farfield dilutions. - - could not be used as a basis for rejecting Site 4 over Site 2.5 or even over Site 2. Consequently, the document does not yet make a convincing case for choice of an outfall site in the range between Site 2 and Site 4. There appears to be no justification to extend the outfall beyond Site 4, although the document seems reluctant to state this explicitly. It is strongly implied on page 7-9: "In contrast, the differences in impacts between Sites 4 and 5 are relatively small and are generally within the precision of the prediction methods. The major differences between these two sites is the additional cost ($79 million) required to construct the tunnel to Site 5

I hope you will find these comments useful in finalizing the document.

Sincerely yours,

David Tabla

David Tabla
Assistant Professor of
Economics and
TAG Member

cc: Judy Peterson

P26

South Shore Coalition

Town Hall · 345 Main Street · Norwell, Massachusetts 02061 · (617) 659-4600

May 27, 1988

Mr. Michael Deland, Regional Administrator
Environmental Protection Agency
J. F. Kennedy Federal Building
Boston, MA 02203

Dear Mr. Deland:

The South Shore Coalition (a voluntary association of ten towns) is writing to urge you to continue your strong efforts to see that the waters of Boston Harbor are cleaned up.

The Coalition very much supports the good beginnings made by the MWRA to carry out this goal by rebuilding their sewerage treatment facilities. However, the group is fearful that the time and financial pressures imposed for accomplishing this mandatory objective may result in decisions that will be ultimately harmful to other parts of the environment - most specifically, Massachusetts Bay. The group feels that concern for the environment should be the overriding consideration in planning and constructing facilities to handle the sewage from the MWRA district.

The Coalition voted unanimously at its last meeting to make the following recommendation to you:

1. That the MWRA do nothing to violate the Clean Waters Act. (Therefore before any discharge begins in Mass. Bay the secondary treatment plant must be operational.)

2. That the outfall pipe be located as far out as possible (Site 6) in order to provide the best opportunity for dilution and dispersion of the effluent away from our beaches.

3. That the financing for this critical project be expanded beyond the rate payer base to include a much broader state-wide base so that economics not drive the decision making process.

We appreciate your consideration of these recommendations.

Sincerely,

John M. Silva

John M. Silva, Chairman

cc: Sen. William Golden
Rep. Frank Hynes

P27

Nahant Village Church

Rev. Hugh H. Knapp, Pastor
Residence 330 Nahant Road, Nahant, Massachusetts 01908
Telephone 581-1288

Church Office 39 Cliff Street
P. O. Box 70
Nahant, Massachusetts 01908
Telephone 581-1288

P27

May 27, 1988

Mr. Michael Deland
Regional Administrator
E.P.A.
J.F. Kennedy Building
Boston Ma. 02203

Dear Mr. Deland:

I wish to add another voice of real concern for the proposed outfall site of the new Boston Harbor sewage treatment system. There is obviously a need both to clean Boston Harbor, and also to protect the waters of the beautiful Northshore. I urge you to require an outfall location at "site six" - nine miles from Marblehead, Swampscott, Nahant, Hull, Cohasset and Scituate.

This area depends on fishing and recreation and is greatly threatened by the prospect of sewage discharge near its shore.

Sincerely,

Rev. Dr. Hugh H. Knapp

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MAY 31 1988
REGION I
OFFICE OF THE
REGIONAL ADMINISTRATOR

P38

P28

May 28,1988
Newton Corner

Mr. David Tamov
USA EPA - Region I
WQE - Room 1900c
JFK Federal Building
Boston,Mass 02203

Subject: Further comments on proposed outfall

Dear Sir,

The EPA 'Fact Sheet' and the DEIS have serious flaws that should be remedied before any outfall is built. The following represents my feelings as the time for comment ends.

There is a river in the heart of Boston, a river without a name. Grossly polluted at the moment, it will, within ten years, be cleaner than the Muddy River and the bordering fens and nearly as large as the Charles and nearly as clean. That river, now known as the Boston Sewer will be totally changed: after primary and secondary treatment it will sparkle and be 99.99% pure. Due to traces of toxics and bacteria it will still be unfit for swimming or drinking, but after a few hours mixing with sea water its presence will be undetectable. It will cause no odors, nor will it cast up disgusting debris on the nearby beaches.

There is controversy about how to direct its course. A strong contingent wants it piped ten miles out from Deer Island into Massachusetts Bay, rather than continue to release it from the treatment plant direct into the Presidents Roads, as at present, and where, according to the MWRA, the system is well sited, or out to Site 2, four miles from Deer Island. It's not like Nahant, where a good sized system empties into Lynn Harbor, less than a mile away, and with little or no mixing. It's rather like the Merrimack, where seven treatment plants discharge treated sewage into the river and, because of the river's natural cleansing action, two communities tap into the river for their drinking water and at the mouth of the river there is bathing and fishing.

According to the MWRA and EPA statements, the only significant problems are pesticides, sediments, and the possibility that nutrients in the effluent could cause blooms. Examination of their data, however, shows that the pesticide data was not measured, but only guessed at, since no pesticides could be detected; the scientists studying the secondary sediment failed to realize that it was biodegradable (this is the same sludge that Mr Levy wants to sell as compost), and it is nowhere explained why blooms will be a problem, while the much richer present discharges cause no blooms.

The cleanup of Boston Harbor must come about in many stages, probably as follows:

1) Restore primary treatment, to prevent gross filth from washing up on the beaches.
2) Stop dumping digested sludge into the harbor, to reduce the rate of sediment buildup.
3) Start secondary treatment, to reduce contaminants in the effluent to parts per million (and satisfy the court).
4) Take care of combined sewer overflows (CSOs) by diverting all sewers bearing noxious materials to Deer Island.

---That, with various system improvements, is as far as the Authority is presently committed to go.---

5) Somehow reduce the remains pollutants in the harbor sediments. The extent and biological status of the sediments and the dynamics of the inner harbor must be better known if a workable solution is to be found.

Yours very truly

Lawrence A Schafer.

P29

May 30,1988
Newton Corner

Mr. David Tosov
USA EPA - Region I
WQE - Room 1900c
JFK Federal Building
Boston,Ma.,02203

Subject: Comments on proposed outfall

Dear Sir,

I regret sending in these comments piecemeal, but the more I look at the draft of the Environmental Impact Statement, the more mistakes I find. On reexamining the basic data, it appears that the EPA assumed values for pesticide concentrations in the raw sewage that were as much as five times the minimum limit of the MWRA studies which, as you know, found neither pesticides nor PCBs. Also, the application of the EPA criteria gives odd results, making site selection very questionable.

I recommend that the SEIS draft not be accepted until the following issues are resolved:

1) Get credible and consistent data on raw sewage toxics.

2) Honestly evaluate the effectiveness of the existing outfalls and the relative effect on Nahant of the proposed outfalls and the Lynn-Saugus outfall.

3) Find better justification for the construction, operation and maintenance of the proposed tunnel/diffuser.

Yours truly

La Schafer

Lawrence A Schafer PE

METALS IN BOSTON SEWAGE

		Arsenic	Copper	Mercury	
Influent<V3,p6-50>(1),lb/day		6	350	4	
Conc.in 480mgd	ppb	1.5	84	1.0	
Pri/Pri+Sec removals<p7-9>	%	25/50	35/82	22/75	
Conc.in effluent,pri-sec,ppb		1.2-.8	55-15	0.8-.3	
Conc.after 100:1 dilut.,ppm		12-8	550-150	8-3	
EPA std<EPA 1,p4-18>(2),ppm		20	3000	30	
Ratio:Dilute/Standard		.6-.4	.18-.05	.3-.1	) Note difference
BEIS Ratio<EPA p5-50>		-	2:1	5:1	
Conc.in bay<EPA 1,p4-22>,ppm		500	400	3	
Effluent,pri-sec<EPAp5-2>,ppm		30-20	1400-400	20-7	
Conc.,ref 17m3/sec flow	ppb	1.8-1.2	83-23	1.2-0.4	
Conc.after 100:1 dilut.,ppm		18-12	800-200	10-4	

PESTICIDES IN BOSTON SEWAGE

		Aldrin	DDT	Metachlor	PCBs	
Influent<Vol III,p6-44>	ppb	0	0	0	0	
Detection limit<ppm>	ppm	50	100	50	500	
Effluent<EPAp5-2>,p-s,	mg/s	3.5-.3	.9-09	4-.4	17-1.3	
Conc.,ref to 17m3/s	ppm	200-20	500-60	240-24	1000-76	
Conc.after 100:1 dil.,	ppm	2-.2	5-.5	2.4-.24	10-.8	
EPA std <EPA,p4-18>	ppm	.08	.02	0.3	.08	
Ratio:Dilute/Standard		25-2.5	250-25	8-.9	128-10	) Note Difference
BEIS Ratio<EPA p5-50>		-	3.5:1	3.5:1	2.4:1	
Conc.in bay<EPA,p4-25>	ppm	-	-	-	5.	
Harbor conc.<V8,App.K>	ppm	.03	0.2	.13	8.5	

References are (1) to the eight volume MWRA Facilities plan and (2) to the EPA SEIS,Vol.1.

Save the Harbor
Save the Bay

P30

May 31, 1988

Mr. David Tomey
United States Environmental Protection Agency
John Fitzgerald Kennedy Federal Building
Boston, MA 02203

Dear Mr. Tomey:

Save the Harbor, Save the Bay, a non-profit constituent organization for Boston Harbor and Massachusetts Bay, supports the recommendation of the Massachusetts Water Resources Authority for the proposed outfall pipe to be located in the area bordered by Sites 4.5 and 5.0., with the diffusion located as far out as possible.

We request, however, that Site Six receive further cost analysis vis-a-vis the recommended site once the geotechnical study has been completed to guarantee EPA's assertion that no significant benefit is accrued beyond Site Five, while the cost increases disproportionately to the benefit.

Sincerely,

David Novak
Executive Director

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ACTING DIRECTOR
ADVISORY BOARD

Save the Harbor
Save the Bay

BOARD OF DIRECTORS
ACTING DIRECTOR
ADVISORY BOARD

May 24, 1988

Mr. David Tomey
U.S. EPA Region 1
WQE - Room 1900C
JFK Federal Building
Boston, MA 02203

Dear Mr. Tomey:

I am writing to respectfully ask that the testimony given on behalf of Save the Harbor, Save the Bay at the public hearing on the *Boston Harbor Wastewater Conveyance System Draft Supplemental Impact Statement* on May 18 be withdrawn. Our position has yet to be finalized.

Thank you for your consideration.

Sincerely,

David N. Novak
Executive Director

Save the Harbor
Save the Bay

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May 18, 1988

Mr. David Tomey
U.S EPA - Region I
WQE - Room 1900C
JFK Federal Building
Boston, MA 02203

Dear Mr. Tomey,

Following is a written copy of the testimony which I presented at the Public Hearing on the *Boston Harbor Wastewater Conveyance System Draft Supplemental Impact Statement* on May 18, 1988.

> "My name is Bud Erland. I live in Somerville, and I am representing Save the Harbor/Save the Bay of Boston, and our membership of over 3000 people from the greater Boston Harbor Region.
>
> The easy way out of any important job is to take shortcuts. Such shortcuts in dealing with human and industrial wastes have been the standard operating procedure in the Boston Harbor/ Massachusetts Bay Region for 200 to 300 years.
>
> I would like to submit to you that anything less than secondary treatment is inadequate, and therefore unacceptable and that any outfall site or diffusion area as close in as site 5 is too close to Nahant and the North Shore, and therefore is inadequate and unacceptable. The outfall site must be located further into Massachusetts Bay.
>
> Save the Harbor/Save the Bay further recommends that the outfall system not be engaged until secondary treatment is on-line.
>
> The key to a successful project is in its cost-effectiveness. The best way to achieve this end is to move ahead with secondary treatment without rehashing decisions which have previously been made, and to locate the outfall pipe nearer to site six, as has been recommended by S.W.I.M., if not, indeed, at site six. Thank you."

Thank you for the opportunity to testify at a hearing so well run.

Sincerely,

Bud Erland

Bud Erland
Membership Director

RECEIVED - EPA
MAY 23 1988
WATER QUALITY BRANCH

cc David Novak, Executive Director, Save the Harbor/Save the Bay

77 NORTH WASHINGTON STREET - BOSTON, MASSACHUSETTS 02114 - (617) 742-SAVE

P31

RECEIVED - EPA
MAY 31 1988
WATER MANAGEMENT DIVISION

RECEIVED - EPA
MAY 31 1988
WATER MANAGEMENT DIVISION

Ronald Manfredonia
Chief, Water Quality Branch
USEPA
John F. Kennedy Building
Boston, MA 02203

Dear Mr. Manfredonia:

These comments address the Draft Supplemental Environmental Statement entitled "Boston Harbor Wastewater Conveyance System, Volumes I and II". The comments are submitted as part of the public comment record under the NEPA requirements.

The NEPA regulations require the federal lead agency, EPA, to meet certain criteria in evaluating the environmental consequences of federally funded projects. The NEPA regulations also require the EPA to follow certain procedures in performing these evaluations. As outlined below EPA has not fulfilled all the NEPA obligations.

I. Under NEPA, EPA must evaluate all reasonable alternatives for the proposed action. The following alternative appears not to have been evaluated.

   A. EPA has not evaluated the environmental impacts associated with locating the effluent outfall at Site 6. The calculations performed by M. Manning, P.E., and presented in the "Sapphire Necklace", indicate that adequate pressure head exists to make Site 6 an alternative comparable to all others. EPA, however, eliminated this Site from consideration, by noting that Site 6 offered no increased environmental benefits over Site 5 but was more costly. EPA utilized data from Site 5 in the analysis of Site 6 to support this conclusion, changing only the depth. EPA use of the same data for both Sites reached the expected result of no difference between the two sites.

II. Under NEPA, EPA must choose an environmentally acceptable alternative. The following list documents the many omissions, violations, inconsistencies, inadequacies, and errors which are presented as evidence in support of the preliminary outfall siting decision presented in the DSEIS. The list demonstrates that this decision is environmentally unacceptable.

   A. EPA's calculations result in the demonstration that the Water Quality Standards of the Commonwealth of Massachusetts will be violated. This demonstration is made by the prediction that the Dissolved Oxygen Criterion will not be met under a variety of conditions during the "tentative" 5 year period of primary discharge. According to the Clean Water Act, the State Water Quality Standards should be met, and one of EPA's functions is to ensure the permitination and compliance with the State Standards. In this case, EPA is ensuring that the MWRA will violate the State Standards.

B. EPA, by proposing that the effluent outfall be located in the Class SA, relatively undegraded waters of Massachusetts Bay, for the "tentative" 5 year period, is violating the federal and the Commonwealth's anti-degradation provisions of the Clean Water Act. According to these provisions such a proposal can only be implemented if all alternatives are economically not feasible. According to these provisions the economically feasible continued discharge into the Class SB waters of Boston Harbor should continue until secondary treatment is in place.

C. EPA is justifying the above violations of the Clean Water Act by stating that these violations will occur over the "tentative" 5 year period of primary effluent discharge. The likelihood of primary treatment being implemented within the "tentative" court scheduled deadlines is questionable at best. EPA does not offer a contingency plan in the event that the primary discharge period, for whatever reason, is prolonged. EPA also does not evaluate the impacts which would result from the continued discharge of primary effluent. As with the siting of the treatment plant on Deer Island, when EPA approved the siting of the facility with or without the prison remaining on the island, so should EPA be approving the siting of the primary discharge for an undetermined period of time. It has already been shown that the court requirements can be changed and the "tentative" deadlines postponed.

D. It is highly likely that the impacts predicted by EPA for the proposed Sites in Massachusetts Bay are underestimating adverse impacts. The following list documents the reasons why the EPA analyses are seriously flawed.

1. EPA does not set absolute standards or criteria which must be met for the proposed Sites. Instead EPA equates impacts from Site 4 with those from Site 4.5, then equates impacts from Site 4.5 with those from 5, and finally equates impacts from Site 5 with those from Site 6. This analysis leads EPA to conclude that Site 4 is indistinguishable from Site 6 with respect to water quality impacts. This conclusion is not supported by the MWRA's modeling, which shows that significant differences exist between Site 4 and Site 5.

2. EPA is utilizing underestimated projections for flows and loads. EPA's projections are those developed by the MWRA and suffer the same inadequacies. First the projections are based on the design life of the treatment facility (20 years), not the design life of the effluent outfall (100 years). As detailed in public comments to the MWRA the population projections are underestimated. Also, the increases of flow in the treatment plant as the result of the implementation of future CSO facilities is not considered. EPA is accepting the secondary treatment removal rates for Suspended Solids and Dissolved Oxygen below the 85% without first requiring that the MWRA demonstrate that the flows are not the result of excessive infiltration and inflow.

3. EPA is basing the calculations of the water quality criteria violation frequencies, and therefore, the entire evaluation of impacts due to priority pollutants, by considering the factors such as water column stratification, currents, flows to the plant, removal efficiencies, and pollutant concentrations as independent events. It is certain that all of the above events are weather dependent, and that EPA should be evaluating the true combined frequencies of the most critical situations which are likely to result in water quality violations.

4. EPA uses sedimentation rates lower than those that it used in performing the evaluation of the MWRA's 301(h) Waiver Application. The sedimentation rates determine the extent of Dissolved Oxygen depletion and the extent of bottom sediment contamination by pollutants. Both of these impacts are, therefore, underestimated by EPA.

5. EPA does not make use of the toxicity studies on the MWRA's effluent presently required by the NPDES permit. It is not certain that the discharge at EPA's recommended Sites will or will not be toxic to sensitive marine life as measured by the No Observed Effect Concentration and the No Observed Acute Effect Level.

6. EPA makes no evaluation of the adequacy of chlorination as a means of disinfection. Studies (by Victor Cabelli, for example) have shown that viruses are resistant to chlorination and die-off in marine waters. These organisms are also associated with human hepatitis, gastroenteritis, and other illness. EPA has also determined that E. coli is not the most appropriate indicator organism for marine water, yet the DSEIS makes reference only to E. coli in the evaluation of the likelihood of human infection by pathogens.

7. EPA makes no evaluation of the chlorine toxicity to marine organisms although EPA criteria exist for this highly toxic pollutant. EPA does not perform this evaluation and also does not place a requirement on the MWRA to implement de-chlorination. If de-chlorination will not be a mandatory treatment process then chlorine toxicity to marine organisms presents a singularly important danger.

8. EPA has performed no evaluations which pertain to the nutrient enrichment of the north shore waters and the associated likelihood of exacerbation of the Pilayella littoralis, phytoplankton bloom problem. EPA concluded in its evaluation of the MWRA's 301(h) Waiver Application that there was inadequate information to assume that the exacerbation of this problem would not occur with primary discharge at Site 5. Yet in the DSEIS, EPA concludes that these blooms will be unlikely with effluent discharges at Site 4. EPA does this without collecting any additional information on the problem.

9. EPA does not accurately represent the north shore resources, particularly the north shore beaches. Many local and some regional beaches are simply not on EPA's maps in the DSEIS. EPA also makes no evaluation of the adverse aesthetic impacts at local north shore beaches with the primary effluent dilution at 175 to 1.

10. EPA makes no evaluation of impacts at Nahant and Revere beaches resulting from the combined discharge of the Lynn and the MWRA sewage effluents. The combined pathogenic contamination from the two separate sources is not evaluated in the DSEIS.

11. EPA makes inaccurate assessment of the PCB concentrations in the effluent. While the concentrations of PCBs in the Deer Island effluent were reported in the MWRA's 301(h) Waiver Application at 2.1, 1.8, 1.5, 1.3 micrograms per liter in four of the eight samples from 1984, EPA reports that these concentrations were at 1.0 micrograms per liter. While the Application data indicated that four Arochlor mixtures were represented, the EPA states that only one mixture was present. Since EPA's consultant collected the 1984 Application data it is difficult to understand why EPA's DSEIS does not relate correct information.

12. EPA does not perform any evaluation of adverse impacts associated with the contaminants for which no water quality criteria exist but which are found in the effluent. Negative synergistic effects resulting from the multitude of contaminants which will empty into the Massachusetts Bay daily are nor even mentioned.

13. EPA erroneously represents enhanced effectiveness of source controls for toxic contaminants, through the increased enforcement of the pretreatment program, as the means of reducing concentrations of contaminants which have no point sources, such as: PAHs, PCBs, and copper.

14. The endangered species evaluation performed by EPA merely documents sightings of endangered species. DSEIS does not evaluate the effects of this tremendous discharge of fresh, chlorinated, and contaminated effluent into Massachusetts Bay on the endangered species or on the prey species upon which the endangered species depend. The lack of this evaluation appears to be not in conformance with NEPA as the conclusions reached under sections addressing the Marine Mammal Protection Act and the Endangered Species Act are not supported. In citing the Marine Mammal Protection Act in Appendix B, the DSEIS states that harassment is a form of taking and that the operation of the outfall cannot harass marine mammals or reduce their ability to maintain optimum sustainable population levels. The fact that sightings of threatened and endangered species are rare within the study area should not be construed to represent that they were historically rare or that normal sustainable population levels would not in the future require habitat within the study area.

15. EPA claims that the effects of the "tentative" 5 year primary discharge will be reversible. However, EPA does not perform any study or present any example to make such a claim valid.

III. Under NEPA, EPA must follow prescribed procedures. The following procedures appear to violate the NEPA requirements.

A. The purpose of NEPA is to lead the federal agency, EPA, toward the selection of the environmentally acceptable alternative. The evaluation should include the consideration of the "no-action alternative". As EPA's comments on the MWRA's Facility Plan indicate, the discharge into President Roads is certainly possible. However, the rejection of the "no-action alternative" was argued for by the parties in the law suit against the MWRA and consequently dictated by the court. The environmentally acceptable alternatives were in this way pre-selected prior to the draft SEIS being written. The continued selection of the outfall alternatives is presently being dictated by a court schedule.

B. EPA has segmented the process of evaluating the different components of the controversial Wastewater Treatment Project for metropolitan Boston and therefore, is not evaluating the combined socio-economic and environmental impacts of the several segmented project components, such as: (1) transportation of workers, (2) transportation of materials, (3) sludge handling and disposal facilities, (4) treatment plant siting, and (5) effluent outfall siting, on the north shore communities. The treatment plant has been located in Winthrop and the outfall may be located to the north of Boston Harbor. The remaining project components are now being considered for the north shore without the EPA evaluating the combined adverse effects on water quality, air quality, noise, hazards, transportation, property values, etc., as a result of the combined impacts from the various project components. If any project is segmented enough, the individual impacts may seem insignificant while the project as a whole may have treamendous adverse environmental and social consequences.

C. NEPA requires that EPA make a choice among alternatives. The DSEIS does not make a concrete recommendation, it merely outlines an area for the discharge without providing the coordinates which define this area. By doing this the document equates an outfall location 2.9 miles from land (Nahant) with an outfall location at Site 5. It is untenable that these two locations are equivalent from the environmental impact standpoint.

This concludes the comments for the record on the DSEIS. They are submitted with the hope that the EPA will work within its original charter to protect the environment. The EPA should not allow the Boston Harbor cleanup to be done at the expense of Massachusetts Bay and those who depend on the bay's resources. The EPA's goal should not be expediency.

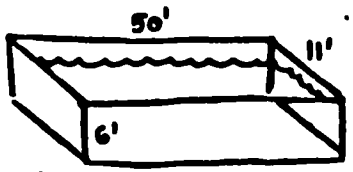
Respectfully yours,

Dorothy Allen

SAY "ITE 6" TO GOVERNMENT TELLING YOU, (revision)
"IT IS O.K. TO SWIM IN HUMAN AND INDUSTRIAL WASTE".

1. DILUTION OF PRIMARY SEWAGE AT NORTH SHORE BEACHES ?
1:175 (or 0.57%)
From:
EPA's EIS – Boston Harbor Wastewater Conveyance System, p. 5-21

2.



11'×50'×6' = 3300 cubic ft
≅ 25,000 gallons

25,000 ÷ 175 = 143 gallons

A POOL WILL CONTAIN 143 gallons OF PRIMARY SEWAGE

three 55 gallon drums

3. IF PRIMARY SEWAGE ≈ HUMAN "P"
AND 1 ADULT "P" = 2 CUPS = 16 FL.OZ.
THEN 1 gallon OF PRIMARY SEWAGE = 8 ADULT "P"s
RESULT: (143 × 8) or 1,144 PEOPLE "P"ed INTO THE POOL

4. IF PRIMARY SEWAGE ≈ TOILET FLUSH
AND 1 FLUSH = 3.5 gallons (OLD BUILDING CODE)
or 1 FLUSH = 1.6 gallons (NEW BUILDING CODE)
RESULT: (143 ÷ 1.6) = 89 FLUSHES INTO THE POOL

5. WHAT IS PRIMARY SEWAGE?
HUMAN WASTE FROM 43 COMMUNITIES + INDUSTRIAL WASTE FROM 6000 INDUSTRIES + INFECTIOUS WASTE FROM HOSPITALS AND LABORATORIES + RAINWATER WITH STREET SCUM – 50% SOLIDS + CHLORINE

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Environmental/Hydraulic/Mechanical Engineering
Water Quality Management Planning
Environmental Analysis/Modeling/Research

P32

May 31, 1988

Mr. David Tomey
U.S. Environmental Protection Agency
WQE - Room 1900C
J.F. Kennedy Federal Building
Boston, MA 02203

SUBJECT: DSEIS for Boston Harbor Wastewater Conveyance System

Dear Mr. Tomey:

On behalf of the Selectmen of the Town of Winthrop, this letter provides comments on the Draft Supplemental Environmental Impact Statement (DSEIS) for the Boston Harbor Wastewater Conveyance System, dated April 1, 1988. Also incorporated are comments on related portions of MWRA's Secondary Treatment Facilities Plan Volume IV (Inter-Island Conveyance System), dated March 7, 1988, and Volume V (Effluent Outfall), dated March 31, 1988, and associated appendices.

Our comments regarding inter-island conveyance are limited to those presented in our MEPA comment letter of May 11, 1988, pertinent excerpts from which are attached.

Our comments on outfall siting are entirely in the area of water quality impacts. Our comments are organized along the lines of the Outfall Siting Criteria "Impact Concerns" proposed in our MEPA comments of April 16, 1987 (and adopted by the CAC Outfall Subcommittee and full CAC, and incorporated in the Facilities Plan (Volume V, at § 2.2)).

Before presenting specific comments, we wish to commend EPA and their consultants for preparing a well organized DSEIS, which strikes an excellent balance between readability and technical content. The index and glossary are appreciated. We also acknowledge the considerable work of MWRA and their consultants, which provided most of the essential input for the DSEIS effort.

SAFETY & PALATABILITY OF FINFISH & SHELLFISH TO CONSUMERS

Section 5.1 4.2 and Table 5.1.1.1.i (p. 5-26) indicate that a number of carcinogens are projected to exceed the EPA one-in-one million (10^{-6}) and one-in-one-hundred-thousand (10^{-5}) risk criteria for human consumption We believe that to be cause for considerable concern. Our concern is based in part on the number of chemicals involved, the magnitude of the exceedances, and the extent of the area that may be effected by the exceedances There are also major concerns of a general nature regarding wastewater characterization and institutional aspects of pollution control.

Exceedances of carcinogenicity criteria are projected for arsenic, PCB's, aldrin, DDT, heptachlor, dieldrin, and fluorene There is no consideration of the synergistic effects that these chemicals may have, which could result in risks considerably higher than projected for any of these chemicals alone. Even for secondary effluent (and we note that reduction of such pollutants can be an important advantage of secondary treatment), the risk factors are exceeded substantially, such as by a factor of 6 for the 10^{-6} risk level for aldrin at Site 5 and a factor of 3 for the 10^{-5} risk level for that chemical and Site. That indicates that even for that chemical alone the risk is greater than 10^{-5} and that the area of significant risk extends well beyond the edge of the mixing zone.

We also note that primary discharge of mercury is projected to exceed the 0.025 ug/l aquatic life criterion by a factor of about 5 at Site 2 (Tables 5.1.3 f and 4.2.2.c) Since the human health toxicity criterion (0.146 ug/l per Table 4.2 2.c) would be contravened at only 6 times the aquatic life criterion, it seems likely that the human health mercury criterion is in substantial violation at the existing Deer Island (and possibly Nut Island) discharges. The dilutions at existing discharge locations should be stated, and the impacts at those locations quantified (the "No Action" alternative).

More generally, there is no discussion of very important institutional considerations. Planning is being carried out for a period extending more than 30 years from the present based on "snapshot" sampling which reveals the presence of a certain

number of pollutants. In our March 13, 1985 comments to EPA on the Siting SDEIS/R, we identified by name 29 carcinogenic chemicals or chemical groups that have been found in MWRA wastewaters in the recent past. What is to prevent some of those chemicals from being found again in MWRA wastewaters, and what is to prevent increases in present levels of carcinogenic chemicals?

The answer in part lies in the pretreatment program (meant here to include source control and toxic reduction), but no consideration has been given to the important interrelations between that program and the DSEIS analyses. We note that discharge of four of the seven problematic chemicals mentioned in the DSEIS (PCB's, DDT, heptachlor, and dieldrin) is prohibited by MWRA's Sewer Use Rules and Regulations (360 CMR 10.000, 10 024: Specific Discharge Limitations/Local Limits). (The discharge of mercury is similarly prohibited) The likelihood of success in realizing those prohibitions should be addressed We also note that PCB projections are based on the detection limits, limiting their validity. PCB's and the other prohibited chemicals should be effectively excluded from the system.

The discharge of arsenic and aldrin is allowed, at limited concentrations, by MWRA's Sewer Use Rules and Regulations (360 CMR 10.000, 10.024· Specific Discharge Limitations/Local Limits). Are industries in compliance with those limitations? What is the relation between the allowed levels and projected levels? Were the MWRA limits established with realization of the carcinogenicity of these chemicals? What other chemicals could exceed effluent carcinogenicity limits if discharged by industries at MWRA's allowable limits? Noting that these chemicals are not detected in the wastewaters of some industrialized cities, is it necessary for industries to discharge arsenic and aldrin to the system? Would it not be feasible to specifically prohibit the discharge to the wastewater system of all carcinogenic chemicals?

Why is fluorene (presumed to refer to diphenylenemethane) present in the wastewater system? What is it used for? Need it be present? If so, and since it is presently not specifically regulated by MWRA, should it not be added to the list of regulated chemicals? Does the TTO (Total Toxic Organics) limit sufficiently regulate this chemical?

PCB's and arsenic are said to already exceed carcinogenicity limits in the ambient" waters by up to 100 times (page 5-56). How much of the Harbor and Bay are thus effected? What is the source of those chemicals? What is the present public health significance?

We also wish to reiterate a prior comment made regarding the public health significance of PCB's. Limited Boston Harbor sampling has found PCB concentrations as high as 0 8 ppm in edible fish tissues. When the Food and Drug Administration (FDA) recently lowered the tolerance limit for PCB in food from 5 0 ppm to 2 0 ppm (the value cited on DSEIS page 5-55), FDA stated "the 2 ppm level strikes a proper balance between protecting consumers from the risks associated with exposure to PCBs and the loss of food due to the lowered tolerance". Our Siting SDEIS/R comments cited scientific evidence and an EPA suggestion that a 0 5 ppm level may be more appropriate for human consumption, or one-fourth the FDA level. This is below levels found in Boston Harbor fish.

The arguments suggesting the insignificance of the arsenic exceedances (page 5-54) are fallacious The evidence for arsenic carcinogenicity is somewhat typical of that for other carcinogens, and is not to be taken lightly. Also, although arsenic may not bioaccumulate "in at least some tissue of resident demersal food fish around large municipal wastewater outfalls", arsenic concentrations in seawater are accumulated by oysters and other molluscan shellfish ("Quality Criteria for Water" [Red Book], U S. EPA, July 1976, p. 16).

For public health implications of sediment contamination, the focus is on PCB's (questionably based on the detection limit) DSEIS page 5-55 indicates that aldrin and heptachlor may also be of concern from that standpoint.

The DSEIS does correctly note that the discharge of secondary effluent is predicted to produce much less public health risk compared to primary.

We believe that pretreatment/source control has much greater potential than outfall siting as the means for dealing with the public health issues raised. This should be addressed in much greater detail in the Final SEIS. If a sound basis for the adequacy of pretreatment as a means of addressing this problem cannot be developed, then the maximum area of 10^{-6} risk exceedance should be established and consideration given to restricting that area to fishing. In that case, the economic consequences of doing so should be determined, and consideration should be given to outfall sites more remote from fisheries resources.

Our Siting SDEIS/R comments noted by name five chemicals found in MWRA wastewater in the recent past for which organoleptic criteria are lower (more stringent) than those for marine life.

How are such criteria to be factored into the pretreatment program, etc.?

Treatment plant influent and effluent limitations, reflecting assumptions made in outfall siting and Harbor/Bay impact analyses, as well as inhibitory and other factors, should be developed as part of the Facilities Planning process. Such limitations should be compared with influent limitations inherent in the rationale for MWRA's pretreatment/source-reduction program. Institutional recommendations should be developed relative to pretreatment and NPDES limitations.

PROTECTION & PROPAGATION OF AQUATIC LIFE

The DSEIS addresses aquatic life impacts in terms of sediment organic enrichment, sediment toxicity, nutrient enrichment, water column toxicity, dissolved oxygen deficits, and impacts to protected species. Comments on most of these are provided under the present heading Although recognizing the aquatic life implications of nutrient enrichment, our focus on that impact is provided under the separate heading of MAINTENANCE AND ENHANCEMENT OF AESTHETIC CONDITIONS. Protected species come under our separate heading of AVOIDANCE OF IMPORTANT HABITAT (UNIQUE MARINE RESOURCES)

Sediment Organic Enrichment

Sediment organic enrichment is addressed in Subsection S 1.3.1.1 The analysis indicates advantages of secondary treatment, especially in preventing benthic community degradation. Site 4 shows a substantial advantage over Site 2 with primary treatment under nonstratified conditions Site 5 shows a substantial advantage over Site 4 with primary treatment under the more critical stratified conditions. The analysis also indicates that Site 5 is adequate from this standpoint, with minimal degradation under all conditions. The paragraph at the middle of page 5-35 regarding sedimentation rates could be clarified substantially (including correct presentation of dimensional units), and made more accessible by referring to the proper final STFP appendices. Also, the figure references in the last two paragraphs of page 5.35 should be corrected

Sediment Toxicity

DSEIS Subsection 5.1 3.1 2 summarizes an innovative effort to address the issue of sediment toxicity Using limited scientific evidence, two chemicals are identified as being of concern bis (2 ethylhexyl) pthalate and DDT The former, a plasticizer, is ubiquitous in modern wastewaters (including domestic wastewaters), the results (summarized in Table 5 1 3 d) provide a good argument in favor of secondary treatment that can quite possibly be extended to other wastewater constituents. DDT is a long-banned pesticide that simply should not be allowed in the wastewater system; the pretreatment program should include a very concerted effort to identify sources of that chemical and eliminate it The Chapter 7 discussion of sediment toxicity (pp. 7-10 to 12) should be expanded to include the two chemicals just mentioned. The reversibility of contamination due to interim primary discharge of these two chemicals should be addressed (as it is for PCB's in Chapter 7).

Water Column Toxicity

Assessments of water-column toxicity are summarized at Subsection 5 1 3 1 4 PCB's are projected to exceed the chronic toxicity criterion with primary treatment at all sites However, that was based on projections using the detection limit, as discussed above (under SAFETY & PALATABILITY OF FINFISH & SHELLFISH TO CONSUMERS). PCB's should be completely excluded from the system. As noted previously, the discharge of PCB's to the MWRA sewer system is prohibited by MWRA's Sewer Use Rules and Regulations PCB's are not the only priority pollutant which would be problematic, with respect to water column toxicity, at concentrations near its detection limit. Suggestions have been given earlier for specifically dealing with such chemicals via the pretreatment program

Heptachlor, DDT, and mercury are projected to exceed chronic toxicity criteria for primary effluent discharged to any of the sites, while heptachlor (Site 2) and mercury (Sites 2 and 4) are projected to exceed chronic toxicity criteria with secondary effluent at certain sites (Table 5 1.3 f) Copper is projected to exceed the acute toxicity criterion (and, of course, the lower chronic toxicity criterion as well) for primary effluent discharged to Sites 2 and 4.

It is noteworthy that the analyses clearly indicate the significant reduction in toxicities of heptachlor, DDT, mercury, and potentially other chemicals obtained with secondary treatment.

Comparing Tables 5.1.3.e and 5.1.3.f, it is evident that DDT in primary effluent would exceed the water column toxicity criterion by a larger factor than the sediment toxicity criterion As discussed above relative to sediment toxicity, DDT should be eliminated from the wastewater collection system As noted previously, the discharge of DDT to the MWRA sewer system is prohibited by MWRA's Sewer Use Rules and Regulations.

Neither the exceedance projected for heptachlor nor the argument used to justify that exceedance should be accepted Most particularly, the fact that certain marine organisms (e g., the sheepshead minnow - page 5-48) are less sensitive to heptachlor is not a valid argument for the acceptability of exceedance of the EPA criterion. Unless it can be demonstrated that there are no significant marine organisms in the Harbor/Bay area of comparable sensitivity to those on which the criterion is based, then the criterion should be presumed to be directly applicable. The fact that the projected concentration is a small multiple of the criterion suggests that better pretreatment may enable the heptachlor criterion to be attained. That feasibility should be thoroughly assessed during preparation of the Final SEIS As noted previously, the discharge of heptachlor to the MWRA sewer system is prohibited by MWRA's Sewer Use Rules and Regulations.

All of the comments in the preceding paragraph apply equally to mercury (although the conservatism of the mercury criterion could possibly be argued in relation to mercury levels commonly found in seawater). The argument regarding mysid shrimp on page 5-50 should be presented in detail. (Also, should the 1 6 ng/l concentration mentioned on that page by 1.6 ug/l?) As noted previously, the discharge of mercury to the MWRA sewer system is prohibited by MWRA's Sewer Use Rules and Regulations.

The same comments made for heptachlor and mercury apply to copper Since the CMC (acute toxicity level) is exceeded, the CCC (chronic toxicity level) would also be exceeded The chronic toxicity level may be expected to be an order of magnitude below the acute toxicity level. An estimate of the acute toxicity level should be made and added to Table 5.1 3 f Should the units "mg/l" be "ug/l" in the paragraph on copper on pages 5-50 and 51?

Although exceedances of aquatic life criteria are projected for only a few chemicals, those exceedances are potentially significant The conclusion (page 5-51) that the criteria exceedances "are not expected to have a significant impact on the ecosystem due to the small areal extent in which they are predicted to occur and conservativeness of the criteria" is not well supported by the information presented.

Residual chlorine toxicity should also be addressed, with appropriate reference to STFP volumes and appendices

Dissolved Oxygen Deficits

Dissolved oxygen deficits are addressed in Subsection 5 1 3 1 5, along with pages 5-11, 15 to 18, and 21 to 23, and Subsection 4 2 2.2 (Dissolved Oxygen). Conclusions are summarized at pages 7-4 & 5, 9, 11, and 12. Primary discharge at Site 2 is shown to cause excessive dissolved oxygen depletion under stratified conditions (Table 5.1 1 g), with the potential (somewhat uncertain) for still worse depletion during resuspension events (Tables 5.1.1 h and 5 1 3 g) Conditions at Sites 4 and 5 are found acceptable for all conditions

PROTECTION OF SHELLFISH AREAS

The issue under this heading deals with coliform bacterial levels at shellfish areas, coliform representing the time-tested indicator for this purpose. Other issues relative to shellfish consumption come under the heading of "Safety & Palatability...". The DSEIS does not address this area as explicitly as would be desired. However, a synthesis of information presented by MWRA and EPA yields an adequate assessment.

STFP Volume V, Appendix C, notes at page C-151 that the EPA criterion for protection of shellfish harvesting areas is 14 fecal coliforms per 100 ml. That is followed by the following conclusion: "It was deemed unnecessary to evaluate health impacts from shellfish consumption since fecal coliform levels were below this standard at all times at a distance of more than 100 feet from the proposed outfall." That conclusion can be understood by noting that: (1) the discharge permit requires an average fecal coliform level of 200 per 100 ml and a maximum not to exceed 400 per 100 ml; (2) that a dilution of 400/14 = 29 is required to reduce the maximum level to the criterion level; and (3) that the minimum (10 percentile) initial (nearfield) dilution at Sites 2, 4, and 5 (Table 5 1.1.C) is at least twice that (i.e., > 2 x 29).

A 10:1 ratio of total coliform to fecal coliform is typical of chlorinated effluents. Thus the 200 fecal coliforms per 100 ml limit corresponds approximately to 2000 total coliforms per 100 ml. Dilution of that total coliform level by 29 would result in about 70 total coliforms per 100 ml, which equals the Mass

Surface Water Quality Standard for Class SA marine waters (Table 4 2 2 b) That also corresponds to the U.S Public Health Service median standards for "approved" and "conditionally approved" shellfish areas.

Shellfish resources are located predominantly in nearshore areas Even if deep-water shellfish (such as Ocean Quahogs) were found near the outfall site, the initial dilution would be sufficiently protective. In this connection, it is helpful to note the conservatism of the farfield vertical-mixing assumption relative to bottom organisms close to the diffuser (e.g., shellfish).

Although sites beyond Site 2 provide a greater factor of safety for near-shore shellfish resources (due to the additional farfield dilution), it is evident that reliability of the wastewater disinfection process is far more important Sites 4 and 5 do provide the advantage of having travel times to shore which exceed a single flood tide, allowing greater time for notification in the unlikely event of a disinfection failure.

It is also noted that combined sewer overflows must be greatly reduced in order to provide substantial further improvement to certain shellfish areas, and that urban stormwater runoff will continue to impact those shellfish resources.

PROTECTION OF BATHING AREAS & OTHER RECREATIONAL USES

Although the impacts on those beaches may have been considered (see below), a number of recreational beaches have not been included on Figure 4.2.5 d (also Appendix D, Figure D 3 d) A more complete representation is found in Secondary Treatment Facilities Plan, Volume V, Appendix C, at Figure C-15 and Table C-64. That Volume V, Appendix C listing should be expanded to include Halford Beach (on Broad Sound south of Short Beach, off Nahant Avenue in Winthrop); should note that there is public access to Boston Harbor beaches facing Snake Island and around Court Park in Winthrop that would be used if not for the pollution, and should note that what is given therein as Yirrell Beach actually consists of Yirrell Beach and Point Shirley Beach (Town of Winthrop Open Space & Recreation Plan, 1986). There may also be additional beaches at shoreline locations in other coastal communities. Figure 4.2.5.d should be augmented accordingly.

As noted above, under PROTECTION OF SHELLFISH AREAS, the Class SA coliform bacterial standard (70 total coliforms per 100 ml) is projected to be met at the edge of the mixing zone for all sites considered. That standard (equivalent to approximately 7 fecal coliforms per 100 ml) has traditionally been considered sufficiently protective of waters used for contact recreation.[1] On that basis, the additional farfield dilution between the mixing zone and beaches would provide a factor of safety. An analysis using the Transient Plume Model is reported (Subsection 5.1.1.6 - Shoreline Impact Analyses, also Appendix A at A 3.7), which indicates the combined (nearfield and farfield) concentrations that would result at shoreline locations along Swampscott, Nahant, Deer Island, and Hull (Table 5.1.1.f). It should be stated what shoreline locations were considered along those communities, and whether those were the most critical locations. It would also be helpful if assumptions used in the transient plume modelling were related to critical wind conditions corresponding to sustained shoreward net drift. (Wind-driven surface currents reportedly vary from 20 to more than 100 feet per minute.[2])

Section 5.1.4.1 concludes that "[the] potential for direct exposure of human populations to bacterial and viral pathogens will be reduced over existing conditions by the overall wastewater treatment facilities improvements.. [including] the proposed shift to an offshore discharge location...." It further concludes that discharge at any of the outfall sites considered "would no longer contibute to [beach and shellfishing].. closures or to any discharge-related exposure to bacterial or viral pathogens".

Pages 7-5 & 6 (Shoreline and Recreation Impacts) add to the above, by stating "Discharge at any of the proposed sites is

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1. It is noteworthy that Massachusetts Class SB marine waters, considered "suitable for bathing and recreational purposes including water contact sports" have total coliform bacterial standards of 700 per 100 ml median and 2300 in not more than 10% of samples. The upper figure is used for beach-closing decisions. Although not suggesting that is a desirable situation, we note that the Class SA coliform standard is far more stringent.

2. Burchett, M.E., Tchobanoglous, G., and Burdoin, A.J., "A Practical Approach to Submarine Outfall Calculations". Public Works, May, 1967.

predicted to have minimal shoreline impacts and all sites will represent a significant improvement over existing conditions." A much more explicit discussion of the existing conditons (the "No Action Alternative") would be helpful in making this point. Appendix F (pages F-30 to 33) is especially pertinent in this regard. It is noted there that distance from the discharge to shore can be a misleading indicator of shoreline impacts. Table F.2.g indicates that under "extreme events" the dilutions at Winthrop, Hull, and Nahant due to Site 4 or Site 5 discharges will be better than the dilutions at the President Roads discharges by factors of 8 to 15 (Winthrop), 9 to 17 (Hull), and 4 to 7 (Nahant). The extreme event conditions should be defined. A similar analysis under other conditions (e.g., average conditions and zero net drift) would also be informative.

We suggest that the same reasoning given above, under PROTECTION OF SHELLFISH AREAS, applies relative to the relative importance of disinfection reliability and the preference for Site 4 and 5 over Site 2. The earlier comments relative to combined sewer overflows and urban stormwater runoff also apply.

Appendix H Subsections H.2.1.3, H.2.4.1, and H.3.3.1 (Disinfection System/Primary Treatment Phase) indicate that certain deficiencies could exist in the chlorine contact tankage during interim primary treatment. Rectification of those deficiencies should be addressed.

With a view towards obtaining an added safety factor at little additional cost, consideration should be given to less than complete dechlorination. The possibility should be evaluated of dechlorinating to a residual chlorine level safely below (but not excessively so) that corresponding to incipient chlorine toxicity after minimum initial dilution, so that use can be made of the considerable additional chlorine contact time in the outfall. For example, with an outfall to Site 4 (43,000 ft and 24 ft diameter, per Table 3.2.2.a) an additional 150 million gallons of contact volume would be available. This would give over 300 minutes of additional chlorine contact at the average day high groundwater flow of 670 mgd (Table 5.1.1.a), resulting in about a five-fold increase in chlorine contact.

STFP Volume V, Appendix C, Section 6.0 (Pathogen Assessment) and Subsection 7.4 (Pathogen Assessment Associated with Implementation of the Alternate Plan) adds an interesting evaluation of potential shoreline impacts, which considers projected virus levels at certain beaches. The analysis is somewhat innovative, but questionable on several counts. What proportion of the assumed influent virus level (1000 PFU/liter per page C-154)

represents pathogenic viruses? Is there any epidemiological evidence that calls into the question the adequacy of strict coliform standards alone? Are the Revere and Nahant beach illness incidences referred to on page C-166 differential relative to the control population? Can the assumptions made be justified, and can any correlation be established between incidence of illness and projected virus levels? What dispersive transport conditions were assumed in developing Table C-55? Is their any evidence supporting the 1 PFU infectious dose assumption (p C-168)? The analysis would have been much more meaningful if existing conditons had been analyzed by the same methods (note Figures C-12 to 14), and if the impact of all existing discharges on all three beaches were considered (not merely President Roads/Revere as in Table C-55). The premises (particularly with regard to "acceptable" incidences) and conclusions on STFP page C-170 are contradictory and questionable. The FSEIS should acknowledge and critique the STFP analysis, including its implications (page C-154) that improved virus removals may be a significant additional advantage of secondary treatment and its implications regarding the adequacy of fecal coliform standards. A good review of related epidemiological research would be useful (probably much more so than the STFP approach).

PROTECTION OF COMMERCIAL ON-THE-WATER ACTIVITIES

Although the DSEIS suggests that commercial fishing impacts would be minimal due to outfall operation (e g , at 5 1 5 2 - Commercial Fishing), it also indicates (page 5-63) that diffuser construction could be detrimental to commercial fishing during the 5-year construction period Without making it clear whether the rating is based on construction or operating impacts, the STFP (Volume V, pp. 7-28 & 30 and Table 7 4-1 [p. 7-11, also see p. 7-15]), rates Sites 3 5 and 5 as "excellent" vs. "good" for the other sites because the former are more distant from known flounder spawning areas (although no more so practically speaking than Sites 4 and 4 5) and because "they border, but are not directly situated in, a major commercial fishery"

Further clarity should be provided relative to potential impacts on commercial fisheries. Both documents indicate that a location between Site 4 and 5 could be found that would not impact this important resource. Appropriate mapping of commercial fishing areas may be helpful in establishing more precisely the better outfall locations

Navigation is another area under this category in which the DSEIS and STFP differ The STFP (Volume V, p 7-33 and Table 7 4-1 [p. 7-15]) rates Site 4 and 5 excellent" and Site 4.5 "good" relative to interference with navigation during outfall construction The DSEIS deals only with operational impacts (p. 5-56, also note pp 4-46 & 47). This should be reconciled, by overlaying combined interests of commercial fisheries and navigation, to better define the better outfall locations

MAINTENANCE & ENHANCEMENT OF AESTHETIC CONDITIONS

The new treatment facilities will effectively eliminate floatable materials (as will the existing Deer Island treatment facility beginning this summer when the Interim Scum Management Program gets underway). The distance from shore under any of the alternatives will effectively eliminate direct aesthetic impacts to shoreline or near-shore areas To observers on the water and near the plume itself, the degree of treatment and initial (nearfield) dilution should effectively eliminate observable turbidity. Secondary treatment could prove marginally more effective than primary treatment in this regard.

The predominant issue relative to aesthetic conditions (and one also having broader implications) concerns secondary impacts associated with algal productivity. The potential for algal blooms is influenced by nutrient loadings, dispersive characteristics of the site, and the percentage of time the plume surfaces (allowing nutrients to reach the photic zone) The DSEIS indicates (Subsection 5.1.3 1.3 - Nutrient Enrichment, also note Section 5.1 7 - Boston Harbor Consequences and page 7-9) that algal productivity may be one of the most significant and clear-cut reasons for a longer outfall. We concur with the DSEIS assumption that primary and secondary effluent have similar potential for algal stimulation (the specific types of algae may be somewhat different).

The relevant sentence in the second paragraph from the bottom on page 5-47 should read: "The area of changed conditions is 90 percent smaller at Site 3 than Site 2 during no net drift conditions " Following that sentence, the DSEIS reasons, in effect, that the changed conditions due to a Site 2 discharge could actually result in degraded conditions over a large area due to higher ambient nutrient loadings in the vicinity of Site 2 This argument could be usefully buttressed by more quantitative discussion, perhaps based on modelling, of ambient

contributions.

The STFP (Volume V, pp. 7-31 & 32 and Table 7 4-1 (p 7-12)) is in basic agreement with the DSEIS on this criterion, but gives a marginal advantage (seemingly subjective) to Sites 4 5 and 5 over Site 4.

AVOIDANCE OF IMPORTANT HABITAT (UNIQUE MARINE RESOURCES)

The DSEIS concludes that all of the outfall sites would avoid unique marine resources (e g., 5.1 3 1 6 - Impacts on Protected Species, and 7 1.1 - Comparison of Recommendation for Discharge Location). Based on the information presented in the DSEIS, we concur with the conclusion that this criterion is not site determinative, with the exception that the question of impacts on commercial fisheries should be resolved as discussed above

Thank you for the opportunity to submit these comments.

Very truly yours,

S. David Graber

S. David Graber

cc: Mr. John L. Lyons, Chairman, Winthrop Board of Selectmen
Mr. Robert E Noonan, Winthrop Selectman
Mr Richard F. DiMento, Winthrop Selectman
Ms. Virginia L. Wilder, Winthrop Dir. of Community Development
Ms Margaret Riley, MWRA Board of Directors
Ms. Mary Kelley, Chairman, Winthrop Conservation Commission
Ms. Polly Bradley, Chairman, CAC Outfall Subcommittee
Ms. Kathleen Hearn, MWRA
Mr Richard Fox, MWRA
Mr. Dan O'Brien, MWRA
Mr. Jack Elwood, MWRA
Ms. Mary Usovics, MWRA
Ms. Bonnie Nixon, MWRA
Mr. Steven C Davis, Director, MEPA Unit
Ms. Marilyn Hatch, MWRA
Mr. Marian Doliner, McGregor, Shea & Doliner

It is important to do so to provide a common basis for evaluating noise mitigation details during Facilities design and construction.

Noise mitigation is discussed in Volume III at 11.4.6; please note that a more complete detailing of noise mitigation measures is provided in Volume VII at 10.1.1.

Transportation

Section 5.2.6 of Volume III is essentially the same as Section 5 2 6 of Volume VI. Comments on that Volume III section are the same as provided for Volume VI below. Also, comments provided below on Volume VI, Appendix C, apply to common portions of Volume III, Appendix K.

Inter-Island Conveyance System, Vol. IV

The specific mitigation measures listed in Section 8.5 (Mitigation Measures) are not complete, and there are inaccuracies. For scoping design of inter-island tunnels, reference should be made to Subsection 10.1.1 of Volume VIII and the February 1988 MOU for applicable mitigation measures.

In our Volume IV comment letter of January 19, 1988, we suggested coordination of inter-island tunnel design and construction with the pipeline transport of sludge being considered under the Residuals Management Facilities Plan (RMFP - EOEA #5832), and that conjunctive planning, design, and construction of sludge piping and the inter-island tunnels be considered for all feasible residuals siting scenarios. The response (Volume VIII, p. 6-408) correctly states that such an evaluation is being performed as part of the RMFP effort. We want to emphasize here the importance we place on that and also to note the need to bring together the findings of the RMFP work and Facilities Design in a timely fashion. Volume IV notes that geotechnical work would have to begin later this year (1988) to meet the Court schedule for construction of the inter-island tunnel. It will be important to have final decisions on coordinative aspects that could impact the tunnel alignment and branch points in time for inclusion in the geotechnical effort.

SWIM

Nahan
Safer W

P33

May 31, 1988

Received
KAA
5/31/88

Mr. Michael Deland
Regional Administrator
Environmental Protection Agency
J. F. Kennedy Building

Dear Mr. Deland:

The EPA may be on the verge of making a terrible mistake.

Please consider that SWIM may be correct in its call for Site 6.

If you see only the Headline News on television and hear only the reports from the advocates of current foreign policy, do you expect to understand international affairs? If you see only an occasional "We want Site 6" and hear only the filtered-down reports from the staff that is in the business of defending its own work, do you expect to understand why Site 6 is so important? Valuable as your brief visit with Congressmen Mavroules, Dr. Michael Manning, and William J. Coffey may have been, it was not much more than "Headline News"...perhaps it could be in the category of a synopsis on a national TV channel. And even this short talk was amazingly convincing, apparently.

SWIM would like to have our scientific and technical group talk with you about our legitimate concerns and show you the videotapes from Northeastern University's dive to Sites 5 and 6. Although we have done our best to use whatever legal or political means we could to try to get the attention of the decision-makers (including the judge) our basic arguments are scientific and technical, and if we can get a hearing we feel confident of success. We are not a bunch of rabble-rousers; we have a tremendous amount of volunteer expertise donated by well-qualified professionals who, to put it simply, love the ocean. SWIM fears that the current MWRA and EPA plan endangers Massachusetts Bay.

The MWRA circle and the EPA rectangle (Sites 4-9) are plumbed smack in the middle of the richest lobster fisheries in Massachusetts. Almost half the lobster caught in Massachusetts are caught between Manchester and Scituate in waters shallower than 120 feet. A large percentage of fish and lobster are diseased now along this coast and because of pollution no shellfisheries are open without restriction from Manchester to Hingham. The shallowest waters are the richest in lobster, fish, and shellfish (partly because the sunlight only reaches down so far). Without a longer outfall, these resources will remain polluted indefinitely.

Neither the MWRA nor the EPA have made any cost-benefit study to balance the cost of additional outfall miles vs. the value of the fisheries of Massachusetts Bay. SWIM believes that such an analysis would show clearly the worth of a longer outfall.

We were sorry you did not attend the public hearing May 18. Dr. David Carter's presentation on the computer modelling was outstanding, and many other excellent comments were made. SWIM gave your staff written testimony and some additional testimony is enclosed. I hope you will look over the material yourself.

"Evaluating Two Outfall Siting Options for Boston Harbor: Cos Benefit-Cost Analysis Assist," was written by Enid Kumin, a graduate student in environment and economics at the University of Rhode Island. She is not a Nahanter: she came to SWIM's workshop at the New England Environmental Conference in March and became interested in the economic problems when she learned that no attempt had been made to balance the costs of the outfall and the costs of polluted resources.

Site 6 cannot be selected unless it is studied. SWIM requests a complete study of Site 6 -- currents studies, salinity and temperature profiles, biological studies, geotechnical studies, etc. There is time for this: it will take at least 2 years to get the tunnel boring machine once it is ordered. The MWRA and EPA have both said that Site 6 can be reached by gravity, without pumps. Once Site 6 is studied, we think that the reasons for choosing it will be clear.

Site 6 would be outside tidal currents, which predominate near shore. The MWRA and EPA models show currents going every which way near shore. At Site 6, in the Gulf of Maine, Intermediate Waters, the effluent would be beyond tidal reach. This would protect the shores and the ecology of Massachusetts Bay.

Please look carefully at Figures 8.2.5.c and 8.2.5.d of your own DEIS. These maps are shocking. Surely I do not need to go into detail on what is wrong with them: look for yourself. Is this EPA's concept of the resources of the North Shore and Massachusetts Bay?

Changing anyone's framework of thinking is perhaps the most difficult task possible. SWIM urges you to draw back from any Boston-centered, Hub-of-the-Universe viewpoint and think from the viewpoint of Massachusetts Bay. Better yet, think from the point of view of a spaceship looking down upon our beautiful blue and white Earth.

Mike, if we in our state, with the best environmental laws, the best educated people, the most dedicated environmentalists can commit this travesty, what is the hope for cleaning up the pollution that threatens to engulf our nation and our world?

The outfall will last a century. A hundred plans and promises for CSO's and pretreatment, source reduction and maintenance may go wrong in that time, as they have in the past century since Frederick Law Olmsted (two hundred years ahead of his time, one hundred years ago) designed the Emerald Necklace. Please design this outfall right, so that in another hundred years our grandchildren can look out upon the beautiful blue waters of the Sapphire Necklace.

Sincerely yours,

Polly Bradley

Polly Bradley, President
Nahant SWIM, Inc.

SWIM, c/o Northeastern University Marine Science Center, East Point, Nahant, MA 01908
Phone (617) 581-0075 or (617) 581-1424

May 31, 1988

Mr. Michael R. Deland
Regional Administrator
United States Environmental Protection Agency
Region 1
J.F.K. Federal Building
Boston, Massachusetts 02203

Dear Mr. Deland

This letter contains the comments of BWIM regarding the financial analysis contained in DSEIS and related MWRA documents. We have three comments, as follows:

1. The financial impact of Site 6 is nominal. MWRA and BWIM financial projections both indicate that the average ratepayer will face a rate increase of only 1 to 2 percent per year during the construction period for extending the outfall from Site 5 to Site 6. The actual results vary in minor amounts between the projections due to methodology and assumptions. However, the results are consistent; Site 6 provides vastly improved water quality at the relatively nominal cost of only 1 to 2 percent per ratepayer. The additional costs are applicable only for the five to seven year outfall construction period. (Reference pages 6-191 through 6-965 of MWRA Volume VIII)

2. The MWRA ignores significant cost savings associated with inflation and interest. Inflation and interest are real costs which ratepayers must bear. Accelerating the construction schedule will reduce costs to the ratepayers due to reduced interest and inflation. We believe that the MWRA has not addressed this issue. (Reference page 6-366 of MWRA Volume VIII)

3. The MWRA assumes contradictory positions regarding the financial impact on ratepayers. The MWRA dismisses with one sentence potential savings in interest and inflation of over 1 billion dollars. In the same document the MWRA devotes four pages of analysis and negative commentary to the 100 million dollars of estimated additional costs associated with Site 6. We believe this position contradictory. Cost savings and additional costs should be evaluated equally and fairly. (Reference pages 6-191 through 6-965 and page 6-366 of MWRA Volume VIII)

In summary, we believe that both Site 6 and the accelerated construction schedule are financially desirable. We look forward to discussing these important matters with you.

Sincerely yours,

Robert M. Vanderslice

Robert M. Vanderslice, CPA

Nahant SWIM, Inc.
Safer Waters in Massachusetts..

May 31, 1988

MATHEMATICAL PROBABILITIES

by C. Lawrence Bradley

When one calculates joint probabilities, one must first know whether the individual probabilities are independent of each other.

The Draft Supplemental Environmental Impact Statement has calculated joint probabilities as if they were independent of each other. Factors such as currents, flows, concentration of pollutants, removal efficiencies, etc., are considered as if they were totally unrelated to each other. In reality, they may be closely related, since all are related to the weather.

It is essential to correct this mathematical error in order to calculate water quality impacts.

C. Lawrence Bradley, a graduate of Massachusetts Institute of Technology, received his master's degree in mathematics from Northeastern University. His present work is in artificial intelligence.

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Nahant SWIM, Inc.
Safer Waters in Massachusetts

May 31, 1988

INDUSTRIAL TOXIC CHEMICALS

by Polly Bradley

EPA: Most plants can't stop wastes

WASHINGTON – The Environmental Protection Agency says three out of four municipal waste treatment plants it surveyed are not able to stop industrial toxic chemicals from polluting water. The EPA audit made public at a House hearing last week by two Maryland Marine and Fisheries subcommittees is likely to rekindle a longstanding debate over whether the agency has properly enforced the antitoxics provisions of the Clean Water Act. The House panels are taking an in-depth look at the pollution of coastal waters. The audit focused on 265 of the 1,800 publicly owned sewage treatment plants with EPA-approved plans, which are supposed to minimize the amount of pollutants reaching the environment. (AP)

This article from the Boston Globe highlights the difficulty of preventing toxic waste from polluting the water. Many factors must come together to stop industrial waste: pretreatment, source reduction, enforcement, etc. As the article points out, many times these problems are not adequately solved and therefore in three out of four cases polluted water is discharged.

Secondary treatment in itself does not solve the toxic waste problem.

In light of these difficulties, doesn't it make sense to remove the outfall from the richest coastal waters, in order to give an extra measure of security to our natural resources?

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DSEIS
Comment

Comments for the Environmental Protection Agency on the Draft EIS for proposed sewage outfall at site 5

These comments are based partly on several years of closely following the plans for the harbor clean-up effort. I also conducted some research on lobster and shellfish resources in an area that would be affected by the sewage outfall at site 5. In collecting and presenting this information I have tried to be accurate, although I certainly have an opinion. I ask that the EPA consider that it is their job to be completely objective in considering the alternative sites for the sewage outfall from Deer Island.

I do not feel that the EPA and the MWRA have objectively studied the benefits that would be realized by using site 6, as proposed by the citizen's group SWIM(and numerous others). Nor do I think that enough consideration was given to the severe impacts that an outfall at site 5 would have on towns north of Boston. The Draft EIS reads like a mediocre justification for a foregone conclusion.

Much of what follows is based on two major points that are strongly supported by the SWIM report entitled The Saphire Necklace. The first point is that site 5 will allow too much pollution to reach sensitive waters that are important for their economic and recreational resources. The second point is that site 6 offers much better protection of these resources and deserves better analysis than it has received from EPA and MWRA. I have focused my attention on the coastal waters between Nahant and Manchester.

Here are just a few of the questions that I feel need to be answered before a proper siting decision can be reached.

1. As towns along the north shore upgrade their sewage treatment from primary to secondary, are the improvements going to be obliterated by the massive dumping of sewage from a Deer Island outfall located too close to shore?

Consider:

Relative flows from sewage treatment plants in MGD(million gallons per day):

Lynn.....25.8 MGD

Swampscott.....2.17 MGD

Gloucester.....15.0 MGD

Manchester.....0.67 MGD

Deer Island.....377-670 MGD(!!)Predicted flow from new plant

Even if only 1% of the sewage from the Deer Island outfall strays into the waters north of Nahant, it will be equal to adding a sewage flow equal to the pollution from Manchester and Swampscott combined.

2. Will the additional nutrients flowing from the outfall add to the problem of algae blooms along the north shore beaches? What will be the economic impact if the five years of primary effluent makes this problem worse than it is now? Will the region recover from that impact even if the situation improves with secondary treatment?

Consider:

The towns of Nahant, Lynn, and Swampscott are plagued by blooms of the algae Pylaiella littoralis. The algae covers large areas of the beaches, and even coats the sea-walls. It REEKS, and it is often(very understandably) mistaken for raw sewage because of the odor. On a bad day the otherwise very beautiful shore is really almost unbearable to go near.

In a conversation with Mr. David Tenney of the EPA, I learned that the exact causes of this problem are poorly understood. Perhaps this is why I couldn't find any reference to this problem in the EPA's Environmental Impact Statement. If you can't explain why the problem exists, it seems an incredible leap of faith to assume that 350 Million Gallons per Day(or more) of sewage dumped in shallow water won't make the problem worse.

3. Will the lobster industry be irreparably harmed by higher incidence of black gill disease and shell disease on the North Shore? Why did the map of fishing resources in volume I fail to show the 16.79% of the State's lobster resources that exist between Nahant and Magnolia?(map on page 4-50, figure4.2.5.c.) Why was the potential impact on these areas not considered more carefully? There are more questions here, but these will do for now.

Consider:

According to Dave Esterella of the Massachusetts Division of Marine Fisheries, the division has separated the lobster fishery for the State into Zones. Zone 3 comprises the waters three nautical miles from shore, starting just north of the Nahant penninsula, going parallel to shore to Magnolia, where it comes to shore to form a rectangle. Zone 3 also roughly follows the 120 foot contour line.

This Zone, or catch area, accounts for 16.79% of the lobster caught in the State, according to catch reports. Since the total landings of lobster in Massachusetts was 12,918,388 pounds in

1986, the catch for Zone 3 was 2,168,997 pounds of lobster. This is a conservative estimate, since the lobstermen may tend to under-report their catches.

Attached to this statement is a map from the the report entitled Assessment at Mid-Decade, by the Division of Marine Fisheries, November,1985. It shows the incidence of lobster diseases and the sewage discharge rates for Massachusetts. The area described earlier(zone 3) has a significant incidence of lobster diseases. It is also just north of the areas with the highest sewage discharge rates. The idea of moving a large outfall closer to zone 3 should not even be considered until the impacts on the lobster fishery are more fully examined.

4. If the bacteria from the outfall add to the problems of shellfish beds north of Boston, will there be any hope of reclaiming these beds for harvest in the next century?

Consider:

Massachusetts is facing a challenge that has been successfully met by other states on the East Coast; that of cleaning their waters enough to support a strong shellfish industry.

According to the Division of Marine Fisheries, between Revere and Manchester there were 896.5 acres of productive shellfish areas in 1984. Nearly all of those areas are either restricted or closed completely to harvest. This is largely due to the bacteria present even in treated sewage. If the effluent from Deer Island has any further impact on these areas, then we will have closed a vast resource to harvesting for at least the next century. Bacterial contamination already costs an estimated annual loss of $12.1 million dollars in landed value to Massachusetts shellfisheries. A very conservative approach is called for to ensure that this does get worse.

I would like to close my testimony by asking the EPA to reconsider Site 6. The EPA has played an important role in starting to reclaim Boston Harbor. This is no time to make a rash decision based on short-term savings at the cost of severely damaging MassacHusetts Bay for the next century.

Respectfully submitted,

John Bartlett Hoskins

John Bartlett Hoskins
14 Kensington Park apt. 3
Lynn MA 01902

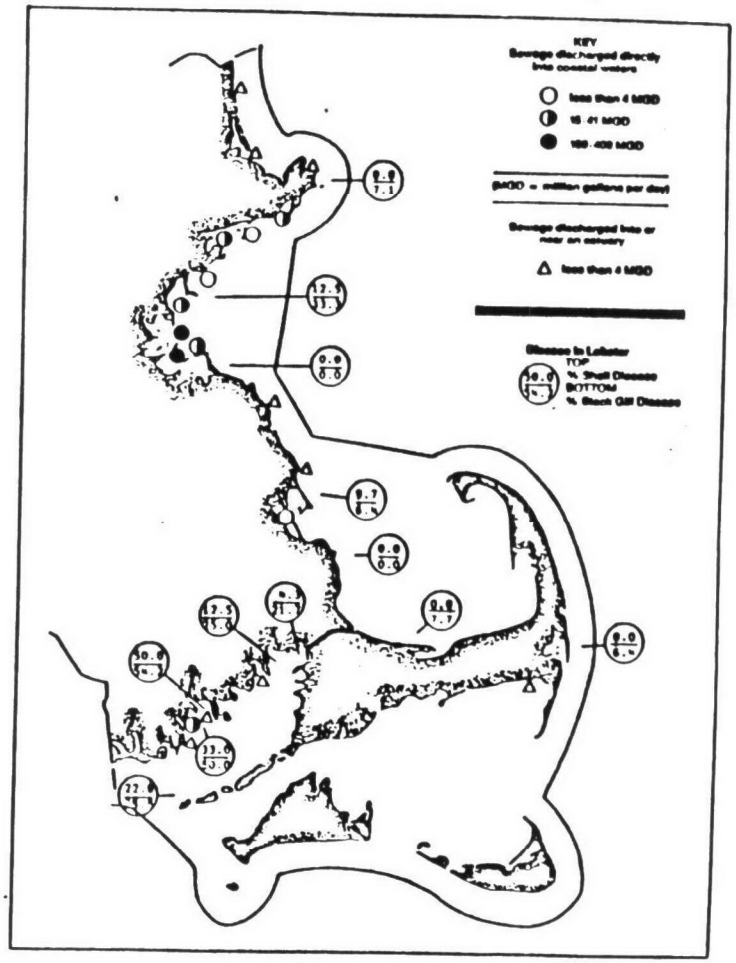

Figure 2. Percent incidence of two diseases in lobster - 1983 and 1984. Locations of major sewage outfalls.

USEIS II
Comment

Enid C. Kunin
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(401) 783-1959

Evaluating Two Outfall Siting Options for Boston Harbor: Can Benefit - Cost Analysis Assist?

Enid C. Kunin
Marine Affairs
URI, Kingston
April 19, 1988

Preliminary Draft
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of the Author

Introduction

The Massachusetts Water Resources Authority (MWRA) has recently completed studies for siting of an effluent outfall pipe for the proposed Deer Island wastewater treatment facility in Boston Harbor. The pipe will bring discharge from the treatment plant away from the Harbor, its current terminus, and deposit it in Massachusetts Bay. Plans for the outfall now call for an endpoint between 7.9 and 9.4 miles east of Deer Island. The recommended endpoint region is bounded by two of seven sites (Sites 4.5 and 5) considered by the Authority. The seven considered sites cover an area generally east of Deer Island and ranging from 4 to 9.4 miles distant. The MWRA, in discussing its selection of the Site 4.5 - Site 5 region, further notes that "...Site 5.0 offers some additional environmental benefit, but cost considerations favor Site 4.5."[1]

A number of responsible parties question the MWRA's choice of the Site 4.5-5 location of the outfall terminus. The Mohant-based citizens' group SWIM, for example, has published a report which advocates extending the outfall pipe 2 miles beyond Site 5 to a location identified as Site 6. SWIM's researches indicate that, from an environmental perspective, Site 6 would be a better outfall terminus than Site 5, and that the additional construction necessary would contribute only a small percentage to the total expense of the wastewater treatment project.[2]

How is the interested observer to weigh the argument for Site 4.5-5 against arguments for a longer outfall? Can economics contribute to discerning the better policy option?

A History of Declining Water Quality

There is considerable urgency in planning for improved wastewater treatment facilities for Boston Harbor. This urgency is reflected in the present court schedule which dictates the tempo of work at MWRA on facilities planning and construction. Boston is one of only two major U.S. cities still relying on primary treatment of waste and the only such urban center on the east coast.[3] Sewage flow into the harbor averages 300 million gallons per day.[4] This figure is as much as 75% of the combined flow contributed by rivers winding to the Harbor.[5] The relatively large sewage flow as compared to river input slows cleansing of the Harbor. Equally harmful is the continued dumping of sewage sludge at the south of the Harbor. Often the sludge fails to ride to sea on the outgoing tide as intended, instead drifting back landward over time.[6]

As early as 1929, studies of wastewater treatment for the greater Boston area indicated the need for construction of additional wastewater treatment facilities. The recommendations of the 1929 report were only partially realized. The report sought the construction of three primary treatment plants, then the best available technology, for Metropolitan Boston. Only two plants were built.[7] In subsequent decades Massachusetts proved even less ready to respond effectively to wastewater disposal issues. The Boston Harbor Pollution Committee in the 1960s and the New England River Basic Commission in the 1970s both called for but failed to achieve remedial action on Boston Harbor pollution.[8]

Meanwhile, the extremely valuable resources of Boston Harbor were being degraded with frightening speed and at alarmingly high cost. The extent of damage to the coastal waters and the shoreline was made all too graphic by the experience of William Golden, a Massachusetts State Senator from Quincy. Golden was startled to find human excrement washed onto the beach along his jogging path one morning on Boston's South Shore. Shortly thereafter the Senator triggered much of the present activity on Harbor pollution issues with his 1982 lawsuit on behalf of Quincy against the Metropolitan District Commission (MDC) and the Boston Water and Sewer Commission.[9]

About the same time that Golden was initiating court action, economic as well as legal, health, and aesthetic consequences of Harbor pollution were attracting attention. Nowhere was this more true than in the fishing industry. A 1985 report prepared by the Division of Marine Fisheries (DMF), Commonwealth of Massachusetts, recorded unusually high rates of liver cancer and fin rot in Boston Harbor winter flounder. Within the entire state, winter flounder was one of 8 species composing 78% of the total value of Massachusetts fisheries landings in 1984.[10] In 1986, a U.S. Office of Technology Assessment (OTEC) analysis of marine wastes noted that more than "... one-half of the shellfish beds in Boston Harbor are closed, at an estimated annual loss of $4 million."[11] The study went on to say that the affected region had shown slow but steady growth over the preceding 5-year period. The addition of appropriate economic multipliers suggests the loss to Boston from

shellfisheries closures must have been even more substantial than the CTEC figure indicates.[12]

Undervaluing Water Services

Given the existing condition of Boston Harbor and environs it may seem surprising, initially, that strong action to reduce pollution was not taken earlier by the MWRA's predecessor agency, the MDC. Part of this oversight must be attributed to problems within the MDC itself; part to the division of Harbor management among a web of agencies which failed to coordinate their efforts;[13] and part to the unwillingness of the state to allot the MDC a large enough budget to do its work. Budget restrictions, for example, were responsible for the design of a 1979 cleanup plan which called for a cumulative investment of $1.2 billion. Less than $1.2 billion of the required monies were committed to the project from 1979 to 1982.[14] In refusing to authorize adequate funds for pollution control, Massachusetts repeatedly undervalued the cost of water services to the public. This undervaluation was reflected in excessively low charges for sewer services in Boston relative to the rest of the country. In 1985, a family of four paid on average of $90 for MDC sewer services. Elsewhere in the country that year, the same services would have cost an average of $200.[15]

Eventually, the inability of the MDC to curtail Boston Harbor pollution would lead to the creation of the MWRA in December, 1984 and its designation as the lead agency for water quality management for Boston Harbor.[16] Prior to this transfer

of authority, however, in 1979, the MDC presented one last scheme for upgrading Harbor water quality. Unfortunately, the MDC proposal showed the usual Massachusetts ambivalence for calculating and paying for the full cost of pollution. The MDC, rather than factor the externalities of pollution into its planning, attempted to avoid passing on costs to rate payers. Thus, in lieu of a program using best available technology (secondary-level treatment) to improve Harbor water quality, the MDC argued for a less expensive but inferior alternative: primary treatment and dilution of wastes in Massachusetts Bay via diffusers at the end of a long outfall pipe.[17] Clearly officials had no interest in convincing the public that it wanted to spend more on a public good like water services.

Assessing the MDC 301(h) Waiver Application

In keeping with its call for primary rather than secondary treatment, the MDC petitioned the Environmental Protection Agency (EPA) for a 301(h) waiver under the Clean Water Act of 1972. The MDC petition was denied and shortly thereafter the Commission ceded its authority in Boston Harbor water quality matters to the MWRA. The MWRA has put forward a plan for the Harbor which calls for secondary treatment of effluent, land-based sludge disposal, and more stringent pre-treatment of wastewater at its source.[18] This is certainly an improvement over the MDC proposal which the EPA was asked to evaluate. Nonetheless, certain aspects of the MDC proposal deserve discussion, not only for their own merit, but in part because they bear on the assessment of the more

recent NWRA plan.

The MDC submitted its original 301(h) waiver application to the EPA in September, 1979.[19] The EPA tentatively denied the MDC application several times between 1979 and 1985. Each point in the EPA analysis involved technical assessment of impacts to environmental processes in the effluent disposal area. An analysis prepared in 1984 by the EPA office of Marine Discharge Evaluation concluded that resuspension of "organically enriched effluent particles,"[20] transport of effluent inshore towards Broad Sound,[21] Boston Harbor and upcoast,[22] and deposition of toxics in neighboring sediments with resulting exposure of biota[23] were all likely to occur as a consequence of the MDC proposal. On the one hand, the

> ...proposed removal and relocation of discharged effluent and removal of the sludge discharge from Boston Harbor [to Massachusetts Bay] would have beneficial effects on the marine biota and recreational activities within the Harbor.[24]

On the other hand, the discharged effluent might not flow out to sea or disperse sufficiently if conveyed to the enclosed waters of Massachusetts Bay.[25]

Thus, in addition to denying the MDC waiver on grounds of site-specific ecology, the EPA seemed unreceptive to a trade-off between improved water quality for Boston Harbor at the expense of reduced water quality for Massachusetts Bay. The latter consideration might have been effected as much by economics as by oceanography. While total land and marine use values of Boston Harbor may exceed those of northern Massachusetts Bay, the Bay area north of Boston is also an area of considerable economic

value. In 1985, the EPA, reviewing another amended version of the MDC waiver application, noted a higher level of marine-based economic activity in the outfall area than did the MDC.[26]

EPA comments are particularly interesting on the subjects of fishing activity and beach use. The MDC at this time argued that the proposed disposal area was not a suitable habitat for shellfish. The EPA researches disclosed, however, that ocean quahogs were present at the site and that lobsters were plentiful.[27] The EPA also disagreed with the MDC's assessment of the importance of sportfishing in Massachusetts Bay. While the MDC stressed the value of sportfishing in Boston Harbor, the EPA saw sportfishing from charter and partyboats as a major part of the Massachusetts recreational fishing industry, with 11,195 fishing boat days and 162,095 anglers served in 1979.[28] Such fishing activity, the EPA determined, might be adversely impacted by the proposed outfall because of potential danger to the quality of Bay fisheries.

Regarding beach use, EPA figures cut the number of summer visitors to Nahant and Kings Beaches along the Bay at 25,000 people per weekend day and 10,000 per day during the week. Nahant and Kings are two of five beaches which must deal with the appearance of Pylaiella littoralis for at least several days each summer. An alga, Pylaiella littoralis may cover beaches with a layer of growth as much as half a meter deep. The foul odor which accompanies the alga's decay considerably lowers the desirability of the beach for recreational or other use. While the cause of the problem is disputed, studies point to nutrient

enrichment from a local treatment plant as a probable factor. Since the recreational value of these beaches is high, the EPA expressed concern that the outfall pipe, due to end only 8.6 miles away, might cut off more massive and frequent algae blooms with accompanying costs to local beach-related industry.[29]

Disposing of Treated Effluent: the MWRA Approach

The objections raised by the EPA to the NDC's 301(h) waiver application revolved, principally, around two issues. These were 1) the siting of the outfall pipe terminus; and, 2) the discharge of wastes treated only to the primary level at the terminus. Although the NDC waiver application is no longer a concern, EPA objections to the waiver have taken on renewed significance. This is due to the still ongoing struggle to resolve Boston's wastewater morass and the remedy to the problem which the MWRA favors. As mentioned earlier, the present MWRA water quality management plan is better than that of its predecessor agency. This is true for a number of reasons. For example, it stipulates secondary level treatment of wastes. The plan also advocates more aggressive efforts at pre-treatment of wastes. In one way, however, the MWRA plan resembles the NDC proposal: treated effluent is deposited via a long outfall pipe to the same region of Massachusetts Bay designated for that purpose by the NDC.[30]

Consequences of the MWRA Plan

The fact that the MWRA would send effluent with secondary rather than primary level treatment into Massachusetts Bay is important. Higher level treatment should lessen the severity of environmental impacts at the disposal site. Whether impacts will be reduced sufficiently to prevent degradation of Massachusetts Bay and its resources is unclear, however. Work by the EPA on the NDC proposal suggests that outfall discharge is so likely to circulate in the Bay as to be transported to open ocean.[31] Environmental damage then becomes a function of effluent quality and the sensitivity of the Bay's ecosystem to such discharge.

The response of the Bay to secondary treatment becomes an academic question, however, under the present court schedule for Boston Harbor cleanup. The schedule orders outfall construction by July, 1994, and completion of secondary treatment facilities in 1999.[32] This timetable produces, in effect, the same outcome which EPA implicitly condemned in denying the NDC's waiver application. It consigns substantial quantities of effluent with only primary treatment to Massachusetts Bay over a 5-year period. Although the MWRA now intends to complete secondary treatment facilities ahead of schedule[33] extended discharge of primary treated effluent still seems likely. The location of the outfall terminus and its discharge has prompted a number of knowledgeable individuals to register concern. The comments of the Massachusetts Office of Coastal Zone Management are illustrative. According to MCZM,

> ...analysis for the effects of worst case conditions appears to be limited to a consideration only for a period of persistent easterly winds. This is not CZM's interpretation of a worst case analysis. We are interested in a comparative analysis of the various sites for environmental effects of a failure in the chlorination process and/or a failure in the treatment process. We are especially concerned with the effects on swimming beaches and other

recreational activities as well as on shellfish and fisheries resources.[34]

The Pre-Treatment Issue

While some degradation of Massachusetts Bay seems inevitable, rigorous pre-treatment of wastes at their source might reduce damage considerably. Indeed, the MWRA waste management plan addresses the need for pre-treatment measures at some length. Generally these programs involve setting standards for reduction of toxic pollutants at their source. At issue, however, is whether a high level of source reduction can be achieved and/or maintained. Such programs have, so far, proved difficult to implement.[35]

Economists argue that toxics reduction objectives can also be achieved through effluent charges (Pigouvian taxes), though it appears that the Authority has given little attention to this possibility. In his book Economics and the Environment, Allen V. Kneese uses a case study of effluent charges on the Delaware Estuary to demonstrate the system's workability.[36] How much MWRA should rely on pre-treatment effected by either regulation or a tax system is debatable. Some reviewers of the Sewage Treatment Facilities Plan (STFP) speculate that catching pollutants before they enter the sewer system may be the most cost effective answer to Boston's wastewater disease.[37] Other reviewers, looking at the uncertainties of wastewater disposal at Site 4.5-5, want more thought given to conveying the effluent farther offshore.[38]

Comparing the Merits of Site 4.5-5 and Site 6

According to the EPA, extending the effluent outfall beyond Site 5 offers no advantage:

> Source control or pretreatment would be equally effective at Site 5 and at Site 6. Based on both EPA's screening analysis and MWRA's work, there are few predicted environmental impacts associated with Site 5. Of the impacts that are predicted at the site, none would be eliminated if a more offshore site were used.[39]

It appears, however, that neither the EPA nor the MWRA has studied the region beyond Site 5 enough to justify such a conclusion. Bradford Butman, an oceanographer with the U.S. Geological Survey at Woods Hole, found that the MWRA study focused on the flushing characteristics of selected sites instead of looking at the dynamics of the Bay overall. Thus, Butman says, the finding that the outermost sites offer superior dilution potential is a relative one. If the study were to include other, more seaward locations, still better results might be obtained. This is especially true since data indicates that the outermost sites (Sites 4.5-5) in the MWRA study mark the edge of an "...inner, less well-flushed region, and that if the outfall were extended only a few km seaward, the residual currents would increase by a factor of two again (at least)."[40]

Kenneth Stubens, a member of the Technical Advisory Group of the State Executive Office of Environmental Affairs, concurs with Butman. Stubens maintains that comparing Site 5 to another point two miles out, in deeper water, would reveal an area substantially different from those already analyzed. Such a study could consider the benefits of greater dilution.

stratification, and exposure to strong currents. The final weighing of Site 4.5-5 against a more distant site, in Stebens' mind, could then rest on comparative benefit-cost analysis. If extending the outfall would yield "...marginal added benefit, and substantial extra cost, this could validate site 5 as the appropriate choice." If, however, costs were "only incrementally higher" in return for considerable dilution and transport benefits, this would warrant the selection of the more distant option.[41]

Costs of Extending the Outfall

In line with Stebens' thinking, SWIM, a citizens' action group based in Nahant, has taken a closer look at costs associated with building the outfall pipe another 2 miles out to the designated Site 6 area. SWIM found some difficulties in making their projections due to inconsistencies in MWRA's figures. In the November, 1987 Draft EIFP, for example, the MWRA quoted two figures for outfall construction at Site 5. Expenditure was set at $469 million (1987 dollars) in Vol. V, and at $490 million in Vol. VII.[42] Furthermore, MWRA cost estimates grew irregularly with increased outfall length. (See Table 1). As a result, SWIM used a ballpark figure of $20 million per mile x 2 miles in calculating additional construction costs for an outfall extended to Site 6. With the inclusion of 15 percent beyond this amount for engineering and construction management, another 20 percent to cover contingencies, and $5 million for leeway, SWIM derives an estimate of $55 million for two more

TABLE 1

COST PER MILE AS OUTFALL LENGTHENS

	Increase in Length	Cost Increase	Cost per Mile
Site 2 to 2.5	1.1 mi	$26M	$23M
Site 2.5 to 3.0	0.7 mi	$21M	$30M
Site 3.0 to 4.0	0.9 mi	$44M	$49M
Site 4.0 to 3.5	0.5 mi	$1M	$2M
Site 3.5 to 4.5	0.7 mi	$12M	$17M
Site 4.5 to 5.0*	2.6 mi	$80M	$30M
Site 4.5 to 5.0	3.1 mi	$80	$26M

*If the location of Site 5 is at 70°67'16" Long. and 42°25'10" Lat. (location provided by the MWRA) then:

Source:
SWIM, The Sapphire Necklace (Nahant, Massachusetts: December 16, 1987), 30.
From Massachusetts Water Resources Authority, Sewage Treatment Facilities Plan, Vol. V, Effluent Outfall (Boston, Massachusetts: November 13, 1987), 7-3.

miles of outfall.[43]

SWIM suggests that since 1) Vol. VII, Institutional Considerations, sets the value of the entire wastewater project at $2.919 billion, and since 2) the higher $490 million figure for the outfall conveyance appears in this volume, that 3) the figure used for the outfall conveyance in tabulating total costs is probably the higher amount of $490 million. SWIM therefore feels justified in adding $60 million to $2.919 billion to get an idea of the financial impact of a longer outfall conveyance on the overall project. In the initial stages of construction, SWIM foresees that a longer outfall would mean an increase in costs beginning at 2 percent of total project expenditure during 1991 and declining to 1 percent by 1993.[44]

The MWRA expects that a longer outfall tunnel will cost far more than SWIM anticipates due to engineering design constraints. According to the MWRA, Site 5 is at the outer limit for constructing a gravity flow tunnel with the hydraulic system envisioned for Deer Island. In the MWRA purview, two headings, an intermediate shaft, and an effluent pumping station may be necessary in a tunnel built beyond Site 5.[45] The pumping station, the most expensive of these items, would add another $150 million to costs.[46] Dr. Michael Henning, a SWIM consultant, believes that elevating the wastewater facilities on Deer Island and modifying the design of a pumping station already slated for construction will allow a longer outfall at minimal extra cost ($60 million).[47]

Even if the lower SWIM projections are more accurate than

the MWRA figures, and even if the cost of extending the outfall will be a fraction of STFP total cost, the MWRA has good reason to be wary. The increase in price of Boston area water service over the next two decades will be enormous.[48] One can view this increase as the logical result of Boston's long refusal to face the costs of pollution. Logic, however, will probably do little to reduce the ire of Massachusetts rate payers confronted with skyrocketing water bills. It may be for this reason that the MWRA has chosen to see building the outfall to Site 4.5-5 or to Site 6 in terms of financial impacts on the Authority's rate payers rather than in terms of benefit-cost analysis.[49] If only to add another dimension to the decision-making process, however, it may be useful here to apply a benefit-cost perspective.

Calculating Benefits

Costs in this instance, while the MWRA and SWIM figures differ, would essentially be the expenses associated with extending the effluent outfall pipe from Site 4.5-5 to Site 6. The calculation of benefits depends first on the dilution and transport qualities at Site 6[50] and secondly on the level of damage anticipated to the resources of Massachusetts Bay. If no ecological damage is anticipated in Massachusetts Bay, then the longer effluent pipe is not justified. However, studies in connection with the NDC 301(h) waiver application indicate that effluent with only primary treatment poses a hazard to fisheries, beaches, and bottom sediments in the Bay, and an economic, health, and aesthetic constraint on humans. There have

been no studies done to ensure that effluent with secondary level treatment will not have at least some of the same deleterious effects.

The Deer Island secondary-level treatment plant will still be completed after the effluent outfall pipe even with present talk of changes in the construction schedule. Thus, at the very least, adverse impacts from effluent are likely during the time between termination of the outfall pipe and completion of the secondary treatment plant. Preventing such adverse impacts would constitute an economic benefit.

Quantifying such potential benefits is not easy. A first step is to examine the value of Massachusetts fisheries. In 1983, for example, $105 million worth of shellfish were landed. With the application of an appropriate economic multiplier (4.5) to include related benefits, the value of the fishery nears $500 million.[31] On the recreational side, 1980 data show 550,000 saltwater anglers consigning $111.6 million to the sport in Massachusetts.[32] New boat and boat fuel purchases for recreational fishing, which are in addition to this figure were approximated at $20.4 million for 1984.[33] The North Shore, of which the Bay is a part, has traditionally been an important area for both shellfishing and sportfishing. It therefore seems reasonable to ascribe a large percentage of Massachusetts fisheries earnings for the North Shore. If, using the above figures, one-fourth the value of Massachusetts' shell- and saltwater angler fisheries, plus one-fourth the value of new boat and boat fuel purchases, are assumed to benefit the North

Shore, the area gains revenue of approximately $150 million dollars.

Another indicator of economic benefits may be the worth of beach visits to the northern sector of Massachusetts Bay. If figures quoted earlier for Nahant and Kings (Lynn) Beaches are used to calculate demand for the two beaches over a 13-week summer season, there will be 10,000 x 5 x 13 weekday visits plus 25,000 x 2 x 13 weekend visits for a total demand of 1,300,000 visits per summer season. Assuming that each visitor spends $5 per visit on food, drink, fuel, and other items, a cautious estimate of the worth of these visits is $6,500,000. Since Nahant and Kings are but two of a series of beaches in the area, $6,500,000 is only a partial estimate of economic benefits accruing to the North Shore from Massachusetts Bay beaches.

A third benefit of an unpolluted Bay is the preserved quality of important coastal habitats such as barrier beaches, salt marshes, and tidal flats. Along the North Shore in Essex County alone a 1985 reckoning put barrier beach acreage at 2,955.4, salt marsh at 10,026.9 acres, and tidal flats at 6,087.7 acres.[34] The market value of salt marshes and tidal flats would be a function of their contribution to commercial and recreational fisheries and to such leisure pursuits as walking, viewing, and bird-watching.

A Final Reckoning

Adding the salt marsh/ tidal flats value to benefits to the North Shore from Massachusetts Bay fisheries and beaches produces

a combined total more than $100,000,000 above the cost of extending the effluent outfall pipe to Site 6. Thus, even if the cost of the outfall is estimated at more than SWIM's $60,000,000 figure, benefits from safeguarding Massachusetts Bay may compensate for the expense of construction. Benefits of the outfall extension will outweigh costs if 1) discharge of effluent with primary-level treatment only is allowed in Massachusetts Bay and/or 2) dilution of effluent is greater at the Site 6 region than at the Site 4.5-5 region. In the first case, the MWRA's schedule and the quick, universal adoption of strong pre-treatment measures may be key. In the second case, there is insufficient basis for informed decision-making. Further scientific study of the Site 6 region is advisable.

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Nahant SWIM, Inc.
Safer Waters in Massachusetts

May 31, 1988

Mr. Michael Deland
Regional Administrator
Environmental Protection Agency
J. F. Kennedy Federal Building
Boston, MA 02203

Dear Mr. Deland:

Please include the enclosed article as part of SWIM's comments on the Draft Supplementary Environmental Impact Statement on the proposed Massachusetts Water Resources Authority outfall. The article, by Mark B. Patterson, was written as a part of SWIM's comments concerning Lynn's 301(h) waiver application. It includes information about currents and circulation in Nahant Bay that is pertinent to the MWRA proposal.

I believe this information supports SWIM's position that the outfall should be placed at Site 6.

Please study this material in relationship to the color maps that Kevin Jungaard has made as a part of SWIM's testimony. As you can see, the MWRA outfall plume would be dangerously close to Nahant Bay, where the algae problem exists.

I have included as well in the algae material a letter from William Crawford of Nahant written about the algae for the Swampscott 301(h) waiver application, a description of the algae for those who have not smelled it, and a page from the Boston Harbor Tidal Current Chart showing how tidal currents flow INTO Nahant Bay on the OUTGOING tide because of the unusual tidal patterns around Nahant.

Sincerely yours,

Polly Bradley

Polly Bradley, President
Nahant SWIM, Inc.

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30 July 1984

Mrs. Polly Bradley
Chairperson
SWIM - Nahant Citizens' Committee to
Seek Water Improvement Measures
Nahant Town Hall
Nahant, MA 01908

Dear Committee Members,

My name is Mark Patterson and I am a graduate student at Harvard University in the Department of Organismic and Evolutionary Biology. I am graduating next June with a Ph.D. in marine biology (biomechanics of marine invertebrates). I have been a regular SCUBA diver in Nahant waters since 1976; since 1981, I have continuously maintained laboratory space at Northeastern University's Marine Science and Maritime Studies Center at East Point, where I am pursuing my thesis work. I also monitor by SCUBA diving two field sites near the laboratory several times a month, 12 months a year. One site is located at Shag Rocks (Broad Sound) in 15 m of water; the other is near Canoe Beach Cove and East Point (Nahant Bay) in 10 m of water. Part of my training is in fluid mechanics; I am also familiar with the professional literature pertinent to near-shore physical oceanography. I wish to draw attention to several deficiencies in the documents "Application for Modification of Secondary Treatment Requirements for Discharges into Marine Waters" and "Revisions to the Application for Modification of Secondary Treatment Requirements for Discharge into Marine Waters", submitted by the City of Lynn in support of a Section 301(h) waiver of the Clean Water Act.

My major criticism concerns water current data presented for the proposed outfall site. Lynn maintains that effluent discharged from the proposed site will, in general, be subject to a net southerly transport, and thus should not pose a significant danger to Nahant's shoreline. However, both plate III-20 (showing the movement of ebb tide drift pole markers) and plate III-10 (showing the dispersion of dye in the surface waters) indicate that trajectory of the ebb currents is back toward Nahant Bay. Indeed, the application states "The ebb plume, by contrast, exceeded 4000m in length and was both narrow and sinuous. (Italics mine.) This dye extended east-northeast from the alternate outfall site and swung counterclockwise at its outer end. (Italics mine).....The ebb plume, however, correlated closely with the results of the ebb drift pole experiment in terms of the long excursion, lack of lateral dispersion, and counterclockwise hook (Italics mine)." (p. III-29). On p. III-23, calculations based on the d[illegible]odies are presented to estimate the far-field dilution of effluent from the proposed site. The numbers indicate that the ebb plume must travel at least twice as far to achieve the same dilution as that obtained by the plume on a flooding tide. In sum, the ebb plume would hang together much longer as it travels along Nahant before starting the counterclockwise hook into Nahant Bay.

I wish to draw the committee's attention to work done by Alan Noureux while a graduate student at the Massachusetts Institute of Technology. His master's thesis is entitled "An Analysis of Hydrodynamic Circulation in Nahant Bay" and was completed in 1980. Noureux applied a computer model called CAFE-I to analyze "the joint influence of tide and wind on the transport of sewage particles from the Swampscott Sewage Treatment Plant and on the distribution of algae fouling the nearshore region of the bay." (p.2). Noureux computed particle paths and the magnitude and direction of currents in the bay under a variety of wind conditions and tidal states. It should be emphasized that Noureux's study has not been field tested. However, several of his results should be of concern with respect to the coherent ebb plume that would start hooking in direction near East Point from the proposed outfall site.

Pages 69-74 discuss the flow in the bay during a tidal cycle with a southwest wind at 20 knots, a summer condition. Figures 20, 21, and 22 show that during much of the tidal cycle a gyre may exist in the bay. Particles entering the gyre may have a residence time of a week or more. While the gyre does break down during ebb tide, the coherent nature of the ebb effluent plume from the proposed outfall may pulse enough sewage to be entrained by the gyre when it reforms a few hours later. The potential exists for water enriched in nutrients to be brought into the bay from the ebb sewage plume, through the action of the counterclockwise hook and the action of the gyre. A separate study by Mowle (1980) indicated that the alga, Scinaia furcellata, which lives in Nahant Bay was limited in its growth during most of the year by the availability of nitrate in the water. Scinaia is a close relative of Pikeella littoralis, the infamous nuisance alga of Nahant/Swampscott, and it lives in the same habitat. The implications for the growth of Pikeella are obvious.

Noureux discusses the limitations of the computer model on pages 74-78 and then compares his results with the limited available field data. He concludes that his velocity calculations for the surface waters are consistent with field data derived from three sources. He also finds that the particle trajectories calculated for one wind condition (NW; the only one for which there was field data) are valid, and tentatively concludes the others are valid too.

It would be a shame to exacerbate the problem of the nuisance algae while potentially damaging the unique intertidal and subtidal habitats near Nahant, yet the proposed design has that potential. In the absence of further field testing of the near-shore current field around Nahant and Lynn, no well-informed decisions can be made regarding the effects of the proposed outfall. Moving the outfall further offshore will avoid the headache of trying to predict the movement of effluent in the near-shore environment. Velocity fields in shallow water in this area (less than 20 m) are quite variable (Bohlen 1980). My own measurements made over the past three years at my two field sites using a custom underwater flowmeter and my personal observations support this. There is a net southerly flow down the coast as

Lynn claims (see references in Heureux (1980)), but its effect will be dominant in the offshore environment.

Finally, I wish to comment on the revised monitoring of benthic macroinvertebrates that Lynn will execute to monitor the effects of the outfall. The protocol proposed is the barest minimum that could be done to compute any statistics. The statistical power of any analysis done on these samples will be low (see EPA 1982), and I believe more extensive sampling is warranted if Lynn wishes to have the capability to detect any adverse effects of the outfall on the local biota.

Sincerely yours,

Mark R. Patterson

Mark R. Patterson

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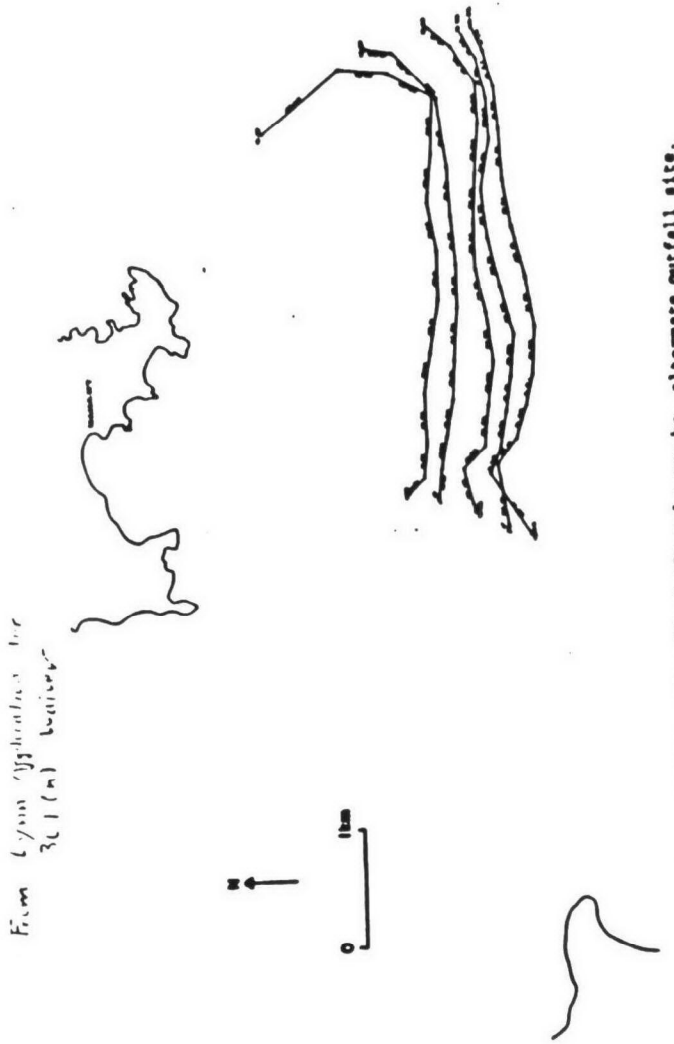


Figure III-16. Ebb tide drift pole tracks, alternate outfall site, May 10, 1979. Extrapolated speeds are given in cm/sec.

From Lynn Application for 301(h) Waiver

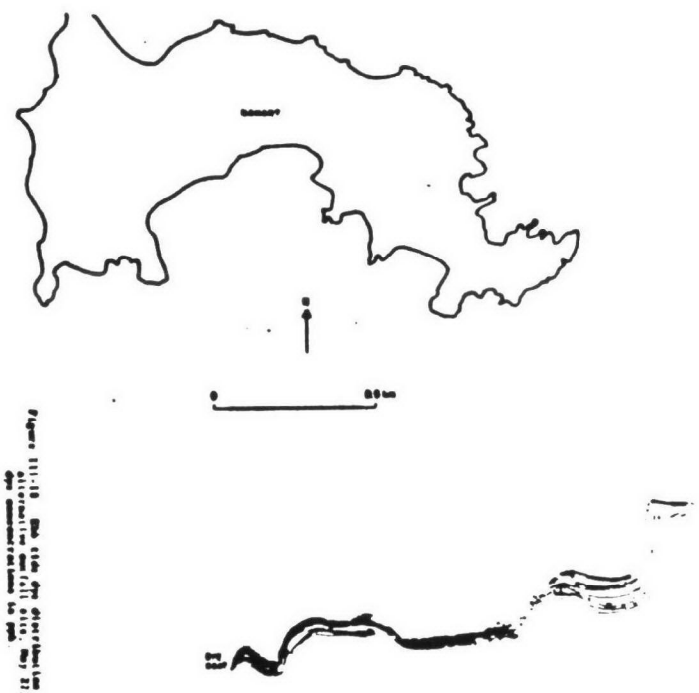


Figure III-10. [illegible] alternative [illegible] May 22, 1979. [illegible]

III-11

From [illegible]

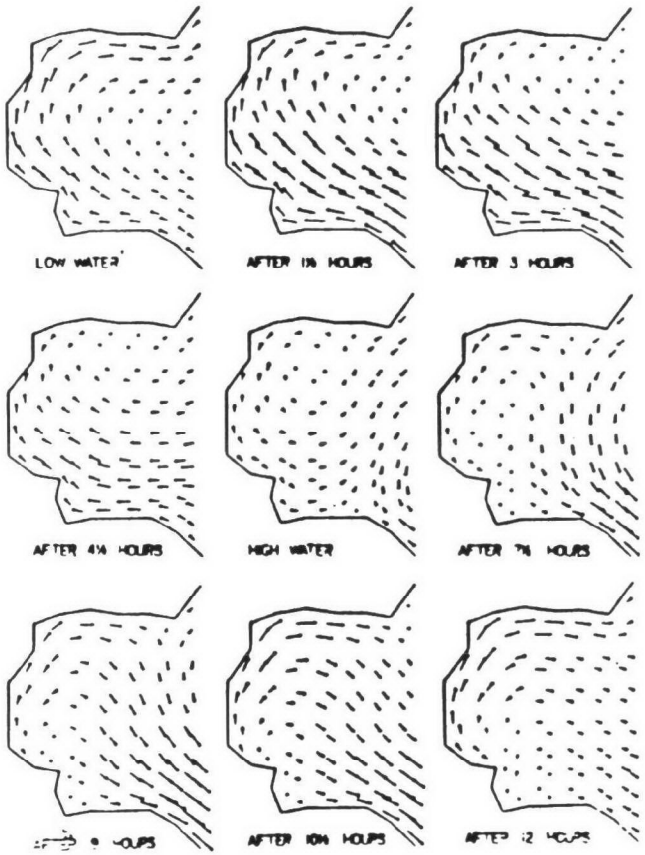


Figure 20. Computed One-Layer Circulation Pattern in Nahant Bay - Southwest Wind at 22 Knots.

From Hess (1975).

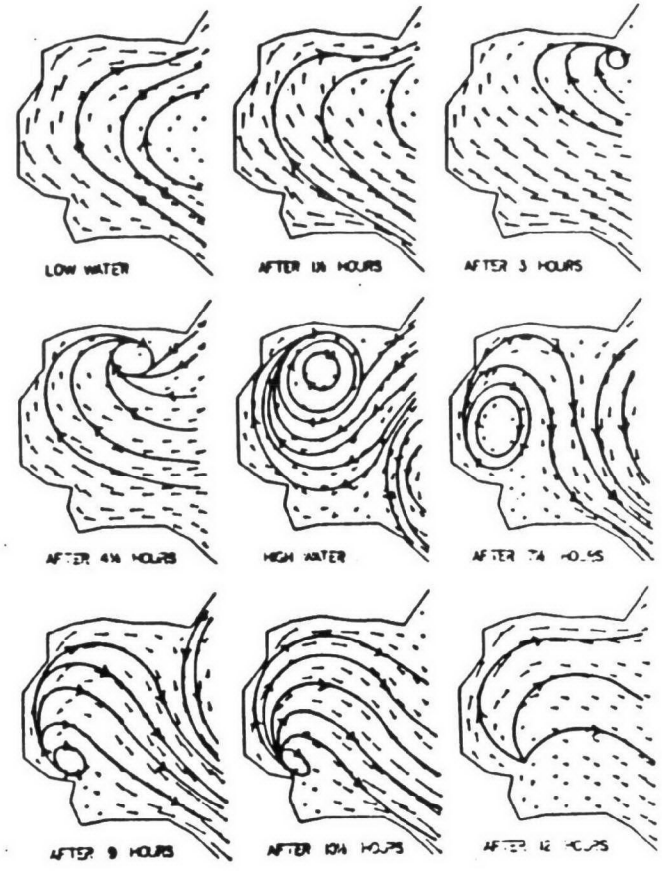


Figure 21. Computed One-Layer Circulation Patterns in Nahant Bay Showing Flow Streamlines Converging into a Gyre - Southwest Wind at 20 Knots.

From Hess (1980)

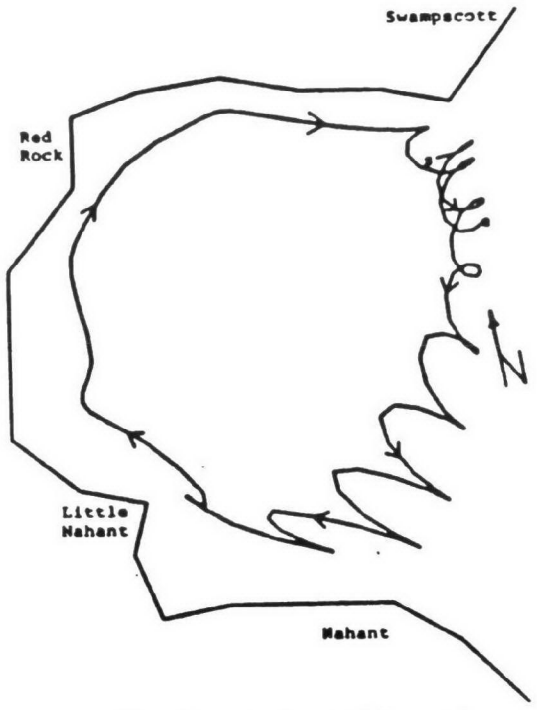


Figure 22. Computed Particle Path for a Release at the Swampscott Treatment Plant Outfall - Southwest Wind at 20 Knots. Residence Time = 1 week.

15 Hoyt Road
Nahant, MA 01908
May 29, 1987

Mr. Michael Deland, Regional Administrator
Environmental Protection Agency - Region 1
J. F. Kennedy Federal Building
Boston, MA 02203

Dear Mr. Deland:

I am writing as a concerned citizen and a volunteer to the Nahant S.W.I.M. Committee. I have reviewed in detail the recent Revised 301(h) Waiver Application from the Town of Swampscott. I am concerned that the proposed treatment system provides only for primary treatment, with no secondarary treatment. It is unconscionable at this late date that a plan be would put forth to discharge anything less than full secondary-treated effluent into Boston Harbor/Massachusetts Bay, acknowledged to be the worst polluted body of water in the United States. In addition, it is not clear that the plan adequately provides for treating the pollution/contamination from Stacy Brook. The continuous closing of shellfish beds in this region, along with the frequent closing of public beaches due to bacterial contamination should provide reason enough to correct the pollution problem to which Swampscott, along with neighboring communities, has contributed. I trust that your upcoming decision on the Swampscott Waiver Application will be a denial, consistent with your decisions on other related cases. In addition, I am very concerned that the extremely short outfall extension proposed by Swampscott will not provide sufficient diffusion of the effluent to significantly reduce pollution in Nahant Bay.

My concern over the issues of primary-treatment-only and the Stacy Brook pollution have likely been addressed by other writers. It is with respect to the outfall location that I wish to elaborate. In the Lynn-Swampscott-Nahant area, we have an additional problem resulting from the decay of Pilayella littoralis, a form of free-floating alga. When the alga, driven by the wind, washes up on the beach, it quickly decays, resulting in a vile stench. Since wind direction is variable, the location of the rotting mass of alga changes from town to town surrounding Nahant Bay - truly a regional problem. My academic training and professional experience are as an engineer, not as a botanist, but it is clear to me that all plant species require nutrients, and from personal observation, debris which make up inadequately treated sewerage (tampon inserters, etc.) invariably are found with the alga buildup. One cannot tell from which of the many outfalls in the Greater Boston region a given piece of debris originates, but it is obvious that the Swampscott outfall and Stacy Brook make a significant contribution, and these sources of pollution must be corrected. In addition, the dropge data presented in the Swampscott Waiver Application are suspect, as outlined in my letter of March 18 to the Mass. Water Resources Authority - copy attached. Tidal circulations in this region are highly variable, and the data are far too limited to be conclusive. Wind and tidal conditions can exist which would force Swampscott's effluent onto the beaches of Swampscott itself, along with Lynn, Nahant, and Marblehead.

I urge you to reject the Town of Swampscott's 301(h) Waiver Application, along with its accompanying extremely short outfall extension proposal.

Very truly yours,

William Crawford

Nahant SWIM, Inc.
Safer Waters in Massachusetts

May 21, 1988

To: Environmental Protection Agency

From: Polly Bradley, SWIM

Re: Algae (Pylaiella littoralis)

Have you ever driven along Lynn Shore Drive on a beautiful summer day?

Have you ever smelled the algae...the reverse of beautiful?

The smell of decaying algae hangs over the houses...it drifts along the beach...drivers close their windows...children hold their noses and run. Long stretches of beach in Lynn, Swampscott, and Nahant are unusable.

Nutrients from Massachusetts Bay help fertilize the algae now.

Note the tidal current chart (attached). Think of the ZID (zone of initial dilution) of an MWRA outfall at Site 8. Imagine...algae.

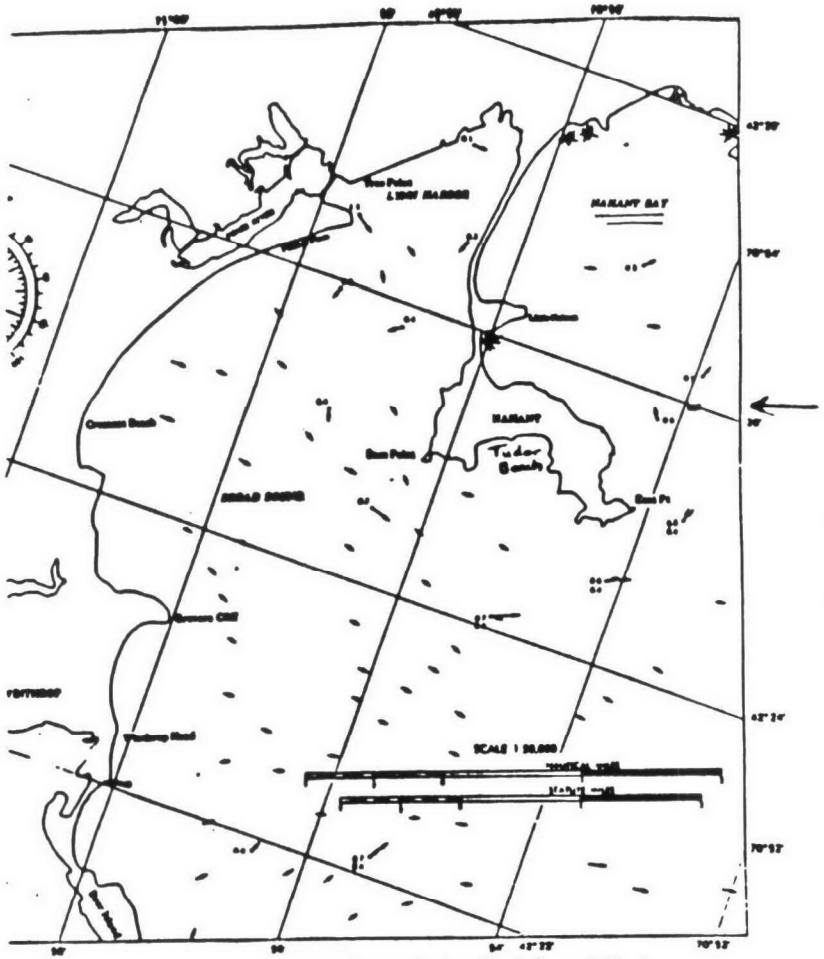
Look at the circulation pattern in Nahant Bay (attached). Imagine effluent and algae...trapped.

Imagine the beachgoers of Nahant, Lynn, Swampscott...and all the people of Greater Boston who use Nahant/Lynn/Swampscott beach...

TRAPPED!

SWIM c/o Northeastern University Marine Science Center, East Point, Nahant MA 01908
Phone (617) 581-0075 or (617) 581 1434

NOTE: Tidal currents flow INTO Nahant Bay on OUTGOING tide.



Source: Boston Harbor Tidal Current Chart
National Oceanic and Atmospheric Administration

* Some major spots where algae collects.
It lives FREE-FLOATING and reproduces FREE-FLOATING in the Bay.

Northeastern University

College of Arts and Sciences
Marine Science Center

May 10, 1988

John R. Elwood
Program Manager
Massachusetts Water Resources Authority
Charlestown Navy Yard
100 First Avenue
Boston, MA 02129

Dear Mr. Elwood:

We are writing to express our concern over the inadequacy of the Boston Harbor outfall siting project. By our understanding of the EPA's Clean Water Act, it is the responsibility of the MWRA's outfall siting study to choose a site with the least possible degradation to the marine environment. We have read the Environmental Impact Report and we have conducted much of the studies of hard bottom benthic communities at sites 5 and 6. It is clear that the EPA's approval of a region centered around sites 4 to 4.5 will result in substantially more degradation to the benthic habitats of Massachusetts Bay than site 6. Both the EPA and MWRA reports are inadequate by not having a study site beyond the recommended region for comparison. It is thus unclear if sites 4-5 are the best region or just the most acceptable of those studied.

Our specific problems with EPA and MWRA's position are as follows:

1. At the meeting with MWRA in Nahant on April 22, 1988 the oceanographic consultants stated that they expected a minimum of 20% more dilution of sewage effluent discharged at site 6 than site 5, and the actual percentage could be far greater once actual dispersion data are available for site 6. Twenty percent more dilution will surely result in less degradation to the bottom dwelling marine life of Massachusetts Bay. We urge MWRA to investigate near and far-field currents at site 6 over the next year so that the actual dilution factors for site 6 can be determined.

2. By placing the outfall at site 6 rather than sites 4-5, there is certainly less chance that the sewage plume will drift onshore and pollute coastal habitats which support productive fisheries and have considerable recreational value. This is based on the fact that an outfall placed at 150 ft. depth (site 6) will be well within the Gulf of Maine Intermediate Water and thus effluent at this depth will have a lower probability of being transported onshore by wind-driven currents in the Maine Surface Water than would effluent from an outfall located at 100 ft. (sites 4-5). No oceanographic data were collected from site 6 for the EIR, thus the MWRA cannot adequately address comments in the "Sapphire Necklace" proposal without information on currents and temperature conditions. Oceanographic conditions at site 6 must thus be studied over the next year.

Northeastern University
East Point, Nahant, Massachusetts 01908
617 581 7370

3. The densities of commercially important species such as lobsters and demersal fish were not sampled correctly at the rocky bottom sites therefore the "true" abundance of these species are not known. For example it is stated on page B-167 of Vol. V (appendix B) of the EIR that "Collection of demersal fish and epibenthic shellfish by otter trawls near candidate outfall sites was difficult because of the rocky bottom and seasonal influx of fixed lobster gear in July and particularly in September" We have found in our research on hard bottom benthic communities in the Gulf of Maine that the only way to obtain accurate counts of lobsters and fish in rocky habitats is conduct research underwater with divers and submersibles, using direct counts on video, and to deploy time-lapse cameras for several days per site Based on our observations at sites 4 -6, we predict that lobster and fish densities will be significantly lower at site 6 than at sites 4-5 and therefore more landward We recommend that these underwater techniques be used to determine the population densities of commercially important species. We predict that the outfall will affect lobster and fin fish fisheries adversely in the part of Massachusetts Bay if it is located at sites 4-5.

In summary, we implore you to spend the additional time needed to study the oceanographic conditions and populations of commercially important species at site 6. We are confident you will find that the degradation of the benthos and the threat to coastal habitats will be significantly less at site 6 than at any other site.

Sincerely,

Jon D Witman Ph D
Assistant Professor of Biology

Kenneth P Sebens Ph D
Professor of Biology and
Director, Marine Science Center

Siting of the Outfall — Simulation Results

David W Carter, Ph.D.*
288 Castle Road
Nahant, MA 01908

23 May 1988

This note contains formal comment on the Draft Supplemental Environmental Impact Statement (SEIS) for the Boston Harbor Wastewater Conveyance System, distributed by the U.S. Environmental Protection Agency in April of 1988. It also makes reference to the Secondary Treatment Facilities Plan (STFP) prepared by the Massachusetts Water Resources Authority. We shall address the siting of the outfall, with focus on issues concerning mathematical modeling and computer simulation of the outfall. Appendix A of volume II of the Draft SEIS reviews the simulation methods used by EPA. MWRA's discussion of these matters is contained predominantly in Appendices A and J to Volume V of the STFP.

In the screening of proposed outfall sites, a great deal of weight has been given to the modeling and simulation results described in these appendices. Results from computer modeling have the feel of authority and accuracy — especially when the models come with an MIT copyright! The MIT models in question are called TEA-NL (hydrodynamic modeling) and ELA (modeling of pollutant dispersion). As the simulated currents from TEA-NL are inputs of ELA, the realism which we attribute to the results of ELA must depend on the realism which is afforded by TEA-NL. In Appendix J of the STFP ("The MIT Report") the following facts are stated:

1. TEA-NL diverges (misbehaves) when operated in full nonlinear mode unless unrealistically large values are specified for bottom friction coefficients.

2. Comparison of tidal ellipse (calibration information) predicted using TEA-NL with tidal ellipse generated by processing real data collected using current meters shows disagreements on the order of 20 percent.

*The author is a mathematician employed by the Draper Laboratory, and a resident of Nahant MA.

Note in addition that TEA-NL is depth-averaged (two dimensional). This means that when its output indicates that effluent released at position a will be carried by currents to position b but not to position c, this conclusion is only true in some average sense. It is well known from experience that current direction near the sea floor may differ considerably from current direction on the surface. Unfortunately, effluent cannot be guaranteed to flow in the depth-averaged direction.

Also note — because of the frequency domain structure of TEA-NL, it is difficult to specify realistic wind scenarios other than steady wind. This is especially the case when TEA-NL is set up to consider only two frequencies, (zero and the M2 tidal frequency). For this reason, as well as because TEA-NL is depth-averaged, realistic modeling of flows due to wind has not been (and can not be) done using this tool.

> *Conclusions based on runs of the simulation model TEA-NL — and therefore conclusions based on runs of ELA — must be made very conservatively.*

Given these caveats — what effects does TEA-NL show? Perhaps the most interesting results are MWRA's simulated particle tracks given on pages 6-25 and 6-26 of Appendix A to Volume V of the 1FYP (attached). In these runs, the position of a packet of effluent discharged at each of the outfall sites under consideration is tracked for a period of roughly one week. The path each packet follows resembles a stretched coil — the packet moves in and out with the tide as it gradually drifts off, north or south, direction depending on fall. Note that the trail from site 5 is dramatically different from the trails from other sites. Indeed, packets tracked from sites 4A and further west move only a short distance in a week, and in these cases seem to move shorewest, whereas packets released from site 5 move rapidly away, either up or down the coast.

> *These results suggest strongly that site 5 should be preferred over the other sites considered.*

It appears unlikely in the long run that "Sites 6 and 5 show little difference in impact ... and both appear to be acceptable." [Draft SEIS, p. 3-12] Rather, the results suggest that additional benefit might be realized by siting the outfall to the east of site 5.

To test this conjecture, the author obtained a copy of TEA-NL and its official finite element grid, and (with limited time and resources) made some additional runs. TEA was first run in linear mode. Both 10 cm eastward tilt and 10 cm southward tilt were simulated. The M2 tide was the only nonzero frequency included; it was specified to have constant phase along the ocean boundary, with amplitude increasing from 1.31 m at Cape Ann to 1.37 m at Provincetown. The simulations were deliberately started on an incoming tide and run for seven days.

Results of these runs are included on pages 6 and 7 of this note. By observing the distance between successive tidal peaks, one can compare the relative rates of motion (read also dispersal) of effluent released at each of the sites. Observe that this rate doubles as we go from site 6 to site 5, then nearly doubles again as we go from site 5 to site 4. Keeping in mind that these simulations are depth-averaged and cannot model an effluent plume which has matured and is being driven to shore by wind, we must conclude that

> *Site 5 offers the advantage not merely of being further from shore but of providing more rapid effluent dispersion.*

A limited number of additional runs have been made, using TEA-NL in more 'realistic' modes. This work is ongoing. The author has confirmed that TEA-NL diverges when run in full nonlinear mode with friction coefficient 0.005. Unfortunately, 0.005 is thought to be the correct magnitude for this parameter according to the MIT Report [1FYP, Appendix J to Volume V, p.17] Note that the value used by the consultants to the EPA was 0.1 — 20 times larger than expected. [Draft SEIS, Volume II, p. A-67]

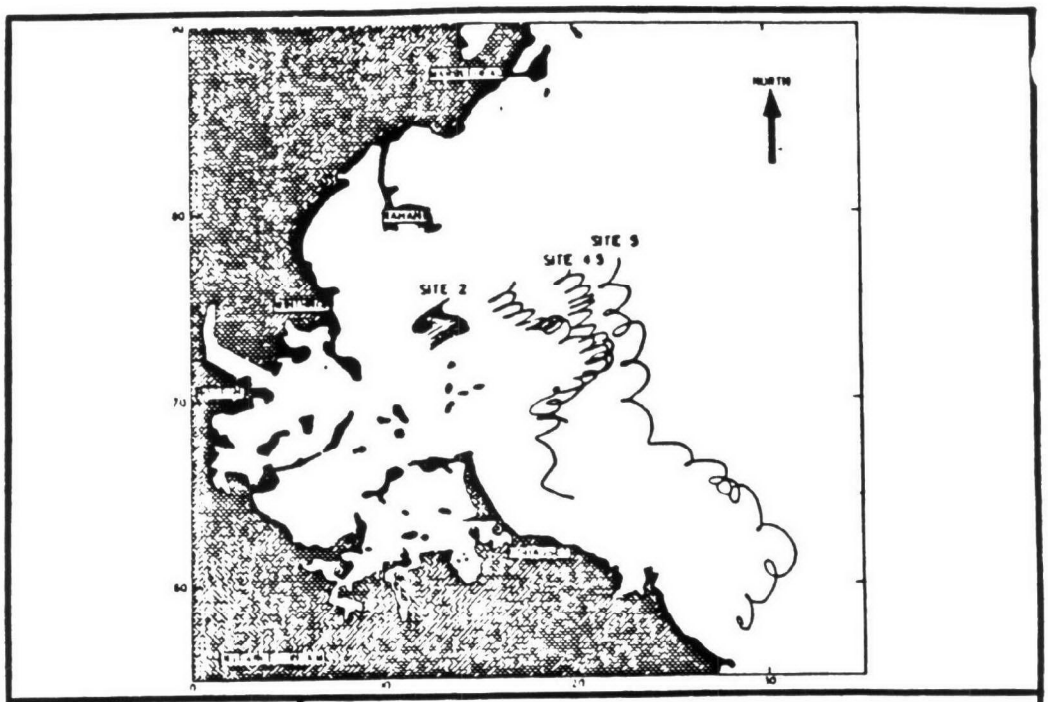
TEA-NL simulations made by the author using the linear mode with iteration for nonlinear friction currently show rather extreme differences between sites 4 and 5. Indeed, these results seem to be very sensitive to location specified for site 4.

The plot on page 8 shows this clearly. Note that the particle started near site 4 exhibits no net drift in the seven day period. Incredibly, this particle follows a nearly periodic path, made up of the M2 tidal motion superimposed on a clockwise rotation.

To summarize:

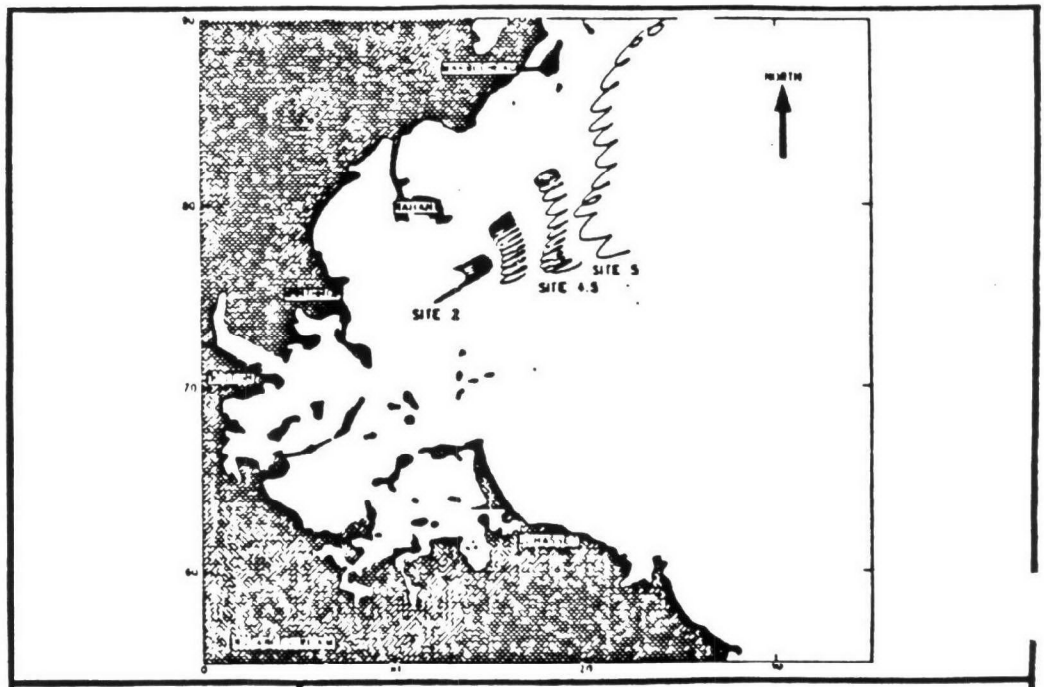
> *TEA-NL simulations indicate a qualitative change in behavior between sites 4 and 5. In the absence of wind action, discharge near site 4 may result in little or no dispersion of the effluent over time. Action of wind might then result in the rapid transport of unacceptable concentrations of pollutants to shore.*
>
> *Preliminary simulation results suggest that site 5 can provide an even greater measure of protection against this contingency.*

In particular, it is not conservative engineering to assert that "no great differences are found between Sites 6 and 5" [Draft SEIS, Executive Summary] Additional study of the hydrodynamic characteristics of sites 5 and 6 is urgently recommended.



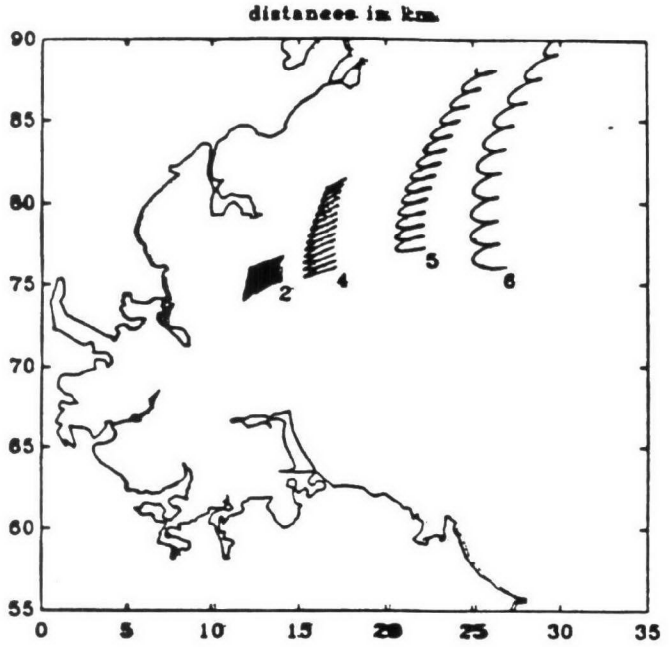
MASSACHUSETTS WATER RESOURCES AUTHORITY

FIGURE 4.10.1-1
SIMULATED PARTICLE TRACKS ALONG NORTHERN TRANSECT
FOR 10 cm NORTH-TO-SOUTH TILT

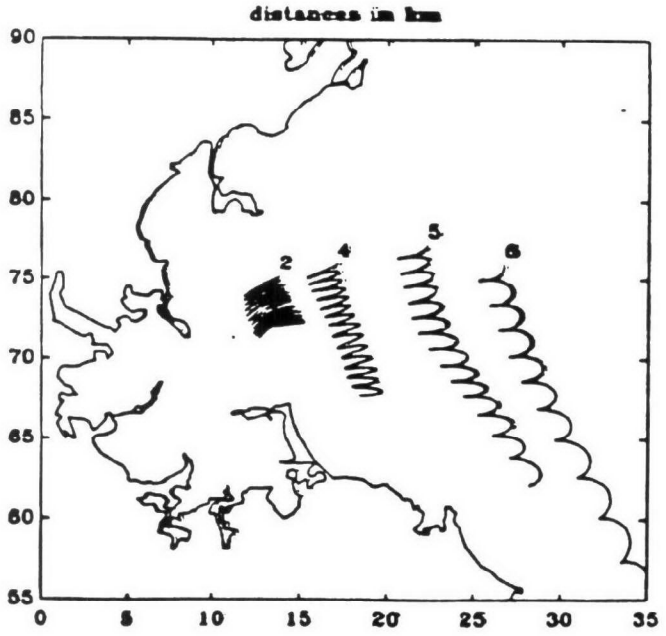


MASSACHUSETTS WATER RESOURCES AUTHORITY

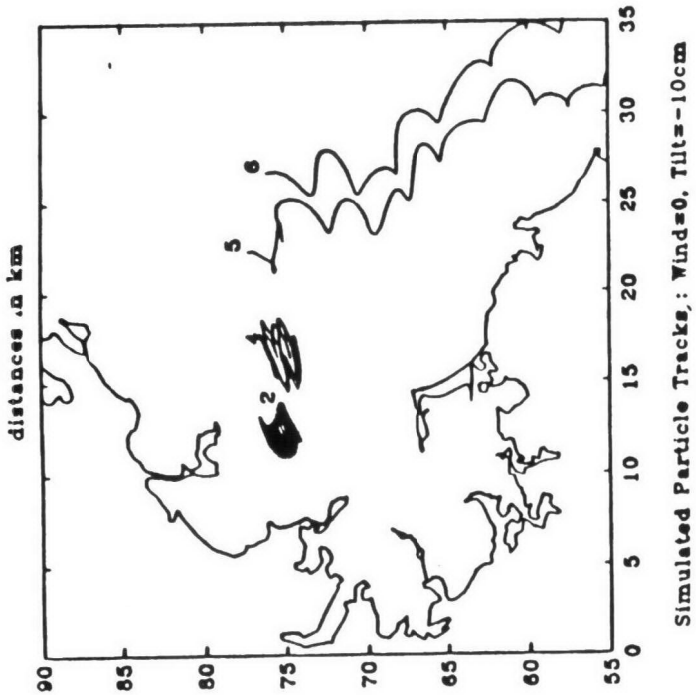
FIGURE 4.10.1-2
SIMULATED PARTICLE TRACKS ALONG NORTHERN TRANSECT
FOR 10 cm SOUTH-TO-NORTH TILT



Simulated Particle Tracks : Wind=0, Tilt=+10cm



Simulated Particle Tracks : Wind=0, Tilt=-10cm



Nahant SWIM, Inc.
Safer Waters in Massachusetts

May 31, 1988

SWIM ADDITIONAL COMMENTS ON SCREENING PROCESS AND EXECUTIVE SUMMARY

by Polly Bradley

Screening Process

Site 2 should never have been reconsidered by the EPA. It was eliminated early by the MWRA for many excellent reasons, and was apparently only included in the DSEIS by the EPA to give an "F" to balance Site 5's "A" (as the best location considered when grading on the curve) and Site 6's "C" (a Gentleman's C, neither good nor bad, apparently acceptable to the EPA, but unequivocably unacceptable to the North and South Shores).

The EPA did not find "substantial additional benefits" at Site 6 because the same assumptions were made as for Site 5. The environmental should not be traded off for the one-time cost of the outfall, especially when the asset in the environment is given no consideration.

Where is your cost-benefit analysis including the asset in fisheries of an outfall near shore, the benefit in fisheries of an outfall at Site 6?

If you assume there are no lobster, no fish, few shellfish in this area...of course you come up with no damage. Given the EPA's maps of resources (Figs. 8.2.5.c & 8.2.5.d), how can we convince you of the riches of the fisheries resource in the asset area where you propose to plunk the outfall?

Please read carefully the enclosed papers by John Bartlett Hoskins, a zoologist, and Enid C. Kumin, a graduate student in economics and the environment at University of Rhode Island. These strongly support SWIM's call for a cost-benefit analysis of the outfall sites.

SWIM, c/o Northeastern University Marine Science Center, Nahant Point, Nahant, MA 01908
Phone (617) 581-0075 or (617) 581-1434

Outfall Site Comparisons

Remember the stories of the Oklahoma Run of 1889? Thousands of horses and covered wagons were massed at the edges of what used to be Indian Territory to race to claim the newly opened lands. But only were automobiles and airplanes, electric lights and telephones, hydrogen bombs and spaceships unknown, but rights of minorities and women were unknown...

That was 100 years ago. What will happen in the next 100 years? God willing and no nuclear war, the MWRA effluent outfall will be there, pumping 500,000,000 gallons a day average, up to 1,225,000,000 gallons in storms, day in, day out, forming its ZID -- the Zone of Initial Dilution, the Zone of Perpetual Pollution.

How many times in that century will there be "primary" (or worse) conditions, due to delays in building on the several sewage treatment plants, due to poor maintenance, due to catastophic failure, due to slugs of chemicals yet unknown to mankind, due to problems with industrial pretreatment or source reduction?

Probably many times.

The EPA says that Massachusetts Bay will be "degraded" during the period of discharge of primary effluent, but that the impacts are "reversible."

"Degraded" but "reversible" is not good enough for 5 years -- or for many times within 100 years -- in one of the richest lobster fisheries in the nation, probably in the world. The Regional EPA has (rightly) taken a stand against oil drilling in Georges Bank; you should take an equally strong stand against effluent discharge in the rich, shallow, near-shore fisheries of Massachusetts Bay.

On "Sediment Enrichment" and "Water Column Enrichment": we register a protest! We doubt that any change from putting sewage effluent anyplace is not a degradation. If it is changed -- it is certainly not improved.

On "Commercial and Recreational Species": one look at your "resource" maps makes it obvious why the EPA thinks there's no problem. The EPA thinks there's no resource.

SWIM would like to add strong support for industrial pretreatment, source reduction, solutions to the problems of combined sewer overflows, and the other components that are so important to the final product -- a clean Boston Harbor and a clean Massachusetts Bay. But these plans cannot replace a longer outfall.

Plans often fail and promises are often broken, just as the promises were broken that gave Indian Territory to the Indians "forever." There is no reason to think that the lessons of history are less valid now than they were a century ago. Without an outfall to Site 6, the next century will not bring clean water to the North Shore.

SWIM will work diligently for state and federal aid for the MWRA provided the North and South Shores are not put in the position of paying to pollute ourselves.

Marine Resources

The importance (in fact, even the very existence) of marine species is consistently underestimated, and their health is consistently overestimated in the DEIS.

The biological community in Broad Sound is already stressed. No shellfish beds are open without restriction from Manchester to Hingham. No shellfish beds are open at all (with or without restriction) in Nahant, Lynn, or Saugus. In Revere 143.6 acres are closed; 32.8 acres restricted. These shellfish beds are closed because of pollution.

Objectionable Impacts?

I would like to elaborate a little on the following comment found on page 8 of the Executive Summary of the Boston Harbor Wastewater Conveyance System Draft Supplemental Environmental Impact Statement:

> "The impacts at Sites 4 and 9 are comparatively small and similar to each other and more importantly, they are reversible and therefore acceptable over the five-year period.

SEEN believes that it has been shown definitively by Dr. David Carter in his mathematical analysis, by Dr. Jon Witman and Dr. Kenneth Sebens in their biological assessment, by David Jungbard and Dr. William H. Dennen in their application of "physiographic determinism," and by other commentators, ranging from scientists (such as Dr. David G. Aubrey's oceanographic analysis for the South Shore Towns) to elected officials (such as the Hahant Selectmen's critique of the EPA plan, as well as comments by other North and South Shore local, state, and federal elected officials) to ordinary citizens (such as those who have written to the EPA and those who spoke at the EPA hearing) that:

> The impacts at Sites 4 and 9 are not small. The impacts are not similar. Over a period of 100 years, they are not acceptable. Only if all plans and promises succeed as never before in the history of mankind would these impacts be acceptable.

Therefore SEEN urges you to study -- AND CHOOSE -- Site 9A.

I refer you particularly to "Contamination of Fin Finfish and Shellfish," by Anne M. Alpem, Coast Alliance, and Paul Boyce, Conservation Law Foundation (Washington: Coast Alliance, 1987) and the more technical report on which it is partially based, "Fish and Shellfish Contamination in New England Waters: An Evaluation and Review of Available Data on the Distribution of Chemical Contaminants," by Judith McDowell Capuzzo, Woods Hole Oceanographic Institution, and Anne Maylor and Gordon Allison, U.Mass: Boston (Washington: Coast Alliance, 1987).

Winter flounder in contaminated waters such as Broad Sound typically have the following problems:

- abnormalities (fin rot, skeletal abnormalities, tumors) and growth retardation in juveniles
- abnormalities and reproductive failures in adults
- genetic abnormalities and death of early embryos
- death or abnormal development of larvae

Lobster in contaminated waters have comparable abnormalities.

Much of the technical data which found Boston Harbor so dangerously polluted came from Lynn Harbor (a part of Broad Sound). Pollutants pour in from the current Deer Island sewage treatment plant -- from the Lynn-Nahant-Saugus sewage treatment plant (fortunately scheduled to complete its secondary plant about 1990) -- from leaching of the pollutants in the old Saugus Dump, still being used for ash from the RESCO incinerator -- from air pollution from RESCO and farther west, even acid rain from the Midwest -- from further North in Swampscott and South Essex Sewage District (SESD) where secondary treatment is (incredibly) still being resisted but where we trust the EPA will make them toe the line.

By the way, please do not punish Nahant for the sins of SESD and Swampscott.

As for the Lynn-Saugus-Nahant treatment plant, MWRA tried desperately to get an EIR-EIS required by the state and federal environmental agencies, since the current plan is fraught with problems, including an outfall shamefully close to shore, within .6 miles from land and in only 30 feet of water. No environmental review was required for this plant, and EPA protested bitterly to MWRA and to the EPA.

The North Shore is, alas, not pristine. The MDC beaches on the North Shore frequently have distinctly high coliform count:

- Swampscott Beach: up to 10,000
- Steady Beach, Swampscott/Lynn: up to 10,000
- Kings Beach, Lynn/Swampscott: up to >10,000
- Lynn Beach: 8,000

(Source: Boston Globe 5/16/88)

This is pointed out to show that the North Shore is not a clean area that can [illegible] more pollution. Only those who the sources of pollution closest to find an MWRA sources of pollution added. Nothing less will open our beaches and shellfish beds; nothing less will heal the illnesses of our fish and lobster.

This is all fairly clear common sense. If you want further reason, please note that degrading an area now close violates the outdoor [illegible] provisions of the State and Federal Clean Water Acts. If science and common sense will not suffice to protect our waters, we will protect them by whatever legal and political means are available.

"Assessment at Mid-Decade" (Boston: Division of Marine Fisheries, Executive Office of Environmental Affairs, 1985) says (page 9): "Areas closed to shellfish harvest due to bacterial contamination cause an estimated annual economic loss of $90 to $70 million." For a financial investment in just about that range, the MWRA effluent outfall can be extended so that for one hundred years there is an annual gain of a large percentage of that figure for all Massachusetts

[illegible] being considered are close to the MWRA outpourings.

Yet the [illegible] close out fish, lobsters, shellfish in great numbers [illegible] the beaches of the North and South Shores.

[illegible] analyzed? There are the state and federal environmental [illegible] have either [illegible] the point where damage to the environment was measured a problem yet here we are, back in the same old error of ignoring the externalities or ignoring the cost to the environment.

w to share gri timbers in the ... and ra- ... always is highest after a rain when ... ing animal waste) wash off streets into storm drains. ...d when the load of water overwhelms the sewage treatment system, causing untreated or partially treated sewage to pour into the harbor. DiPietro says rain is the biggest single determinant of water quality at beaches: if the summer is dry, the beaches will be fairly clean. If it is rainy, more beaches will be posted with pollution warnings.

The MDC's weekly testing program, which starts June 8, will be more complicated than in the past. The commission is going to test for two bacteria, not just one, and will post warnings if there is too much of either one.

Postings will be based both on fecal coliform, the bacterium it has measured for several years, and enterococcus, another bacterium carried in the feces of warm-blooded animals. Neither causes human illness, but both indicate the presence of sewage and thus the likelihood of infection. The primary worry is human waste; you're far more likely to get sick from a virus or bacterium carried by humans than by dogs or horses. The MDC has added enterococcus ... ter, drawn from ... and take 24 48 hours to complete, howe... postings refers to that day's pollution. T... signed to provide guidance for swimmers ...

DiPietro also hopes to test sediments ... this summer for lead, zinc, cadmium, mer... ...um to see if bathers near sewage outflows ... ing to other hazardous materials.

Although polluted water gets - and dra... there are other health risks associated wit... ming.

Skin cancer is tied to sun exposure, a... major cause of accidental death in young ... the last year for which figures are avail... and adolescents drowned in Massachusett...

You can get an ear infection from sa... ciron water, says Rebecca L. Calderon, ... epidermidis[sic], because water washes aw... waxy coating in the outer ear, leaving it ... germs normally growing on skin. You ca... infections by swimming in crowded pools ... or get an infection by injuring your self un... posing the cut to bacteria normally in wa...

Very crowded swimming pools may ne... up with the need for disinfection. Calderon ... mends swimming early in the day, when ... to be cleanest.

Risk debated

Calderon says the risk of swimming at ... beaches is not particularly great; she say... at more risk of being injured crossing th... the beach than of becoming ill from som... ter. The problem with polluted water, sh... thetic than medical. Nevertheless, "I th... been sitting around in the dark not realiz... to what is in the environment around us ... ple are at least interested. They may be on... least they're interested."

But Dr. Robert Dennis, an orthopedi... tune, N.J., and co-founder of the New J... group Save Our Shores, says not enough ... Calderon's conclusion. At his group's ins... Jersey health department to undertak... study, partly designed by Calderon, in ... ples will be taken all along the state ... 100,000 bathers will be interviewed.

Says Dennis: "Are people really gettin... ge in the ocean? No one's really wanted ... fects tourism, the fishing industry, proper... has dared ask the question because every... itical or financial [stake]. It's taken ... corr of people here to ask the question ... the study will produce an answer."

In the meantime, he advises that if you ... the water, don't put your head in it, sta... open cuts, don't go in deep and don't ste...

For information about a particular bl... commission's public information office ... weekends, lifeguards and beach manage... mation about the beach's water quality.

Beaches at state parks, including ... Brussel, Horseneck, Salisbury, Fort Ph... Cape, and inland swimming areas, inclu... are run by the Department of Environme... A spokesman for the agency said none of ... was closed last year because of pollution. ... swimming areas are managed by the c... which they are located.

Betsy A. Lehman is a member of the

Pollution at MDC beaches, 1987

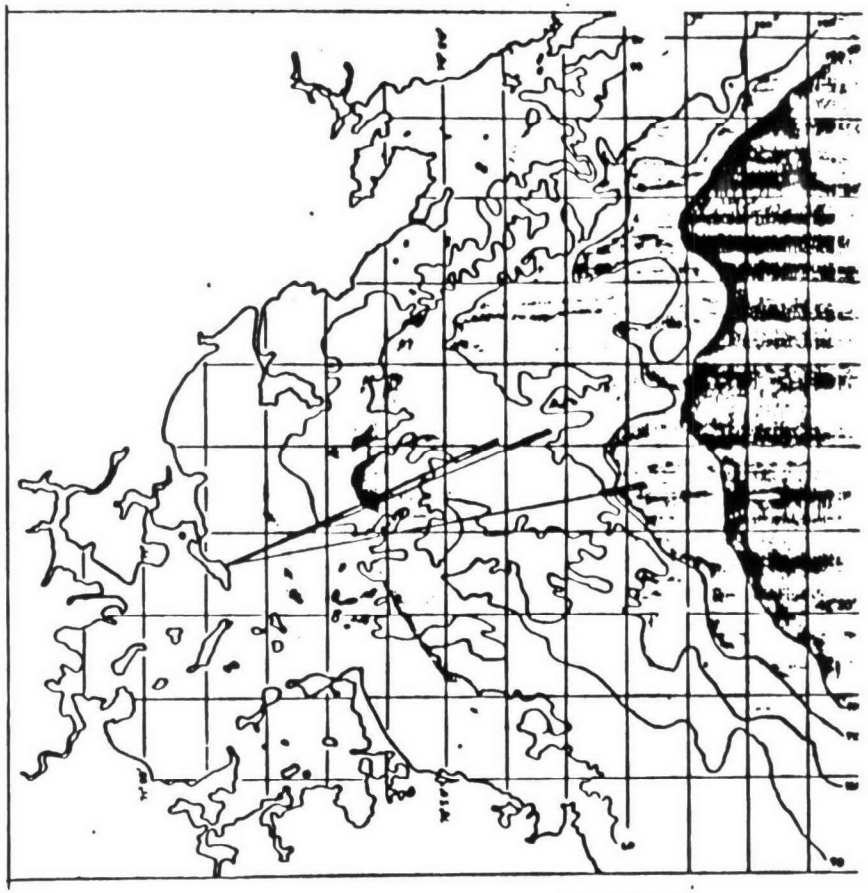
The Metropolitan District Commission tests water for fecal coliform, a bacterium that indicates the presence of human and animal wastes. Warnings are posted when the results exceed 200 coliform per 100 milliliters of water. Several tests are taken at some beaches; warnings are posted when that level is exceeded in more than half the samples. Numbers in parentheses show how many samples were taken. The test doesn't register levels over 4,000. (> means "greater than.")

Beach	Average coliform count	Maximum coliform count
Sandy Beach, Winchester (14)	10	40
Prearce Lake, Saugus (14)	15	95
Prekem Pond, Saugus (14)	18	150
Swampscott Beach (15)	21	>4000
Stacey Brook Outlet, Swampscott (15)	10	>4000
Kings Beach, Lynn-Swampscott (16)	22	>4000
Lynn Beach (15)	22	2000
Nahant Beach (43)	14	378
Revere Beach (43)	13	282
Short Beach, Winthrop (14)	8	32
Winthrop Beach, Winthrop (8)	13	138
Yirrel Beach, Winthrop (8)	8	48
Constitution Beach, East Boston (52)	35	2080
Pleasure Bay, South Boston (15)	30	242
Carson Beach, South Boston (54)	45	4000
Malibu Beach, Dorchester (16)	16	275
Tenean Beach, Dorchester (39)	52	2260
Wollaston Beach, Quincy (66)	88	>4000
Nantasket Beach, Hull (55)	12	148
Lovell Island, Boston Harbor (7)	13	268
Houghton's Pond, Milton (14)	9	40

Source: Metropolitan District Commission

State staff chart

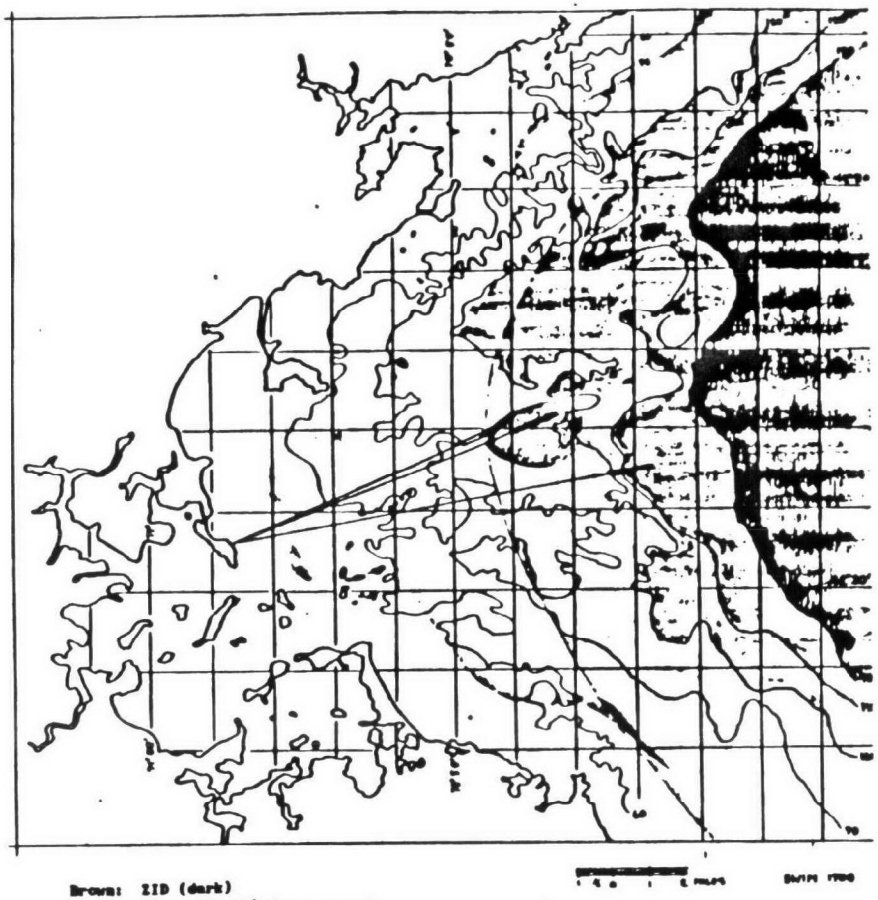
May 16, 1988



Brown: ZID (dark)
Plume (light) for one week
Green: Tidal reach, one tidal cycle
Blue: 120 foot contour (light)
140 foot contour (medium)
180 foot contour (dark)

SITE 6

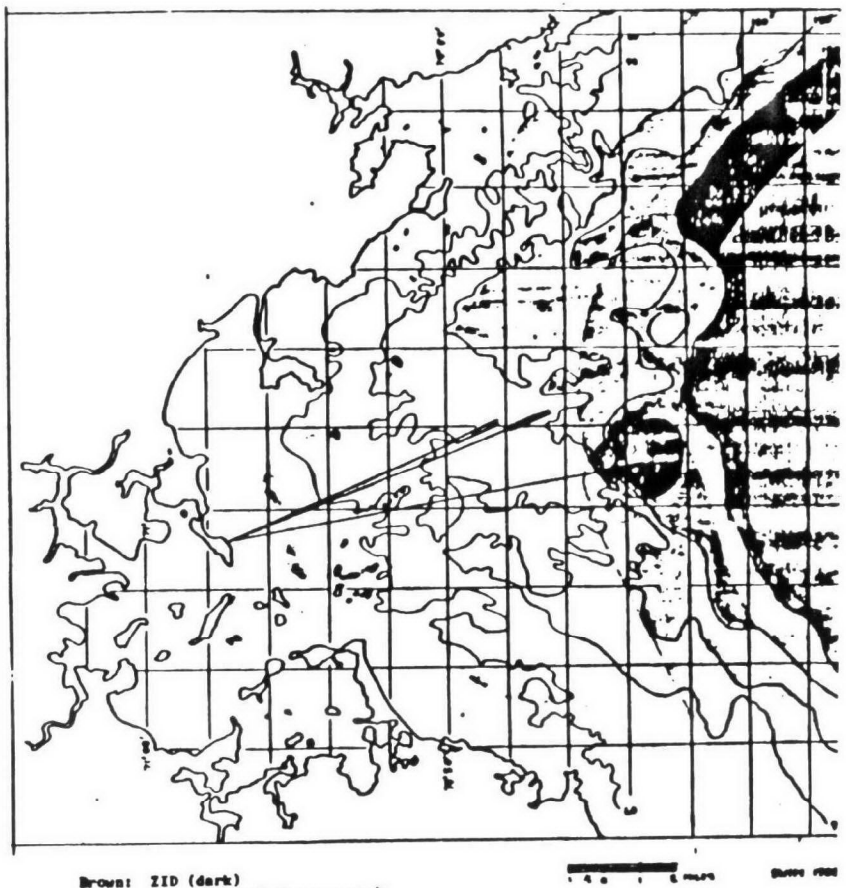
Please see enclosed explanation.



Brown: ZID (dark)
Plume (light) for one week
Green: Tidal reach, one tidal cycle
Blue: 120 foot contour (light)
140 foot contour (medium)
160 foot contour (dark)

Please see enclosed explanation.

SITE 5



Brown: ZID (dark)
Plume (light) for one week
Green: Tidal reach, one tidal cycle
Blue: 120 foot contour (light)
140 foot contour (medium)
160 foot contour (dark)

Please see enclosed explanation.

SITE 6

Nahant SWIM, Inc.
Safer Waters in Massachusetts

May 31, 1988

COLOR MAPS

by Kevin Jaegaard, A.I.A.

SWIM, in previous comments by Dr. William N. Dennen, has recommended that physiographic determinism be used to aid in selecting an outfall location. The accompanying figures illustrate the benefits of this approach and also demonstrate the superiority of Site 6.

The three color illustrations show the effluent plume for Sites 4, 5, and 6. The graphic expression of the plumes is based on plotting the zone of initial dilution (ZID) on the particle tracks g...erated by the TEA-HL model. The ZID diameter represents the initial dilution which occurs during the first few minutes as the effluent mixes with the sea water. The rate of dilution then becomes very gradual and widens slowly over a period of days. During this secondary dilution period, the effluent dispersal is significantly affected by tides and currents. A useful analogy is smoke emitting from a smokestack. The TEA-HL model simulates the track over tidal cycles during a seven day period. The length of the tan areas in the figures illustrates the distance the effluent travels over a seven day period for both a northern and southern tilt. The longer plumes indicate a faster dispersal and dilution. The Site 6 plume is substantially longer than the other and goes off the chart on the southern drift.

The green line indicates tidal reach. It can be seen that the Site 4 plume is within the tidal reach of the North and South Shores. The TEA-HL model has exhibited disagreement with real data collected

SWIM, c/o Northeastern University Marine Science Center, East Point Nahant, MA 01908
Phone (617) 581-0075 or (617) 581 1424

(more)

using current meters on the order of 10 percent. This level of accuracy may mean that the Site 5 plume could also be within the tidal reach.

The Gulf of Maine Intermediate Water is a cold layer of water which generally begins 100 to 120 feet below the surface. This layer can act as a conduit to transport the plume off shore and prevent it from rising to the surface. The three shades of blue indicate depths of 120, 140 and 160 feet or deeper. Site 6 is 150 feet deep, which provides at least a 30 foot zone below the pycnocline. The figure for Site 5 shows that the Gulf of Maine Intermediate Water will have a marginal impact at this diffuser location.

The MWRA could certainly refine these illustrations and also plot overlays for the other factors recommended by Dr. Dennen in the attached paper, "Outfall Site Selection." The beauty of this system is that evaluation can be immediate, without wading through pounds of text and tables.

OUTFALL SITE SELECTION

William H. Dennen

The large number of parameters to be evaluated in the selection of an outfall (diffuser) site and the fact that it will underlie a considerable length of Massachusetts Bay suggests that point by point analysis to obtain the optimum location will be both onerous and subject to errors in the correlation of data. A modification of the method of "physiographic determination" is recommended as a means of assessing the interaction of all of the pertinent variables on an areal rather than point basis. The following description of the method is excerpted from Environmental Geology, 3rd ed., 1982, by E.A. Keller, Charles E. Merrill Publishing Company, Columbus, Ohio.

Physiographic Determinism

An interesting graphic method of site selection based on physiographic determinism, or designing with nature is structured such that the appropriate site literally selects itself (12) The method uses physical, social, and aesthetic data, and the objective is to maximize social benefit while minimizing social cost

The actual methodology in selecting a site or a route for a highway, regional development plan, or other land use involves selecting a group of factors for physical and social values For each factor, three or more grades of the value are mapped on transparencies in tones for clear to dark grey The darker tones indicate areas of conflict where physical conditions are not appropriate or social values are in conflict with the desired land use When the transparencies (one for each factor) are superimposed upon one another the darkest areas represent those places with the greatest physiographic obstructions and social costs and the lighter areas represent places where the physical limitations (construction costs and social costs) are least By this method, the best sites emerge as the lightest areas on the set of superimposed transparencies No matter how dark the entire area may look, there will always be relatively lighter areas (12)

The method of determining the lowest social co of land use in site selection discussed above is innov tive in addressing social values as well as tradition physical-economic values but it is not above criticism It is very subjective in that the person doing the eva uation selects the factors and thus essentially builds th formula used in the evaluation For example in evalu ating the siting of a highway route the evaluator ma decide that property values are important and that th darker tone should be assigned to high property value This decision essentially prescribes that the highw should be routed away from people and wealthy pe ple most of all a point some planners would vigorous argue against (8) Another criticism is that all factor whether physical or social values are weighted th same That is a geologic factor such as suitability of te for foundation material or susceptibility to erosion weighted equally with social values such as scen value or recreational property value Regardless o these shortcomings the method of physiographic de terminism in evaluating both physical economic factor and social values is a step in the right direction (8)

8 WHYTE, W H 1968 *The last landscape* Garden City, New York Doubleday

12 McHARG, I L 1971 *Design with nature* Garden City New York Doubleday

The parameters described by Keller are, of course, inappropriate to outfall siting but would be replaced by the following plus others:

Geotechnical parameters	Data source
Overburden thickness	Seismic measurements, coring
Percent glacial sediment in overburden (glacial deposits may be bouldery thus increasing drilling costs)	
Rock thickness above tunnel line	
Cost data	Calculation
Hydrographic parameters	
Water depth	Charts and soundings
Sedimentation/scour	Piston coring
Zone of initial diffusion	Calculation
Average current set	Neutral floats, current meters, calculation
Depth to Gulf of Maine intermediate waters	Temperature profiles
Salinity	Water sampling
Biologic parameters	
Shell fisheries	
Fin fish fisheries	
Dissolved oxygen	Water sampling
Background toxic level	

91 High Street
Mahant MA 01908
11 May 1988

Dear Secretary Hoyte:

Site A has been suggested as a better location for the proposed ocean outfall than sites 4.9 and 9 by the Mahant-based SWIM group, and their position is supported by town and citizen groups around the entire circumference of the Bay. At this time, the publicly expressed interest of EPA in having this site studied appears to be receiving lip service only from MWRA and its consultants.

I have reviewed available materials on the physical conditions at the EPA-recommended outfall study area centered about 5 miles from Mahant and 7 miles from Hull. From a geotechnical point of view, the better conditions for the construction of a diffuser are in the southern half of this area. Indications from oceanographic observations and computer modeling are that effluent dispersal will be improved significantly, and perhaps dramatically, as the outfall site is displaced seaward.

I propose, and have the endorsement of SWIM, that the EPA-recommended study area be modified in shape by halving its north-south and doubling its east-west dimensions; the western and southern bounds to coincide with the present western (AC) and southern (CD) bounds of the EPA rectangle. This action would:

1) Include the most geotechnically favorable portion of the area.

2) Extend the study area seaward into depths with Gulf of Maine intermediate water.

3) Include Site A.

4) Involve an identical area and hence the same amount of geophysical work and drilling as is currently planned.

Sincerely,

William M. Dennen, PhD

Secretary Jesse E. Hoyte
Executive Office of Environmental Affairs
Att: MEPA 06136

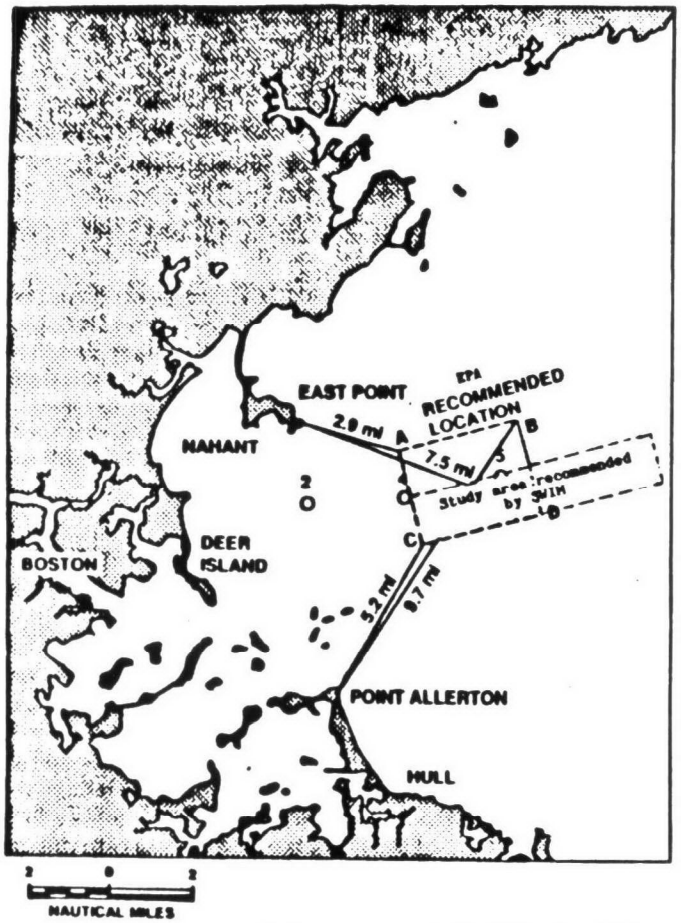
The gray scale employed can combine both parametric and non-parametric data. For example, "depth greater than 130, 130-120, less than 120 feet" or a judgemental scale "acceptable, marginal, unacceptable".

In use, overlays of the parameters can be readily added or subtracted, weighting may be accomplished by varying the density of the gray scales or use of multiple overlays of the same parameter. The procedure is amenable to computerization given digitized input, an appropriate algorithm, and graphic display.

A presentation of this kind would go far to provide all interested persons - MWRA staff and management, consultants, representatives of EPA, MEPA, CZM, etc., and concerned citizens with an understandable overview of the solution obtained and how it was reached.

(Adapted from EPA handout
at Revere Public Meeting,
April 19, 1988)

RECOMMENDED LOCATION OF THE DEER ISLAND WWTP DISCHARGE



Study area recommended by SWIM - May, 1988

Please include at DSEIS Comment. 75

KEVIN WARREN JANGAARD

372 Nahant Road
Nahant MA 01908
May 10, 1988

Mr. James Hoyte
Secretary
Executive Office of Environmental Affairs
100 Cambridge Street 20th Floor
Boston MA 02202

Reference: MEPA 6136 Environmental Impact Report MWRA Secondary Treatment Facilities Plan

Dear Secretary Hoyte:

I have reviewed Ms Elwood's letter of April 26, 1988 to Polly Bradley in which he states that the "Sapphire Necklace" comments were not included in Volume VIII of the Secondary Treatment Facilities Plan because it's format did not lend itself readily for this purpose.

Judging from the wide variety of comment formats contained in Volume VIII, I find this hard to believe. Unfortunately, the

CDM summary of responses in many cases do not adequately respond to the SWIM document.

The following comments contained in portions of the "Sapphire Necklace" to which I have contributed have not been adequately adressed. The numbering system used in Mr Elwood's letter has been adopted to allow comparison.

4 How can the outfall be used for a four year period when the water quality standard is not achieved? The MWRA has stated in their response that they are "exceeding" EPA Water Quality Criteria which are "guidelines" rather than "violations" of specific regulatory criteria." This is the wrong response, they should meet the criteria by building an acceptable facility.

5 A site further out (site 6) with a potential for meeting all criteria, with substantially different qualities, should be evaluated. The MWRA has a three part response - The MWRA states that it does not feel bound by EPA guidelines, therefore a more distant site need not be considered for ability to meet standards and guidelines - The construction cost would increase dramatically

and the construction schedule would exceed the court mandated deadline - Site 4 5 and 5 are sufficiently onto the Bay to provide adequate protection of marine life and human health. These responses have several short comminings. In the Boston Harbor Wastewater Conveyance Systems DSEIS Site 6 is shown to be superior during the period of primary treatment. As far as the construction cost and schedule, the MWRA does not address how the costs and construction schedules could deviate from their current estimate. Until geotechnical studies are complete there is no certainty that the court schedule could be maintained with any of the schemes. The MWRA does not address the small portion of the over all project cost represented by the outfall. They consider a 2% portion of the project to be considered "significant" when evaluating water quality for the next century. As far as any "certainty" that marine life and human health would be protected, see the next item

6 Site 6 would be well within the Gulf of Maine Intermediate Water, which would keep more of the plume in the deeper water and transport it further from shore. The MWRA says that

there is not available data that might describe the Maine Intermediate Water in the Bay, therefore no conclusions can be made as far as deep water transport of the plume from site 6 which is in 150 feet of water. Yet, in the DSEIS, Site 5 is claimed to be within the Maine Intermediate Waters, at an average depth of 90-95 feet. If there is so little data available, how is protection of the environment be assured?

7 See cost comment portion of item 5. In addition, delays due to an unsuitable location being chosen would cause inflation increases which would soon surpass the cost of the additional out fall length.

8. The out fall will outlast the rest of the facility. The MWRA statement that the amortization life expectancy is 30 years does not address the comment.

9 The MWRA did not address evaluation of tunnelling at a different heading.

10 The MWRA did not address evaluation of a proposed graded elevation closer to the prevailing site elevation of 140 MDSD, and the impact on outfall hydraulics.

60 There is no evaluation of impact of the outfall on the economic life of the Bay.

61 The MWRA construction cost estimates show an unusual range of costs per mile. They still do. On page 6-554 of Volume VIII the MWRA says that due to variations in bedrock elevations, the diffuser cost at site 4.5 is $12 million less than site 4 and $16 million less than site 5. The cost for the tunnel is fairly constant at $32 million a mile. Yet they estimate 6 to cost $82 million more than site 5. If the additional two miles of length costs $64 million, they are estimating the diffuser to cost $18 million more than site 5, even though there is less bedrock to drill through at site 6.

62 Response accepted.

The MWRA did not comment on the financial projections of the cost per user in the "Sapphire Necklace" — less than $14 per person spread over 11 years. Perhaps they do not want to address this inexpensive insurance policy for a cleaner Bay.

Very truly yours

Kevin W. Jengaard

EPA Concept of Resources of the North Shore
Lobster fisheries completely ignored
Shellfish map entirely inaccurate
Finfish not included at all

FIGURE 4.2.5.e. COMMERCIAL FISHING RESOURCES

From EPA Draft Supplemental Environmental Impact Statement
Boston Harbor Wastewater Conveyance System - April, 1988

SMITH Note:

Missing: Tudor Beach, all small Nahant beaches
Devereux Beach, all small Marblehead beaches
Fishermen's Beach, all small Swampscott beaches
All Saltmate and Chesabet Beaches
And to top it all BEVERE BEACH is missing.

FIGURE 4.2.5.4. BEACHES, SHORELINE PARKS, AND ISLAND PARKS

From EPA Draft Supplemental Environmental Impact Statement
Boston Harbor Wastewater Conveyance System - April, 1988

From "Assessment at Mid-Decade"
Massachusetts Marine Fisheries
November, 1985

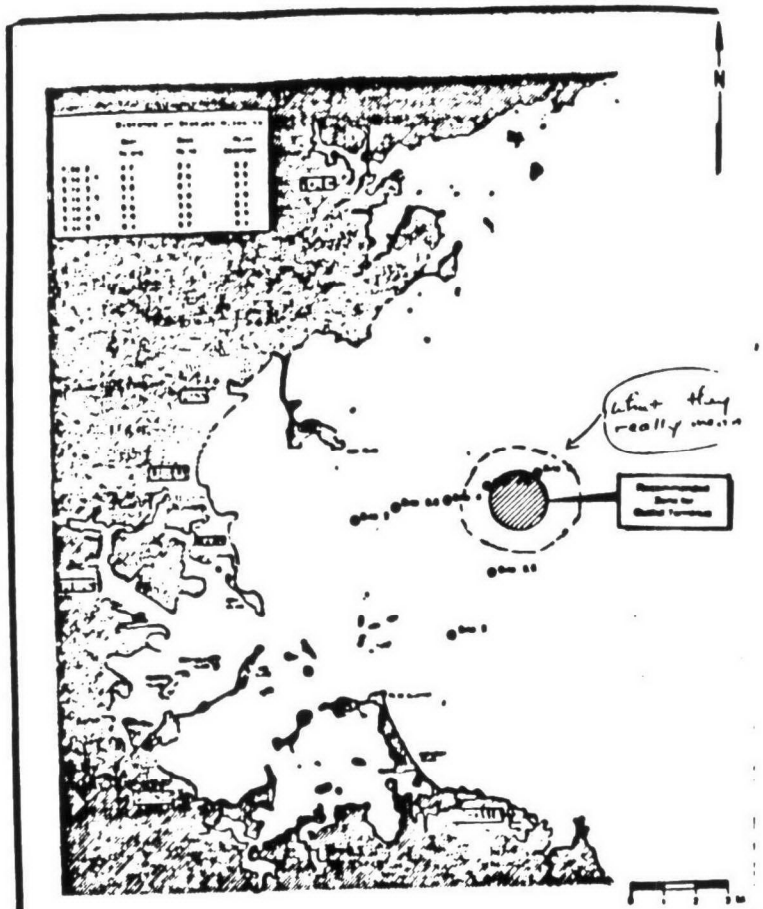
Table 8. Status of productive shellfish areas in [illegible] (acres)

NORTH SHORE

	Productive	Open	Closed	Restricted
Salisbury	228.0	0	209.0	0
Newburyport	52[illegible].0	0	[illegible]	[illegible]
Newbury	233.0	138.[illegible]	129.0	1[illegible]
Rowley	[illegible]	[illegible]	0	0
Ipswich	833.0	633.0	0	200.0
Essex	340.7	340.7	0	0
Gloucester	800.2	602.0	37.7	227.7
Manchester	16.7	0	16.7	0
Beverly	87.0	0	87.0	0
Danvers	98.0	0	98.0	0
Salem	228.0	0	191.2	37.1
Marblehead	94.0	0	0.0	94.0
Nahant	42.0	0	42.0	0
Lynn	98.0	0	98.0	0
Saugus	223.1	0	223.1	0
Revere	[illegible]8.2	0	[illegible]3.0	32.0
	3,826.0	1,423.0	1,879.0	524.0

BOSTON HARBOR

	Productive	Open	Closed	Restricted
Boston	1,883.0	0	1,[illegible]1.0	2[illegible].0
Milton	19.0	0	18.0	1
Quincy	1,230.0	0	232.0	998.0
Hull	336.0	0	22.0	333.0
Braintree	42.0	0	0	42.0
Weymouth	380.0	0	54.0	326.0
Hingham	344.0	0	10.0	334.0
Hingham	92[illegible].7	0	[illegible]4.[illegible]	7[illegible].7
	4,890.8	0	1,[illegible]28.4	3,[illegible]84.0
Total		1,423.0	3,[illegible]07.0	3,[illegible]78.0
Grand Total			8,[illegible]80.0	



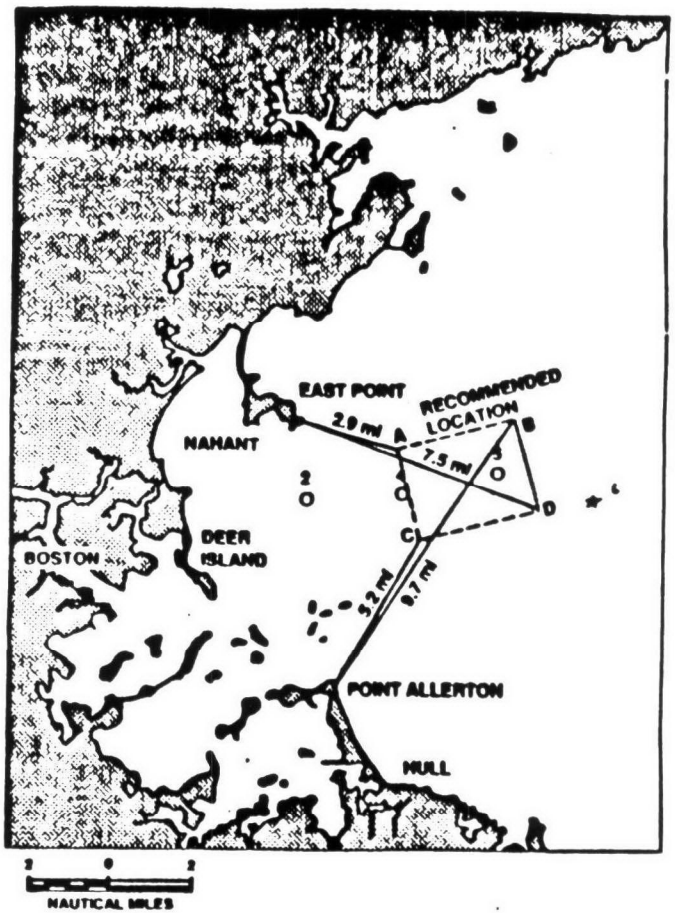
MASSACHUSETTS WATER RESOURCES AUTHORITY

FIGURE 1.3-1
RECOMMENDED OUTFALL LOCATION

MWRA Handout at Public Meeting, November 23, 1987

(Environmental Protection Agency handout
April 19, 1988 Public Meeting, Revere)

RECOMMENDED LOCATION OF THE DEER ISLAND WWTP DISCHARGE



Nahant SWIM, Inc.
Safer Waters in Massachusetts

May 11, 1988

The Honorable James S. Hoyte
Secretary of Environmental Affairs
100 Cambridge Street
Boston, MA 02202

Re: MEPA #6136

Dear Secretary Hoyte:

I am submitting the enclosed material as MEPA comments. Included are letters and comments from citizens and officials, from scientists and engineers, newspaper reports and the SWIM report, "The Sapphire Necklace," all urging that you require the MWRA to select Site 6 for its sewage outfall.

MOST OF THE FISH, LOBSTER, AND SHELLFISH COME FROM SHALLOW WATERS. THIS IS BECAUSE BELOW A CERTAIN DEPTH THE SUNLIGHT DOESN'T REACH ENOUGH TO SUPPORT RICH LIFE. SITE 6 IS BEYOND THE DEPTH WHERE THE RICHEST LIFE OCCURS.

TIDAL CURRENTS PREDOMINATE NEAR SHORE. THE MWRA AND EPA MODELS SHOW CURRENTS GOING EVERY WHICH WAY NEAR SHORE. AT SITE 6, IN THE GULF OF MAINE INTERMEDIATE WATERS, THE EFFLUENT WOULD BE BEYOND TIDAL REACH. THIS WOULD PROTECT THE SHORES AND THE ECOLOGY.

Recognizing that until Site 6 is studied, it cannot be selected, at this time I request that a complete study of Site 6 -- current studies, salinity and temperature profiles, biological studies, geotechnical studies, etc -- be made. There is time for this: it will take at least 2 years to get the tunnel boring machine once it is ordered. After the study is made and a final site selected, there should be an environmental review.

There should be an environmental review after site selection in any case, because the MWRA circle and the EPA rectangle are so enormous. Even the MWRA said that Site 8 was not acceptable. Please review the comments made by John Gall when he presented the results of the Camp Dresser & McKee study to the MWRA Board of Directors. He was eloquent concerning the inadequacies of Site 8. Yet the outfall as proposed could come almost to Site 8.

I request accelerated secondary treatment, preferably with primary and secondary plants built simultaneously. Enclosed as a resubmission is SWIM's position paper on accerated secondary treatment.

I urge you not to permit the Massachusetts Water Quality Standards to be degraded.

As I said in an earlier letter, the MWRA did not adequately respond to "The Sapphire Necklace." It's after-the-fact digging through the pages to see what it could find that it could call a "response" is not sufficient. I request that a serious response to our serious report be given. Our scientists and engineers are attempting to go through the disjointed "response" in John Elwood's letter of April 25, 1988, but having had only two weeks to study it and having other professional responsibilities, some of SWIM's responses to John Elwood's reponses to "The Sapphire Necklace" will be about two days late. We will hand deliver them on or about Friday the Thirteenth.

Jamie, I implore you as Secretary of Environmental Affairs for the COMMONWEALTH OF MASSACHUSETTS, please protect MASSACHUSETTS Bay, not just Boston Harbor.

You have been around long enough to know that plans and promises go oft astray. The outfall, once built, will last 100 years. Every other part of the plan can be changed, redone, improved. We're stuck with the outfall.

Thank you for all your considerations and kindness, for talking to SWIM and listening to us. But now comes the moment of truth...GIVE US SITE 6!

Sincerely yours,

Polly Bradley

Polly Bradley, President
Nahant SWIM, Inc.

SWIM, c/o Northeastern University Marine Science Center, East Point, Nahant MA 01908
Phone (617) 581-0075 or (617) 581 1424

Nahant SWIM, Inc.
Safer Waters in Massachusetts

May 9, 1988

The Honorable James S. Hoyte
Secretary of Environmental Affairs
100 Cambridge Street - 20th Floor
Boston, Massachusetts 02202

Re: MEPA # 6136

Dear Secretary Hoyte:

In reply to my letter of April 18, 1988, pointing out that the Massachusetts Water Resources (MWRA) had not included SWIM's report, "The Sapphire Necklace," in its public participation and responsiveness document, the MWRA sent a list of pages in the MWRA's Final Environmental Impact Report on which there are comments related to SWIM's report, "The Sapphire Necklace."

There are several reasons why SWIM thinks this approach is inadequate:

(1) Many of the answers are vague and general on points where SWIM's comments were specific and detailed. For example, there are inadequate comments on "Scientific Study of Sites 5 and 6" and "Gulf of Maine Intermediate Water" (Pages 32 to 43 of "The Sapphire Necklace."

(2) Some answers only touch on the issues peripherally. For example, the answer to our questions about additional nutrients to the nuisance alga Pylaiella littoralis doesn't indicate a full understanding of the issue. (Page 22 of "The Sapphire Necklace".)

(3) Some of our points were not answered at all. For example, there are not comments on all the items listed in the section "Impacts of Sewage at Site 5." (Pages 19 through 31 of "The Sapphire Necklace.") Some of these, such as the request for an assessment on whether the discharge would comply with the State and the Federal Antidegradation Provisions" (Page 21) are extremely important.

(3) SWIM will have had only from April 26 to May 11 to respond to the MWRA responses, less than the required MEPA review time. Others who received the FEIR cannot respond at all.

(4) The other people who have received the Draft Environmental Impact Report received neither SWIM's comments nor the MWRA list of pages, but only an inadequate summary of the contents of "The Sapphire Necklace": a summary of my oral comments at the December 16, 1987 MWRA meeting and my letter of January 20, 1988 which mentions some of the points in "The Sapphire Necklace" and adds a few more. From these comments, no one reading Volume VIII or the other volumes of the FEIR can get any in-depth understanding of SWIM's comments. In other words, SWIM's comments are essentially not being given public review.

What the MWRA has done is to take all the disjointed, miscellaneous odds and ends of comments and respond to them...but when there was a coherent, well-thought-out, scientifically based comment, it responded in a disjointed and inadequate way.

Sincerely yours,

Polly Bradley

Polly Bradley, President
SWIM

cc: David Shepardson, MEPA
Congressman Nicholas Mavroules
Paul Levy, MWRA
Michael Deland, EPA
Board of Selectmen, Town of Nahant
Peter Shelley, Conservation Law Foundation
Dr. William N. Dennen
Kevin Jarnard, ASA
Dr. Michael P. Manning
Michael J. Meagher, Esq.
Dr. Kenneth P. Sebens
Robert Vanderslice, CPA
Dr. Jon Witman
William J. Coffey

SWIM, c/o Northeastern University Marine Science Center East Point, Nahant, MA 01908
Phone (617) 581-0075 or (617) 581-1424

SWIM - Nahant Citizens Committee for Safer Water in Massachusetts

c/o Northeastern University
Marine Science Center
East Point, Nahant, MA 01908
April 14, 1988

The Honorable James S. Hoyte
Secretary of Environmental Affairs
Commonwealth of Massachusetts
100 Cambridge Street
Boston, MA 02202

Re: 86136 (MWRA)

Dear Secretary Hoyte:

I would like to point out early in the MEPA review process for the MWRA Secondary Treatment Facilities Plan that there has been no reply to SWIM's comments in "The Sapphire Necklace," which has been omitted from Volume VIII, the public participation and responsiveness document.

"The Sapphire Necklace" was presented to the final body of MWRA at a public meeting on December 16, 1987, and at that time I personally handed a copy to David Shepardson of MEPA, saying, "This is now official MEPA comment."

Also in my MEPA comment letter of January 20, 1988, I said, "Please include the attached additional comments and SWIM's report 'The Sapphire Necklace: Proposal for Evaluation of Site 6, Nine Miles from Nahant and Hull,' as an integral part of this comment on MEPA #6136."

In the additional comments on Volume V (Effluent Outfall) attached to that letter, I wrote, "SWIM's report, 'The Sapphire Necklace: Proposal for Evaluation of Site 6, Nine Miles from Nahant and Hull,' is hereby submitted as an integral part of our comment on Volume V." Another copy of "The Sapphire Necklace" was included. Although the letter of January 20 was photocopied several times in Volume VIII of the Final EIR, neither the letter nor the additional comments were included in the section of Volume VIII dealing with Volume V of the EIR. Volume V of the Final EIR did not address the questions raised in "The Sapphire Necklace."

I would also like to point out that in your Certificate on the Draft Environmental Impact Report (January 27, 1988), you said, "The Final EIR should also include a determination of any potential marginal benefits of discharging at a more remote site, including an analysis of the magnitude of change in contaminant concentrations using existing data and models if possible." This directive was not followed, since the data in "The Sapphire Necklace" was not used or commented on in the Final Environmental Impact Report.

"The Sapphire Necklace" was the result of many months of volunteer work by many dedicated professionals. SWIM has worked actively within the process and has made more substantive comments on the MWRA secondary treatment plan and in particular on the effluent outfall that any other group. Our work was done without any paid staff, by a generous and talented group of marine biologists, engineers, mathematicians, accountants, architects, lawyers, writers, artists, and concerned citizens who care deeply about leaving a legacy of clean water and a safe environment to future generations. Our valuable input should not have been ignored.

The MWRA's lack of comment on "The Sapphire Necklace" in the Final Environmental Impact Report may negate the MEPA public review process with regard to the Deer Island Secondary Treatment Plan.

Sincerely yours,

Polly Bradley, President
SWIM

cc: David Shepardson, MEPA
Congressman Nicholas Mavroules
Paul Levy, MWRA
Michael Deland, EPA
Board of Selectmen, Town of Nahant
Peter Shelley, Conservation Law Foundation
Dr. William M. Adams
Kellie Jenkins; AIA
Dr. Michael P. Manning
Michael J. Mauser, Esq.
Dr. Kenneth P. Sebens
Robert Vanderslice, CPA
Dr. Jon Witman
William J. Coffey

New England Aquarium

P34

May 31, 1988

Michael Deland
Administrator
U.S. EPA, Region I
JFK Federal Building
Boston, MA 02203

Attn: David Tomey
Water Management Division

Re: Draft Supplemental EIS, Boston Harbor Wastewater Conveyance System

Dear Mr. Deland,

The New England Aquarium has reviewed EPA's Draft Supplemental Environmental Impact Statement for the Boston Harbor Wastewater Conveyance System (SEIS). Several issues emerged from our review. We feel there are important questions to be answered regarding water quality impacts and noncompliance with Water Quality Criteria.

Evaluations and conclusions reached in the federal SEIS are generally consistent with those reached in the state Facilities Plan/EIR on the Effluent Outfall (FP/EIR). We responded to these conclusions in comments to MEPA, which are attached. We respectfully request that EPA review the attached document re: the effluent outfall, and respond to each of the questions/issues raised.

We offer here some additional comments:

- The SEIS summarizes available physical oceanography data, current/projected estimates of water quality parameters, characterization of bottom sediments, listings of biological species, projected impacts on commercial fishing operations, and tabulation of resources in the proposed outfall areas. However, there is a great deal of biological data, contained in MWRA's FP/EIR (Volume V and associated appendices, December, 1987) which the SEIS appears to have ignored.

For example, Massachusetts Surface Water Quality Standards for Class SA waters state that nutrients shall not exceed the site-specific limits necessary to control accelerated or cultural eutrophication. Data were included in the FP/EIR (supplied by Dr. Theodore Smayda, University of Rhode Island) that specifically addressed the issue of effluent-spurred shifts in algal species composition. Yet the data were not mentioned in the

SEIS, and the question of changes in species composition (and potential food chain effects) not sufficiently addressed.

In addition, data on fish histopathology, fish body burden, and contaminant bioaccumulation in marine mussels, while not available in time for the production of the state's facilities plan/environmental impact document, are currently available and should be included in the SEIS.

- It is predicted that, once secondary treatment is in effect, the seawater at Site 5 will still exceed five Public Health Criteria at the one-in-one million risk factor (PCB's, arsenic, aldrin, 4,4 DDT, and heptachlor), and will exceed two Public Health Criteria at the one-in-one hundred thousand level (PCB's and arsenic). The SEIS does not address the question of whether or not steps will be taken to ensure that federal Water Quality Criteria will be met. What specific measures can/will be taken to achieve compliance?

Can ongoing point-source reduction of toxics in the MWRA system, the Lynn system, and the South Essex Sewerage District, along with reduction of inputs into the Merrimack River, lead to compliance with Water Quality Criteria? Is progress being made with curtailment of these inputs?

The Aquarium believes these points are especially important for the EPA to address, given this agency's regional authority and oversight responsibility.

- In view of EPA's denial of the state's 301(h) waiver application, reasons for denial of permission to discharge primary effluent in Massachusetts Bay are still valid. Four to five months of primary discharge is sufficient time to degrade water quality and adversely impact marine resources. While the impacts of conventional pollutants should be reversible, temporary impacts may nevertheless be unacceptable.

Accumulation of certain toxics under primary discharge may produce lasting effects. As many as five Aquatic Life Criteria and five Public Health Criteria would be exceeded by interim primary discharge in the region bounded by Sites 4 and 5. One Aquatic Life Criterion and, as noted above, two Public Health Criteria would be exceeded by secondary discharge. These exceedences place in question the adequacy of the recommended site, in absolute terms, for both secondary and interim primary discharge.

- Like the FP/EIR, the SEIS lacks specificity as to the ultimate fate of the particulates that will be released by the new outfall. Where will the pollutants be deposited under varying tidal conditions and current flows?

Again, the Aquarium requests that the EPA respond to each of the points contained in the attached comments to the state on the effluent outfall, noting especially our concerns with regard to compliance with Water Quality Criteria.

The Aquarium believes that because the Boston Harbor case is so large in scale, it is of national importance as a model for gaining control over coastal pollution. While we recognize that huge financial burdens are involved, we also feel it is critical that the most cautious path possible be chosen in solving these pollution problems. It would be the most ironic of tragedies if we simply moved the harbor's present pollution further offshore, to the long-term detriment of the tremendously valuable fishery areas of Massachusetts Bay, the Gulf of Maine and Georges Bank. Clearly, the EPA is best positioned to facilitate cautious, coordinated action to prevent and abate pollution of these regional resources.

The New England Aquarium is ready to aid EPA's decision-making needs in what ever way we can.

Thank you in advance for your response to these comments. If you have any questions about the issues we have raised, please contact me.

Sincerely,

Sharon E. Dean

Sharon E. Dean
Conservation Coordinator
New England Aquarium

SED
Enclosure

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page MI

New England Aquarium

May 11, 1988

Mr. James S. Hoyte
Secretary
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, MA 02202

Attn: Steven Davis, Director, MEPA Unit

Re: Deer Island Secondary Treatment Facilities Plan
Final Volume II: Facilities Planning Background
Final Volume III: Treatment Plant
Final Volume V: Effluent Outfall

Dear Mr. Secretary,

The New England Aquarium commends the Mass. Water Resources Authority (MWRA) for the thorough responses given to questions and concerns raised by the Aquarium and other parties during the comment period for the Draft Deer Island Facilities Plan. Our review has focused on the issues of flow and load management, the industrial waste program, unit processes design, the plant's ability to meet water quality standards under the full range of operating conditions, and environmental considerations surrounding siting of the effluent outfall in Massachusetts Bay.

We submit these comments on the Final Facilities Plan, Volumes II, III, and V, requesting further elaboration on certain points contained in our previous comments on the Draft Facilities Plan and raising some new issues. We ask that questions on issues outside the scope of the Facilities Plan be directed to the appropriate agency as part of the Secretary's Section 61 findings, pursuant to the Massachusetts Environmental Policy Act. While we strongly support the MWRA's plan for secondary treatment facilities on Deer Island, we stress that successful implementation of the Plan and attainment of water quality goals in Boston Harbor and Massachusetts Bay will require attention to these "peripheral" issues.

Volume II, Facilities Planning Background

Flows and Loads:

- Mandatory mitigation measures that have been federally imposed through MEPA and state imposed through MEPA Section 61 Findings are conditions of all federal construction grants awarded to the MWRA (Final Facilities Plan, Volume II, Section three, pp. 41-43). These "mandatory" commitments, in contrast to mitigation commitments set forth by the MWRA to alleviate impacts associated with the construction and operation of the Deer Island plant, do not appear to include flow and load commitments. Is it the Secretary's intention to make adherence to flow and load commitments a qualification for state grants?

We recommend that the awarding of state grants for expansion of treatment capacity (satellite facilities or new connections) be made conditional upon exhaustion of flow management techniques and pollutant minimization measures. Such techniques/measures include infiltration and inflow management, water conservation, true-cost pricing of sewer services, source reduction and pretreatment, and strict adherance (locally and regionally) to integrated land use/wastewater treatment plans.

- Present and future wastewater treatment needs must be met through adherance to wastewater treatment planning goals and land use management goals. Such goals were formally established through the federal Clean Water Act's Section 208 and 303e planning processes instituted in the 1970's. Section 208 and 303e Plans for the metropolitan Boston region should be updated and incorporated into current planning efforts for the MWRA district water and sewer system, and subsequently implemented and enforced by the MWRA.

- The Aquarium requests that the MWRA and other environmental agencies demonstrate progress to date regarding integration of wastewater treatment planning with land use planning. Do the various permitting programs and long-range planning for wastewater treatment capacity needs reflect the importance of integrating, rather than segregating, the two planning processes on an ongoing basis?

- We recommend that flow and load "trigger" levels be established as benchmarks for initiating planning for management of excess flows and loads. Actual noncompliance with water quality standards should not be relied on as triggers. Rather, trends toward violation of industrial sewer use permits and of MWRA's NPDES permit should be recognized early enough to allow for planning and implementation of measures that will avert noncompliance.

- Contingency plans to manage excess flows and loads should be prepared by the MWRA as soon as possible. Such plans might include tighter controls on sewer use permitting and infrastructure hook-ups, and focused effort on source reduction and pretreatment. Wastewater treatment capacity (in terms of flows and loads) must never be exceeded in the district.

- Estimates of flows for the new treatment facilities allow for infiltration and inflow at existing estimated levels. As pointed out in the MWRA Interim Infiltration/Inflow (I/I) Management Program Plan, the assumption that I/I flows will not increase is based on the additional assumption that I/I reduction will be required. Because existing systems can be expected to deteriorate and system expansion will occur, I/I reduction must be effective in order to maintain current flows. We strongly recommend that a long-term I/I reduction program which produces verifiable results be developed and implemented by MWRA as soon as possible.

- Sewer connections less than 2000 gal./day are permitted by local communities. Are communities complying with the capacity limits of their infrastructure? If not, MWRA should facilitate increased enforcement in this area.

- The Final Facilities Plan, Volume II, does not contain information on what, if any, provisions are being made for stormwater flows in the South System during storms greater than the "one year-six hour" storm. In portions of the South System, the storm runoff from the one year-six hour storm may cause backups in the MWRA interceptor sewers, resulting in sewer surcharging. Alternative means of managing excess flows in the South System should be explored.

Industrial Waste Program:

- The Aquarium commends the MWRA in its expansion of the industrial pre-treatment program. However, not enough attention has been given to source reduction. MWRA should commit to expanding agency efforts in promoting source reduction of toxic wastes. Emphasis should be placed on positive incentives, rather than a strictly regulatory approach. A successful source reduction program will achieve for the MWRA improved compliance with discharge limits and consistent maintenance of water quality standards. This "preventive" approach to wastewater management will provide insurance against the ambiguous federal Clean Water Act discharge standard of "no toxics in toxic amounts".

- The Final Facilities Plan, Volume II, does not specify which chemicals listed on the federal and state Hazardous Substances List (the "prohibited substances" list) are monitored. Monitoring for Hazardous Substances List pollutants should be contrasted with monitoring for Priority Pollutants.

- We underscore a recommendation we made in our comments on the Draft Facilities Plan, that MWRA establish a municipal in-

spection program for the purpose of monitoring wastewater quality at main interceptor points. By sampling and characterizing municipal effluent, each community's relative toxics contribution can be assessed. Coincident with this inspection program, MWRA must work to establish an aggressive household hazardous waste collection/reduction/source reduction program. Municipal sampling results can be used as a measure of each community's progress in reducing toxic discharges into the sewer system.

- The MWRA should also monitor for toxic constituents in septage, as part of the septage disposal inspection program. Characterization of septage would assist in measurement of community progress in household hazardous waste reduction.

- The MWRA has indicated that Category II industries are not permitted under the Sewer Use Permit program. How else are Category II industries regulated and toxic discharge limitations enforced?

- It is still unclear as to whether or not an industry is "in compliance" with sewer use permits only once it has achieved actual compliance with toxic discharge limitations and effluent standards. If permits stand merely as goals for which industries are required to show "good faith" toward compliance, MWRA must commit to strict enforcement of compliance schedules and deadlines for meeting toxic discharge limitations and effluent standards.

- We again offer the recommendation that the MWRA, as part of its enforcement program, require companies to prepare Toxics Usage Reduction Plans as a precondition of receiving a permit to discharge industrial wastewater into the district system. Companies which fail to prepare such a plan should be subject to added fees.

The MWRA should require that industrial sewer users continually move toward improving the quality of their effluent; simply meeting the permit standard should not be the final goal of sewer users. We recommend that MWRA consider implementing industrial sewer use fees based on quality of discharge, with fee reductions awarded to users which show progress in cutting back on toxics production/discharge. Apportioning sewer costs based on each industry's relative toxics contribution (measured according to each toxic's hazard/toxicity level and quantity) would be consistent with MWRA's plans to establish a rate structure based on water use. Financial incentives can be a valuable addition to the penalty system applied to permit violations.

- A critical step toward reduction of toxic discharges is accurate qualification and quantification of hazardous waste that is being produced in the MWRA district, and determination of the routes of disposal of these toxics. Types and quantities of toxics being disposed of in wastewater by "Very Small Quantity Generators", nonreporting dischargers, and households, in addition to major industries, must be assessed.

Volume III: Treatment Plant

The New England Aquarium emphasizes the importance of the Deer Island treatment plant meeting Water Quality Standards under the full range of operating conditions.

- What will be plant performance during periods when unusually high (i.e. greater than anticipated or projected) amounts of toxics enter the system? The Final Facilities Plan states that oxygen aeration systems have a proven track record in successfully handling large variations in organic loadings (Volume III, p. 10-81). What about metals and chlorides? Can the oxygen activated sludge system rebound from an infusion of these chemicals?

- The MWRA has stated that with the selector the secondary clarifiers have been designed to handle a Sludge Volume Index of 15, with a factor of safety of 1.4, for the design MLSS at peak flow. Design with a selector allows the secondary clarifiers to be reduced in size. But if the selectors should fail or operate at reduced efficiency (due to chemical upset, for example), what alternative measures can be taken to ensure proper sludge settling?

- As our comments on Volume II imply, the Aquarium believes that toxic chemicals in the wastewater are a major threat to effective treatment of district sewage. They are problematic in terms of meeting effluent standards, water quality standards, and in the production of residuals "clean" enough for land application and incineration. MWRA should therefore develop a Comprehensive Plan for identifying, controlling and reducing toxics loading -- from both point-sources and non-point sources -- to the wastewater stream. Such a Plan should further establish goals for reductions in total pounds of discharge for certain Priority Pollutants. Reductions in toxics discharge will have the effect of creating widening margins of safety against future permit violations. We maintain that this Comprehensive Plan should be incorporated into the Facilities Plan, and adopted as the Official Plan of MWRA's Industrial Pretreatment (/Source

Reduction) Program.

- The Aquarium is generally in support of the Accelerated Schedule for construction of the secondary treatment plant on Deer Island. However, we urge that water quality implications and impacts on the residuals program be assessed before proceeding with the new schedule.

Volume V, Effluent Outfall

- The New England Aquarium strongly maintains that the MWRA must make every effort to implement federal EPA Water Quality Criteria for listed organic and inorganic chemicals.

Scientific uncertainty surrounds assessments of chemical toxicities and relative impacts on humans and the environment, particularly as regards the effects of discharge at the proposed outfall location. Consequently, while the federal criteria are guidelines, not legally enforceable standards, compliance with them is important to maintaining water quality and to prevention of chronic or acute toxic exposures in marine life and humans.

The MWRA states, in its response to the Secretary's Certificate for Volume V:

> The view of EPA's Water Quality Criteria casting them as inviolable...is inconsistent with their regulatory application -- either as it is promulgated, or as practiced.

While this is true, the MWRA goes on to state that the 1987 amendments to the federal Clean Water Act require that the state develop numerical limits for pollutants for which the EPA has published criteria. Although the states are not required to adopt the EPA numerical criteria, it should be noted that the federal Water Quality Criteria reflect the latest scientific knowledge on environmental and human health risks. Massachusetts may choose to adopt standard values which are consistent with federal Water Quality Criteria. Therefore, at this time, we believe it is imperative that the effluent discharge comply with federal Water Quality Criteria.

- The Aquarium is critical of the state's guidance recommending: 1) use of the one-in-one million or one-in-one hundred thousand risks as goals, and 2) in cases where the background levels exceed criteria, that the discharge meet the existing background levels.

The risk analysis guidance is applied to 4,4'-DDT and aldrin, concluding that exceedences by these chemicals at the proposed outfall location are not a violation because the exceedences meet the goal of the risk criterion. In contrast, for arsenic and PCB's, the ambient levels cause the exceedences and are used as the discharge criteria, which the two chemicals meet. What is the rationale for application of different criteria to these chemicals?

In cases where the background levels exceed criteria, merely meeting the existing ambient levels in the discharge may effectively push the exceedences higher and higher over time. This is unacceptable. Ambient levels should clearly not be used as the criteria.

Again, the possibility exists that the federal Water Quality Criteria will be made legally enforceable state standards. We urge that choice of the outfall location consider this possibility.

- The Aquarium strongly concurs with state guidelines suggesting that where other contaminant sources interact to cause exceedences, the Division of Water Pollution Control develop a Waste Load Allocation for all discharges.

- According to the MWRA, in their response to the Secretary's Certificate, effluent toxicity tests show secondary treatment discharge will have no noticeable impact on marine organisms. This conclusion is based on toxicity tests performed on the most sensitive species, Chaetis parvula. Does this conclusion hold true for primary discharge? Also of concern is that the mercury exceedence of water quality criteria in both the primary and secondary discharges may result in cumulative impacts on fatty species, such as bluefish and benthic invertebrates.

- The Aquarium maintains that information presented in Volume V of the Facilities Plan, and in MWRA's response to outfall comments, does not amply justify exceedence of the federal Water Quality Criteria. Consequently, MWRA's contention that the recommended outfall location is "adequate in absolute terms" needs further substantiation.

- Does maintenance of ambient water quality criteria within the region bounded by Sites 4.5 and 5 require significant progress with source reduction/pretreatment in the MWRA district?

- In answer to several of our questions on the outfall report, we have been referred to MWRA's response to the Secretary's Cer-

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tificate. We restate two questions which were not addressed in this response:

1) Is the proposed outfall location in attainment or non-attainment of Class SA water quality for conventional pollutants? What are the implications of the discharge with respect to maintenance of Class SA quality in the receiving waters? With the outfall, is attainment of ambient quality a goal, rather than an immediate requirement, projected to occur at some future time when the secondary treatment plant is on line and other sources of pollution (such as Salem Harbor and CSO discharges) are eliminated?

2) If degradation of Class SA quality is expected for certain parameters during the interim period of primary treatment and prior to implementation of a remedial program for CSO discharges, what are the sources (ambient levels, sediment resuspension, other discharges) of this noncompliance?

- The New England Aquarium has reviewed S.W.I.M.'s "Sapphire Necklace" proposal. Their report raises legitimate questions regarding the suitability of the area within Sites 4.5 and 5 for location of the outfall. S.W.I.M.'s findings that: 1) by going to Site A, the outfall will be within the Gulf of Maine Intermediate Water -- the deep water layer -- not just in an area marginally at its edge; 2) both Sites 4.5 and 5 are depositional; and 3) the reasons for 301(h) denial of permission to discharge primary effluent at Site 5 are still valid, further weakens MWRA's argument that the region bounded by Sites 4.5 and 5 is adequate in absolute terms. We recommend S.W.I.M's proposal be thoroughly responded to by the MWRA, and that serious consideration be given to evaluation of Site 6 for location of the outfall.

- Once again we call attention to the importance of developing a Comprehensive Source Reduction Plan for the MWRA district, to complement pretreatment initiatives. Maintaining a quality effluent which complies with water quality standards and criteria for Massachusetts Bay requires development, aggressive implementation, and enforcement of such a Plan. Both point-sources and non-point sources of toxic loadings should be targeted.

- The New England Aquarium continues to support development of a long-term monitoring and research program for Boston Harbor and Massachusetts Bay. Such a program should be directed at long-term evaluation of water quality status and trends in the harbor and bay, and basic research on short-term and long-term physical, chemical and biological processes in these waters. Monitoring and research activities in Boston Harbor and Massachusetts Bay

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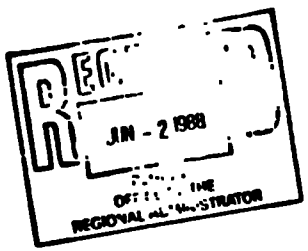
DAVID STANDLEY, P.E.
Consultant in Environmental Management

P35

May 31, 1988



Mr. Michael R. Deland, Esquire
Regional Administrator
U.S. Environmental Protection Agency
Region I
J.F.K. Federal Building
Boston, MA 02203

Attn: Mr. David Tweedy
Water Management Division

Re: Draft Supplemental EIS
Boston Harbor Wastewater Conveyance System

Dear Mr. Deland:

These comments on the Draft Supplemental Environmental Impact Statement (DSEIS) for the Boston Harbor Wastewater Conveyance system are submitted on behalf of the City of Quincy. They supplement comments submitted orally by me on May 18, 1988 at the public hearing held by EPA in Cambridge, MA. Earlier, on May 10, 1988, I related Quincy's concerns with those elements of the MWRA Facility Plan relating to the wastewater conveyance system to MA EOEA and the MWRA. A copy of those comments are appended and I ask that all relevant portions be included in the comment record for this DSEIS.

On Wednesday, May 25 the MWRA Board voted acceptance of the recommendations of its staff concerning the Facility Plan for wastewater treatment and conveyance. A copy of those recommendations is also appended. It is clearly stated therein that discharge of South System flows through Deer Island would at best be delayed 0 - 15 months from the schedule (March, 1995) currently ordered by the Federal Court (Item 2, page 5) and the inter-island conveyance system would be delayed accordingly. This delay, we are given to understand, is because the original schedule called for South System flows, treated at Nut Island, to be conveyed and discharged through the new outfall (subject to conditions) by March 1995. However, an extended outfall will take much longer to construct. The parties did not contemplate,

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have thus far been fragmented. Research must be directed and ongoing, so that progress with the harbor clean-up can be continually assessed and appropriate remedial/management techniques applied.

o Our question regarding the potential for shifts in phytoplankton species composition from elevated nutrient levels has not been sufficiently responded to by MWRA. Once again, with regard to the results of the nutrient-spike experiments showing that after 48 hours "...the existing dominant species tended to increase their dominance after enrichment" (Volume V, Appendix B, p. B-6);

Since a shift in the percent of the dominant species is apparent after 48 hours, how can the conclusion be made that the community structure will not change, or that an algal nuisance species will not predominate? What are the implications for the existing trophic structure -- might the food source of certain fish or whale species be impacted by changes in algal species composition and succession?

In conclusion, the New England Aquarium is generally in support of the Deer Island Facilities Plan. However, we believe that the several outstanding issues discussed above must be addressed, in order that the Deer Island Facilities Plan -- and the long-term water quality goals the Plan is intended to accomplish -- can be realized.

Thank you for consideration of these comments.

Sincerely,

Sharon E. Dean
Conservation Coordinator
New England Aquarium

SED
cc: Paul Levy, Executive Director, MWRA
Michael Deland, Regional Administrator, EPA
Daniel Greenbaum, Commissioner, DEQE
Thomas McMahon, Director, DEQE Division of Water Pollution Control
Betsy Johnson, Chairman, MWRA Facilities Planning Citizens Advisory Committee
Jack Elwood, MWRA Program Manager

- A comprehensive water quality assessment based on currently-available data and applicable models should be carried out to compare water quality and environmental and public health impacts in the affected waters and for four discharge or operating conditions.

- The affected waters are President Roads and contiguous waters and shores, especially of Winthrop; Quincy and Hingham Bays, flats, and beaches; and the natural drainage system of those lands served by the South Metropolitan Sewage district.

- The four conditions are the present; the conditions that will exist after the cessation of discharge of sludge and scum; the conditions that would exist were Nut Island effluent discharged at President Roads in 1995; and the conditions that would exist were all MWRA sewage flows provided primary treatment in new facilities at Deer Island, and part of those flows further provided secondary treatment, with discharge through the existing Deer Island outfall.

Upon a reasonable showing that water quality in the waters off Deer Island and Winthrop would not be significantly deteriorated, or that a net benefit to the "affected waters" would result, from a comparison of the third or fourth conditions to the first condition above, the MWRA should proceed in accordance with the original Court-ordered schedule (activation of the inter-island system in either March 1995, or in January 1996 when full primary is operational).

It is strongly recommended that the outfall be a gravity system, for conservation of energy and to minimize operational complexity. The shaft/tunnel/bored diffuser concept of design for the outfall is appropriate and should be accepted.

The preferred design and layout of the inter-island conveyance system, including the Nut Island headworks, the shaft/bored tunnel, and the South System pumping station at Deer Island, is supported as the most appropriate, both environmentally and economically. The schedule for design and construction of the facilities (especially the tunnel and pumping station) should be advanced as much as possible to minimize the impact of delays in acquisition of equipment or in construction.

nor did the Court schedule incorporate; any discharge of effluent of the Nut Island treatment plant through the existing Deer Island outfall.

Full new primary facilities at Deer Island were not required by the schedule to be fully operational until January 1996. It appears the MWRA does not intend to meet that obligation, and thereby provide full primary treatment at Deer Island for South System flows, unless the water quality assessment discussed below and in the appended MWRA staff recommendation is favorable to discharge of that effluent through the existing Deer Island outfall. Otherwise, the MWRA would defer completion of the entire inter-island conveyance system (headworks, shafts, tunnel, and pumping station) and of the third and fourth batteries of the new Deer Island primary treatment plant until the extended outfall is operational. The date for that milestone is quite conjectural at this time, but it could well fall in 1997 or 1998! An outfall longer than now proposed by the MWRA and under consideration by EPA through this SDEIS would probably require even more time for environmental studies, redesign of Deer Island facilities, and construction.

South System discharges to Quincy Bay and overflows to the Neponset River are to be ended in March of 1995 under the current Court schedule. That pollution, it now appears the MWRA has determined, will nevertheless continue at least until January of 1996 as a result of the decision to extend the outfall, despite the major improvement in water quality in the President Roads area that will result from termination of all sludge discharges by January of 1992. The MWRA must bear the burden of establishing either that unacceptable water quality impacts would ensue from maintaining the March 1995 milestone for activation of the inter-island conveyance system (using the Deer Island outfalls) or that it is technically infeasible to do so. Should either situation be reasonably determined to be the case, then the fallback and latest acceptable date for activation of the inter-island conveyance system is January 1996, when primary treatment capacity on Deer Island is required to be operational.

Until this disagreement is resolved and any linkage between activation of the inter-island conveyance system and the new Deer Island outfall is dissolved Quincy cannot recommend that extension of the outfall beyond the original site be found to be environmentally or economically appropriate.

With respect to the water quality assessment program associated with the decision on activation of the inter-island conveyance system, Quincy's position is stated below.

DAVID STANDLEY, P.E.
Consultant in Environmental Management

May 10, 1988

Honorable James S. Hoyte, Secretary
Executive Office of Environmental Affairs
Saltonstall State Office Building
100 Cambridge Street
Boston, MA 02202

Attn: Mr. Steve Davis, Director
MEPA Unit

Mr. Daniel W. O'Brien, Acting Director
Engineering Division
MWRA
Charlestown Navy Yard
100 First Avenue
Boston, MA 02129

Attn: Mr. Jack Elwood
MWRA Program Manager

Re: MWRA Secondary Treatment
Facilities Plan - EOEA 6136

Sirs:

These comments on the Final Report of the MWRA's Secondary Treatment Facilities Plan for the Boston Harbor waste water treatment facility are submitted on behalf of the City of Quincy. The City's earlier comments on draft portions of the Report have in most cases been satisfactorily addressed in Volume 8 of the final report. The exceptions, those comments which were overlooked or to which the responses are unsatisfactory to the City, will be dealt with point by point.

The City is concerned about impacts of the MWRA proposal to accelerate construction of secondary treatment capacity, and offers comments below. Additionally, the City has very serious concerns with the MWRA proposal to defer completion of the full primary facility at Deer Island and thus to defer the treatment thereof of sewage from the South Metropolitan System until such time as the new outfall is operational. Because this concern is generic, and has reference to several volumes of the Final Report, it will be discussed as an issue.

PRIOR COMMENTS - REMAINING CONCERNS

1. Construction Noise at Moushe Nack (Volume IV, Inter-Island Conveyance System)

The response to the comment of January 22 concerning construction noise level in Moushe Nack suggested that 63 db(A) "is the maximum which would be experienced at Moushe Nack over the duration of construction." This gives the impression that 63 db(A) is a peak level. Volume IV however seems to indicate that noise level will be experienced on the norm during the period of pier construction. The pile support system for the piers has been changed from placement of concrete piles by augering to driving of steel piles. While shrouding may have some slight beneficial impact, and certainly should be employed, it must be supplemented by other pile driving

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(617) 356-5852

Thank you for the opportunity to comment on behalf of the City of Quincy.

Respectfully,

David Standley, P.E.
Consultant to the City of Quincy

Enclosures (2)

cc: Commissioner Anderson
Daniel O'Brien, MWRA
Kathy Hearn, MWRA
Richard Fox, MWRA
Stephan Lipman, DEQE
Cheryl Breen, EOEA
Peter Koff, Esquire
David Graber
Gwen Ruta, US EPA

methods such as damping of the piles, and selection of the least noisy pile-driving technique. Noisy activities should be restricted as provided in the mitigation commitments for the Piers and Staging Project (time of day and weekend restrictions, community liaison, and noise monitoring).

3. Projected Sea Level Elevation

While the planning period for this project extends only to the year 2020, and a 1.1 foot sea level rise may be quite appropriate for the planning period, this facility and its outfall will be in existence and operation for many decades further. In the final design for the facility, hydraulic grade lines should be reassessed against a 100-year planning horizon. Reliable operation without major future interruptions or major facility reconstruction should be assured by setting the facility elevation and the hydraulic grade lines consistent with that projection.

3. North System Modifications (Volume III, Treatment Plant, § II.2 Construction Considerations)

Alternative II, which would limit the north main pumping station to only five operable pumps for thirty days presents a significantly greater risk of system backup and overflows than does Alternative I. Alternative I is also preferable from the standpoint of long-term flexibility. Therefore, it is urged that the Secretary find Alternative I to be the environmentally preferable alternative.

ACCELERATION OF SECONDARY TREATMENT

The MWRA has made two proposals which are insufficiently and inadequately addressed in the final facilities plan. These proposals, to accelerate the construction of secondary treatment and to delay the connection and treatment of South Metropolitan System flows at Deer Island, are linked although not interdependent.

The final report proposes as an alternative to the base plan the early construction of one-fourth of the secondary treatment capacity. The result would be a three-year period (1996-1999) in which approximately 36% of the average daily flow at the treatment plant would receive secondary treatment. Reduced discharges of both conventional and non-conventional pollutants to Massachusetts Bay would result. This would be a fully loadable outcome, were it not for the associated costs. The proposal therefore requires considerable scrutiny before it can be found to be the environmentally preferable alternative and adopted as the MWRA position and objective.

Implementation of the proposal would significantly increase the volume of sludge to be handled in the 1996-1999 timeframe, would render that sludge more difficult to manage, and would increase its contamination by non-conventional pollutants. The proposal thereby may affect the potential for management through "beneficial reuse" of all the sludge during that period.

The Authority has proposed to avoid further complication of construction management and construction, both at Deer Island and at the on-shore staging areas, by deferring the construction of primary batteries C and D in connection for the increased activity associated with the partial secondary facility. This deferral is also justified by Authority spokespersons on other grounds, which will be discussed below. The deferral has the effect of continuing the operation of the inadequate Nut Island treatment plant and its discharges into Quincy Bay for at least one more year, when compared to the base plan. The most significant water quality impacts from discharge of treated and untreated sewage (not sludge or other residuals) by the MWRA are clearly those associated with the Quincy Bay discharges.

As shown in Section 9 of Volume V, Effluent outfall, any water quality benefits, or benefits to marine organisms or to protection of public health, from the alternate plan (for accelerated secondary treatment) are minimal and fleeting. While measurable changes in constituent concentration in the mixing zone may be projected as compared to the base plan, it is extremely doubtful that changes in the system would occur in the three-year period which would result in differences in environmental or public health. In contrast, continued discharges of Nut Island effluent into Quincy Bay have direct, demonstrable, and sustained adverse impacts on water quality, environmental health, public health and recreation. It is not a reasonable trade off. The upstream hydraulic capacity of the South Metropolitan System is being increased by the construction of major relieving sewers. As the City has in the past pointed out, these increases will transfer peak flows (from either storage within the system or overflows) to the lower reaches of the High Level Sewer. Once the inter-island tunnel is in service, and the free fall capacity of the High Level Sewer of 360 mgd is thereby realized, these pooling effects will not be of hydraulic or environmental concern in Quincy. However, the MWRA alternate proposal, deferring construction of full primary capacity at Deer Island and connection of the south system flows for at least a year, means another year (or more - see below) in which the maximum hydraulic capacity of the Nut Island treatment plant (280 mgd) and the current capacity of the high level sewer (305 mgd) are at serious risk of being exceeded. (This statement recognizes that the DEQE and the MWRA are seeking compensatory reductions in I/I in the South System.)

Thus, the consequences of the alternate plan will be sustained discharges of minimally treated sewage to Quincy Bay, and potential overflows of untreated sewage to the Neponset River watershed and bypasses of the Nut Island treatment plant, for at least one more year.

DEFERRAL OF PRIMARY TREATMENT CAPACITY

The MWRA has recognized that the present commitment to an outfall which reaches some seven to nine miles off-shore will take considerably longer to construct than the previously-assumed three to four mile outfall. While this is not clearly stated within the final report, it is now clear that the Court-mandated schedule for completion of the outfall cannot be met if the outfall is extended as far as sites 4.5 or 5 (a decision which the City supports). The increase in

tunnel boring time is a direct function of the increase in tunnel length. To progress from, say, site 2 to say, site 3, represents an increase of two years in tunnel boring time. The uncertainties in such a project are more than a direct function of the length of the bore. Not only do the odds of "hitting a snag" increase on a linear basis; the complexity of the boring operation increase substantially with distance, thereby increasing the risks of mishap and down time. Therefore it is not unreasonable to project that the current Court schedule date for completion of the outflow may in reality be missed by as much as three years.

Why is this of concern to Quincy? MWRA personnel have postulated that the current Nut Island treatment facility and outfalls should not be decommissioned, and new primary treatment capacity at Deer Island should not be provided for the South System, until the new outfall is ready to receive that discharge. The MWRA has argued for the deferral on one or more of the following grounds. First, that NPDES permit conditions would otherwise be violated. Second, that water quality in the vicinity of Deer Island and Winthrop would be significantly exacerbated if the alternative identified below were implemented. Third, that somehow footnotes in the Court schedule regarding discharge of Nut Island effluent through a new Deer Island outfall would be violated.

An alternative, tentatively deemed technically feasible by the MWRA, is to construct the full primary treatment capacity (with or without a portion of the secondary capacity) and the inter-island conduit consistent with the current Court schedule (1994); make a temporary connection to the existing Deer Island outfall conduit (also tentatively determined by the MWRA to be technically feasible); render the system operational after testing in 1995; and decommission the Nut Island facility.

The interim conditions for discharge of pollutants by the MWRA are established by the Court, and can be modified by the Court if necessary and appropriate. This, and the matter of potential degradation of water quality in the vicinity of Deer Island, are linked and will be discussed together. First, it must be recognized that the existing discharges to President Roads consist of treated effluent from Deer Island, digested sludge from Deer Island, and digested sludge from Nut Island. Sludge discharges will cease no later than January 1992, providing major reductions in the discharges of conventional and non-conventional pollutants to President Roads. Treatment in new primary facilities at Deer Island will increase BOD removal and significantly increase TSS removal, as compared to the performance of the present Deer Island and Nut Island treatment plants. Inclusion of partial secondary treatment would provide more than one-third further reduction in these discharges as well as reducing the discharge of non-conventional pollutants. The President Roads outfall, as compared to the Quincy Bay outfalls, provides significantly higher current velocities, three times the water depth, much greater distances to publicly-used bathing areas and shorelines, and significantly less exposure to otherwise-productive shellfish flats. It is expected that a soon-to-be-released EPA study concerning Quincy Bay water quality and health effects, when added to the studies concerning the President Roads area, will show that a pound of pollution discharged to Quincy Bay is of considerably more significance than a pound of pollution discharged to President Roads. For these reasons Quincy believes it is inappropriate to reject out-of-hand the construction of full primary capacity at Deer Island and of the inter-island tunnel, with treatment of the South System flows at Deer Island discharged through the existing President Roads outfall. It is further believed that an environmental assessment of the options will demonstrate the overall superiority of the alternative outlined above.

It is clear that the footnotes in the Court schedule are (1) irrelevant because they addressed a different situation and (2) not prohibitive but only contingency.

The complication to the residuals management program created by a deferral of decommissioning of Nut Island for a period of several years ago cannot be overlooked. During the period of deferral, raw primary sludge would continue to be generated at Nut Island and would have to be transported and treated through either an extension of the interim sludge processing facilities or at new long-term facilities; while digested sludge combined with some secondary sludge from Deer Island were being processed. Since the residuals management facilities plan has not considered such a possibility, it is wholely speculative to discuss the impacts; but they must be developed and considered as part of the decision process.

It must be clear that the City of Quincy will oppose, based on the present state of knowledge, any deferral of new primary treatment at Deer Island for South System flows beyond the Court-scheduled date of 1995.

OTHER MATTERS

1. Schedule for the Inter-Island Tunnel and South System Pump Station (Volume IV, Section 8)

   The recommended plan urges earlier implementation of design and contracts for the inter-island tunnel and for the South System Pumping Station, in order to provide additional time for uncertainties and give greater assurance to the attainment of the 1994 completion date. The City strongly supports this recommendation. It is noted that the schedule presumes only twelve months for the design, construction, and assembly of the Tunnel Boring Machine. That in itself is an extremely optimistic assumption. The reality may be at least twice that, and every opportunity to provide additional lead time should be taken.

2. South System Pumping Station Design and Construction Schedule (Volume IV, Section 8)

   There is a note on figure 8.1.3-4 (page 8-7) which suggests that startup of the pumping station should not begin until the new effluent outfall is ready to receive waste water. Consistent with the argument raised above, this portion of this note should be deleted.

Dave P36

FRANKLIN PARK IMPROVEMENT ASSOCIATION, INC.

c/o 77 Liberty Avenue
NO REVERE, MA 02151

P36

Rec'd 5/6/88
May 3, 1988

Mr. Michael DeLand, Regional Administrator
Environmental Protection Agency
J.F. Kennedy Federal Building
Boston, Massachusetts 02203

Dear Mr. DeLand:

Please help protect BOTH Boston Harbor AND Massachusetts Bay from pollution.

The area now recommended for the largest sewerage outfall in the world is dangerously close to shore. Tidal currents could bring it onto our beaches, shellfish areas could remain closed forever, and fish and lobster diseases could increase. It doesn't make sense to clean up one area -- Boston Harbor -- by polluting another -- Massachusetts Bay.

We urge you to require:

1). An outfall location at "SITE 6" - nine miles from Marblehead, Revere, Swampscott, Nahant, Hull, Cohasset, and Scituate

2). Primary and secondary plants built simultaneously, so minimally treated sewage is not discharged into Massachusetts Bay

3). No degradation of the Massachusetts Water Quality Standards.

PLEASE.

Very sincerely yours,

Adele J. Toro
Adele Johnson Toro,
Corresponding Secretary/
NEPA Appointee to the MWRA Regional Task Force/Quincy

3. Prison Availability (Volume I)

It is unrealistic for this final report to be carrying a prison decommissioning date of 1989. There is now ample evidence in the record, and has been for some time, that 1991 is the earliest decommissioning date and that is far from certain. Therefore, the early site preparation activities and other CIP planning should be revised so that prison decommissioning in 1991 is the base plan. The necessary impact mitigation measures, rescheduling, and multiple materials handling requirements imposed by that delay should be incorporated into a supplemental final report.

On behalf of the City of Quincy, I wish to express my appreciation for the opportunity to offer these comments. I close with the observation that the final report of the secondary treatment facilities plan is an outstanding set of documents, for which the contributors and managers deserve considerable credit.

Respectfully,

David Standley

David Standley, P.E.
Consultant to the City of Quincy

cc: Commissioner Anderson
Peter Neff, Esquire
Richard Fox
Steven G. Lipson
Kathleen K. Hall