VOLUME 2

THE COMMONWEALTH OF MASSACHUSETTS

ENVIRONMENTAL PROTECTION AGENCY

SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT/REPORT ON

SITING OF WASTEWATER TREATMENT FACILITIES FOR BOSTON HARBOR

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 1
JFK FEDERAL BUILDING
BOSTON MASS. 02203

ABOUT THE COVER

The photograph on the front cover shows an aerial view of Boston Harbor and the islands on which the siting studies concentrated. Logan Airport can be seen to the left of center, Downtown Boston is in the lower center, Winthrop is in the upper left, and Quincy is to the upper right. Cape Cod is visible along the horizon.

Photos on the back cover show Deer Island, Long Island, and Nut Island which are the alternative sites being considered for new wastewater treatment facilities.

Inside the back cover is a map of Boston Harbor and vicinity showing place names used in the SDEIS/EIR.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J. F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

January 23, 1985

To All Interested Government Agencies, Public Groups and Citizens:

Pursuant to Section 102 (2)(c) of the National Environmental Policy Act of 1969 (P.L. 91-190), and implementing regulations promulgated by the Council of Environmental Quality (CEQ) and EPA, the enclosed Supplemental Draft Environmental Impact Statement (SDEIS) on the Siting of Wastewater Treatment Facilities in Boston Harbor is provided for your review and comment. A period of 45 days following the notification of availability in the Federal Register will be allowed for this review, after which a Final EIS and subsequent Record of Decision will be prepared and distributed by EPA.

The SDEIS presents the environmental evaluation of three primary treatment and four secondary treatment siting options for the metropolitan Boston wastewater service area. The impacts of each siting option are outlined, and the proposed decision criteria for making a final siting decision are explained.

EPA will be participating jointly with the Commonwealth of Massachusetts in upcoming public information meetings in Winthrop, Quincy, and Cambridge. Formal public hearings will then be held in the communities of Winthrop, Quincy, and Cambridge (see enclosed list for times and locations of meetings). Comments on the SDEIS may be submitted at the public hearings or in writing to EPA by March 18, 1985.

The SDEIS is also being submitted by the Metropolitan District Commission to Massachusetts Secretary of Environmental Affairs, James S. Hoyte, for review pursuant to the Massachusetts Environmental Policy Act (MEPA) (M.G.L. Ch.30, Secs.61, 62-62H). The statutory MEPA comment period will end March 11, 1985, and persons wishing to have their views considered in Secretary Hoyte's determination on adequacy of the SDEIS may file written comments with Secretary Hoyte at the Massachusetts Executive Office of Environmental Affairs, 100 Cambridge Street, Boston, MA 02202 on or before that date.

Comments to EPA should be addressed to me. Additional copies of the SDEIS are available at EPA's Region I office in Boston by contacting Mr. Robert Mendoza (617/223-0841).

Sincerely,

Michael R. Deland
Regional Administrator

Enclosures

SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT AND DRAFT ENVIRONMENTAL IMPACT REPORT ON SITING OF WASTEWATER TREATMENT FACILITIES IN BOSTON HARBOR

VOLUME 2

Prepared For:
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I
And Submitted By The
METROPOLITAN DISTRICT COMMISSION
To The
MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

Prepared By:

THE MAGUIRE GROUP

CE MAGUIRE, INC.
Architects • Engineers • Planners
One Davol Square, Providence, Rhode Island 02903

12/31/84
MICHAEL R. DELAND — Date
Regional Administrator,
U.S. EPA

12/28/84
WILLIAM J. GEARY — Date
Commissioner, Metropolitan
District Commission

12/28/84
JAMES S. HOYTE — Date
Secretary, Executive Office
of Environmental Affairs

TABLE OF CONTENTS

Page No.

VOLUME 2: APPENDICES | Page No.

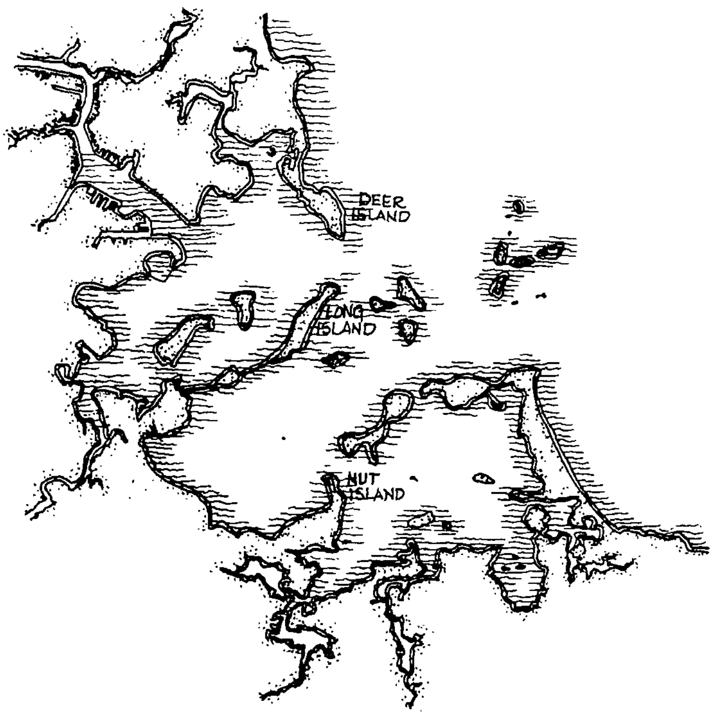
SDEIS Reports Printed Separately and Available from EPA:

- Evaluation of Satellite Advanced Wastewater Treatment Facilities (May 16, 1984)
- Boston Harbor Water Quality Baseline
- SDEIS/EIR Summary Report (December, 1984)

9.0 PERTINENT STATE LEGISLATION

9.0 COPIES OF PERTINENT STATE LEGISLATION

- Chapter 742, Acts of 1970
- Chapter 296, Acts of 1977



Chap. 742. AN ACT PROVIDING FOR THE ACQUISITION OF THE ISLANDS IN BOSTON HARBOR BY THE DEPARTMENT OF NATURAL RESOURCES FOR THE PURPOSES OF RECREATION AND CONSERVATION.

Be it enacted, etc., as follows:

SECTION 1. The department of natural resources, hereinafter referred to as the acquiring agency, is hereby authorized in the name of the commonwealth to take by eminent domain under the provisions of chapter seventy-nine or chapter eighty A of the General Laws, or acquire by gift, purchase or otherwise, the fee or any lesser interest, for the purposes of recreation and conservation under a program described in section three, such privately owned islands or portions of islands as are hereinafter named and such other property as may be necessary or expedient therefore: Thompson, Spectacle, Peddocks, Gallops, Bumpkin, Greater Brewster, Middle Brewster, Outer Brewster, Calf, Little Calf, Green, Raccoon, Hangman, Grape, Slate, Sheep together with islets, rocks, and flats adjacent thereto, provided that existing private uses not inconsistent with the purposes of this act may be permitted to continue subject to periodic review.

Said acquiring agency is further authorized to acquire by gift or otherwise any island, islet, rocks, flat land or portion thereof in Boston Harbor owned by any city or town or agency of the federal government.

SECTION 2. The acquiring agency shall designate such lands located in, under or bordering Boston Harbor south of a line drawn from Castle island to the neck of Deer island which are owned or under the control of any department, commission or agency of the commonwealth and which are not actually being used as the site of a public facility, to be thereafter under the control of the acquiring agency for the purposes of this act.

SECTION 3. Lands acquired by or transferred to the acquiring agency shall be held and maintained for the purposes of this act under a program of maintenance and improvement pending the completion and approval of a comprehensive plan for the area and its approval by the general court, and the acquiring agency may expend such sums as may be provided by section four of this act for the development, redevelopment, construction and improvement of outdoor recreation areas and associated facilities on lands acquired or transferred to it under this act.

SECTION 4. The acquiring agency is hereby authorized and directed to expend a sum not to exceed three million five hundred thousand dollars to carry out the provisions of sections one, three and six of this act, including all expenses in connection therewith. To meet the expenditures necessary in carrying out the provisions of this act, the state treasurer shall, upon request of the governor, issue and sell at public or private sale bonds of the commonwealth, registered or with interest coupons attached, as he may deem best, to an amount to be specified by the governor from time to time, but not exceeding, in the aggregate, the sum of three million five hundred thousand dollars. All bonds issued by the commonwealth, as aforesaid, shall be designated on their face, Boston Harbor Islands Acquisition, Act of 1970 and shall be on the serial payment plan for such maximum term of years, not exceeding twenty years, as the governor may recommend to the General Court pursuant to Section 3 of Article LXII of the Amendments to the Constitution of the Commonwealth, the maturities thereof to be so arranged that the amounts payable in the several years of the period of amortization other than the final year shall be as nearly equal as in the opinion of the state treasurer it is practicable to make them. Said bonds shall bear interest semiannually at such rate as the state treasurer, with the approval of the governor, shall fix. The initial maturities of such bonds shall be payable not later than one year from the date of issue thereof, and the entire issue not later than June the thirtieth, nineteen hundred and ninety-nine. Seventy-five per cent of all interest payments and payments on account of principal on such obligations shall be paid from the metropolitan parks district fund, to be assessed by methods fixed by law, and the balance shall be paid from the State Recreation Areas Fund, to be assessed by methods fixed by law.

SECTION 5. The acquiring agency shall have authority to contract with agencies of the federal government for the receipt of funds.

SECTION 6. The acquiring agency shall prepare comprehensive plans to carry out the purpose of this act, may engage such consultants as are necessary and shall submit the results of its investigation, study and planning to the general court.

SECTION 7. The provisions of this act are hereby declared to be severable and if any such provision or the application of such provision to any person or circumstances shall be held to be invalid or unconstitutional, such invalidity or unconstitutionality shall not be construed to affect the validity or constitutionality of any of the remaining provisions of said sections or the application of such provision to persons or circumstances other than those as to which it is held invalid. It is hereby declared to be the legislative intent that said sections would have been adopted had such invalid or unconstitutional provisions not been included therein.

SECTION 8. This act shall not be construed to limit the power or authority of any department, board or commission of the commonwealth or of any political subdivision thereof or any public authority except where expressly provided otherwise herein; provided, however, that in, under or bordering Boston Harbor there shall be no acquisition of land by any such public agency or instrumentality other than the acquiring agency without the approval of the acquiring agency, and no public land on or bordering said area may be sold, leased or used as a dump or refuse disposal area, and no sand, gravel or soil may be removed therefrom or deposited thereon, and no structure may be built thereon, without the approval of the acquiring agency.

SECTION 9. For the purposes of this act, Boston Harbor shall be defined as that portion of the body of water shown on chart 246, 32d ed., Feb. 26, 1968, "Boston Harbor", U. S. Coast and Geodetic Survey, which lies to the west of a line beginning at the tower on Allerton Hill in the town of Hull, thence running to the eastern most point on Outer Brewster island, thence running to the Graves lighthouse, and which lies to the south of a line beginning at the Graves lighthouse, thence running to the most northwesterly point of Deer island, thence running to the most northerly point of Spectacle island, thence running to the monument on the northeasterly shore at Fort Independence, Castle island in the South Boston district of the city of Boston.

Approved August 22, 1970.

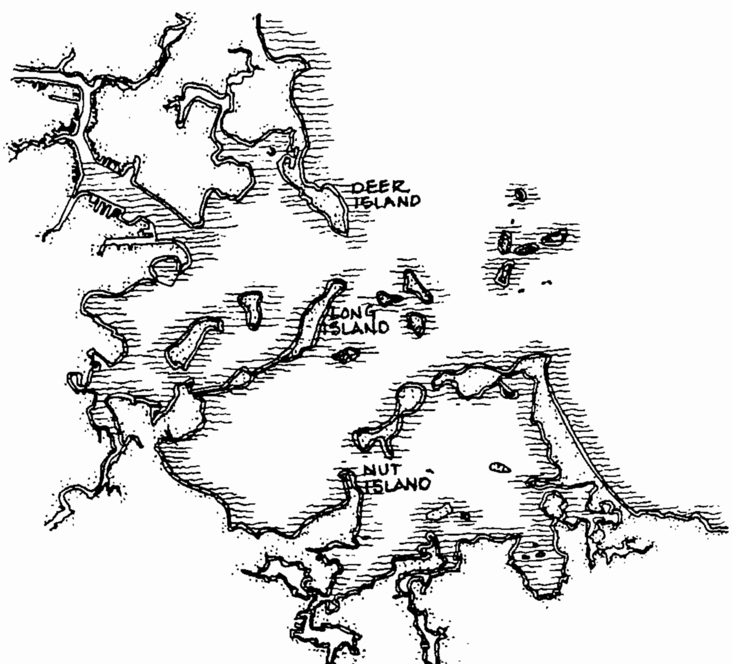
Chap. 296. AN ACT PROHIBITING THE CONSTRUCTION OF ADDITIONAL SEWERAGE FACILITIES OR ANY LANDFILL OPERATIONS AT NUT ISLAND IN THE CITY OF QUINCY.

Be it enacted, etc., as follows:

Notwithstanding any provision of law to the contrary, neither the metropolitan district commission nor any political subdivision of the commonwealth may construct an additional sewerage treatment plant or expand existing sewerage treatment facilities at the existing Nut Island facility in the city of Quincy in a manner which involves any landfill operation or the filling in of Quincy bay.

Approved June 14, 1977.

10.0 PUBLIC PARTICIPATION PROGRAM



10.1 Statements by Involved Parties

INDEX TO:

10.1 STATEMENTS BY INVOLVED PARTIES

Date	Statement Made By:	Submitted To:
10/25/84	S.F. Cole, Director, Boston Redevelopment Authority	J. Gutensohn, Commissioner, Massachusetts Department of Environmental Management
9/5/84	D.R. Cochrane, Winthrop Board of Selectmen	M. Deland, Administrator U.S. Environmental Protection Agency Region I
8/14/84	J.E. Falbo, Winthrop Planning Board	Barry Lawson Associates, Inc.
8/2/84	A. DeFronzo, Chairperson, East Boston Land Use Advisory Council	R. Manfredonia, Chief, Environmental Evaluation Section, EPA Region I
7/26/84	R.L. Flynn, Mayor, City of Boston	M. Deland, Administrator, EPA Region I
6/21/84	M. Deland, Administrator EPA Region I	R.L. Flynn, Mayor, City of Boston
6/18/84	M. Deland, Administrator EPA Region I	Letters to the Editor, Boston Globe
6/15/84	M. Deland, Administrator EPA Region I	J.F Timilty and J.F. Cusack, Chairmen, Joint Committee on Housing and Urban Development
5/20/84	EPA	F.H. Tosches
4/6/84	M. Deland, Administrator EPA Region I	R. Flynn, Mayor, City of Boston
4/5/84	L. Chretien, Aide to Rep. T.F. Brownell	Barry Lawson Associates
4/3/84	F.X. McCauley, Mayor City of Quincy	J.S. Hoyte, Secretary, Executive Office of Environmental Affairs
3/22/84	M. Deland, Administrator, EPA Region I	F.X. McCauley, Mayor, City of Quincy
3/1/84	F.X. McCauley, Mayor, City of Quincy	M. Deland, Administrator EPA Region I

Date	Statement By:	Submitted To:
2/22/84	M. Deland, Administrator, EPA Region I	R. Noonan, Chairman, Winthrop Board of Selectmen
1/30/84	South Shore Chamber of Commerce	Newsletter
1/9/84	T.C. McMahon, Director Division of Water Pollution Control	W. Newman, Acting Chief, Environmental Evaluation Section, EPA Region I
1/9/84	J.S. Hoyte, Secretary, Executive Office of Environmental Affairs	M. Deland, Administrator, EPA Region I
11/30/83	R.E. Noonan, R.A. DeLeo, R.V. Vecchia, Winthrop Board of Selectmen	M.R. Deland, Administrator, EPA Region I
10/21/83	EPA Region I	(Final Scope of Work for Preparation of a Supplemental Draft EIS on Boston Harbor Wastewater Treatment Facilities Siting)
9/9/83	J.S. Hoyte, Secretary, Executive Office of Environmental Affairs	(Environmental Notification Form)
4/27/76	C. Corkin II, Chief, Environmental Protection Division, Massachusetts Department of the Attorney General	W.A. Garrity, U.S. Federal District Court
4/26/76	J.A.S. McGlennon, Administrator, EPA Region I	E. Murphy, Secretary, Executive Office of Environmental Affairs
3/26/76	P.E. Dunn, Director of Development, City of Boston Penal Institutions Department	E. Murphy, Secretary, Executive Office of Environmental Affairs

Boston Redevelopment Authority

Stephen F. Coyle/Director

October 25, 1984

Commissioner James Gutensohn
Department of Environmental Management
100 Cambridge Street
Boston, MA 02202

Dear Commissioner Gutensohn:

I am writing to confirm understandings arrived at between you and representatives of the City of Boston to the effect that the Flynn Administration places the highest priority on integrating Long Island into the Boston Harbor Islands State Park.

The approximately 160 acres of the Island not occupied by the Long Island Hospital have the potential to offer unparelleled recreational opportunities to residents of the City and region. The Mayor has asked me, as part of the Harborpark planning initiative to begin discussions that will lead ultimately to the use of the undeveloped portions of the Island for park and recreational development.

It is my understanding that you will be seeking capital funds for development of the Island as part of your fiscal year 1986 capital outlay request, and it is therefore necessary to expedite these discussions.

The City of Boston looks forward to working with you on the development of Long Island as a major center in the Boston Harbor Islands State Park.

Sincerely,

Stephen Coyle

SC/ecm

1 City Hall Square
Boston, Massachusetts 02201
(617) 722-4300

807 Shirley Street
Winthrop, MA. 02152
September 5, 1984

Mr. Michael Deland
Region I Administrator
Environmental Protection Agency
John F. Kennedy Federal Building
Boston, MA. 02203

RE: MDC Wastewater Treatment Facilities Planning

Dear Mr. Deland:

I am a resident of Winthrop. Having reviewed the proposed "mitigative measures" section of the handout given at the August Workshop on Siting Alternatives, I wanted to reiterate my concern regarding the proposed mitigative measure of barging only construction materials to the Deer Island site. I am truly of the belief that to allow equipment and construction workers to travel to Deer Island by road would be a grave mistake on the part of the project planners and designers. That statement is intended to include the proposed mitagative measures of busing workers to and from the site. The only reasonable mitigative measure which I can conceive of as being acceptable to the residents of Winthrop would be a construction contract condition that requires all workers, vehicles, equipment and materials to be transported to and from the project site by means of water or air. This condition would also have to include cash penalties to be paid by the contractor to the Town of Winthrop for each violation . I would suggest a $1,000 per violation as a reasonable penalty. In some emergency cases it may be worth it to the contractor to pay the penalty, but for the most part, I would think a $1,000 fine per violation would be a sufficient deterrent. Workers residing in Winthrop could be excluded from the requirement since they must drive through the town streets in either case.

I believe the above requirement is necessary for the protection of the lives and limbs of the residents of Winthrop and the construction workers as well. The Town's roads were simply not designed nor built for commercial traffic. Winthrop has no through traffic, other than that effected by the Deer Island Treatment Plant and Prison. In recent years, the traffic associated with these two facilities has become quite significant. I know you must be aware that the proposed trucking and worker busing route through Winthrop is saturated with residential and light commercial development. Along the route, sidewalks are narrow and many of the homes and businesses are located close to the street. The town has at least its share of children, dogs, bicycle riders, elderly and joggers moving about on the sidewalks and crossing the roadways. Whenever a moderately-sized truck comes into the town to make a delivery, its presence often results in blocked intersections and the creation of temporary one-way traffic , especially in the light commercial zones where there is just barely enough room for opposing passenger cars to pass under ordinary circumstances. Add to the above the unique traffic problems related to the State Public Boat Landing. The landing is a major recreational facility and one of a very few in the Metropolitan area. Its use is year-round.

Traffic in Winthrop becomes especially heavy in the summer months as out-of-towners head for, not only the Landing but also Winthrop's M.D.C. Beach, Yirrel Beach, Grandview Avenue, and the five marinas. In spite of all this current traffic, safety has not been a major problem in Winthrop. I am afraid that with the introduction of construction-related traffic that picture will change completely. Commercial traffic is very different from residential and recreational traffic. There is an urgency about it, politeness is lost in the rush, drivers are not so cautious when they are on the clock. The constant congestion at intersections and along narrow roadways will cause further aggravation not only to resients but to the workers and contractor as well.

For everyone's safety, I urge you to consider as a mitigative measure, a proposal that all men and equipment be transported to and from the Deer Island site by air or water and that a penalty clause be included in the construction contract for direct payment to the Town of Winthrop for each violation.

Sincerely,

David R. Cochrane

David R. Cochrane

cc: Winthrop Board of Selectmen
Edward Ionata, P.P.C.

WINTHROP PLANNING BOARD

WINTHROP, MASSACHUSETTS 02152

August 14, 1984

Barry Lawson Associates, Inc.
P.O. Box 648
Concord, MA. 01742

Attention: Edward Ionata

Re: Wastewater Treatment Site

Dear Mr. Ionata:

The Winthrop Planning Board wishes to be recorded as being adamantly opposed and irrevocably committed to stop all further expansion of sewerage treatment facilities at the Deer Island Treatment plant. Our position is and has been in the past, that all further expansion be it primary and/or secondary treatment be located on Long Island. However, we do support improvement in maintenance to increase the effectiveness of the present sewerage disposal operation at Deer Island. In essence, we do not support any increase in sewerage disposal operations but support improvement of the present capacity level.

Under the provisions of Chapter 40A and local zoning by-law. the Planning Board is called upon to give its opinion relative to any change or INCREASE in a particular use of land which represents a potential hazardous effect to the community.

Throughout the several years that the issue of sewerage treatment has confronted the Town of Winthrop, the Planning Board has not been persuaded by the arguments raised by the proponents of the primary and secondary updated treatment facility at Deer Island. We have heard that the cost factor to locate such a facility at Long Island is prohibitive; that Deer Island is already "institutionalized"; that the opposition by the City of Boston to a location at Long Island is insurmountable and many other arguments. We have recently reviewed the eight alternative wastewater treatment siting options as provided to us in the BOSTON HARBOR UPDATE II, dated July, 1984. We have not been persuaded to alter our strong opposition to increasing the sewerage disposal capacity at Deer Island in any manner.

Our Board believes that the need to protect the health and welfare of our residents as well as improve and maintain property values is of greater importanance than to cut back costs relative to re-locating the facility to Long Island. Unfortunately, the Town of Winthrop is long accustomed to hearing the words "cost factor" concerning expansion and progress from quasi Governmental agencies such as the Deer Island Sewerage Treatment Plant, the Deer Island Penal Institution and Logan International Airport. We cannot consider a qualitative comparison between dollar values and human suffering. Dispite the consideration as to cost factor, Long Island is institutionalized by reason of its hospital facilities and is located approximately 5 miles from the City of Boston. The Deer Island Treatment facility coupled with the other Governmental agencies threaten to destroy the residential quality of Winthrop. It must be remembered that the sewerage treatment facility is located a few hundred yards from a substantial portion of the Town of Winthop's overall population of approximatly 22,000.

We accept the concept that strong opposition should have been made to the original construction of the sewerage treatment plant some 25-30 years ago. However, at the time of the original construction, the majority of home owners in the Point Shirley area of Winthrop were summer residents who were unable to vote or participate in the fate of our community. That temporary resident status has all but vanished as the entire area has become a community of permanent residents. Clearly, we are not concerned nor persuaded by the arguments of those who would penalize the community of Winthrop for allowing the initial construction of the Deer Island Sewerage Treatment plant to take place.

The Planning Board is also extremely concerned with the secondary effect of a massive construction program at Deer Island. The community CANNOT and SHOULD NOT be forced to tolerate the additional problems of excessive traffic flow and conjestion that will accompany the expansion and new construction of the sewer treatment plant. The construction involved in updating and expanding of the Deer Island Treatment facility will take yearshis community presently wages a constant battle with noise, air pollution and the threat of expansion from Logan International Airport. The populace of the Town of Winthrop live in fear of the consequences of an overcrowded, understaffed and poorly maintained prison facility at Deer Island. The years of inadequate maintenance and low staffing levels at the exising treatment plant has caused a significantly poor water quality throughout the Winthrop shores. The residents of the Town of Winthrop CANNOT and WILL NOT endure further environmental abuses. Therefore, we cannot support any alternatives relative to any wastewater sludge management or wastewater treatment siting other than relocating facilities on Long Island or some other location sufficiently removed from the Town of Winthrop. Further expansion of sewerage treatment facilities at Deer Island is unwarranted, unfair and unconscionable to the inhabitants of the Town of Winthrop.

Respectfully submitted for
THE WINTHOP PLANNING BOARD

Jerome E. Falbo

BY: JEROME E. FALBO, MEMBER

cc: Edward Ionata, Public Participation Co-Ordinator
E.P.A. - Boston Harbor, S.D.I.S.
P.O. Box 1357, G.M.F.
Boston, MA. 02205
cc: WInthrop Board of Selectmen
cc: Representative Alfred Saggesse
cc: Senator Michael LoPresti
cc: Paul Dawson, Winthrop Board of Health
cc: Planning Board members
cc: Margaret Riley

2 August 1984

Mr. Ronald Manfredonia, Chief
Enviromental Evaluation Section
EPA Region I
J.F.Kennedy Federal Building
Boston, Massachusetts 02203

Dear Mr. Manfredonia:

The East Boston Land Use Advisory Council (The Council) has several concerns regarding the Boston Harbor Wastewater Facilities Siting. They are:

1. Conditions of Present facilities

2. Addition of new commmunities to the system

3. Future of Satellite facilities

4. Long Island

5. Impacts on the East Boston community

6. Mitigation

7. Water quality in Boston Harbor

Expanding on these points:

1. Conditions of Present facilites : The Council considers the maintainance and operation of the present facilities to be of the first priority. The existing sewerage treatment plants, combined sewer overflows (CSO) and dry weather overflows (DWO) must work properly so that studies undertaken are started from a current basis and do not project unrealistic conditions into the future.

2. <u>Addition of new communities</u> : A moritorium should be declared on the addition of new communities until the entire system is working properly. It is senseless to continue to degredate the Harbor. This violates the Clean Water Act as upheld by the Quincy Law Suit. The Council would also like to stress the immediate importance of looking at new developments in the communities already being served by the Metropolitan Distrist Commission (MDC). The impacts of new developments should continue to be monitored and plans developed how best to treat the additional sewerage that will be added to the system.

3. <u>Satellite facilities</u> : The Council considers the continued investigation of Satellite Facilities to be of paramount importance. It sees no sense in draining our water supply from our suburban watershed areas and dumping this water in the ocean. Our water resourses must be protected. How soon will our reservoirs run dry? The aquisition of land in the metropolitian area--for future expansion of the system--should be considered immediately. No longer can the suburbs have the luxury of flushing the toilet and not knowing where the water goes.

4. <u>Long Island</u> : The Council sees no sense in degradating another location in the Boston Harbor, plus opening up the possibility of expansion of the system in an unsuitable location. Although the upgrading and possible expansion of the Deer Island plant will have severe negative impacts on our community as well as Winthrop, we see no reason to expand these negative impacts to new locations. Therefore, The Council recommends that Long Island not be considered as an appropriate site.

5. <u>Impacts on the East Boston community</u> : Traffic congestion, noise and air pollution, and enviromental health factors as a result of the airport and tunnel proximites are of great concern to the residents of East Boston and Winthrop. Impacts from any construction projects on Deer Island would aggrevate already intolerable conditions.

Another impact would be air pollution from incineration. The Council strongly recommends against this option, should the waiver for secondary treatment not be granted.

6. <u>Mitigation</u> : Whatever project goes ahead the community affected must be considered in every way possible.

Barging must be used whenever possible to alliviate traffic congestion, noise and air pollution.

The possiblity of rate reduction or reimbursements must also be explored.

Meetings with the community must occur before and during the project to ensure an open line of communication.

7. <u>Water Quality in Boston Harbor</u> : Let it not be forgotten that the primary purpose of this entire project is the upgrading of the water quality in Boston Harbor. This is most important with the way the Harbor is developing as a recreational facility for the city, the state, and the nation. The Harbor and the Harbor Isands are an economic and recreational resource that must be protected--but they cannot be considered separately concerning water distribution and waste disposal.

The East Boston Land Use Advisory Council considers it imperative that the Metropolitan District Commission or new agency reevaluate the entire system as a whole and prioritize the steps necessary for a clean and healthy harbor before any action is taken.

Sincerely yours,

Anna DeFronzo

Anna DeFronzo, Chairperson
East Boston Land Use Advisory Council

cc: CE Maguire, Inc.

CITY OF BOSTON • MASSACHUSETTS

OFFICE OF THE MAYOR
RAYMOND L. FLYNN

July 26, 1984

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

Dear Mr. Deland:

In response to your letter of June 21, 1984, I would like to restate my position concerning the location of waste water treatment facilities in the Boston Harbor. Be assured that the lack of correspondence since we last met is not indicative of the City's effort to improve the condition of the Boston Harbor and the Boston Harbor Islands. My concern for the Boston Harbor did not begin when I was elected to the Mayor's Office. For the longest time, both as a State Legislator and as a City Councillor, I have expressed my belief that the Boston Harbor is vital to the economic and social well being of Boston and the Boston Metropolitan area.

My administration is committed to doing whatever possible to improve the condition of the Boston Harbor. And we applaud the efforts of the EPA to find a suitable location for waste water treatment facilities. I would, however, like to reiterate my unequivocal position to siting the waste water treatment facility at Long Island. Long Island plays, and will continue to play an integral role in the City's effort to provide basic human services. I have repeatedly stated my commitment to the Long Island Chronic Care Hospital and the Long Island Shelter for the homeless, which is the only shelter for the homeless operated by the City. Since my inauguration, the number of beds at the Long Island Shelter has been increased from one hundred to two hundred; while the Chronic Care Hospital continues to serve over one hundred and fifty patients.

BOSTON CITY HALL • ONE CITY HALL PLAZA • BOSTON • MASSACHUSETTS 02201 • 617/725-4000

In short, the future use of Long Island is of paramount concern to the City of Boston. As an irreplaceable location for sheltering the City's homeless and the chronically ill; and as one of the last remaining undeveloped areas in Boston, the future use of Long Island should not include a waste water treatment facility.

Sincerely,

Raymond L. Flynn

Raymond L. Flynn
Mayor

RLF/PW/amcd

June 21, 1984

Honorable Raymond Flynn
Mayor of Boston
City Hall
Boston, Massachusetts 02108

Dear Mayor Flynn:

On April 12, 1984, Secretary Hoyte and I met with you and members of your staff to discuss the clean-up of Boston Harbor and specifically your views of Long Island as a potential site for a wastewater treatment facility. At our meeting you agreed to provide EPA with documentation on the City's long term plan for Long Island as well as provide us with certain information which would assist EPA in our environmental impact statement (EIS) evaluations. Since several months have passed and we have not received any correspondence from the City, I wish to bring this issue to your attention.

I believe we both agree that a clean harbor is important to the future economy and recreational opportunities for the citizens of the Boston metropolitan area. EPA is working as quickly as possible on decisions which affect the clean-up of the harbor. Our ongoing EIS is evaluating eight alternatives for siting of wastewater treatment facilities for the Metropolitan District Commission either at Deer Island, Nut Island or Long Island. In order for our EIS to be as comprehensive as possible as well as to comply with the legal requirements of the National Environmental Policy Act, we must request that the City of Boston inform EPA of future plans for the long-term use of Long Island. This information will assist us in thoroughly evaluating those wastewater treatment scenarios under consideration for Long Island to determine the compatibility of such facilities with those plans set forth by the City of Boston. Without this information EPA must make certain assumptions about Long Island which may not be consistent with the objectives of your administration.

As you can imagine, the final decision on siting a wastewater treatment facility in Boston Harbor will undergo tremendous scrutiny and public review. Our recommendations must be sound and supported by adequate information. I would appreciate your assistance in providing EPA with your view of the future of Long Island and to provide members of my staff and our contractors the necessary approvals for access to Long Island to conduct our EIS investigations. Your assistance in providing EPA with this information will allow us to complete our EIS on siting wastewater treatment facilities and move us one step closer to the long overdue clean-up of Boston Harbor.

Sincerely yours,

Michael R Deland 6/21/84

Michael R. Deland
Regional Administrator

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J. F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

June 18, 1984

Letters to the Editor
Boston Globe
135 Morrissey Boulevard
Boston, MA 02107

Dear Editor:

Your series of three editorials on the need for Super Harbor was constructive journalism at its best. The writer put a mass of history and current planning, or the lack of it, into context and made a reasoned plea for unified planning and administration in place of misrule by 125 government agencies, boards and departments.

Critical to the harbor's future is adequate wastewater treatment. Two avenues for progress in cleaning up harbor pollution now offer themselves. One is the Governor's pending legislation to create a new Metropolitan Water Resources Authority (House Bill 5915). This would be an independent authority capable of gaining adequate funding and expertise for construction, operation and maintenance of a first-rate system in the manner of a public utility. I urge you and your readers to support House Bill 5915.

The second opportunity already has been seized by many devoted public officials and citizens who are contributing their wisdom and expertise on siting of treatment facilities. A supplemental environmental impact statement being prepared by EPA will examine eight alternative plans involving Deer Island, Nut Island and Long Island. A public hearing on the draft EIS will be held this fall and the final EIS recommending the sites will be issued early in 1985.

The public will benefit from the long sought harbor cleanup only if there is a commitment to public access and appropriate shoreline uses that capitalize on harbor cleanup -- uses such as parks, promenades, restaurants, fish piers, boat moorings, and marinas. The MDC has an opportunity to acquire waterfront parkland with $12 million earmarked for this purpose in the capital outlay budget. The Boston Redevelopment Authority can take the initiative to plan for compatible shoreline uses.

(more)

Speaking of waterfront amenities, wastewater treatment facilities can be sited, designed and built to incorporate recreational and aesthetic benefits and minimize community disruption. The Tallman's Island treatment plant in Queens, Long Island, N.Y., incorporates a waterfront park, landscaped waterfront walkway and a public pier. Major interceptors linking the Lowell Industrial Park and the Duck Island treatment plant on the Merrimack River were constructed to accommodate attractive walking and biking paths.

This is not yet the Globe's vision of Super Harbor. The structure to achieve this goal remains to be designed. The recent Boston 2000 Conference of mayor's, planners and developers from Boston and across the Nation began to form an alliance that could shape the future uses of this priceless asset. We who love the harbor deserve nothing less.

Sincerely,

Michael Deland/SFE

Michael R. Deland
Regional Administrator

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J. F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

June 15, 1984

The Honorable Joseph F. Timilty
The Honorable John F. Cusack
Joint Committee on Housing and Urban Development
State House
Boston, Massachusetts 02133

Dear Chairman Timilty and Chairman Cusack:

I am writing to support the creation of an independent, professional, adequately financed water and sewerage authority for the greater Boston area, as set forth in House Bill No. 5915. This authority is needed to bring to an end the continuing discharges of raw and partially treated sewage into Boston Harbor. The current discharges from the Metropolitan District Commission system create the most serious water pollution problem in New England and make the Commonwealth of Massachusetts one of the worst violators of the federal Clean Water Act in the country. The discharges regularly result in beach closings, cause diseases in fish and other organisms and threaten the public health to a greater extent than may be generally realized. They cannot be allowed to continue.

House Bill No. 5915 would address the pollution problem first, by creating a new agency with the administrative ability to undertake the large clean-up effort required. The resolution of the pollution problem will require long-term planning. In comparison with the MDC, the new agency should be better able to do this planning, since it will have independent long-term financing. The resolution of the problem also will require the undertaking of a long overdue effort to expand and rehabilitate the sewage treatment system serving the Boston area. This will require a large construction management effort. In comparison with the MDC, the new agency should be better able to make the concerted effort required, particularly since its top management will not have the widespread responsibilities of the MDC and will be able to focus on sewage treatment projects. Finally, the resolution of the pollution problem will require better operation and maintenance of treatment facilities. An independently financed professional agency should be in a better position to do this than the MDC, which has long been understaffed and underfunded.

EPA has positive experience around the country with independent professional sewerage agencies like the one proposed to be created by House Bill No. 5915. For example, the St. Louis area Metropolitan Sewer District is widely regarded as among the leaders in water pollution control. Closer to home, the creation of the Narragansett Bay Commission to handle the sewage from Providence, Rhode Island, and several surrounding communities has been an important step in addressing the pollution problem in Narragansett Bay.

The other key part of resolving the Boston Harbor pollution problem is of course adequate funding. Currently, in contrast to many modern sewerage agencies, the MDC lacks the ability to issue revenue bonds. It also lacks the ability to raise sufficient funds from the users of its services because its assessments have been capped at a low level. In the absence of either a mechanism for raising sufficient funds from its users or of supplemental appropriations, the MDC facilities continue to pollute the Harbor and to violate pollution control requirements. If current funding levels and mechanisms were continued unchanged, the Boston Harbor pollution problem would never be corrected. It is time for the Commonwealth of Massachusetts to address this pollution problem by adopting a system which provides for adequate funding. The Commonwealth is being asked to do no more than what industry and other governmental bodies have already been required to do throughout the country.

House Bill No. 5915 would address the funding problem by giving the new authority the ability to issue revenue bonds to pay for capital projects and the ability to raise adequate funds through user charges to residential, commercial and industrial users of its services. While this could be expected to lead to manageable increases in sewer user charges, it is of course not the new authority that would bring about the need for increased user charges, but rather the need to stop pollution and the violations of the law. As set forth in a recent study by the Bank of Boston, sewer user charges in the MDC system currently are far below those in most other areas around the country. Because funding levels have been below the levels necessary to pay for sewage treatment, the MDC system has not been properly operated and maintained and has not been expanded and updated. Major metropolitan areas that have increased sewer charges such as Philadelphia have made considerable progress in addressing their pollution problems. The MDC system, with its low user charges, stands out as among the systems that have made the least progress.

It also should be emphasized that a failure by the Commonwealth to address the pollution problem is not likely to result in a continuation of the MDC system's low user charges. EPA cannot allow violations of federal law to continue and believes that it is time for the MDC member communities to accept the responsibility for paying for the full cost of sewage treatment. EPA is confident that it can prevail in any necessary federal court action. Moreover, any delay in addressing the pollution problem could actually cost the Commonwealth money. EPA is currently administering a sewage treatment grants program, which has already provided almost $1 1/4 billion to Massachusetts projects and which is available to help fund the clean up of Boston Harbor. But this grants program cannot do the job alone and will not be continued forever. Should the Commonwealth delay in creating the administrative structure and funding mechanism needed to address the Boston Harbor pollution problem, the Boston area could end up building its new treatment facilities after the federal program expires, thus being one of the few areas in the country required to build the treatment facilities without federal assistance.

In addition, Congress has mandated that sewage treatment grant assistance may not be given to areas which lack user charges sufficient to pay for the costs of operation, maintenance and replacement of their treatment systems. It is becoming increasingly apparent that the MDC system lacks sufficient user charges, placing continued federal assistance to the MDC and its member municipalities in jeopardy. In a similar situation, EPA this past year cut off grant assistance to the five communities in the South Essex Sewerage District until they agreed to pay for the full cost of sewage treatment.

I call upon the Legislature to act on H. 5915 as a matter of great urgency. A full-scale effort to clean up the Harbor is long overdue. Moreover, if new legislation is not adopted, the pollution problem could actually get worse as funding restrictions lead to further service cutbacks and breakdowns. None of us should sit back as this major pollution problem remains unaddressed and violations of the law continue.

Sincerely,

Michael R. Deland

Michael R. Deland
Regional Administrator

cc: The Honorable Michael S. Dukakis
Secretary James S. Hoyte

8 Lakewwod Drive
!edfield, Mass., 02052
May 20, 1984

Dear EPA,

I would like to comment on the proposed site options for wastewater facilities in Boston Harbor.

I feel the existing facilities should be rehabilitated and upgraded to advanced primary with decreased flow; that several satellite facilities should be constructed and that all outfalls be designed for deep ocean.

Serious consideration should be given to decreasing the amount of inflow to the Nut and Deer Island facilities, by removing several towns from the sewerage system. The towns hosting the Southern System of the MDC are closely surrounded by towns with existing wastewater facilities. Several of these towns could be joined to nearby plants; such as Hingham to Hull, Weymouth to Rockland, Walpole to Abington. There are not as many facilities on the North Shore. This is where two or three secondary satellite facilities could be utilized, not exclusive to the Northern Line but involving such large areas as Framinham and Natick.

If the burden of the present facilities at Nut and Deer Islands were decreased, they would be able to deal with wet weather flows more easily.

Satellite facilites, although costly, are the best way to stop polluting Boston Harbor. Towns that are not on the MDC system have developed sound methods of constructing and maintaining their plants. With the proposed change of the Water and Sewerage Divisions of the MDC, this is the time that alltowns and communities be responsible and accountable for their waste.

I firmly believe that there should not be future growth of wastewater facilities in Boston Harbor, particularily at Long Island. The Harbor cannot tolerate any more pollution, adding more poor quality effluent will only add insult to injury.

Upgraded primary with decreased flow and secondary satellite facilities will help to insure health to ourselves, marine life and our water.

Thank you for your consideration.

Sincerely,

Frances H. Tosches

Frances H. Tosches

4-6-84

Honorable Raymond Flynn
Mayor of Boston
City Hall
Boston, Massachusetts 02108

Dear Mayor Flynn:

EPA, Region I, has undertaken the preparation of an Environmental Impact Statement for wastewater treatment facilities proposed by the MDC in Boston Harbor. This environmental review is currently examining eight final options out of eighteen that were initially proposed to determine a preferred alternative for treatment plant siting. The remaining options being evaluated involve facilities to be sited at either Deer Island, Long Island or Nut Island.

While we recognize the very serious concerns and potentially adverse impacts of proposed siting at Long Island, it is EPA's mandate to fairly and fully examine the comparative impacts and benefits at each of the proposed sites. Such an analysis will serve to establish the factual basis for a comparison of impacts at Long Island and the other sites, as well as provide a basis to evaluate associated siting issues of concern to the City such as elements involving Long Island Hospital, the bridge, or the Deer Island House of Correction. Because of the previous City administration's opposition to any such facility siting at Long Island, current data on Long Island is least adequate and not up to date.

In order to facilitate this analysis within the time frame established by EPA and the State (EOEA) I am requesting your assistance to give our consultants and staff access to Long Island and to information that may be available from various City Departments. A list of these data and access needs is attached. If possible, we would like to initiate this site access and information review within the next two weeks in order to meet our established deadlines.

I look forward to meeting with you on April 12, 1984, and I appreciate your assistance in this matter.

Sincerely yours,

Michael R. Deland

Michael R. Deland
Regional Administrator

List of Data Needs

1. Authorization to conduct preliminary site analysis on Long Island. This will entail site visits by small groups of EPA staff and consultants to view the areas on the island including the hospital grounds, take soil samples, and inventory the island's features. Such visits would be during daylight hours and would not disrupt any of the island's present uses or activities. We anticipate approximately six visits over the next two months to accomplish the variety of site viewing and analysis tasks.

2. Access to information prepared by other City Departments regarding elements of Long Island's or Deer Island's use. The following are key pieces of such information:

a. Inspection of Long Island Bridge--information received from Paul Donahue of the Public Facilities Department (725-4862) indicates that an inspection of the Long Island Bridge was to be carried out by a contractor to the City; any information obtained to date would be helpful to the EIS review.

b. Studies of reuse of Long Island--any studies involving reuse or relocation of hospital services and facilities for both short-term and long-range time frame.

c. Studies of reuse of DI House of Correction--information received from Peter Scarpignato, Public Facilities Department, indicates that rehabilitation and/or rebuilding of the prison is pending availability of funds. Any feasibility studies or other assessments are requested, including studies of possible relocation of the prison.

d. Recreational uses of Long Island--any plans by the City to develop the Island's recreational uses would assist in broadening our analysis of the site. We already have incorporated State recreational plans.

e. Other development plans--any other plans to develop the island for commercial or residential uses would be useful in establishing the sites future potential.

The Commonwealth of Massachusetts
House of Representatives
State House, Boston 02133

THOMAS F. BROWNELL
ASST. MAJORITY LEADER
2ND NORFOLK DISTRICT
15 MORELAND ROAD
QUINCY, MA 02169
OFFICE - 722-2430

Committees on
Taxation
Transportation
Rules

ROOM 236, STATE HOUSE
BOSTON, MASS.

TO: BARRY LAWSON ASSOCIATES

FROM: LARRY CHRETIEN, AIDE TO REP. THOMAS F. BROWNELL

SUBJECT: MITIGATION MEASURES FOR SDEIS

DATE: APRIL 5, 1984

The mitigation measures we now recommend relate heavily to those that we outlined in our statement for the public meeting in January. You might want to refer to that letter, dated January 18th. Other ideas we have have grown out of subsequent discussions and study, including that of the CAC meeting on April 3rd.

First and foremost, we are in favor of secondary option 1a and primary option 4a. 2. Under these options we recognize the impacts on Winthrop and the need for mitigation. Consequently, we recommend that the following actions be taken:

1. A moratorium must be continued on expansion of the district.

2. Host communities should not be assessed sewer charges. In fact, they should be financially compensated for carrying the burden of hosting wastewater treatment facilities. A community with a secondary facility would receive the most, a community with a headworks would receive a lesser amount.

3. The Metropolitan Water and Sewer Authority must be established. Without the promise of depoliticization and sufficient funding, host communities still would have to expect dangers due to inadequate pre-treatment and excessive wastewater flows from I/I and CSO's.

*This office has filed the legislation necessary to carry out those proposals.

In terms of on-site mitigation at Deer Island, we offer these suggestions:

1. It's doubtful that the prison could ever be moved, but it should be looked into and a judgement should be made prior to the facilities siting.

2. During construction barge in materials and bus in workers. Any large vehicle movements on the streets of Winthrop should be scheduled around the need for public safety. If necessary, a police escort should be provided.

3. Substitute sodium hydrochlorite or another means of disinfection for chlorination. Regardless of the cost, chlorination is not acceptable.

4. Provide State of the art odor and noise control equipment.

5. Provide a considerable degree of aesthetic improvements, such as landscaping.

*Frankly, we have not had the time to do an exhaustive study of possibilities for mitigation. But we do support any well-reasoned proposal to alleviate local impacts. Costs of maintaining public safety, water quality and the like should be internalized into the sewer assessments. We shouldn't sacrifice neighborhoods or environmental quality for the sake of cutting budgetary corners. We should pay the price for whatever is necessary. It is the obligation of the MDC (MWSA), the Commonwealth and the EPA to determine exactly what is necessary. But we do appreciate these efforts to include citizens and elected officials in the planning process. If you have any questions or comments about our position, please feel free to call us at 722-2430.

City of Quincy, Massachusetts
City Hall

OFFICE OF THE MAYOR

FRANCIS X. McCAULEY

April 3, 1984

Hon. James S. Hoyte, Secretary
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, MA 02202

Dear Secretary Hoyte:

I wish to express our appreciation for the attention given by the Boston Harbor Quality Committee to the presentation by our representatives on Wednesday, March 21, 1984, and to assure you their statements, including those concerning priorities, are reflective of my position. We regret we had not better understood the format for this meeting or what was expected of the City.

In addition to the points made in the statement offered by Mr. Colton, a copy of which is attached, the City reiterates its statements previously given either at open forums or in communications to you, and the observations which were made at the aforesaid meeting by its representatives are set forth in the attached "position paper ." I anticipate you will assure its distribution to the Committee.

Sincerely,

Francis X. McCauley

Francis X. McCauley
Mayor

March 21, 1984

Boston Harbor Water Quality
Position Paper on Facility Siting
Presented to the Boston Harbor Water Quality Committee

A major objective of any program, an absolute minimum requirement for any facility, must be that it is a good neighbor. This means an environmentally and aesthetically sensitive design, a facility that not only meets the test of long-term operability but is as redundant as necessary to ensure compatability, and a budgetary commitment and management structure which assures those goals can be attained and maintained. It means also a commitment to continued vigilance by oversight agencies and a determination to take vigorous enforcement action where needed; a dedication to prompt and effective actions to protect the rights of neighbors and the quality of the environment and to assure that agreements and stipulations are rigorously honored.

It is not our intention or wish that environmental problems be "dumped" on some one or other location or group of people. However, it must be recognized that a metropolitan sewage treatment facility is inescapably industrial in nature, and must be operated continuously. It represents a dedication of a substantial tract of land to that function; it will be visible; it must be serviced. It is also absolutely essential that the current MDC facilities be upgraded and replaced on a most expeditious schedule. Strong and careful consideration must be given to land-use impacts of any siting decision.

The siting decision must provide for an efficient arrangement. The sensible requirement for cost-effectiveness should, of course, include the requirement for public health protection and recognize potential social and aesthetic impacts, as well as addressing water quality goals and standards. Certainly, any impacts during construction and demolition of facilities which are unavoidable or cannot successfully be mitigated must both be factored into the siting decision and be compensated for.

We recognize that the preliminary assessment and estimates of impacts, benefits, and costs that are presently before us are subject to considerable refinement. Some, will, of course, remain subjective or intangible but are nevertheless important - it is the task of your Committee in part to weigh such factors. Nevertheless, we firmly believe some facts and considerations will not change. It is clear that Nut Island cannot support additional facilities, and that any facility at that location will be the most proximate to habitation and have the most difficult (and impacting) land access. Combined facilities on Deer Island will have significantly lower capital and operating cost, and present the most efficient operational and management situation, of all the options available. This option minimizes the number of facilities that must be managed, operated, and maintained. It takes maximum advantage of existing facilities, especially pumping stations and tunnels, and requires only a new conduit from Nut Island. It limits the volume of and distance over which liquids must be pumped. The extended outfall length is minimized.

<u>None</u> of the proposed siting options would have any significant direct environmental, aesthetic, or construction impact on the City of Boston (save, possibly, for the impact of construction staging facilities common to each). In our opinion, therefore, potential economic benefits to that City should not weigh in the decision process. When comparing Deer Island and Nut Island, it must be recognized that both Deer Island and Nut Island under any option will always have <u>at least</u> a "headworks" facility; that demolition and removal of facilities abandoned at either Deer or Nut Island will be required along with restoration of the sites; that the recreational and public use potential and value of Deer Island, even with extensive renovation, can never approach that of Long Island at <u>its current</u> state. Further, in the absence of a clear, workable, funded commitment to the contrary, the decision process cannot assume the relocation of any Boston facilities currently in use on either island.

Further, it is regrettably clear that any treatment works must have an emergency bypass which will function to protect both "upstream" areas and the facility itself, under loss-of-power situations among others. (Major efforts and facilities must be incorporated to reduce this potential need, of course.) The facility must be so located and constructed as to discharge untreated wastes under those conditions to the location which will minimize impacts. Deer Island and the President Roads channel best meet this requirement, and are perhaps the only locations which do. We consider this to be a significant factor in the analysis of environmental and public health impacts, given our past experience with Nut Island.

It is our position that use of Harbor islands for treatment of wastewaters from the metropolitan area is an undesirable use of those lands which has evolved from practices, priorities, and commitments of the past. We believe that any further expansion of the contributing system must not increase flows to harbor facilities which would necessitate any increases in their capacities, increase the probablity of overflows or bypass, or reduce the effectiveness of treatment. We also believe that additional areas of these islands need not be used for management or disposal of sludge, and insist that other locations of lesser public value be utilized for that purpose

In summary, we believe a factual and comprehensive analysis, evaluation, and weighing of all relevant factors will establish that combining all facilities on Deer Island is far and away the most appropriate resolution. Upon reaching that conclusion, it would then be very appropriate, in fact mandatory, to provide compensatory mitigation to residents and the Town of Winthrop. Even though the facility must not create odor, noise, water pollution, significant aesthetic impacts, or traffic impacts under normal conditions in Winthrop, its presence still will have unavoidable effects. The City pledges its vigorous support to that Town in this matter.

UNITED STATES ENVIRONMENTAL PROTECTION

3/22/84

Honorable Francis X. McCauley
Office of the Mayor
City Hall
Quincy, Massachusetts 02169

Dear Mayor McCauley:

Thank you for your letter of March 1, 1984, expressing concern relative to the use of Long Island as a site for an MDC wastewater treatment facility to serve the metropolitan area.

EPA and the Commonwealth of Massachusetts are jointly preparing an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) on the siting of wastewater treatment facilities in Boston Harbor. The National Environmental Policy Act (NEPA) process requires that EPA's EIS evaluate all feasible alternatives on siting wastewater treatment facilities before a final recommendation is made. The evaluation of the eight remaining options for Deer Island, Nut Island, and Long Island will take into consideration all social, technical, economic, environmental, legal and institutional factors. Once this information is available and carefully analyzed, I believe EPA and the Commonwealth will be in a position to make a final recommendation. To foreclose Long Island options at this stage in the process is premature and unfair to the concerns expressed by the Town of Winthrop.

I thank you for your interest regarding Long Island, and I welcome the opportunity to meet with you to discuss issues and concerns pertaining to locating wastewater treatment facilities on either Long or Nut Island. I can assure you that your concerns will be given special attention in our EIS analysis.

Sincerely yours,

Michael R. Deland

Michael R. Deland
Regional Administrator

City of Quincy Massachusetts

City Hall

OFFICE OF THE MAYOR

FRANCIS X. McCAULEY

March 1, 1984

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

Dear Mr. Deland:

We have learned, indirectly and to our considerable concern, of a recent preliminary decision of yours concerning the Boston Harbor SDEIS. We understand that despite the urgings of City and State, despite the fiscal realities, you are opting for continued consideration of Long Island as a site for primary or secondary treatment of M.D.C. sewage. This would represent support for violation of the environment of Long Island, for permanent interference with its extraordinary recreational and open-space potential, for newly impacting the Squantum area, and for needlessly squandering capital resources of the region -- a further and pointless taxation of the people of the area. You risk extending and refocusing the controversy over facilities siting, and render any sludge management option less attractive.

I strongly urge you at this time to face the hard choices, to limit the options to those both feasible and reasonable, and get on with the task of cleaning up the harbor.

Sincerely,

Francis X. McCauley

Francis X. McCauley
Mayor

FXM:jr
CC:Commr. Anderson

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J. F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

February 22, 1984

Mr. Robert Noonan, Chairman
Winthrop Board of Selectman
Winthrop Town Hall
Winthrop, MA

Dear Mr. Noonan:

Re: Screening of Alternatives for Further Study in SDEIS

As I had promised at the Public Information Meeting on the Supplemental Draft EIS in Winthrop on January 19, 1984, I have given a thorough evaluation of C.E. Maguire's recommendations to EPA regarding the final set of alternatives that the SDEIS will include for further study. Based on my own evaluation of the consultant's work and based on the citizen input received during the public comment period, I have reached some conclusions that I would like to communicate to you.

First, the SDEIS will evaluate alternatives 2b.1 and 5b.2. These options, as you know, place all treatment works for either a primary or secondary level of treatment on Long Island, converting both the present Deer Island and Nut Island sites to headworks facilities. I have directed our consultants to include these alternatives for further study in the SDEIS and to give them full and equal attention with the other alternatives recommended for further evaluation. These alternatives clearly would provide a benefit to the Town of Winthrop.

The second thought that I would like to convey to your community is that any of the alternatives for long-range planning will not be implemented for at least 10 years. In the meantime, immediate improvements are absolutely necessary to alleviate the most critical chronic problems which have plagued the Deer Island treatment plant. EPA will participate in the funding of the Fast-Track Improvements and fully supports the concept of immediate improvement to both the Nut and Deer Island treatment plants. Improvements to the Deer Island facility will increase the reliability of the plant and thereby reduce sewage overflows to Boston Harbor.

However, it must be noted our agency's support of the Fast-Track Improvements will not foreclose any of the long-term options being considered in the SDEIS. We view the Fast-Track Program as essential for improvements to water quality and as necessary to provide reliable primary treatment for the intervening period before any long-range solutions for Boston Harbor are implemented.

I urge you to continue to support both the current evaluations being performed under the SDEIS and the Fast-Track Improvement Program. If you have any further questions or concerns, please feel free to contact Bob Mendoza of my staff at (617) 223-3916.

Sincerely yours,

Michael R. Deland
Regional Administrator

cc: James Hoyte, Secretary of Environmental Affairs
William Geary, Commissioner, MDC
Russell Hughes, Town of Winthrop

NEWS FROM

SOUTH SHORE CHAMBER OF COMMERCE

P.O. Box 488 36 Miller Stile Road Quincy. MA 02269 479-1111

Contact Terry N. Fancher, Manager
Community Development

Home

For Release Immediate

January 30, 1984

SOUTH SHORE CHAMBER OF COMMERCE
TAKES FORMAL POSITION ON WASTE WATER SITING

The South Shore Chamber of Commerce has voted unanimously to support City of Quincy officials on the siting of Waste Water Treatment facilities.

The Chamber Board of Directors has voted to give its support behind what is commonly known as option 4A2. That option would provide for the conversion of the present primary treatment plant at Nut Island to a pumping station. The plan, according to Community Development Vice-President Warren Noble "provides for construction of a headworks on Nut Island, an underwater pipe to take the sewage to Deer Island, a new primary treatment plant at Deer Island and a deep ocean outfall between 10 and 12 miles long for the discharge from the Deer Island Plant."

Noble says "while it would be nice if the problem would just go away, it's a problem that impacts everyone along the South Shore coast and time is running out to do something about it." Noble goes on to say "option 4A2 represents the best of the limited options available to us."

Three months ago there were over 20 option plans being considered. A month ago those options were narrowed to six. Noble explains, "although the Chamber Board did consider option 1A which would have provided for secondary treatment at Deer Island instead of a deep ocean outfall, it was our opinion that it would provide too much of a negative impact on the town of Winthrop, and would have less chance of approval in the long run."

The Environmental Protection Agency, the Metropolitan District Commission and local groups have all been working to come up with a long term solution to the problem of waste water treatment. The cost for option 4A2 is estimated to be 760 million dollars.

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Division of Water Pollution Control
One Winter Street, Boston 02108

ANTHONY D. CORTESE, Sc. D.
Commissioner

January 9, 1984

Walter Newman, Acting Chief
Environmental Evaluation Section
Environmental Protection Agency
J.F.K. Building
Boston, Ma 02203

Re: MDC
SDEIS, Siting of
Wastewater Treatment
Facilities

Dear Mr. Newman:

In response to your request, the Department of Environmental Quality Engineering, Division of Water Pollution Control submits the following documentation in support of your tentative determination to maintain primary treatment facilities for North System flows at Deer Island. As has been stated previously by personnel from DEQE, our Agency was extremely concerned about EPA's initial inclusion of SDEIS Options 2b.1, 5b.1 & 5b.2 which provide for the construction of treatment facilities on Long Island with the elimination of all treatment works at Deer Island. Our major concerns are as follows:

1) DEQE and MDC are developing a phased program for fast tracking over $37 million federal dollars worth of critical construction work for the Deer Island Wastewater Treatment Facility (1.2 million federal dollars of which is contained on the State's FY 84 Construction Grants Priority List and the remaining to be included on the FY 85 and 86 lists). This work consists of immediately needed improvements to the facility such as; power distribution, sludge thickeners, pump station/power supply, disinfection system, remote headworks renovations and odor control. The construction timing for Phases 1 and 2 of this work would extend over a 1½ year period and would not be completed until approximately January 1987. One major part of this work is the electrification of the Deer Island Pump Station which includes the laying of a trans-harbor powercable by Boston Edison (at their cost). Boston Edison plans to recoup the cost for this work through long-term power charges to the MDC. Boston Edison has already indicated to MDC and their consultant that they do not intend to proceed with the necessary environmental and alternative analyses for the cable laying until they have received commitments from both the MDC and DEQE that the long-term plan is to electrify Deer Island and that grant or

state monies are available to the MDC for reconstruction of the pump station. DEQE has recently met with the MDC to develop a strategy to provide Boston Edison with these commitments. If the long-term treatment plan does not include a major power user at Deer Island, Boston Edison would certainly rethink their plan for laying the multimillion dollar cable. Even a delay of six months by Boston Edison for initiation of the environmental and alternative studies could cause the fast-track program to be delayed beyond our target dates for funding of this project. This is due to the need for a MEPA filing by Boston Edison on the cable laying with its probable requirement of an EIR and incorporation of that document into DEQE's FNSI for the fast-track projects.

2) The residents in Winthrop who have attended the various Deer Island Fast-track hearings held by MDC are opposing certain portions of the project, in particular the temporary wharf, to ensure that no new project will be constructed at Deer Island which will impact the possible revision of Deer Island to a headworks facility. Therefore, the longer the possibility exists for turning Deer Island into a headworks, the more difficult it will be for MDC, DEQE, and EPA to adequately upgrade the treatment facilities.

The turning of Deer Island into a headworks facility after making the fast track and/or sludge improvements would only allow for the use of these $40 and $80 million facilities for seven years in the case of fast track and four years for sludge incineration. This assumes completion of Phase 1 and 2 fast track facilities in January 1987, sludge incineration in January 1990 and full treatment facilities in January 1994.

3) Not only could the $40 million for the Deer Island Immediate Upgrade be jeopardized, but the planned sludge management program at Deer Island ($80 million for primary sludge incinerators) would be severely impacted if the possibility exists for relocation of the primary treatment plant.

4) If EPA indeed planned to examine the feasibility of removing all treatment facilities from Deer Island, the EIS should be expanded to examine alternative tunnel arrangements from the three existing main headworks facilities and the possibility of completely reconstructing and redirecting system flows between the North and South Systems. This would require that all existing MDC, BWSC and Winthrop sewer projects be held in abeyance until such an analysis is completed. This certainly would add significant delays to the siting process but would be the only logical action to take since the entire backbone of the MDC system would be called into question.

Therefore, DEQE strongly supports EPA's tentative determination not to include alternatives which would examine the removal of primary treatment from Deer Island.

Very truly yours,

Thomas D. McMahon

Thomas C. McMahon,
Director

TCM/SGL/bd

cc: David Fierra, EPA
Noel Baratta, EPA
Marjorie, O'Malley, EOEA
Steven Lipman, DEQE
Commissioner Anthony D. Cortese, Sc. D., DEQE
Commissioner William J. Geary, MDC

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

MICHAEL S. DUKAKIS
GOVERNOR

JAMES S. HOYTE
SECRETARY

January 9, 1984

Michael Deland, Regional Administrator
Environmental Protection Agency
J.F.K. Building
Boston, Ma 02203

Re: MDC
SDEIS, Siting of
Facilities Treatment

Attn: Walter Newman, Environmental Evaluation Section

Dear Mr. Deland:

In response to your request, the Executive Office of Environmental Affairs (EOEA) submits the following documentation detailing the extent and nature of work being performed by my Agency which complements and supports the ongoing Site Option EIS.

1) MDC Reorganization -

I have officially requested that Governor Michael Dukakis support and file legislation for the formation of an independent Metropolitan Water and Sewer Authority. My Agency is currently drafting the basic legislative documents and one major aspect of the plan will be to provide the new Agency with the financial and administrative capability to issue Revenue bonds and develop a staffing and budgetary plan based upon providing adequate O&M monies and personnel to ensure the necessary preventive maintenance for all existing and proposed treatment and transmission facilities.

In order to ensure the proper development of this Authority I have retained the Bank of Boston to develop the financial plan for the Authority. It is anticipated that the Authority will begin transition operation on July 1, 1984 and be completely independent by January 1985.

2) MDC Staffing -

Consultants for the MDC have recently completed staffing plans for both the Deer and Nut Island Treatment Facilities. The plans call for increasing staffing at Deer Island by 93 people over its current labor force and Nut Island by 11. This additional staffing will allow the MDC to institute the needed preventive maintenance plans for both facilities and should significantly increase the reliability and efficiency of the plants. I have requested funding for an additional 142 people for the MDC Sewer Division in a FY 84 Supplemental Budget Request and have been assured that the positions will be funded.

3) The Department of Environmental Quality Engineering (DEQE) has filed legislation to provide $100 million for a Grants Program to fund up to 90% of the cost of Infiltration/Inflow (I/I) Reduction by the MDC and its member municipalties. If passed, this would provide my Agency with the necessary monies to institute innovative tecnhiques of I/I reduction and this will complement the overall Boston Harbor Clean-up/MDC Infrastructure Plans.

4) The MDC and DEQE are developing a sequencing and implementation plan for the design and construction of the thirty additional Combined Sewer Overflow (CSO) Projects which exist in the sewer systems serving the Municipalities of Boston, Chelsea, Cambridge, Somerville, and Brookline. Concurrently the MDC and DEQE are completing the design and associated environmental reviews for three additional BWSC CSO's which discharge onto MDC Beaches and will be applying for funding from EPA - Washington through a Special Marine CSO Appropriation.

5) MDC, DEQE, and EPA are attempting to develop an integrated sludge management plan so that the existing method of harbor disposal of digested sludge on outgoing tides can be eliminated. Extensive personnel effort and monies are currently being allocated to this project and it is planned to integrate the various sludge treatment proposals under review into the ongoing siting opertions being developed through this EIS process. In addition, MDC has recently initiated construction on a $1.5 million pilot demonstration compost facility at Deer Island.

6) MDC has retained a consultant to perform a hydraulic analysis of the BWSC Calf Pasture Pumping Station and the currently abandoned Moon Island Holding Tanks to determine potential utilization of the facility to reduce periodic bypasses of partially treated sewage to Inner Harbor Areas.

7) The BWSC has recently installed chlorination facilities at their Calf Pasture Pumping Station to ensure that all dry weather sewage flows through Moon Island are chlorinated prior to discharge into the Harbor. The MDC reimburses the BWSC for all chlorine utilized at this facility.

8) EOEA is in the process of developing a three-year environmental monitoring plan for Boston Harbor which will include water column, sediment and fish tissue analyses throughout the harbor. The monitoring program will allow my Agency to guage the changes and impacts of the ongoing clean-up efforts and to ensure the proper expenditure of monies for capital pro- [illegible] provide the most environmental and health benefits for the [illegible]

9) DEQE has been and is continuing to take a very active role in developing an integrated sewer management plan for the entire MDC sewer system and as a part of that plan is strongly persuing I/I reduction and rehabilitation in member communities. All member communities have either already initiated I/I programs or have been informed in writing by the Division of Water Pollution Control that they are being required to initiate the subject work. DEQE is also forming an interdisiplinary Techincal Adivsory Group to work with the Agency to develop an integrated plan of action. DEQE has also convinced EPA to hold a regional two-day Seminar in Boston during March titled New Concepts in I/I Rehabilitation to which all MDC communities will be invited to participate. As a necessary adjunct to this I/I work, MDC has retained Black and Veatch to examine the revisions to the MDC's assessment procedures so that surcharges might be placed upon municipalities discharging excessive I/I into the MDC Sewer System.

10) 301(h) Waiver - EOEA has established an independent technical peer review committee with representatives of environmental groups and several experts in various disciplines to assist the state in reviewing the plan of study for the waiver reapplication and in reviewing work tasks as they are completed.

11) Many of the initiatives I have outlined move the state forward in cleaning up Boston Harbor. We are taking the initiative on many fronts and need to gain a level of consensus on these actions. I must point out however, that many of our efforts are expensive and we are looking for the federal government for increased funding. We have begun to work with the congressional delegation to lobby for increased levels of funding to clean-up Boston Harbor. We hope the federal government will back-up its verbal commitments to clean-up Boston Harbor with the financial commitment to carry it out.

The above listing is by no means a complete compilation of ongoing work by EOEA Agencies regarding Boston Harbor/MDC, but should provide your Agency with a reasonable idea of the extent of ongoing work and our level of commitment to ensuring an integrated, complete and implementable clean-up program.

Very truly yours,

James S. Hoyte

James S. Hoyte
Secretary

JH/bd

cc: Commissioner Anthony D. Cortese, Sc. D., DEQE
Commissioner William J. Geary, MDC
Marjorie O'Malley, EOEA
[illegible], MDC
[illegible], EPA
[illegible], MEPA
[illegible], DEQE

TOWN OF WINTHROP

ROBERT E. NOONAN, *Chairman*
ROBERT A. DeLEO
RONALD V VECCHIA

MARIE T. TURNER, *Secretary*

TOWN HALL
WINTHROP, MASS. 02152
846-1077

OFFICE OF THE
BOARD OF SELECTMEN

November 30, 1983

Mr. Michael R. Deland, Administrator
U.S. Environmental Protection Agency
John F. Kennedy Federal Building
Room 2203
Boston, Massachusetts 02133

Dear Mr. Deland:

The Winthrop Board of Selectmen have reviewed the letter of November 1, 1983 of the Special Commission on the Development of Boston Harbor, signed by Joseph P. Walsh, Chairman.

We are concerned that a Commission such as this can take a vote on such an important issue with no communication with an impacted community. We are not aware of the makeup and membership of this Commission, and would appreciate receiving this information, in order that we may make them aware of the problems experienced in this Community as the result of the location of the treatment plant at Deer Island.

As you know, the Town of Winthrop has gone on record numerous times in opposition to the Deer Island location, and stated our firm and we believe well-substantiated belief that the permanent long-range solution is to locate the facility on Long Island.

The Commission states they voted to recommend that options previously considered and rejected ought not to be included in the EIS. Our answer to this, of course, is that we feel Long Island has not received sufficient study to warrant rejection, and should be pursued as the long term solution.

We are also concerned that the options they support include secondary treatment at Deer Island, to which we are unalterably opposed.

We certainly agree with their wanting a <u>true</u> harbor clean-up as soon as possible. Hopefully, the problem will be resolved <u>permanently</u>. We are enclosing copy of the position of the Board of Selectmen as presented at the Public Hearing in Winthrop on September 29, 1982 relative to this matter. We stand on that position and we feel we have excellent reasons.

We have led the fight for restoration of existing facilities at Deer Island which have been allowed to deteriorate so badly, that we have suffered all the accompanying adverse impacts.

As a Board, this Office has put forth more time and effort in this problem than any other faced by this community in the past twenty years or more.

The permanent long-range solution to sewage treatment and the clean up of Boston Harbor must be accomplished. We feel that permanent long-range solution is Long Island, and that solution must be given proper study and evaluation through your final scope of work.

We are forwarding a copy of this letter and accompanying statement to the Special Commission on the Development of Boston Harbor, with the hope they reconsider the vote taken on October 25, 1983, and their position that other suggested options are either impractical, controversial, or too time consuming.

The permanent long-range solution is too important to be dismissed as "controversial or too time-consuming."

Thank you for your consideration of our position in this matter.

Very truly yours,

BOARD OF SELECTMEN

Robert E. Noonan, Chairman

Robert A. DeLeo

Ronald V. Vecchia

CC:
Senator Joseph B. Walsh
Special Commission on the Development of Boston Harbor
State House - Room 15
Boston, Massachusetts 02133

FINAL SCOPE OF WORK FOR
PREPARATION OF A SUPPLEMENTAL DRAFT EIS
ON BOSTON HARBOR WASTEWATER TREATMENT FACILITIES SITING

OCTOBER 21, 1983

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I
WATER MANAGEMENT DIVISION, ENVIRONMENTAL EVALUATION SECTION
ROOM 2103, JFK FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203

FINAL SCOPE OF WORK FOR
PREPARATION OF A SUPPLEMENTAL DRAFT EIS ON
BOSTON HARBOR WASTEWATER TREATMENT FACILITIES SITING

A. Introduction and Objectives

EPA, with its consultant, CE Maguire, Inc., is now preparing a Supplemental Draft EIS (SDEIS) for proposed wastewater treatment facilities siting in Boston Harbor. This EIS is being prepared in cooperation with the Executive Office of Environmental Affairs and the Massachusetts Environmental Policy Act Unit (MEPA) along with other state and federal agencies. This Supplemental Draft EIS will also be considered jointly under the state Environmental Impact Review (EIR) process. This joint process will conclude the necessary environmental reviews in a timely fashion and assure a complete evaluation of the issues involved.

Public participation is also an important element of the EIS/EIR. Public participation has been applied during the scoping process to assist EPA and the state in defining the issues of concern to individuals and groups within the affected communities. It will continue to provide important inputs to the study as it proceeds.

This final scope of work is designed to identify the options and issues which will be evaluated in the Supplemental Draft EIS. It incorporates previous environmental reviews and decisions made, and considers current facilities plans and proposals being developed and implemented by the MDC. The final scope of work has been developed after wide ranging discussions and deliberations incorporating the comments and proposals made during the series of scoping meetings held jointly by EPA and the state. The EIS is intended to provide a full evaluation of the reasonable alternatives being considered and array the impacts associated with construction and operation of the proposed MDC wastewater treatment facilities in order that a siting decision can be made by EPA.

In order that this process can move forward, leading to a commitment of federal and state funds necessary for construction to commence, it is necessary that all the project participants, including representatives of the affected communities, involved agencies, and public at large have a complete presentation of the complex issues and their resolution leading to a siting decision. The Supplemental Draft EIS is intended to provide such a presentation at its conclusion to assist the federal and state officials in reaching a final decision.

This Final Scope of Work is further organized into five sections:

B. Background Summary
C. Scoping Process and Screening of Alternatives
D. Proposed Alternatives, Significant Issues and Scoping Comments
E. Agency and Public Participation Program
F. Appendix: Figures, Key Agency Comments and Public Issues Raised During Scoping

B. Background Summary

The problems of pollution in Boston Harbor are not new. They have been occurring with increasing frequency and have prompted a variety of local, state and federal agency actions. These problems include public health threats to use of beaches and fishing areas, odor and aesthetic problems, issues of community safety, and impacts upon water quality and marine life throughout the area of the Harbor influenced by the Deer Island and Nut Island treatment plants. These two treatment facilities operated by the MDC are not the sole causes of the pollution problems in the Harbor; however, they further exacerbate problems through their periodic incapacity to treat wastewater flows adequately and chronic need for repair.

EPA, in cooperation with state agencies, has been evaluating the most recent alternative treatment proposals put forth by the MDC in order to reach agreement on an environmentally sound treatment facility and its location in Boston Harbor.

The following discussion of the past efforts leading up to the present SDEIS serves to highlight the past work associated with siting of harbor wastewater treatment facilities. The related elements of sludge management are being considered further by the state and will be incorporated to the siting to the extent possible. Attachment 3 graphically portrays these events in chronological sequence.

Beginning with the first Enforcement Conference in May of 1968, facilities planning for wastewater treatment in Boston Harbor was a coordinated effort among state, local and federal agencies. The efforts begun continued through two additional Enforcement Conferences, organization of a Boston Harbor Pollution Task Force, a variety of studies, and agreements between EPA and state agencies responsible for pollution control and waste treatment.

In 1976, the MDC and its consultants presented a comprehensive plan for wastewater engineering and management in Boston Harbor for the Eastern Massachusetts Metropolitan Area (EMMA). That plan made several recommendations designed to achieve adequate wastewater treatment for the communities in the EMMA study area and clean water goals for Boston Harbor and its tributary rivers. The principal recommendations of this study were for upgrading the existing primary treatment facilities at Deer Island and Nut Island to secondary treatment, sludge disposal by incineration at Deer Island, construction of two advanced waste treatment (AWT) "satellite" plants on the Charles and Neponset Rivers, and improvements to the MDC's interceptor sewer system plus alleviation of combined storm-sewage overflows.

In the following year, EPA Region I began preparation of a Draft EIS (DEIS) concluded in 1978 to consider and assess the range of environmental impacts associated with those proposed wastewater engineering and management recommendations made by the MDC in the EMMA Study. The EIS focused only on those aspects of the MDC's recommended plan that dealt with the transportation, treatment, and ultimate disposal of municipal wastewaters within the MDC's Metropolitan Sewage District. The factors considered by EPA in 1978 were:

1. Necessary interceptor system modifications;

2. Environmental and engineering feasibility of advanced secondary satellite treatment plants;

3. Alternative secondary treatment plant sites and treatment facility configurations in Boston Harbor;

4. Wastewater treatment plant effluent discharge locations; and

5. Alternative methods for treatment and disposal of secondary sludge.

Other wastewater treatment elements of the EMMA Study, including infiltration/inflow analysis, combined sewer overflow, and primary sludge disposal were not considered by EPA in the 1978 DEIS. These other elements were considered in separate studies, some of which are currently underway.

Following the conclusion of the DEIS by EPA, in August of 1978, a public hearing was held. The combination of critical comments received from all sectors, as well as changes in the Clean Water Act allowing application for waiver of secondary treatment, resulted in a hiatus in the review process following the conclusion of the 1978 DEIS.

During this period also, agreement was reached by EPA and MDC to initiate key facilities planning projects in a segmented fashion in order to accelerate actions needed to remedy the chronic problems and immediate upgrade needs of the MDC wastewater treatment facilities.

Also, during this period, following completion of EPA's wastewater treatment DEIS, the MDC began its work on a 301(h) waiver application. This entailed an extensive analysis of water quality in Boston Harbor including assessment of further treatment facilities elements.

Concurrently, the MDC also developed more detailed wastewater treatment facilities plans for Boston Harbor, presenting its first phase recommendations in the Nut Island Wastewater Treatment Plant Facilities Planning Project, Phase I Site Options Study (1982). This more detailed analysis and facilities plan by Metcalf & Eddy, Inc. concluded that upgraded primary treatment at both Deer Island and Nut Island with local outfalls was both environmentally sound and economically preferred.

A separate Draft and Final Sludge Management EIS were also undertaken by EPA and concluded in 1979. This document examined the MDC's proposals for sludge disposal and confirmed that incineration was the recommended sludge disposal method. EPA issued a Record of Decision on sludge management in 1980 which affirmed the recommendations of the sludge EIS, but raised several questions to be examined further by MDC. Subsequently, MDC issued a Sludge Management Update (1982) report which addressed additional facilities planning elements as raised by state and federal reviewers. Action on sludge management continues, aimed at answering further remaining questions on the incineration option, while the state is formulating its policy on sludge management. Additional environmental reviews will be carried out by EPA, if necessary.

Additionally, a series of legal actions and state initiatives were instituted towards improving the water quality of Boston Harbor and coordinating the various actions being undertaken by state, federal and local authorities. The City of Quincy instituted a lawsuit against the MDC and other state agencies aimed at eliminating the pollution from the Nut Island treatment plant to Quincy Bay. The Conservation Law Foundation instituted a separate lawsuit against EPA and state agencies aimed at overall improvements to harbor water quality which identified deficiencies in administrative and regulatory reviews and decisions that are required. EPA has also instituted a suit against the MDC which focuses on administrative violations of the existing NPDES permit for discharges from the Nut Island treatment plant. The court appointed Special Master in the Quincy suit submitted his findings of fact in the case and the Court recently issued its ruling outlining an agreement for a 10-year plan to clean up the harbor. The schedule for completion of the EIS process conforms with this plan.

On a related course is the work of the Sargent Committee empowered by Governor Dukakis to examine programs and plans to improve water quality in Boston Harbor and serve as a central focus for coordinating and directing efforts aimed at eliminating the problems of the harbor.

Recently in June, EPA issued a tentative decision denying the MDC's application for waiver of secondary treatment requirements. This tentative finding was based on certain water quality and marine life impacts at the proposed outfall locations. The MDC has formally stated to EPA that it will reexamine those water quality parameters which led to a denial and resubmit the application to EPA within one year.

C. Scoping Process and Screening of Alternatives

A series of scoping meetings has been conducted to define the issues and provide a forum for agency and public comment prior to undertaking detailed assessment of impacts of facility siting alternatives. The purpose of the Scoping Meetings was to define the issues associated with the impacts and alternatives to be analyzed in detail in the SDEIS. This final scope of work is being issued for the Supplemental Draft EIS now underway, based on the comments received at these meetings from federal and state agencies, local officials and the public at large.

This scoping document incorporates the alternatives studied by the MDC and their consultants in the Nut Island Site Options Study (1982) report. These alternatives encompass both primary and secondary treatment options at various harbor locations with associated local or deep ocean outfalls. Sub-regional treatment options, commonly referred to as satellite facilities, were previously studied in the EPA Draft EIS (1978) and will also be analyzed based on the comments received during scoping. New alternatives not previously studied were also identified during the scoping process. These involve new combinations of treatment facilities and siting options at Long Island and outer harbor locations. All of these reasonable choices will be preliminarily analyzed in an initial assessment and screening in the Supplemental Draft EIS.

As a first step in the environmental impact assessment, all of the alternatives will be preliminarily examined in order to screen out those with comparatively unacceptable impacts. This first-tier analysis is intended to compare the relative impacts of the various options across a range of key potential impact categories. These categories include:

(a) Compliance with existing water quality standards and applicable state and federal environmental regulations;

(b) Land availability and adverse land use/recreational impacts;

(c) Adverse community impacts (traffic, noise, odor) and social consequences;

(d) Economic feasibility: construction costs and O&M, cost-effectiveness, affordability;

(e) Engineering feasibility;

(f) Institutional constraints;

(g) Beneficial impacts;

(h) Agency and public comments.

A matrix format will be used to array the above impacts across each of the alternatives being studied. Quantifiable values, such as costs, affordability, and land area will be combined with more subjective valuations, such as recreational resources, traffic, institutional constraints, or social impacts. Relative impact levels will be shown as either severe, moderate or minimal in order to judge which alternatives appear to have an unacceptable number of higher impact levels or fewer mitigation opportunities and therefore should be eliminated from further consideration.

This screening process will incorporate the comments of the Technical Advisory Group and CAC in setting weightings and priorities among categories of impacts. State policy as formulated by the current deliberations of the Sargent Committee and the Executive Office of Environmental Affairs will also be factored into this screening process as it is developed during the SDEIS analysis.

As the analysis proceeds and the screening process is further applied to evaluate alternatives and continue to narrow the number of options for further more detailed study, a final set of reasonable and affordable alternatives will be developed whose environmental consequences can then be fully evaluated. This process will lead eventually to the selection of a preferred alternative (both primary and secondary) whose impacts can be shown in order to reach a final siting decision.

D. Wastewater Treatment Alternatives and Significant Issues

Wastewater Treatment Alternatives

MDC's previous engineering studies (Nut Island Site Options Study, 1982) identified several wastewater treatment alternatives that were analyzed, to varying degrees, in terms of their construction and operation-maintenance costs, and environmental impacts. These alternatives examined both primary and secondary treatment options. The alternatives identified and studied by the MDC were the basis for the initial listing of options in the scoping discussions held.

In addition, new alternatives not previously studied, or alternatives which had been examined previously but for which conditions may have changed, have also been raised during scoping and will be analyzed in this SDEIS. These include primary and secondary treatment options at alternative siting locations and satellite advanced treatment options. Intermediate levels of treatment which may be considered, if proposed by the MDC in their reapplication for a waiver of secondary treatment, were not identified during the scoping process and will not be considered as part of this SDEIS. This treatment option could be analyzed at a later date during the EIS analysis if it becomes an alternative of the MDC.

In all, there are presently five major alternatives being studied in the SDEIS. These include options identified by the MDC as well as previous and new options developed from comments received at the scoping meetings. These are listed in a Attachment to this document.

There are presently two major levels of wastewater treatment being considered. These are secondary treatment, as required under current state and federal laws, and upgraded primary treatment as proposed by the MDC in their 301(h) waiver application. Advanced wastewater treatment (AWT) is also being examined for sub-regional "satellite" facilities which may be warranted in conjunction with operation of harbor secondary treatment facilities. The satellite option includes a proposal presented by the Quincy Shores Association, Inc. which identified several potential inland sites which may serve as treatment facility locations, while providing groundwater recharge benefits in those watersheds.

There are three major alternatives with a secondary level of treatment. These involve siting of facilities at Deer Island, Nut Island, Long Island, or a new island option. In addition to the alternatives previously considered by the MDC, new options in this category include the above-mentioned AWT satellites, combined secondary treatment on Long Island, and a newly formed island in the outer harbor as a site for combined secondary treatment facilities.

Two major options, additionally, consider a primary level of treatment (should the 301(h) waiver be granted). In addition to those alternatives studied by the MDC, there are new options for siting of primary facilities on Long Island.

Intermediate treatment at a level less than secondary is not considered at this time, as noted previously, but may also be included if it becomes appropriate. Because state and federal regulatory reviews are still being carried out, no final decision has yet been made on the level of treatment required. The EIS will examine all levels pertinent to a decision on facility siting, with a recommendation on preferred sites for both primary and secondary treatment facilities.

Significant Issues and Scoping Comments

A variety of issues and impacts require consideration as part of the evaluation of proposed wastewater treatment facilities siting in Boston Harbor. These issues range from concerns about the harbor's water quality, its marine life, and its numerous recreational and aesthetic resources to community impacts resulting from construction and operation of proposed wastewater treatment and disposal facilities. The current incapacity of the existing Deer Island and Nut Island treatment facilities to adequately treat wastewater flows exacerbate the problems being experienced which have led to this EIS process.

Since none of the siting solutions to the treatment needs and problems of the present MDC system are without some significant effects, the EIS/EIR serves as a basis for identifying the range of both positive and adverse impacts which can then be evaluated and compared to reach a decision on siting and facility options.

The listing below provides a compilation of some of the major issues and impact categories being analyzed in the SDEIS. Comments made on these or other issues during scoping are incorporated to this document. There will be further opportunities for agency and public comments on impacts during the monthly progress meetings of the Technical Advisory Group and CAC.

The following issues and impacts have been identified during the scoping process and will be analyzed in the SDEIS.

Issue 1: Water Quality and Marine Life

Water quality problems and violations of federal and state laws result from the current practice of discharge of primary effluent and sludge into Boston Harbor. Direct discharges to the harbor of untreated raw sewage during periods of high flows and inadequately treated sewage from equipment breakdowns results in public health threats at beaches and shoreline recreation areas and economic effects on fishing and boating interests.

Water quality issues to be examined in the SDEIS will be limited to impacts of primary and secondary treatment plant siting and secondary effluent quality discharges. The separate 301(h) waiver review by EPA will consider the water quality impacts and issues associated with a less than secondary effluent at outfall locations to be proposed by the MDC. A review of the broad comparative effects of primary versus secondary effluent will also be generically addressed in the SDEIS. Potential problems associated with the proposed facilities are:

- Characterization of secondary effluent, its volume and chemical makeup, with particular concern for toxic material and priority pollutants.

- Concentrations of heavy metals and chlorine used as a disinfectant, in the receiving waters as they might impact marine resources.

- Dredging, filling, and sediment runoff during construction which could impact harbor water quality and marine life, as well as the effects of removal of harbor sediments and its disposal.

- Characteristics of the harbor receiving water with regard to the mixing and dispersion capacities of the present channels and shoreline areas.

- Commercial and recreational fisheries and their food value.

- Fisheries population and their habitat loss, alteration, and disturbance.

- Impacts upon wetlands and floodplains associated with construction and operational elements of facility siting.

A more detailed assessment of these issues will be provided in a technical report addressing water quality assessment issues.

Issue 2: Institutional Factors

The historical development of the MDC metropolitan wastewater collection and treatment system has not necessarily been integrated with growth factors in the member communities, or with organizational elements of administering a large metropolitan system. Questions of municipal jurisdictions, budget allocations, and land acquisition among others require complex coordination in any plans for future facility construction and operation. The elements to be addressed in the impact evaluation include:

- The export of water from local watersheds to Boston Harbor via the sewer system may be affecting local water supplies, while the practices of member sewer communities towards new sewer hookups and problems with infiltration and inflow (I/I) may be ignoring present system deficiences.

- Present institutional constraints to effective system management.

- Adequacy of future growth and water use projections as they relate to system design flow characteristics.

- Institutional and legal issues associated with siting of new facilities, as well as factors involving the continued operations of existing major facilities in the harbor area (airport, prison, Harbor Islands State Park, hospital and others).

Issue 3: <u>Air Quality</u>

- Air emissions and odor impacts during construction and operation from transportation sources and operational equipment at the proposed treatment plants will be analyzed.

- To a limited degree and depending on forthcoming state policy determinations, the issue of air quality associated with a sludge incinerator facility may require consideration insofar as secondary facility siting is examined. The availability of land for an incinerator and its resultant impacts at sites other than Deer Island are a preliminary aspect of those sites' screening. This issue will be incorporated to the EIS as necessary.

Issue 4: <u>Traffic, Noise and Construction Impacts</u>

Traffic impacts resulting from the construction and operation of the proposed treatment plants could burden local roads and may pose safety problems in the vicinity of the plant sites. Impacts in other communities may also result from proposed centralized staging areas or satellite worker parking locations. Specific impacts which will be examined are described below.

- Construction activities could generate noise levels in excess of normally experienced levels; proposed 24-hour work shift schedules, and the staging of construction activities will be examined for their impacts.

- Construction traffic associated with truck deliveries of materials and worker traffic on local roads, along both residential streets and utilizing the major access network of the metropolitan area, must be examined in detail to establish the impacts associated with the proposed facility construction and operation periods.

- Sites designated for staging areas and/or terminal facilities (for barge operations) require analysis, particularly as they relate to associated traffic and construction activities.

- The duration of construction activities and the peak year work force may increase community disruption beyond levels noted above.

- Use of a barge ferry service for workers and materials may pose difficulties to use of the harbor waters for recreational boating and commercial fishing and must be examined for the effects upon staging and parking areas, as well as for safety issues and permitting requirements.

- Truck traffic during operations, including the arrival of chlorine trucks, may pose hazards to local residential areas; while chlorine deliveries by barge requires further definition and analysis.

Issue 5: Socio-Economic

Impacts in this category relate to the economic and social environments within the affected communities. Both construction and operation effects will be analyzed including:

- Impacts associated with the land use requirements of the proposed projects, and associated impacts of proposed industrial facilities adjacent to residential areas.

- Other effects of the combined construction activities in the area of the harbor (including airport expansion, improvements to the roadway network, and other wastewater treatment facility construction).

- Impacts associated with the reliability of future MDC operation and maintenance programs.

- Other impacts and issues involving local taxes, impacts on adjoining property values, historical and archeological impacts, and potential disruption of established community patterns.

- Costs of operation and maintenance of proposed treatment facilities including user fees and associated user community system costs.

- Construction employment and wage levels, particularly during peak years and the effects upon local and regional economies.

- Secondary income and employment generated in local-regional economies.

Issue 6: Recreational and Scenic Areas

There are approximately 250 miles of shoreline in Boston Harbor encompassing recreational areas from Winthrop to Hull. There are, in addition, the major resources of the Boston Harbor Islands which serve as a focus for both local and statewide recreational activities. These areas represent major and significant resources which must be carefully evaluated prior to any siting decisions. Issues include:

- Impacts on the Boston Harbor Islands State Park and its boating, fishing, hiking, camping, picnicking, and swimming resources.

- Compatibility (or conflict) between proposed industrial and recreational uses.

- Impacts on beach areas and fishing due to aesthetic and health effects of potential raw sewage discharge.

- Visual impacts associated with locating new treatment facilities or expanding/reducing existing facilities.

- Effects on local and state coastal resource planning and management programs.

The issues discussed above encompass the major categories of impacts and issues associated with them that were raised during the scoping process. A compilation of the principal comments made during the scoping meetings is provided in the Appendix to this document. Both agency and public comments are listed.

E. <u>Agency and Public Participation Program</u>

Another aspect of the EIS process involves regular monthly Progress Meetings of the <u>Technical Advisory Group</u>. This group is made up of representatives of key agencies participating in the EIS. These meetings, to be held at EPA's offices in Boston, will include discussions of the work underway, problems encountered, and technical issues being examined. They will also focus on the coordinations necessary among state and federal agencies and reviewers to assure complete and comprehensive coverage of issues and impacts within the EIS/EIR process.

The agencies which make up the <u>Technical Advisory Group</u> include, at the state level, the Office of the Secretary of Environmental Affairs under which operate the Department of Environmental Quality Engineering (DEQE), Division of Water Pollution Control (DWPC), Metropolitan District Commission (MDC), Coastal Zone Management (CZM), Department of Environmental Management, and the Division of Marine Fisheries. The Massachusetts Environmental Policy Act Unit (MEPA) of the Secretary's Office is the agency responsible for coordinating the state's Environmental Impact Review (EIR) process. Also participating are the Executive Office of Communities and Development, Massport, MAPC, Department of Public Works, Massachusetts Historical Commission, Executive Office of Economic Development. At the federal level, involved agencies include the U.S. Army Corps of Engineers, National Marine Fisheries Service, and the U.S. Fish and Wildlife Service, and U.S. Coast Guard. Other state and federal agencies may also participate according to their particular areas of responsibility and concern.

Local government agencies and public officials are also involved in the public participation process through both the Technical Advisory Group and the <u>Citizens Advisory Committee</u> (CAC) as representatives of their respective community's needs, and to comment on the various siting alternatives as they might impact their communities and citizens. The CAC moreover serves as a forum for the range of local and community-wide interests affected by this project. Representatives of the CAC would also participate in the Technical Advisory Group meetings.

Completion and review of the SDEIS will include a public hearing and will be followed by a Final EIS and a Record of Decision (ROD) by EPA. These documents will serve as the basis for a final siting decision for treatment facilities in Boston Harbor. It is anticipated that the scope of the SDEIS and following documents in the EIS process will encompass actions to be followed by the MDC under a final waiver decision from EPA, expected to coincide with the Final EIS and Record of Decision. In this way, the environmental review process leading to necessary approvals for siting of harbor wastewater treatment facilities can proceed in a timely fashion.

EPA is establishing a comprehensive public participation effort as part of the environmental review process. A range of activities will be undertaken to keep the public informed about the process and give interested individuals and organizations opportunities to comment on proposals and recommendations.

Barry Lawson Associates, Inc. of Boston will manage the public participation program. They will prepare and distribute materials to the public, organize and give notice of public meetings and workshops, coordinate the efforts of the project participants and serve as a centralized source for public comments and questions.

The public participation program will include:

Scoping Meetings - Scoping meetings were held to define the issues, impacts and alternatives to be analyzed in detail in the SDEIS. A scoping meeting for federal and state agency staff was held on September 19, 1983 at 9:30 a.m. in the John F. Kennedy Federal Building, Executive Dining Room. This meeting was specifically held for comment by federal and state agencies involved in the SDEIS.

A public scoping meeting was held on September 28, 1983 in two sessions, one beginning at 2:00 p.m. and another at 7:00 p.m. in the main auditorium of the U.S. Department of Transportation building located at 55 Broadway Street, Kendall Square in Cambridge. Notice of these meetings was made in advance in local newspapers. The public scoping meeting was open to all residents, public officials, and other interested parties. A comment period for public and agency comments on issues and alternatives relative to scoping closed on October 5, 1983 for both the state EIR and federal EIS portions of the effort, with a final scope of work issued following receipt of all comments.

Citizens Advisory Committee (CAC) - A Citizens Advisory Committee has been established to represent a variety of public interests and local concerns associated with the proposed treatment facilities siting. The Committee will meet monthly and members will be called upon to review the work in progress and advise the consultants and EPA of the various critical issues and impacts associated with the elements under study. CAC meetings are open to the public and will be announced in advance.

Mailing List - A mailing list of more than 600 names has been developed and will be used to send notices of meetings, "Boston Harbor Update" newsletters and other program material to interested groups and individuals. These names include public officials, civic groups, local special interests, and the public at large. The lists will be updated periodically.

"Boston Harbor Update" - Information on progress and results of studies will be reported on in newsletter form three times over the course of the project.

Information Centers - Program information will be available for review at several "depositories" set up in libraries in Boston and surrounding communities. Project information and materials will be stored in reference binders provided to these centers.

Public Meetings - Scheduled meetings will be held to present information to the Public on the work in progress. Comments and opinions will be recorded, and key issues and impacts discussed. In addition, periodic smaller meetings may be held in surrounding communities to explain options under consideration.

Public Workshops - Workshops will be held to facilitate more intensive discussions of critical issues and special topics which will influence decisions to be made on treatment and siting options.

Public Hearing - A formal hearing jointly held by EPA and the state will be held after the SDEIS has been published and distributed to obtain public comments on the findings and conclusions of the environmental review. A comment period will be established to allow written comments in addition to statements made at the hearing.

Responsiveness Summaries - A summary will be prepared following each public meeting/workshop which identifies and responds to the questions and concerns raised by the public concerning findings and recommendations presented.

ATTACHMENT

BOSTON HARBOR SUPPLEMENTAL DRAFT EIS

WASTEWATER FACILITY SITING ALTERNATIVES

A. SECONDARY TREATMENT ALTERNATIVES

Option 1: Deer Island - Nut Island Treatment Facilities

a. Convert Nut Island to a headworks and construct secondary treatment facilities (either separate or combined system flows) at Deer Island; inter-island transport of effluent via tunnel.

b. Construct upgraded primary treatment at Nut Island and construct secondary treatment facilities (either separate or combined system flows) at Deer Island; inter-island transport of effluent via tunnel.

c. Separate secondary treatment facilities at Nut Island and Deer Island.

d. Satellite AWT treatment facilities on the Neponset River; Charles River; or other locations.

Option 2: Nut Island - Deer Island - Long Island Treatment Facilities

a. Construct secondary treatment facilities (for north system flows) on Deer Island and secondary treatment facilities (for south system flows) on Long Island with preliminary treatment (either headworks or primary) facilities on Nut Island; inter-island transport effluent via tunnel.

b. Construct secondary treatment facilities on Long Island (for combined system flows) with preliminary treatment (either headworks or primary) facilities on Deer Island and Nut Island; inter-island transport of effluent via tunnels.

c. Satellite AWT treatment facilities as noted above.

Option 3: New Island Option

- Construct a new island site for secondary treatment facilities in an appropriate outer harbor location.

B. PRIMARY TREATMENT ALTERNATIVES

Option 4: Deer Island - Nut Island Treatment Facilities

a. Construct combined primary treatment facilities at Deer Island with a headworks at Nut Island (and either a local or deep ocean outfall); inter-island transport of effluent via tunnel.

b. Construct separate primary treatment facilities on Deer Island and Nut Island (and either separate local outfall or combined deep ocean outfall).

Option 5: Deer Island - Nut Island - Long Island Treatment Facilities

a. Construct separate primary treatment facilities at Deer Island (for north system flows) and Long Island (for south system flows) with headworks on Nut Island.

b. Construct combined primary treatment facilities on Long Island (with deep ocean outfall) with headworks on Deer Island and Nut Island; inter-island transport of effluent via tunnels.

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

MICHAEL S. DUKAKIS
GOVERNOR

JAMES S. HOYTE
SECRETARY

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS

ON

ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME: Site Option Study

PROJECT LOCATION: Boston/Quincy

EOEA NUMBER: 4911

PROJECT PROPONENT: MDC

DATE NOTICED IN MONITOR: September 9, 1983

Pursuant to M.G.L., Chapter 30, Section 62A and Sections 10.04(1) and 10.04(9) of the Regulations Governing the Implementation of the Massachusetts Environmental Policy Act, I hereby determine that the above referenced project does require the preparation of an Environmental Impact Report.

My office has participated with the EPA in the development of the EPA Scope of Work and I adopt that document as the Scope for the EIR with the following comments and expectations for the Supplemental DEIS/DEIR.

I. INTRODUCTION; PURPOSE; SCHEDULE

At both the state and Federal level, we are in a period of intensive re-evaluation of options for treating MDC sewerage. The EMMA study (1976) formulated a long-term approach to the problem. The EPA Draft EIS (1978) examined and narrowed the options, based on conditions prevailing at the time. The Draft EIS did not, however, result in consensus on what facilities should be constructed. To further refine the options, the Site Options Study was prepared by the MDC under the direction of the EPA and DEQE.

Today, the determination exists at both the state and Federal level to make the difficult decision and move forward into final planning, design, and construction. Factors of enormous complexity must be weighed: technological questions, environmental impacts, social impacts, and fiscal impacts.

At the state level, my office as well as the Boston Harbor Water Quality Committee and the Boston Harbor Interagency Coordinating Committee are charged with arriving at this decision. However, significant Federal permitting and funding questions are involved as well. Compliance with the National Environmental Policy Act (NEPA) is a precondition to a federal allocation of grant monies or necessary permitting actions, and compliance with the Massachusetts Environmental Policy Act (MEPA) is a precondition to state (MDC and DEQE) actions. Although the EPA initiated NEPA compliance procedures in preparing the 1978 DEIS, it did not complete those procedures. Passage of time may have rendered some of the EIS conclusions out-of-date or not. MDC did not commence MEPA compliance in 1978 (the Draft EIS was never filed for state review under MEPA). The MDC has, however, now filed an ENF, and NEPA and MEPA compliance for this project will proceed henceforth in a coordinated fashion.

EPA is scheduled to complete the Draft Supplemental EIS in June 1984, and a Final EIS in November 1984. I am hopeful that close coordination will be maintained between EPA and MDC, so that the Draft Supplemental EIS can be adopted by MDC as a Draft EIR. MDC may wish to add its own perspective to the Draft Supplemental EIS before submitting it as a Draft EIR. This could be done by the addition of an Appendix to the federal document, which would present the MDC's analysis and conclusions in any areas in which they differ from those of the EPA. I hope that MDC and EPA conclusions shall have converged by the time of the final EIS, and that the Final EIS and the Final EIR will, therefore be the same document.

II. TREATMENT OF ALTERNATIVES

A. NEPA/MEPA Compliance

The scoping of the EIS poses a difficult issue which has frequently surfaced in the fourteen years since the passage of the National Environmental Policy Act introduced formal requirements for environmental review into the planning of major public works projects. The dilemma relates to the interrelationship between project design and environmental study. On the one hand, the law provides that environmental study shall influence decisions on the form a project shall take; it should thus precede, or take place concurrently with, those design decisions. On the other hand, environmental analysis cannot take place in a vacuum. It must be applied to projects which have taken shape (general nature as well as location), so that their impacts may be fully assessed. Thus, some design must precede environmental review.

Where few alternatives exist, or a project's impacts are relatively simple, this interrelationship poses no problems. Where, however, the project has the breadth and complexity of sewage treatment for the MDC system, it takes time and money to prepare an alternative for effective environmental analysis. Each additional alternative added for review introduces new preliminary design costs and a time lag.

When the present ENF was filed, MDC and DEQE felt that alternatives examined should be limited to options identified in the Site Options Study. However, both the State and National Environmental Policy Acts require that a formal public scoping process occur before the list of options is closed. During the required scoping of the

SDEIS/DEIR in October 1983, public comments called for the examination of certain options in addition to the options proposed by state and Federal agencies for study. These options include an all Long Island option, and re-evaluation of satellite options, which I shall discuss later in this Scope.

An EIS which examines to an equal level of detail many very different options would be an unmanageable document. It would take long to prepare, and it would be so bulky as to preclude effective agency and public review. Thus, the list of options must be narrowed between the initial scope and the draft EIS.

The EPA has agreed to perform an inital screening which will determine which options are infeasible for reasons of high cost, excessive environmental damage, or lack of benefit. This initial screening is planned for December. Documentation available at that time should permit determination of which options shall be exhaustively studied for the SDEIS.

It is essential that the public be involved in this preliminary screening because the avoidance of litigation and delay at later stages requires that the SDEIS evaluate all feasible alternatives. The Boston Harbor Interagency Coordinating Committee will work closely with the EPA,as the options are narrowed, to ensure that determination of infeasibility are made on solid grounds. Continual working contact between the agencies shall ensure that the time for preparation of the EIS is kept to a minimum without jeopardizing the quality of the document.

B. Comments on Specific Alternatives

(i) Satellite

Several satellite treatment options for the south system were examined by EPA in the 1978 DEIS and ruled out on technical grounds. Representatives of the City of Quincy have urged that satellite options be re-examined in the SDEIS,and have asked that the SDEIS not merely review the 1978 options, but conduct a fresh search for a juxtaposition of flows and environmental conditions where a satellite plant might make sense. In response to the concern that a further search for new locations would interpose additional delays before the Harbor cleanup occurs, Quincy has suggested that satellite plants might affect the size,but not the configuration, of harbor facilities eventually selected. If this is the case, it seems clear that satellite plants would increase construction costs, complexity, and operation/maintenance costs of the system. In addition, they would add further siting problems to an already difficult set of public policy choices and delay on-going state funded projects. For these reasons, neither DEQE nor MDC believe satellite options are a feasible alternative at this point, and I have given consideration to the possibility that satellite plants should be excluded from the Commonwealth's Scope.

However, public comment has brought forward another issue, water supply, which may deserve further evaluation. It is characteristic of all non-satellite options that they entail discharge of sanitary sewage effluent to salt water, where it is lost to further use. Satellite options, by comparison, would discharge treated effluent to freshwater rivers or wetlands, which could possibly reduce the stress on those resources and increase their usefulness to the metropolitan population. This is a long-term consideration, but it is certainly within the planning horizon for Eastern Massachusetts. As water demands grow, the conservation of local water resources yields increasing dollar savings. Ultimately, recharging of local water resources could lessen the need for furture interbasin transfers. I am inclined to defer to the judgement of MDC and DEQE that satellite plants are not an element of a present solution to the Metropolitan Sewerage District's treatment needs, but I certainly agree with EPA that the feasibility and benefits of satellite plants must be examined in the preliminary screening. Clearly, satellite plants may be an element of any future expansion of MDC service beyond its present boundaries.

(ii) Long Island

There is also much opposition to the examination of an option which places all primary (and potentially, secondary) treatment on Long Island. DEM, DEQE, MDC, and the City of Boston all have expressed opposition to this concept, which finds strong support within Winthrop. EPA is proceeding to estimate costs and institutional issues for this option to determine if on existing information alone it should be ruled out. If costs alone do not clearly separate it from other options, other reasons for state and local opposition to that option shall be considered.

(iii) Primary/Secondary Alternatives

Present indications are that the decision on the MDC's amended 301(h) waiver application will be made in the Spring of 1985, and that the Record of Decision on the EIS will coincide with the waiver decision, but that the Final EIS will appear prior to that time, with a preferred primary treatment alternative and a preferred secondary alternative. Thus, the Draft and Final EIS/EIR will have to address both the possibility of waiver denial and of its granting. This ambivalency will add difficulty to an already complex document, but is necessary in order to permit the earliest possible completion of the EIS/EIR process.

Although, I, Commissioner Cortese and Commissioner Geary have taken a firm position in favor of primary treatment with deep ocean outfalls, I consider it appropriate, for comparison purposes, that the EIR discuss the water quality impacts of all alternatives, including primary treatment/local outfalls. The MDC should ensure that the EIR filed by it includes a summary of the findings of the amended 301(h) waiver application and a comparison of those findings with the findings rejected by EPA in its June 1983 Tentative Decision denying the waiver.

(iv) New Island Option

I am satisfied, based upon review of the ENF, comments thereon and discussion with the BHWQ Committee and the Interagency Coordinating Committee, that the "new island" alternative is wholly infeasible and may be rejected forthwith.

III. SLUDGE

The extent to which the Supplemental DEIS will address sludge management is unclear at this date. In the past, primary sludge disposal issues were segmented out from the site options issues, no doubt because it was optimistically believed that primary sludge issues could be resolved earlier than the other issues. The EPA prepared a Final EIS on primary sludge management and then issued a Record of Decision, calling for a Sludge Management Update Study, since prepared by MDC. The Final EIS, reviewed as a Final EIR, was found inadequate. The Sludge Management Update has been informally reviewed by the MEPA Unit as well as by DEQE, MDC, and the EPA, and further study and analysis is now going forward. The sludge issues are being developed for presentation to the BHWQ Committee, and a consensus on the best approach is being sought. The results of the agency analysis and the preferred alternative will be submitted by MDC for review as a Final EIR.

At the least, the Site Options EIR should discuss compatibility of the various alternatives with both primary and secondary sludge disposal options. If MDC wishes to submit its Final Sludge Management EIR for review simultaneously with the Draft Site Options EIR, that will be entirely acceptable(to the extent permitted by the schedule in the action Quincy vs. MDC.)

IV. GENERIC ISSUES

I look forward in the Supplemental Draft EIS to a thorough discussion of certain issues that may be common to any facility such as the moving of workers and construction materials to a site by water, the potential impacts and benefits of barge delivery of chlorine,and odor control. Techniques, feasibility, potential impacts, and impacts on costs should all be discussed in the Supplemental Draft. Although a construction staging area cannot perhaps be selected, the Draft Supplement should identify the criteria necessary for such an area--such as parking area, storage area, utilities, highway access, water access, and water travel time to the construction site(s) (I expect that during preparation of the Final EIS, more progess can be made in identifying actual sites).

V. State Issues

It is essential that the Supplemental Draft carefully review state and local statutes, regulations, procedures, and programs that may be involved in or affected by the options. All state agencies are responsible for bringing to the attention of EPA those statutes or regulations which govern agency responsibilities. Certain ones which have emerged during scoping are c742, Acts of 1970, Article XLVII, Massachusetts constitution, local floodplain zoning, G.L. c. 111 Sec. 150 and implementing regulations, and G.L. c. 131 Sec. 40 and coastal wetlands regulations and variance procedures. DEM, CZM, MEPA, and DEQE will all be available as necessary to respond to questions on any of these programs.

MISCELLANEOUS

I understand that if secondary treatment is located at Deer Island, federal funding exists for the relocation off Deer Island of the Suffolk County House of Detention. The relocation is not within the Scope of the Site Options EIR. If relocation is part of the alternative eventually selected, siting and environmental review of a new facility will have to proceed at that time.

December 6, 1983
DATE

JAMES S. HOYTE, SECRETARY

JSH/DS/dc

In 1978 EPA published a Draft Environmental Impact Statement which recommended consolidation of secondary treatment at Deer Island. While developing this Draft EIS many of the same questions and issues relative to the proposed future use of Deer Island evolved. A Task Force of EPA and Massachusetts representatives developed a report and recommendations to Judge Arthur Garrity who at the time was reviewing prison conditions at the Charles Street Jail.

The attached corresspondence is included to inform the reader of the history of public use options for Deer Island. Its purpose is one of information only.

THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF THE ATTORNEY GENERAL
JOHN W. MC CORMACK STATE OFFICE BUILDING
ONE ASHBURTON PLACE, BOSTON 02108

FRANCIS X. BELLOTTI
ATTORNEY GENERAL

April 27, 1976

The Honorable W. Arthur Garrity
United States Federal District Court
One Post Office Square
Boston, Massachusetts 02109

Dear Judge Garrity:

Please find enclosed the Report of the Task Force for the public uses of Deer Island.

Very truly yours,

Charles Corkin II
Chief
Environmental Protection Division

CCII:amh

Enclosure

CC: Kevin Keating, Esquire
Kenneth Mickiewicz, Esquire
Terrence O'Malley, Esquire
Max D. Stern, Esquire

THE COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF THE ATTORNEY GENERAL

JOHN W. Mc CORMACK STATE OFFICE BUILDING
ONE ASHBURTON PLACE, BOSTON 02108

April 26, 1976

FRANCIS X. BELLOTTI
ATTORNEY GENERAL

The Honorable W. Arthur Garrity
United States Federal District Court
One Post Office Square
Boston, Massachusetts 02109

RE: Inmate of Suffolk County Jail et als vs. Thomas S. Eisenstadt, et al

Dear Judge Garrity:

Report of the Task Force for the Public Uses of Deer Island:

I. BACKGROUND

The plaintiff and the defendant Sheriff of Suffolk County moved to vacate U.S. District Court Judge Garrity's Order closing the Charles Street Jail and renovating the Hill Prison facility on Deer Island.

On March 22, 1976 Judge Garrity continued the motions until April 26th in order to provide the task force sufficient time to prepare a report on the public uses of Deer Island, including sewage treatment facilities proposed to be built by the MDC.

2. THE TASK FORCE

Members of the task force included, Evelyn F. Murphy, Secretary of the Executive Office of Environmental Affairs for the Commonwealth; John Snedeker, Commissioner of the Metropolitan District Commission; Bette Woody, Commissioner of the Department of Environmental Management; Martin Weiss, Metropolitan District Commission; James Hilliard, Undersecretary of the Office of Human Services, Thomas Sellers, Director of Program Development in the Department of Corrections; Paul Dunn, Director of Development in the Boston Penal Department; Eugenie Beal, City of Boston; Charles Corkin II, Chief, Environmental Protection Division of the Department of the Attorney General; Steve Ells, Environmental Protection Agency; David Standley, Commissioner of the Department of Environmental Quality Engineering; Michael Ventresca, Executive Office of Environmental Affairs.

3. POTENTIAL PUBLIC PURPOSES FOR DEER ISLAND

Three public uses of Deer Island have received considerable attention in recent years -- correctional facilities, sewage treatment, and recreation. While the specific focus of the task force was on space for sewage treatment if Deer Island is to accomdoate the Charles Street Jail inmates, alternatives were developed that might accomodate all three interests.

The following preferences were stated at the outset:

. . . Officials of the City of Boston would prefer no relocation of Deer Island correctional facilities, especially the Hill Prison. After a thorough search for facilities elsewhere in Suffolk County, the City concludes that no adquate structures are available. Moreover, the cost of building a new facility is deemed an extreme financial burden for the City. (See Attachment A, letter Paul E. Dunn to Secretary Murphy, March 26, 1976).

. . . The Metropolitan District Commission would prefer to expand its sewage treatment facility on Deer Island to handle there the secondary sewage treatment requirements of both Nut and Deer Island plants. There are major environmental problems as well as substantial political opposition to filling Quincy Bay in order to accomodate secondary sewage treatment on an enlarged Nut Island.

. . . The Commonwealth and the City of Boston would prefer to retain some recreational opportunities on Deer Island, specifically for the enjoyment of residents of Winthrop, and more broadly, to integrate the island into the urban harbor island park currently under development.

4. <u>ALTERNATIVES ENCOMPASSING ALL THREE INTERESTS</u>

The attached diagrams -- Alternatives One, Two and Three -- represent ways to accomodate the several potential public uses of Deer Island.

Alternative One shows the correctional facilities where they are currently located; the aeration and settling tanks of combined secondary sewage treatment for both Nut and Deer Island; and the use of the fill from the drumlin along the southwest edge and tip of the island for potential local and island park recreational use.

The positive features of this alternative are threefold; first, there is adequate open space around the correctional facilities to permit ample outdoor movement of inmates. Second, sewage is being treated by tried and proven technologies. Finally, limited recreational opportunities are provided.

There are, nonetheless, several drawbacks to this alternative. The drumlin, considered a significant historic and natural feature, will be destroyed. The visual impression of the island will be that of massive sewage treatment apparatus -- a dramatic shift from the current character of the island. Moreover, filling the harbor will introduce added instability in the ecological pattern of the harbor. Filling is typically discouraged by the environmental regulatory department because of the disturbances that ensue.

Finally, this alternative will require that the General Services Administration (GSA) turn over the tip of the island to the MDC for sewage treatment. In preliminary conversation with the GSA land office, Mr. O'Connell, indicated that GSA would consider such authorization if the city and state endorsements were presented to GSA.

The Second alternative would leave the tip of the island for recreation and would put the settling and aeration tanks on a portion of the City's correctional property. Hill prison would remain in its current location.

The primary advantages of this alternative are that implementation can proceed without GSA actions and without filling. The disadvantages are that the Hill prison would be tightly fit between sewage treatment facilities with little outdoor area for inmates; some relocation would be necessary; and the drumlin would be destroyed.

Alternative Three indicates a consolidation of settling tanks that enables consolidated secondary treatment within a much more limited area than indicated in the prior two designs. The advantage of this design are versions of the features discussed previously.

However, there are major problems with this alternative and it should not be considered a serious option at this time. The proposed technology for sewage treatment is considered on the forefront of the state-of-the-art, untested as yet in the United States. Moreover, the added costs -- in excess of $50 million than Alternative One -- would impose considerable financial burden on MDC sewer commitments.

5. ALTERNATIVES ACCOMODATING TWO INTERESTS

Alternative Four (actually Alternative One without filling) would accomodate the needs for correctional facilities and sewage treatment. It is reasonable to wonder whether people would ever regard Deer Island as a recreational area given the predominance of the other two uses. This alternative only dramatizes more the loss of environmental amenities for massive institutional use.

Alternative Five presents a design for sewage treatment and recreational use. Environmental sensitivity is prominent -- the drumlin remains in being; no substantial filling is required.

Considerable relocation costs would be incurred to move the entire correctional facility elsewhere and to build a new facility. The costs of relocation would be bourne by the City and the State. Yet both governments feel financially strapped and may have difficulty making this a financially feasible alternative.

6. QUESTIONS OF VALUE

These alternatives portray some significant questions of value. Is it desirable or appropriate to locate a correctional facility, as contrasted with any other public or private facility, next to a massive sewage treatment plant? How important is it to preserve a significant natural feature, the drumlin?

These questions emerged in our deliberations. The task force, however, was a technical one and we did not attempt to answer these questions.

7. CONCLUSION AND SUMMARY

The task force concludes that an expanded correctional capacity on Deer Island would not preclude plans of the Metropolitan District Commission to enlarge its sewage treatment facilites on the island. This memorandum outlines technical alternatives and their related social, financial and environmental issues.

[See attached letter from John McGlennon to Evelyn Murphy dated April 26, 1976]

Steve Ells,
Environmental Protection Agency

Eugenie Beal

Eugenie Beal
City of Boston

Paul E. Dunn

Paul E. Dunn, Director of Development
Boston Penal Department

Victor E. Hagen

Victor Hagen
Public Facilities, City of Boston

Charles Corkin II, Esq.
Attorney General, Environmental Protection

Evelyn F. Murphy
Executive Office of Environmental Affairs

David Standley, Commissioner
Department of Environmental Quality Engineering

Bette Woody, Commissioner
Department of Environmental Management

John Snedeker, Commissioner
Department of Metropolitan District Commission

Martin Weiss, Director, Environmental Planning
Department of Metropolitan District Commission

Thomas Sellers, Director Program Development
Department of Corrections

Michael Ventresca
Environmental Affairs

James Hilliard, Undersecretary
Executive Office of Human Services

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

EVELYN F. MURPHY
SECRETARY

ADDENDUM TO THE COURT.

The task force was asked, and responded to realities: is it physically possible to accommodate both the prison and sewage treatment needs on Deer Island? Other realities have been prominent in our deliberations, also. The expense of constructing a new jail elsewhere would constitute a heavy financial burden for the City of Boston; few, if any, facilities exist elsewhere that might be converted into penal facilities at reasonable cost.

Yet we would be remiss if some comments were not offered on the Commonwealth's view of the destiny of Deer Island. If such constraints of reality did not exist, or were altered in the future, three uses appear excessive, both for the land mass itself, and for the Town of Winthrop. We would prefer, rather, to see but two uses of the island -- sewage treatment and recreation. Preservation of the waterfront for water related uses would seem the most judicious use of this limited space. The location of new penal institutions nearer to the city and related public institutions -- courts, probation offices, and the like -- would seem to have social value as well as improved efficiency in public administration.

If the Court wishes further work to resolve any issues, we are prepared to commit our offices to prompt and thoughtful resolutions.

Evelyn F. Murphy, Secretary
Executive Office of Environmental Affairs

James Hilliard, Undersecretary
Executive Office of Human Services

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I

J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

April 26, 1976

Evelyn Murphy, Secretary
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

Dear Secretary Murphy:

In light of the "Addendum to the Court" signed by you and Undersecretary of Human Services James Hilliard, I concur in the statement which identifies the technically feasible alternatives and is entitled "Report of the Task Force for the Public Uses of Deer Island", April 26, 1976. This report demonstrates that though it may be feasible to locate all three desired public uses on Deer Island (the correctional facility, an expanded treatment plant and a waterside park), there are significant disadvantages in attempting to do so. Indeed, given the "preferences" stated on page 2 of the report, only two of the proposed uses can be realistically accomodated; the proposed park and the adjacent ninety foot high hill are likely to be destroyed unless further alternatives are pursued.

As you correctly point out, these trade-offs present complex questions of values, finances and the availability of other solutions, and these questions are not readily answerable. I am pleased, though, that in your Addendum the Commonwealth has expressed its policy preference for the future of this Island and assure you that we will wholeheartedly participate in the process of further analysis that you suggest.

Sincerely yours,

John A. S. McGlennon
Regional Administrator

CITY OF BOSTON

PENAL INSTITUTIONS DEPARTMENT

M W. NICKERSON
COMMISSIONER

ROOM 704 – BOSTON CITY HALL
ONE CITY HALL SQUARE
BOSTON, MASSACHUSETTS 02201

March 26, 1976

Ms. Evelyn Murphy, Secretary
Executive Office of Environmental Affairs
Commonwealth of Massachusetts
100 Cambridge Street
Boston, Massachusetts 02202

Dear Secretary Murphy;

At Monday's Task Force meeting you requested further detailing of the City's position on the use of Deer Island for correctional purposes. A quick description of the present Charles Street Jail case may aid in putting the issues into perspective.

In 1973, the Inmates of the Suffolk County Jail sued Sheriff Eisenstadt, Mayor White, the nine Boston City Councillors and Commissioner Hall for violation of constitutional standards. The Federal District Court of W. Arthur Garrity, the Court ruled that the Charles Street Jail should be closed not later than July 1, 1976. In addition, Garrity temporarily required the women at Charles Street be sent to MCJ Framingham and that each cell at Charles Street be limited to one man (recently the one man/one cell ruling was lifted because of overcrowding.)

The Public Facilities Department, as the City agency responsible for capital construction, undertook a survey of a number of alternatives and decided to propose to the Court a plan which would include the creation of a small, short-term (70bed) Intake Service Center (I.S.C.) near the Superior Courthouse and the renovation of the Hill Prison at the Suffolk County House of Correction for long term detention. Both facilities would be placed under the jurisdiction of the Sheriff thereby replacing the present Charles Street Jail. The House of Correction property at Deer Island, save the renovated Hill Prison, would continue its function of past-conviction custody and remain the jurisdiction of the Penal Institution Department. The City offered the plan to Federal Court which on October 20, 1975 ordered it implemented.

The City's decision to propose the plan was based upon three major considerations. In order of importance they are:

ATTACHMENT A

COST:

Estimated costs for new prison construction has been estimated at between $40,000 to $60,000 per cell. Thus construction of a new Charles Street Jail would cost some twenty five m..llion dollars without land acquision expenses. On the other hand, the cost of the present plan is $8.5 million dollars and in addition may result in the Charles Street site becoming available for private use.

RENOVATIONS:

Renovating the present Charles Street Jail was rejected by both the City and the Federal Court. Any renovation to the present site presented a safety and security problem due to structural strain that would occur during the process. Both the roof and foundation at Charles Street present substancial delimmmas.

A further advantage to the City was that the Hill Prison at Deer Island, which has substancial mechanical needs, would be totally improved. The plan allowed the City to save on what would eventually be a substaincial revnovation of that facility if the plan was not adopted.

SITE :

During the Garrity hearings, location becoame the leading issue. Inmates, especially those newly detained need quick access to attorneys, family friends and similiar resources. Yet no downtown site for intake services and detention presented sufficient room or reasonable costs to be justified in the City's view. This was not decided without substancial review and consultation. A number of sites were explored, including:

Nashua Street - This was the most commonly suggested site ie: for the City to "swap" the Charles Street land for property which Massachusetts General Hospital owns on Nashua Street and build a new facility. The Hospital rejected this (see attached letter) when it was determined that the City would first have to acquire Nashua Street, build and move the inmates before it could legally transfer the Charles Street property to the hospital.

Fargo Building - was explored and rejected when the Coast Guard, the present owners, said it was going to transfer the building to the Army. The Army refused to take a position since it did not own the property. In addition because of building structure, renovation costs would be substancial.

Fort Devens - the Department contacted the Army but found that the stockade had been torn down.

Portsmouth Naval Station - was rejected for distance reasons. Further there was some question whether detaines could be taken out of state.

Middlesex County Training School - was explored but rejected as being insecure.

Middlesex County Jail - the East Cambridge Jail, at the top if the new courthouse was rejected because of a lack of sufficient cells.

Roslindale Detention Center - was toured and rejected because it was too small. Further, the Youth Service Board seemed to be uncertain whether it would actually declare the facility surplus. In retrospect, it seems clear that the state will continue using the Detention Center for the foreseeable future.

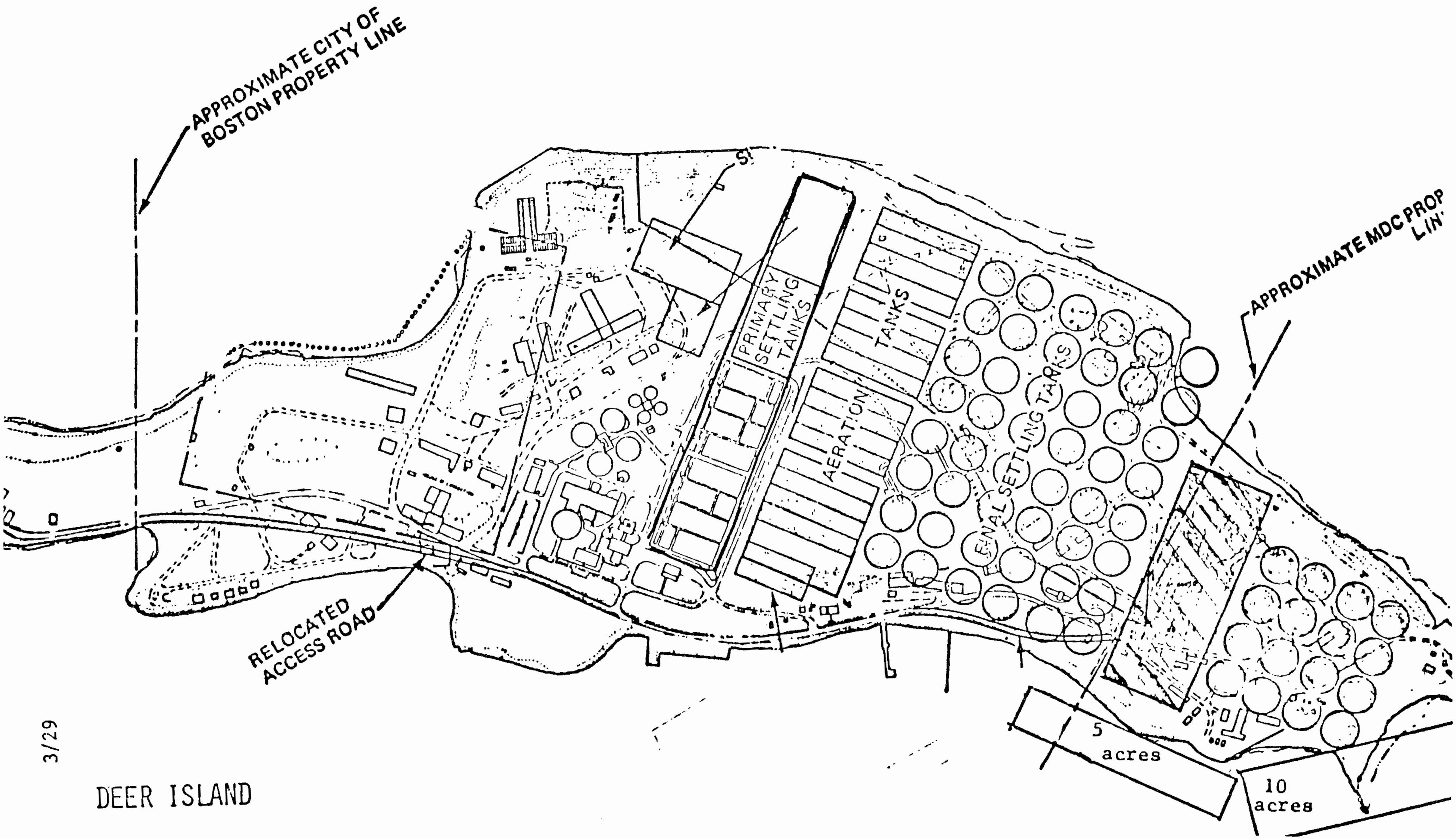
If I can provide any further information or assistance on the matter please feel free to conatct me.

Sincerely,

Paul E. Dunn
Director of Development

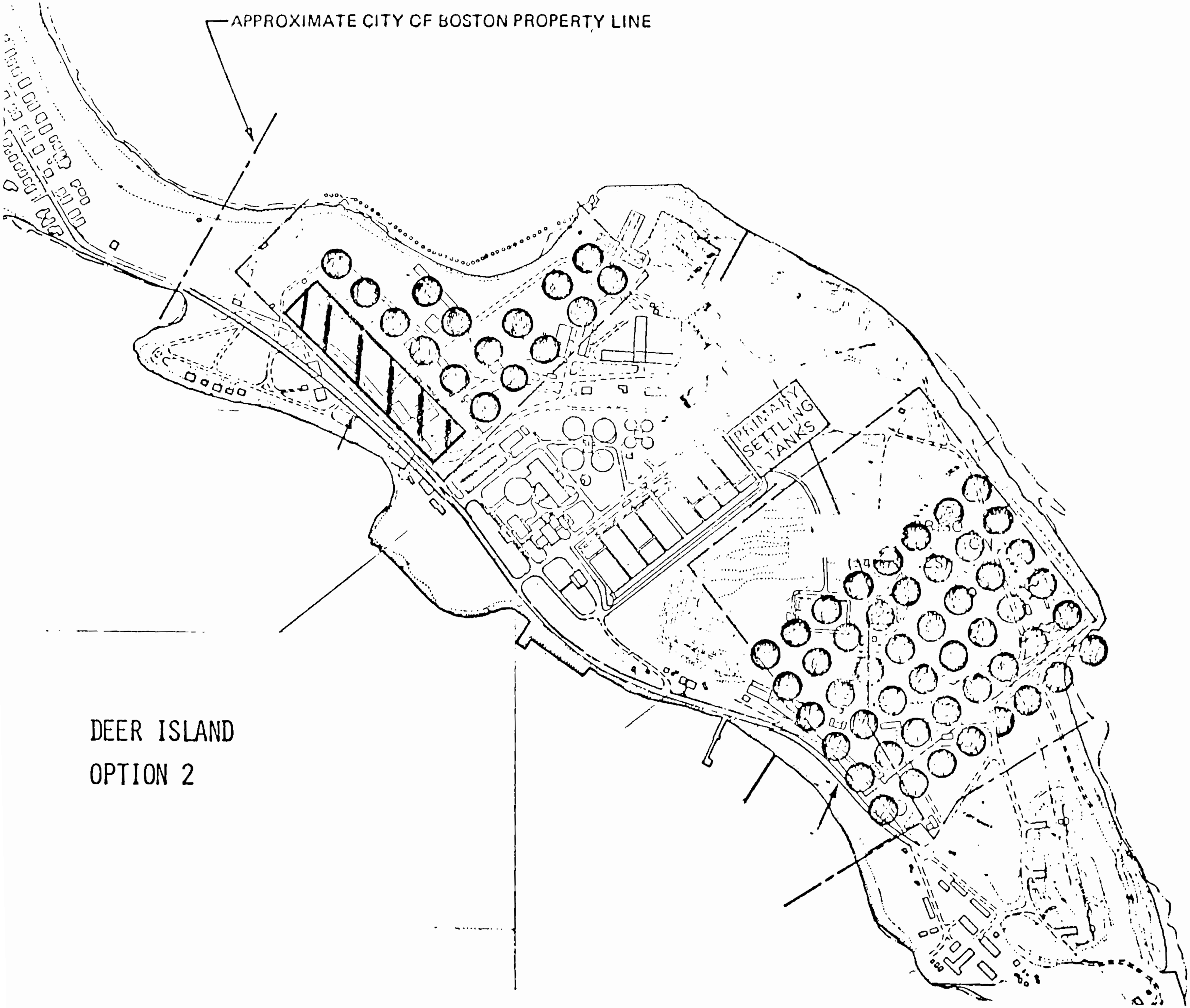
cc: James Hillard Human Services
Betty Wood, Environment Management
John Snedeker, M.D.C.
Martin Wies, M.D.C.
Michael Ventresca, Coastal Zone Management
Robert Vey, Deputy Mayor
Victor Hagan,Public Facilities
Jean Beal, Conservation Commission
Kenneth Mickiewicz, Law

PED/ar

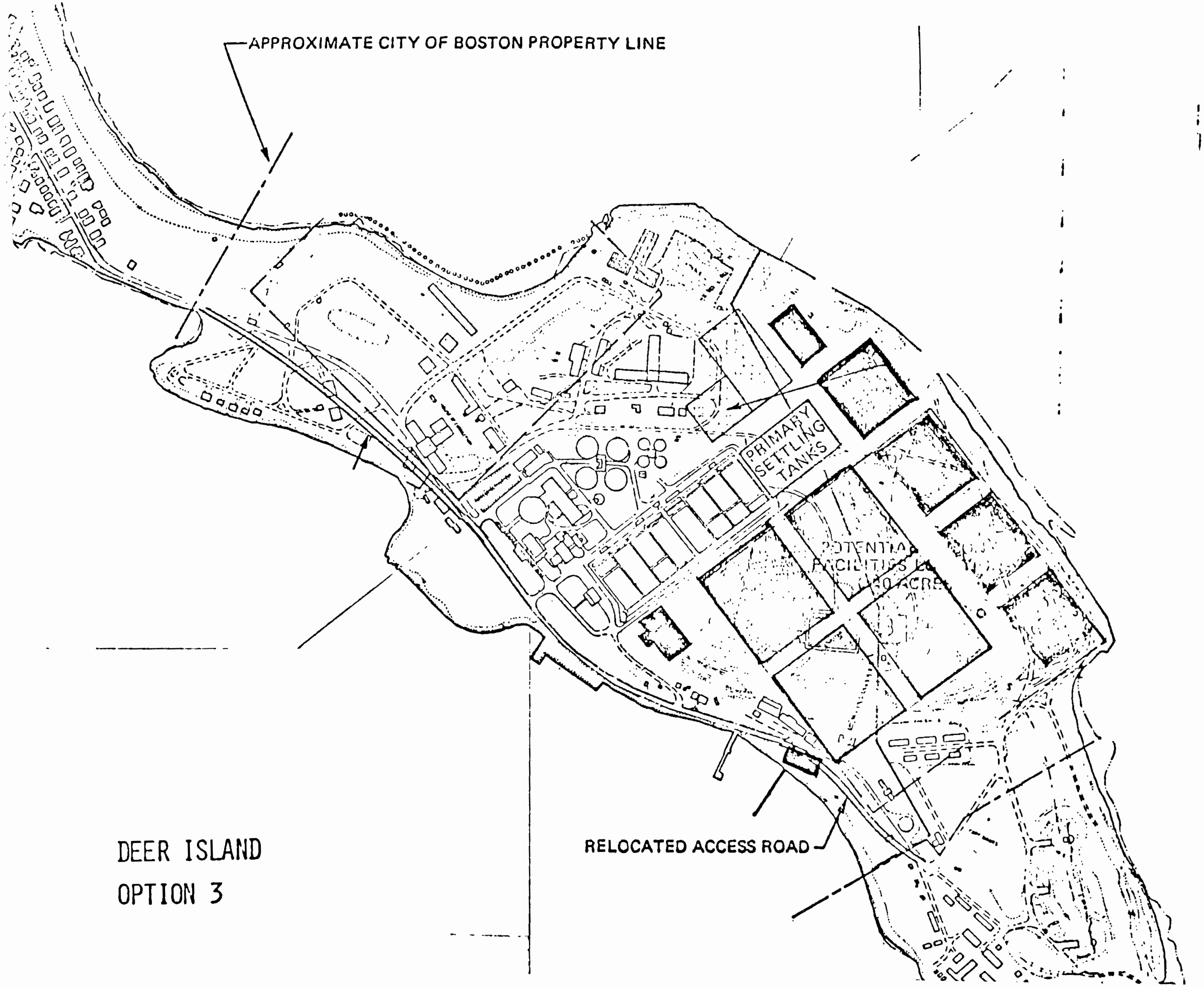


3/29

DEER ISLAND

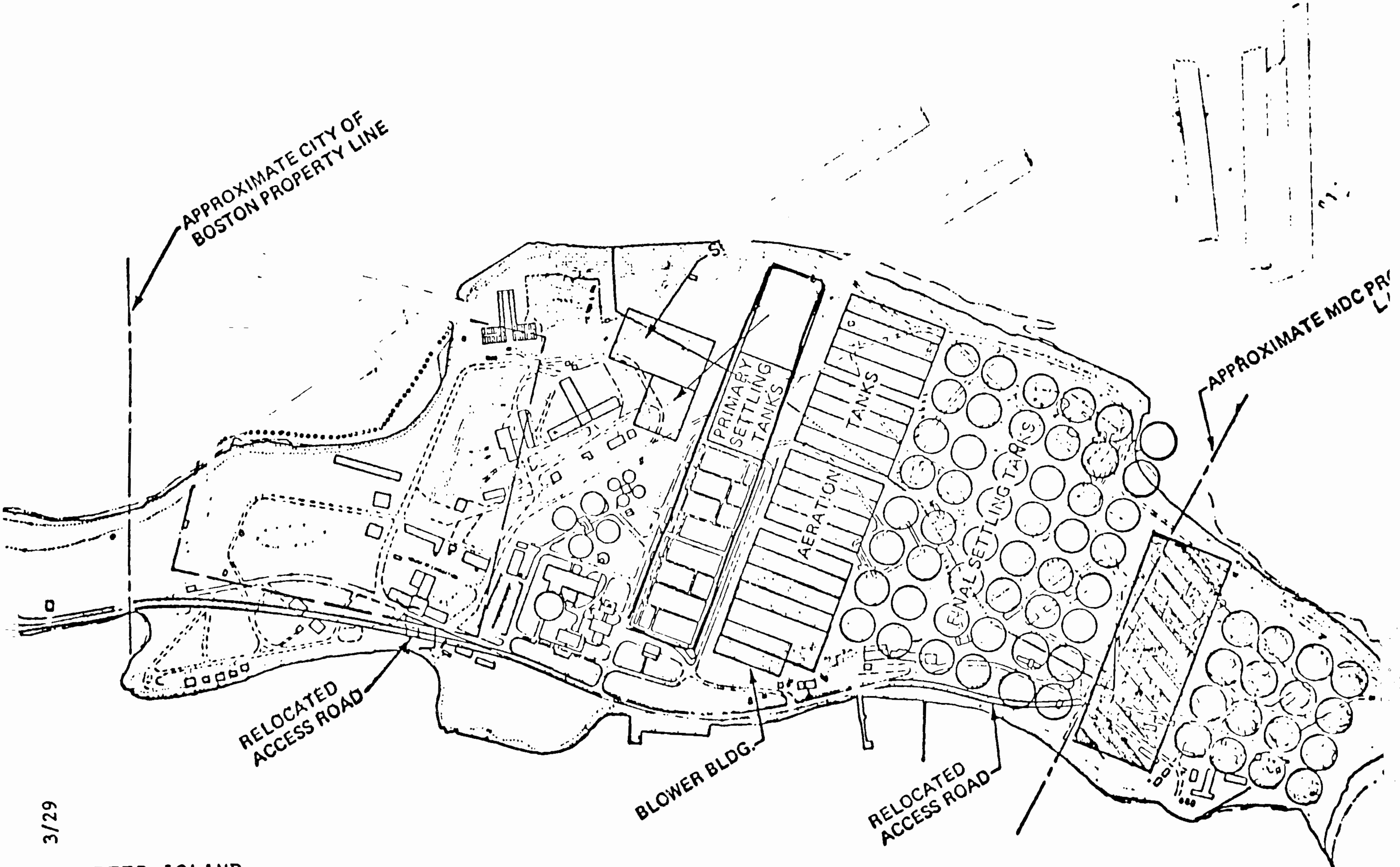


DEER ISLAND
OPTION 2



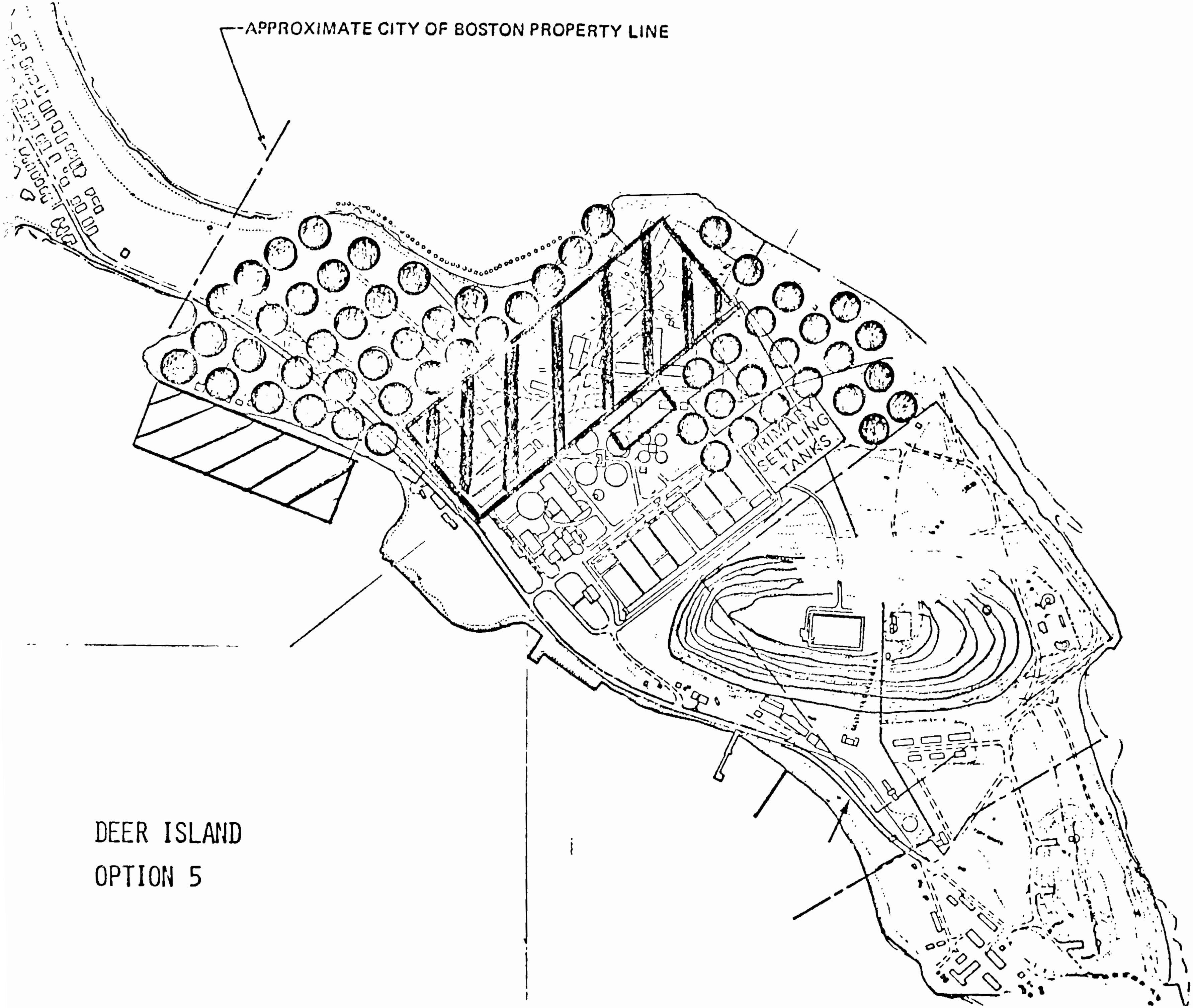
DEER ISLAND
OPTION 3

3/29



DEER ISLAND

OPTION 4



DEER ISLAND
OPTION 5

10.2 Public Participation Program Summary

10.2.1

PUBLIC PARTICIPATION PROGRAM SUMMARY

Supplemental Draft Environmental Impact Statement (SDEIS)

Boston Harbor Wastewater Facilities Siting

September, 1984

Prepared by: Barry Lawson Associates, Inc.
P.O. Box 648
Concord, Massachusetts 01742

Prepared for: C.E. Maguire, Inc.
One Davol Square
Providence, Rhode Island 02903

For the U.S. Environmental Protection Agency
Under Contract Number 68-04-1010

I. INTRODUCTION

Public participation is an important consideration in any investigation of environmental impact. Public involvement throughout the Environmental Impact Statement (EIS) process can ensure that the resulting plans, rec ommendations and policies are not only technically appropriate, but also politically and socially acceptable. The complexity of issues and concerns, and the large number of communities, interest groups, and government agencies involved in this SDEIS increase the need for organized and integrated public participation.

The public participation program designed for this SDEIS by Barry Lawson Associates, Inc. performs two basic functions:

- provides the public with information on the EIS process and the progress of studies for the SDEIS
- creates opportunities for the public to provide input and consultation to the SDEIS study team and responsible agencies.

Several major public participation activities took place to guarantee the performance of the above functions. Each of these activities, and several support services provided, are summarized later in this appendix. In all participation events involving the public, efforts were made to provide the participants with the facts they would need to make informed comments and ask pertinent questions. Public participation activities were designed and planned in close collaboration with the study team. Meetings, workshops, exercises and questionnaires were structured to provide the study team with information it needed, while also offering opportunities for general comments from the participants. The major public participation activities were timed to provide public input at points in the EIS process when important decisions were about to be made by the study team.

II. MAJOR PUBLIC PARTICIPATION ACTIVITIES

1) Public Participation Coordination

Management and coordination are obvious requirements if a public participation program is to succeed. Barry Lawson Associates, Inc. provided overall management, coordination, and production of materials for this public participation program with Barry R. Lawson as project manager and Ann Jacobson and Edward Ionata as public participation coordinators.

2) Planning

A public participation workplan was developed by representatives of the U.S. Environmental Protection Agency Region I (EPA), C.E. Maguire, Inc., and the staff of Barry Lawson Associates. The plan includes all of the activities and services summarized in this appendix and provides for ongoing evaluation and modification of the plan by EPA, C.E. Maguire, and Lawson Associates staff as neccessary to meet changing conditions.

3) Formation and Support of Citizens' Advisory Committee

A twenty-six member Citizens' Advisory Committee (CAC) was appointed in October 1984, by Michael Deland, Regional Administrator, EPA, to assist and advise the study team. Nominations for CAC members were solicited from a wide range of concerned interest groups representing communities involved, the environment, recreation, business, and government. The appointed members began meeting in November 1983 and have held regular meetings each month since then and task force meetings at two week intervals between the regular meetings. Attendance at the regular meetings averages 16.5 members and representatives of members not able to attend.

The CAC worked diligently with EPA, C.E. Maguire, and Lawson Associates to become familiar with the issues examined in the SDEIS and has offered comments at every stage of the EIS process. The CAC has reviewed each chapter of this SDEIS in draft form and edited for possible errors in data or interpretation. Members also took part in structured excercises to assess the importance of various siting impacts and to develop potential mitigation methods. The results of these exercises are reported in section 10.2.3. In June 1984, the CAC offered testimony at State Legislature hearings on the establishment of a metropolitan water resources authority.

The members of the CAC have produced a report summarizing their concerns and recommendations regarding wastewater treatment plant siting in Boston Harbor, which is included as section 10.3 of this appendix.

Lawson Associates is responsible for coordinating the activities of the CAC, producing meeting agendas and minutes, assisting the CAC in document and testimony preparation and keeping CAC members supplied with current SDEIS information.

4) Formation and Support of Technical Advisory Group

A thirty-five member Technical Advisory Group (TAG) was formed in October 1983, to provide technical assistance to the study team and create a forum where study results can be presented to concerned public agencies for discussion. The members of the TAG were appointed by local, state, and federal agencies interested in the project. The TAG met periodically during the initial stages of the study and less frequently in the later stages using bilateral discussions between individual TAG members and the consultant as a forum for review. Future TAG meeting are planned to review this SDEIS and future final documents. Lawson Associates coordinates TAG activities and provides agendas and meeting notes.

A list of TAG members appears in Table 10-1.

5) Production and Distribution of Newsletters

A series of newsletters entitled "Boston Harbor Update" was produced and distributed to all individuals and agencies on the project mailing list (approximately 740). Three Updates have been published to date, informing the public on study progress and upcoming public participation events. A fourth Update is planned for publication at the time of the SDEIS release.

6) Production of Public Meetings and Workshops

Several public meetings and workshops have taken place during this project to reach out to the general public for input at key decision-making junctures. In September 1983, two public scoping meetings and one agency scoping meeting were held. One hundred members of the general public and twenty-one representatives of concerned agencies attended and offered opinions on the scope of work for this SDEIS.

A public workshop was held in November 1983, to identify and discuss factors which should be considered in the screening process. About sixty people attended and took part in excercises designed to identify and weight the importance of various factors involved. Results of this exercise are reported in section 10.2.2.

Two public meetings were held during January, 1984, to obtain public reaction to EPA's recommendation of six sites for further study. One meeting was held in each of the two communities where major impacts are likely to occur; Winthrop and Quincy. Approximately one hundred people attended each meeting and enthusiastically voiced a wide variety of concerns. A summary of the comments made at these meetings was published as Appendix A of the Report of Final Screening Results (May 16, 1984).

A public workshop was held in August 1984, to update the public on the progress of the SDEIS, introduce factors being considered in siting decisions and gather opinion on them, and elicit comments on potential mitigation and compensation measures. Thirty-five members of the public attended and engaged in discussions with project staff, worked in small groups on exercises, and individually on an opinion survey. Results of this workshop are also reported in section 10.2.2.

Future public briefings are planned to answer questions on the SDEIS, and a public hearing will be held to gather the public's official comments on the SDEIS.

III. SUPPORT SERVICES

1) Mailing List Maintenance

A mailing list of approximately 740 concerned citizens, organizations, agencies, and media outlets was developed and is continually updated. The list is used for distribution of the "Boston Harbor Update" and announcements of public participation events. Separate CAC and TAG lists are maintained for mailings to those groups.

2) Media Relations

Lawson Associates acts as a source of information for media personnel and encourages coverage of SDEIS public events.

3) Information Depositories

Information concerning the SDEIS has been distributed to libraries in Boston, Quincy, Wellesley, and Winthrop. The libraries were provided with binders to file the information and current SDEIS information is sent periodically.

4) Field Trips

Field trips were held to allow the TAG and CAC members to view the Nut Island and Deer Island wastewater treatment facilities and to view Boston Harbor by boat.

5) Summaries

Summaries and analyses of all public workshops and meetings were prepared by Lawson associates for use by the study team.

6) Management

A collection of miscellaneous tasks are carried out to support the public participation program. A telephone number with answering service (617-451-3600) and a post office box (P.O. Box 1357, General Mail Facility, Boston MA 02210) are maintained to provide public access to the participation coordinator. Requests for information or documents from concerned citizens, agencies, and media personnel are processed continually. Lawson Associates staff provides advice to the study team regarding public communications and analysis of opinion data.

7) Evaluation

The public participation program was evaluated by members of the study team in April 1984, and is continuously evaluated and modified as the SDEIS progresses. A final evaluation by the study team, the CAC, and the TAG is planned during the review period for the final EIS.

IV. CONCLUSION

The public participation program for this SDEIS is producing a diversity of information. For example, the study team has been provided with detailed comments and opinions on study design, impacts, and mitigation and compensation for the various options. Public input has been extensively incorporated into the work of the study team and plans are in place to ensure the same or greater levels of public involvement for the remainder of this project.

SDEIS - Boston Harbor Wastewater Facilities Siting
Technical Advisory Group List

FEDERAL AGENCIES

Mr. Chris Mantzaris
Habitat Protection Branch,
National Marine Fisheries
Federal Building - 14 Elm Street
Gloucester, MA 01930
281-3600

Mr. Rob Adler
Impact Analysis Branch, Plg. Div.
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02154
647-8231

Ms. Kathleen Castagna
Project Manager
U.S. Environmental Protection
Agency
Room 2103 - J.F.K. Building
Boston, MA 02203
223-3915

Mr. Howard Larsen, Reg. Dir.
U.S. Fish and Wildlife Service
1 Gateway Center
Newton Corner, MA 02158
965-5100

Mr. Jim Mikolaites
U.S. Fish and Wildlife Service
P.O. Box 1518 - 55 Pleasant St.
Concord, N.H. 03301
(603)224-2585

Mr. Michael Frimpter
U.S. Geological Survey
150 Causeway Street
Boston, MA 02114
223-4521

Mr. William Patterson,
Regional Environmental Officer
c/o Department of Interior
National Park Service
15 State Street
Boston, MA 02109
223-5517 or (202)343-3891

Lt. Commander Allen Boetig
U.S.C.G. Marine Safety Div.
First Coast Guard District
150 Causeway Street
Boston, MA 02114
223-6915

STATE/REGIONAL AGENCIES

Ms. Beverly Boyle
A-95 Coordinator
Executive Office of
Communities and Development
100 Cambridge St. - 9th Fl.
Boston, MA 02202
727-3253

Ms. Evelyn Murphy, Secretary
Executive Office of
Economic Dev. & Manpower Affairs
1 Ashburton Place
Boston, MA 02108

Ms. Cheryl Breen
Office of Coastal Zone Management
20th Floor - 100 Cambridge Street
Boston, MA 02202
727-9530

Mr. Sam Mygatt, Executive Director
Environmental Impact Review
MEPA Unit
20th Floor - 100 Cambridge Street
Boston, MA 02202
727-5830

Ms. Kathy Abbott
Department of Environmental Mgmt.
100th Cambridge St. - 20th Fl.
Boston, MA 02202
727-4704

Mr. Emerson Chandler
Water Resources Commission
100 Cambridge Street
Boston, MA 02202
727-3267

Mr. Steven Lipman
DEQE
1 Winter Street-7th Floor
Boston, MA 02108
292-5668

Mr. Glen Haas
Div. of Water Pollution Control
1 Winter Street
Boston, MA 02108
292-5748

Mr. Ron Lyberger
Div. of Water Pollution Control
1 Winter Street
Boston, MA 02108
292-5738

Mr. Eugene Kavanaugh
Division of Water Ways
1 Winter Street
Boston, MA 02108
292-5695

Mr. Leigh Bridges, Director
Division of Marine Fisheries
19th Floor - 100 Cambridge St.
Boston, MA 02202
727-3193

Ms. Valerie Talmage, Exec. Dir.
Massachusetts Historic Commission
294 Washington Street
Boston, MA 02108
727-8470

Ms. Denise Breiteneicher
Massport Planning Division
99 High Street
Boston, MA 02110
482-2930

Mr. Martin Pillsbury
Metropolitan Area Planning Council
110 Tremont Street
Boston, MA 02108
451-2770

Mr. Jack Hamm
Metropolitan District Commission
20 Somerset Street
Boston, MA 02108
727-8881

Ms. Jean Haggerty
Metropolitan District Commission
20 Somerset Street
Boston, MA 02108
727-8880

Mr. Noel Barratta, Director
MDC Sewerage Division
20 Somerset Street
Boston, MA 02108
727-5254

Mr. Justin Radlow
Bureau of Project Development
Department of Public Works
100 Nashua Street
Boston, MA 02114
727-4740

LOCAL/OTHER

Mr. Russell Hughes
80 Woodside Avenue
Winthrop, MA 02152

Mr. Paul Anderson
55 Sea Street
Quincy, MA 02169

Mr. David Standley
McGrath, Sylva & Assoc., Inc.
15 Court Square - Suite 540
Boston, MA 02108
227-1142

Mr. Peter Scarpignato
Department of Public Facilities
26 Court Street - 6th Floor
Boston, MA 02108
725-4802

Mr. Ronald Jones
Office of Environmental Affairs
Department of Health and Hospitals
Administration Building Mezzanine
818 Harrison Avenue
Boston, MA 02108
424-5965

Ms. Frances Lavallee
Boston Harbor Water
Quality Committee
12 Randall Avenue
E. Weymouth, MA 02189
335-6388

Ms. Libby Blank
Boston Water and Sewer Commission
10 Post Office Square
Boston, MA 02109
426-6046

Mr. Robert Reimold
Metcalf & Eddy, Inc.
50 Staniford Street
Boston, MA 02114

Mr. Daniel Garson
C.E. Maguire, Inc.
One Davol Square
Providence, R.I. 02903
426-2120 ex 417

10.2.2

PUBLIC WORKSHOPS

Summary and Exercise Results

Supplementary Draft Environmental Impact Statement
Boston Harbor Wastewater Treatment Facilities Siting

October, 1984

Two public workshops were held during this project to inform the public and to gather public input. The workshops were designed to provide the study team with helpful information at key decision-making junctures of the project. The first workshop was held in November 1983, during the period of the project when the list of options for further study was being screened and narrowed. The goals of this workshop were to inform the public of the progress of the project and to gather public opinion on factors involved in the screening process.

A second public workshop held in August of 1984 focused on mitigation and compensation methods required to make the various options under consideration acceptable to a variety of concerned citizens and groups.

A summary of each workshop and results of exercises conducted at the workshops follows:

I. Public Workshop #1

The first public workshop for this project was held on November 29, 1983, at the State Street Bank Building in Boston, Massachusetts. The group of approximately 60 participants was welcomed by Michael Deland, EPA Region I Regional Administrator and Sam Mygatt of the Commonwealth of Massachusetts. Mr. Deland moderated the workshop.

A briefing and explanation of the project was given by Daniel Garson of C.E. Maguire, Inc. Following the briefing, the group took part in an exercise designed to allow group members to assign weights to various impacts to be evaluated as part of the SDEIS screening process. The list of impacts to be weighted corresponded to the STEEPLI matrix being used by C.E. Maguire, Inc. to screen the options. The exercise was coordinated by Barry R. Lawson of Barry Lawson Associates, Inc.

The workshop participants were divided into several smaller groups and allowed to select a siting option which they would focus on throughout the exercise from a list of options provided (table 10-2). The groups were also provided with a list of major impact categories based on the STEEPLI matrix and several sub-categories for each major category. The groups assigned weights to each major category and ranked each sub-category as high, medium, or low in importance. Results of the exercise are reported in tables 10-3 and 10-4. Table 10-3 also compares the results of the Public Workshop exercise to those of a similar exercise performed with the Citizens Advisory Commitee for this project, and ranks the major categories from most (1) to least (7) important, based on the results of this workshop.

Useful information evolved from this exercise and was incorporated into the analyses performed by C.E. Maguire, Inc. Some of the more important findings of this exercise include:

-- the public is more concerned with environmental, technical, and social impacts than with economic, political, legal, and institutional impacts. (see rankings of major catagories)

-- there is great public interest in options affecting the communities of Winthrop and Quincy. (half of participants chose to focus on options affecting the two communities)

-- the Citizens Advisory Committee opinion is a reasonable reflection of public opinion. (comparable rankings)

II. Public Workshop #2

The second workshop on the siting of wastewater treatment facilities in Boston Harbor was held on August 7, 1984 at 1:00 p.m. in the Enterprise Room of the State Street Bank Building in Boston, Massachusetts. The goal of the workshop was to provide EPA and the consultant, C.E. Maguire, Inc., with public opinion on major siting factors and potential mitigation and compensation measures.

Thirty-five members of the public attended the workshop and were welcomed by Michael Deland, Regional Administrator, EPA Region I. The remaining portion of the workshop was divided into two parts: a portion which provided the participants with relevant information and a portion which solicited public comments and ideas.

The information portion consisted of two presentations. Donald Porteous, Chief of Water Quality, EPA Region I, gave a status report on the Supplemental Draft Environmental Impact Statement (SDEIS). Daniel Garson of C.E. Maguire, Inc. reviewed siting options and impacts, outlined possible mitigation measures, and provided the participants with printed summaries of these issues. Questions from the audience were invited and answered during both presentations.

The public comment portion of the workshop was divided into a working group session and a poll. In the group session, participants were asked to select the decision-making factors which concerned them most and to form small working groups to examine each factor. Each group was provided with a work sheet to guide its discussions and comments. Staff members from EPA, C.E. Maguire, Inc. and Barry Lawson Associates were available to assist the working groups and to answer questions. Following the working group sessions, each group reported its results and offered comments to all of the participants. A brief summary of each work sheet follows:

Group 1
Major Concern: Traffic and Access - Deer Island
- would like to see plant built on Long Island.
- concerned about traffic safety, noise in addition to

current airport noise, and additional traffic in an already congested area.

- mitigation measures for a Deer Island site would be to barge all materials, equipment, and workers to the site.
- barging should begin immediately and include the current fast-track improvements.
- Deer Island is the worst site for a new facility.
- Both the town of Winthrop and the contractor lose if barging is not undertaken because it will be impossible for residents or construction traffic to move through the crowded streets.

Group 2
Major Concern: Land Use

- favor primary treatment option 4b2 (split Nut and Deer Islands) and secondary treatment option la (split Nut and Deer Islands) because they minimize degradation of existing property.
- suggest buffer zones or parks around treatment facilities and purchasing nearby residences at fair market value.
- consider Long Island the worst site for a treatment plant because Long Island is the only harbor island to become part of the Island Park system with land access, making it available to people who cannot afford boat transport.
- if Long Island is chosen as a site, mitigation could be to reclaim Nut Island and Deer Island as parks.

Group 3
Major Concern: Recreation

- favor Nut and Deer Island sites for new facility.
- want long outfalls for all treatment levels.
- feel that there is no equitable compensation for using Long Island as a site because there is no existing treatment facility there and the land is valuable to the State.
- any barging facilities built should be used later for recreation.
- examine building facilities underground with recreation areas on top.

Group 4
Major Concern: Community Impact

- favor consolidated facility on Long Island.
- maximize distance from facility to where people live.
- all materials, equipment, and workers should be barged to Long Island.
- there is no just compensation or mitigation for building a facility on Nut or Deer Islands.

Group 5
Major Concern: Facility Design

- siting not important as long as sludge is taken care of.

- sludge is a resource that should be utilized.
- sites with room for sludge treatment should be favored.
- mitigation for community adjacent to facility could include odor containment, cash compensation, elimination of sewer and water tax.
- Nut Island is a bad site because of lack of room for sludge treatment, but treatment could possibly take place off site.

Group 6
Major Concern: Costs
- consolidated treatment at Deer Island is favored because it is an obviously economic option.

A questionnaire was distributed before the workshop adjourned to poll the participants on their site choices for both primary and secondary treatment options. Participants were asked to provide reasons for their choices. The following are the results of the poll:

Primary Treatment Options:

Seven participants selected option 4a.2, consolidated primary treatment on Deer Island, as the best site. Reasons for this choice were:

- least cost
- least new land destroyed
- water quality in that area is already poor
- does not affect Long Island
- provides an opportunity to compost sludge
- less environmental and community impact, less mitigation
- benefits of consolidated plant while not impacting Long Island

Three participants selected option 4b.2, primary treatment on Deer and Nut Islands, for the following reasons:

- the main construction is already in place and only requires upgrading and enlargement
- opportunity for prompt action
- consolidation at Deer Island is too much for the community of Winthrop to bear

Three participants chose option 5b.2, consolidated primary treatment on Long Island, for the following reasons:

- least amount of residential disruption
- fewer community impacts on Nut and Deer Islands
- Deer Island could be used as park land

Two participants chose option 5a.2, primary treatment on Deer and Long Islands, for the following reasons:

- utilizes existing site on Deer Island without making Winthrop absorb 100% of the impact
- a State Park is still possible on Long Island
- no filling of harbor at Nut Island
- better possibilities for mitigation

Secondary Treatment Options:

Six participants chose option 1a, consolidated secondary treatment at Deer Island, as the best secondary treatment site option. Reasons cited for this choice are the same as reasons mentioned earlier for the choice of site 4a.2 for primary treatment.

Three participants selected option 1b, primary treatment on Nut Island with secondary treatment on Deer Island, as the best option for secondary treatment. The following are some reasons for this choice:

- offers opportunity of a buffer park at Deer Island without further degradation of Long and Nut Islands
- does not impact Long Island

Three participants chose option 2b.1, consolidated secondary treatment at Long Island, for the same reasons option 5b.2 was selected as a primary treatment site.

One participant selected option 2b.3, primary treatment at Deer Island with primary and secondary treatment at Long Island because, if the waiver (301(h) application) is not granted, the impact should be spread out.

The following general comments were added to the questionnaire sheet by participants:

- no secondary options should be considered because the MDC cannot afford operation and maintenence costs and secondary plants are too complex for us to be able to guarantee successful operation
- leave sites where they are and upgrade them, too much time will be taken up to chose a new site and get political approval for it
- construction of ocean outfall should be started immediately to allow pumping of untreated sludge and wastewater out of the harbor to alleviate health hazards
- facilities should be located away from people

Several participants chose not to respond to one or more questions on the questionnaire form.

This workshop indicated that the public was somewhat divided on the siting issue and that there was both support and opposition for each option. There was a general consenus at the workshop that mitigation and compensation are important factors to be considered in siting a treatment facility or facilities. Several EIS staff persons from C.E. Maguire and EPA were present at the workshop and interacted with the participants.

Information gathered through these interactions and through the exercises was used to assist in the formulation of recommendations included in the draft EIS. Information resulting from both workshops will be valuable when it becomes necessary to begin planning for mitigation to ensure implementation of a final siting decision.

TABLE 10-2

LIST OF OPTIONS

FACILITIES AND SITES FOR WASTEWATER TREATMENT

Option	Components
1a.1	Headworks at Nut Island Combined primary and secondary treatment at Deer Island Combined local outfalls
1a.2	Headworks at Nut Island Separate primary and secondary treatment at Deer Island Combined local outfalls
1b.1	Primary treatment at Nut and Deer Islands Combined secondary treatment at Deer Island Combined local outfalls
1b.2	Primary treatment at Nut and Deer Islands Separate secondary treatment at Deer Island Combined local outfalls
1c	Primary and secondary treatment at Deer Island and Nut Island * Local outfalls
2a.1	Headworks at Nut Island Primary and secondary treatment at Deer Island and Long Island *
2a.2	Primary and secondary treatment at Deer Island* Primary treatment at Nut Island with secondary treatment at Long Island Local outfalls
2b.1	Headworks at Deer Island and Nut Island Combined primary and secondary treatment at Long Island * Local outfalls
2b.2	Primary treatment at Deer and Nut Islands Combined secondary treatment at Long Island * Local outfalls

TABLE 10-2 (continued)

3a/b	Headworks at Deer and Nut Island Combined secondary treatment * at either Lovells or Brewsters Local outfalls
4a.1/2	Headworks at Nut Island Combined primary treatment at Deer Island * Either local or deep ocean outfalls
4b.1/2	Primary treatment at both Nut and Deer Islands Either separate or combined deep ocean outfall at Deer Island with inter-island tunnel
	PREFERRED MDC PRIMARY TREATMENT OPTION
5a.1/2	Headworks at Nut Island Primary treatment at Long Island Either local outfalls or inter-island tunnel to deep outfall Separate primary treatment at Deer Island Either local or deep ocean outfalls
5b.1/2	Headworks at Deer Island and Nut Island Combined primary treatment * at Long Island Either local or deep ocean outfall

* assumes primary treatment facilities to treat average 500 mgd, peak 1240 mgd combined flows.

TABLE 10-3

Weighting of Impacts - Major Catagories

Group Code	Option	Social	Technical	Environmental	Economic	Political	Legal	Institutional
		Weights Assigned to Impact Categories (by Group)						
1	1c	15	20	30	15	15	2	2
2	4b2	16	23	23	9	5	4	18
3	4b1/2	25	16	25	5.(L)	5	4	20
4	4b1/2	14	19	19	19	5	5	19
5	1b2	30	8	20	25	10	3	5
6	4b2	15	25	20	10	5	5	20
7	4a2	15	10	30	30.(H)	5	5	5
8	2b2	25	20	20	20	10	0	5
9	4b1/2	24	20	20	15	8	5	9
10	2b1		DID NOT WEIGH					
Total		179	161	207	148	68	34	103
Workshop Average		20	18	23	17	8	4	11.5
Workshop Rank		2	3	1	4	6	7	5
CAC Average		(24+)	(16-)	(22)	(10)	(5)	(7)	(15)
CAC Rank		1	3	2	5	7	6	4

TABLE 10-4

COMPILED GROUP RESPONSES
RATING OF SUB-CATAGORIES

SCREENING CRITERIA	IMPORTANCE OF IMPACT		
CATEGORY/impact	HIGH	MEDIUM	LOW
SOCIAL (Adverse Community Impacts)			
Construction activities	6	1	2
Traffic and safety	4	1	2
Noise	3	1	5
Odor	4	-	4
Property values	1	1	5
Land use (Preclusion/Compatibility of Other Uses)	-	-	6
Community Character	1	-	5
Historical/Archeological	-	-	2
TECHNICAL (Engineering and Scientific)			
Level of treatment/acres required	4	1	-
Ave./peak daily flows	5	1	1
Construction period	3	1	2
System operation during construction	4	-	2
System management/operation	5	1	1
Energy requirements	1	2	1
Long-term viability	4	1	-
Engineering feasibility	6	-	-
Land availability and access	4	1	1
Sub-regional sewage systems	3	1	1
Infiltration/Inflow	6	-	-
System elements (CSO's, etc.)	4	-	-
ENVIRONMENTAL (Natural and Built Environment)			
Water quality	7	1	-
Recreational opportunities	6	-	1
Scenic quality	2	3	1
Marine life (fisheries)	7	1	-
Air Quality	5	-	1
Wildlife habitats	-	1	2

TABLE 10-4 (continued)

ECONOMIC (Costs and financial effects)			
Capital (construction) costs	4	2	1
Operation & maintenance costs	6	1	1
Present worth/annualized costs	2	1	1
Local share (by town)	4	2	1
User charges (per capita)	5	-	2
Affordability (to taxpayers/users)	3	1	2
Employment/wages	2	1	2
Secondary economic impacts	1	1	3
POLITICAL (Jurisdictional implications)			
Federal costs/respons.	2	1	1
State costs/respons.	2	1	2
Municipal costs/respons.	3	2	1
Political relats. toward communities	4	1	1
Personal responsibility	1		
LEGAL (Judicial concerns)			
Statutory requirements/limits	2	-	4
Permits required	1	-	4
Land ownership	1	-	3
Compliance with court actions	2	2	-
Environmental regulations	6	-	-
INSTITUTIONAL (Planning Coordination)			
Institutions affected	1	1	2
System management/operations	4	1	1
Management of facilities	5	-	1
Policies	2	2	2
Other planning elements	1	2	-
Site ownership/acquisition	2	1	1
Periodic review/community input	2	2	1

10.2.3

CITIZENS ADVISORY COMMITTEE EXERCISES

Supplementary Draft Environmental Impact Statement
Boston Harbor Wastewater Treatment Facilities Siting

October, 1984

Two major structured exercises have been undertaken by the CAC to assist the EIS staff. These exercises were performed in addition to the functions mentioned in section 10.2.1 and 11.3.

The first exercise took place in early November 1983. It was designed to yield information about the various impacts being used to analyze siting options. This exercise was similar to the exercise described for Public Workshop #1 (see 10.2.2). In addition to weighing each major category of impacts, the CAC weighed each major category with reference to each particular siting option. The results of this exercise are reported in Tables 10-5, 10-6, and 10-7. This exercise also served as a test of the exercise used at Public Workshop #1, and the results of this exercise can be interpreted in much the same way as the results of the workshop (see 10.2.2). As in the case of the workshop, the information resulting from this exercise was used to assist the EIS staff in screening and narrowing the siting options.

The second CAC exercise took place in April and May of 1984. This exercise used structured questionnaires and the framework of the STEEPLI matrix to elicit and organize comments on impact mitigation/compensation and avoidance of adverse impacts. The task placed before the CAC members was to make each of the siting options "equally acceptable". Individual and group results for this exercise are reported in table 10-8. (Option numbers and STEEPLI catagories are identical to those described in table 10-2 and 10-4.)

The information resulting from this exercise is important when considering the implementability of the various options and the feasibility and cost of possible mitigation/compensation efforts.

TABLE 10-5

CAC WEIGHTING OF MAJOR IMPACT CATAGORIES

CRITERIA	EPA	INDIVIDUAL GROUP SCORES							TOTAL	AVE.	RANK
SOCIAL	25	10	15	25	15	37	45	25	172	24+	1
TECHNICAL	10	25	15	25	15	5	10	15	110	16-	3
ENVIRONMENTAL	25	25	15	20	20	38	15	25	158	22+	2
ECONOMIC	25	20	20	1	5	1	15	10	72	10+	5
POLITICAL	5	0	10	3	10	5	5	0	33	5-	7
LEGAL	5	10	10	1	15	5	5	5	51	7+	6
INSTITUTIONAL	5	10	15	25	20	9	5	20	104	15-	4

TABLE 10-6

CAC WEIGHTING OF IMPACT SUB-CATAGORIES

[Ed. Notes:
(1) EPA's response is added in to total in this Table.
(2) Some groups did not assign an importance to particular categories. Therefore, the number does not add up to the total number of groups.
(3) * indicates an impact added by a group.]

SCREENING CRITERIA	Of what importance is each impact?:		
CATEGORY/impact	HIGH	MEDIUM	LOW
SOCIAL (Adverse Community Impacts)			
Construction activities	5	2	1
Noise	4	2	1
Odor	5	2	
Recreational Opportunities	2	4	
Property values	5	1	1
Land use (Preclusion/Compatibility of Other Uses	5	2	1
Community Character	4	2	2
Scenic Quality	4	2	1
Historical/Archeological	2		
TECHNICAL (Engineering and Scientific)			
Engineering feasibility	5	1	
Traffic disruptions	2	3	2
Land availability and access	5	3	
Sub-regional sewage systems	3	4	
Infiltration/Inflow	5	2	1
System elements (CSO's, etc.)	6	1	1
Other			
ENVIRONMENTAL (Natural and Built Environment)			
Water quality	7		1
Marine Life	7	1	
Air quality	7		
Wildlife	5	1	1
Fishing	7		
Other			

TABLE 10-6 (continued)

ECONOMIC (Costs and financial effects)			
Construction costs	1	5	1
Operation & maintenance costs	4	2	1
Affordability (to taxpayers/users)	3	4	1
Employment/wages generated		3	3
Secondary economic impacts		2	5
Other ______________________			
POLITICAL (Jurisdictional implications)			
Municipal costs/respons.	1	2	3
State costs/respons.		5	1
Federal costs/respons.	3	1	2
Political relationships* toward communities			
LEGAL (Judicial concerns)			
State and Federal reguls.	3	3	2
Land ownership	2	2	4
Pending court actions	2	2	3
Environmental regs.*		2	
INSTITUTIONAL (Planning Coordination)			
System management/operations	6	1	1
Future planning	5	3	
Growth/expansion of system	5	1	1
Periodic review/Commun.input*	1		

TABLE 10-7

CAC WEIGHTING OF IMPACT SUB-CATAGORIES FOR EACH SITING OPTION

(ED. NOTE: IF GROUP INDICATED THAT A PARTICULAR SITE WAS NOT AVAILABLE (NA), NO SCORE WAS ADDED INTO AVERAGE)

CATEGORY	DEER ISLAND	NUT ISLAND	LONG ISLAND	LOVELL ISLAND	BREWSTER ISLAND	OTHER LOCATION
SOCIAL GROUP SCORES §	20 10 25 45 25 25 10	30 10 25 45 25 30 10	15 NA 50 15 50 20 10	5 NA 50 NA 50 25 NA	5 2 50 NA 50 15 NA	20 50 20
TOTAL/AVE	160/23	175/25	160/27	130/33	122/24	90/30
TECHNICAL	20 30 15 10 15 15 25	30 30 15 10 15 5 25	20 NA 15 10 10 10 25	20 NA 15 NA 10 20 NA	20 15 15 NA 10 25 NA	25 10 5
	130/19	130/19	90/15	65/16	85/17	40/13
ENVIRONMENTAL	20 35 25 15 25 15 25	20 35 25 15 25 35 25	20 NA 25 45 25 35 25	20 NA 25 NA 25 10 NA	20 45 25 NA 25 5 NA	20 25 10
	160/23	180/26	175/29	80/20	120/24	55/18
ECONOMIC	0 20 15 15 10 5 20	0 20 5 15 10 0 20	0 NA 5 15 5 5 20	0 NA 5 NA 5 20 NA	0 25 5 NA 5 25 NA	0 NEW ISLAND 100 5 5
	85/12	70/10	50/8	30/8	60/12	110/36
POLITICAL	10 0 0 5 0 10 0	0 0 0 5 0 5 0	10 NA 0 5 0 15 0	10 NA 0 NA 0 5 NA	10 10 0 NA 0 5 NA	10 0 25
	25/4	10/1	30/5	15/4	25/5	35/11
LEGAL	0 0 0 5 5 10 10	0 0 0 5 5 5 10	0 NA 0 5 0 5 10	0 NA 0 NA 0 10 NA	0 0 0 NA 0 15 NA	0 0 25
	30/4	25/4	20/3	10/3	15/3	25/8
INSTITUTIONAL	20 5 10 5 20 20 10	20 5 10 5 20 15 10	20 NA 10 5 10 10 10	20 NA 10 NA 10 10 NA	20 3 10 NA 10 10 NA	20 10 10
	90/13	85/12	65/11	50/13	53/11	40/13

TABLE 10-8

RESULTS OF CAC MITIGATION EXERCISE

SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT (SDEIS)
BOSTON HARBOR WASTEWATER FACILITIES SITING

CAC MITIGATION EXERCISE INDIVIDUAL RESPONSES
April, 1984

(A) Adverse Impacts Requiring Action	(B) Mitigating, Avoidance, Compensatory Measures Suggested	(C) Implication(s) Requiring Investigation
PRIMARY TREATMENT OPTIONS		
Option 4a2: The island is available and expansion/upgrade would be possible without fill. (Andrea Sault)		
Construction traffic	Barging of workers and materials	Availability of staging areas and what impacts would occur in those areas.
	Work with community to find most acceptable time (i.e. not to coincide with travel time of school children)	Set up community advisory group.
	Guarantee repair of any damaged roads.	Study of pre- construction conditions.
Construction noise	Consult community on most tolerable time for high noise levels.	Community advisory group.
	Provide safety equipment if noise levels exceed OSHA safety levels at prison or in neighborhoods.	Cost might be high.
	Take measures to protect prison and residential homes from structural damage if blasting is necessary.	
Construction interruption of plant operations	Any removable of ash or sludge should be in container trucks or barges.	

TABLE 10 -8 (continued)

Construction interruption of plant operations - water quality	Notify public of shut downs. Monitor closely; shut down during periods of least effect on fishing, shellfish harvesting and recreation.	
Construction debris	Take measures to eliminate debris from falling into harbor.	
Construction debris air quality	Take measures to lessen dust impacts on neighboring community; remove old parts quickly; no burning of debris.	
Lessen burden	Remove prison	Another suitable location must be found.
	Reimbursement to host community.	
Air quality	Effective treatment for hazardous waste.	Will be costly; needs to be permanent on-going operation with sufficient personnel to make program work well.
	Install scrubbers where feasible.	
	Install odor control facilities	
	Moratorium of any new city or towns entering the system.	New treatment plants in other areas will have to be built.

Option 4a2: Consolidated use at Deer Island, less significant impacts on Nut Island, no sludge problems, best alternative with choices available. (Terry Fancher)

Technical - construction period - traffic problems in neighborhood	Construction crews would jam local streets - they could be barged in and compensation to Winthop be made - a mitigating measure might be to work with Winthrop in scheduling traffic-workers could be bused in.	Winthop residents believe the MDC has had a slipshod record and may require the establishment of a separate authority before they allow any work to be done.
Social - Traffic and Safety, Land Use	Noise and air quality will always be a concern for residents near a plant of this size. Whatever plant is designed must be able to meet local noise and odor regulations an argument could be made that the plant would only be built if the correction-	The social implications because of noise and odor from existing plant could be criticaly important to local residents.

	al facility were moved.	
Environmental - Water quality and effects on marine life with long ocean outfall.	The biggest problem with a deep ocean outfall (besides the actual construction) is the unknown impact on the marine life suggest an in-depth study be made.	Building a deep ocean outfall runs the risk of polluting the outer harbor. A Study would have to be made of effects.
Legal Residents of Winthrop can be expected to file legal action.	The legal question can be expected to surface from residents. They must feel they are a part of the total process. Buffer zones would be ideal but there is no room with prison on island. Evacuation plans would be practically useless on available streets if a chlorine leak occurred. Suggest a totally fail-safe chlorine solution be found. The idea of financial incentives to Winthrop is important but could only be funded if plant was run as separate authority.	Suggestions made under Column B.
Institutional New location for Deer Island correctional facility would have to be found (ideally).	I consider removal of the correctional institution as biggest selling point for any construction on Deer Island, though currently would not be required with this option.	The residents might like to get rid of the prison but I would think the state would have to be given an alternative, plus the money to build the prison.
Political - MDC should consider a separate authority to run plant.	The whole idea of finances has to be increased. What is the chance of a separate sewer authority? Would performance bond be required? Would the new plant be obsolete by the time it is built?	Astudy has to be made of the plant with state of the art technology that is not simply built because it was the cheapest. The specifications must be written for the best plant for that site.

Option 4b2: Upgrades present system - no impact at Long Island. (Andrew Locke)

Construction traffic	Busing; Bargin g	Docking facilities
Landfill at Nut Island	Take outer part of Hough's Neck instead. Legal process born by State.	Eminent domain Funding 5% increase in cherry sheet.
Enlarge Deer Island plant	Demolish prison.	Finding a new site.
	Build a clean plant.	Complete re-building.

	Run it properly.	Competent employees.
	Open Shirley Gut	Bridge.
Option 5a2: Sharing of responsibilities; minimal impact to residential communities; construction on Long Island without interference with existing plants. (A. Termine)		
Long Island recreation	Co-ordinate recreational plans for Long Island with treatment plant siting. Consider relocation of hospital facility.	Immediate involvement by City of Boston.
Traffic impact on Squantum	Consider docking facility for shipping, receiving bulk goods and for relief· during construction.	Locate shipping and staging area.
	Funds should be made available for the impacted towns for legal and technical consultants prior to final engineering.	
	Reorganize MDC - Develop public relations campaign to convince residents that they can co-exist with a waste treatment plant.	
	Take immediate action on Boston Harbor CSO's and on I/I.	
	Establish final limit on flows to MDC systems future additions to system would require pre-treatment at source.	
	State should declare a moratorium on any additional towns feeding in to the MDC system until wastewater plans are finalized.	
Option 5b2: Removal of adverse impacts on residents adjacent to Nut Island and Deer Island. Removal of bridge mandatory to reduce impacts to Quincy residents. Construction limited to one area with no residents in area. Boston is largest contributor to system and would be sharing in responsibility. (Anne Porter)		
Construction traffic	Take down Long Island bridge.	Special permits may be required for this.
	Barge construction equipment, chlorine.	Staging area (e.g. Perini in East Boston - Meridian Street Bridge) near access to Bridge and Tunnel - effects on Chelsea traffic and East Boston.
Car traffic workers	Ferrying of different work shifts.	Fire Station would be needed on Island for smoke stack fires and any medical

TABLE 10-8 (continued)

		emergencies.
Noise/Air Quality, health should not be a factor, because not directly adjacent to community.		
Loss of Land use	Remaining area to be landscaped and developed for recreational use.	Payment or compensation to Boston in lieu of taxes or lower user charges in Squantum area.
Relocation of homeless and hospital	Facility should be found in Boston area for homeless, not on an Island not accessible to them. Chronic patients should also be relocated to a more central location.	Federal annd State funding for new facility.
Option 5b2: Reclamation of two Islands to the Harbor Islands. Reduced impacts to already overburdened community. (Peggy Riley)		
Community, Social and Environmental.	All listed measures should be implemented.	All institutional, and political constraints should be investigated.
Institutional and cost should be a low priority under impacts due to the adverse impacts on host community.		
SECONDARY TREATMENT OPTIONS:		
Option 1a: Provides for both primary and secondary treatment with best alternative for siting. (Terry Fancher)		
Technical- Construction period - traffic problems in neighborhood	Construction crews would jam local streets. The actual materials might Winthrop may have to be considered. Suggest working with local residents to schedule workers, maybe busing them to site.	Before anything is done local residents must be assured that the MDC will not not run new plant as it has the old. Would prefer gravity flow system with both processes rather than current system of pumping uphill.
Social - Traffic, safety, Land use	Air quality will be biggest concern with a secondary treatment plant. No consideration has yet been given to type of sludge removal to be used.	Implications because of noise and odor from existing plant could be critically important to local residents.

TABLE 10-8 (continued)

Environmental - How and where to dispose of sludge	The biggest problem will be the method of sludge treatment. There has been no discussion on pros and cons of composting, incineration, or barging. With any method the residents should agree the odors will be minimal.	A method must be developed to decide which type of secondary plant would be used.
Legal - residents of Winthrop can be expected to file legal action.	Compensatory measures must be taken to diffuse any legal action taken that would delay or cancel plans.	If legal implications are not taken into account, the plant will never be built.
Institutional - New loca- for Deer Island Correctional Facility would have to be addressed or the alternative is out.	The state is having severe difficulties in finding temporary space for prisons. People do not want them. The problem will be magnified for a permanent facility. This could stop the whole project in its tracks.	Site would have to be found for new tion prison.
Political - MDC should consider separate authority to run plant.	Issue of financing must be dealt with. Performance bonds required, since plant is more complex a guarantee must be given for a period of years to ensure the safe operation of plant.	If the type of secondary system is not considered closely a system could be built that will breakdown as present system has.

<u>Option 1b: Best Harbor quality</u>. (A.M. Termine)

Total List of Social Impacts	Legal Staff Cost to insure compliance. Possible community increase in state aid due to siting problems. Pay for technical consultant to monitor design.	Construction techniques. Removal of sludge.

(Other Impacts - Same as option 5a2)

<u>Option 2b1: Main benefit to water quality of Harbor and surrounding beaches (removal of scum, floatables, etc.)</u>

TABLE 10-8 (continued)

Advantages to communities that have had sewerage treatement plant problems for over ten years. (Anne Porter)

Transporting heavy construction equipment	Mandatory - no land access to plant of this enormous size. Would benefit residential areas because numerous chlorine trucks would not be travelling through narrow streets and congested neighborhoods.	Staging area large enough to handle this amoung of equipment and storage. (e.g. Moran Terminal or Conley Terminal in South Boston) Fire Station would be needed on Island, and medical team for any emergencies.
Large loss of land use for recreational purposes.	Add another island to replace Long Island in the Harbor Parks (e.g. Deer Island easily accessible to Winthrop, Boston, Revere, Lynn.)	Payment or compensation to Boston in lieu of taxes, lower use charges to Squantum and staging area residents if it applies.
Relocaton of homeless and hospital.	Facilities should be in Boston area. (Same expana-tion as primary choice)	Federal and State funding for new facilities.

Option 2b1: Reduced impacts to residents - possible advantage by breaking down system into less centralized facility. (Peggy Riley)

Traffic	Destruction of bridge or limited use. All measures listed under "mitigation" should be implemented regardless of site chosen, as well as those items listed under "avoidance" and "compensatory".	Town permits Availability of land by owner.

Option 2b3: It is the most removed from nearby residential area (if proper odor control and screening is in place it might be made compatible with recreational use) (Andrea Sault)

Construction Impacts	(Same as primary)	
Historical/Archaeological	Archaeological crew should accompany contractors (as was done in Cambridge when Red Line extension built.)	
Air Quality	Odor control devices installed to make it more compatible with recreation	Might increase cost.
Institutional	Move Hospital Moratorium any any additional cities and towns	Another location must be found.

TABLE 10-8 (continued)

SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT (SDEIS)
BOSTON HARBOR WASTEWATER FACILITIES SITING

CAC MITIGATION EXERCISE - COMPILATION OF GROUP RESPONSES
April 3, 1984

(A) Adverse Impacts Requiring Action	(B) Mitigating, Avoidance, and Compensatory Measures Suggested	(C) Implication(s) Requiring Investigation
Option #: 4a2 - [Headworks at Nut Island; Primary at Deer Island]		
Principal Advantages of Option: Consolidated facilities, improvements to Hough's Neck community.		
Institutional (Prison)	Move prison to another site	Other potential sites Fund with portion of sewer fees
Chlorine Spill	Evacuation plans; alternative treatment	
Traffic-Construction	Busing of workers Barging materials	Staging area for buses Identify appropriate staging area (So. Boston Naval Yard?
User Fees incentives	Permanent fee reduction Create Water and Sewer Auth.	Need legislative approval Requires legislative approval Allocate some portion of fees for prison removal
	Moratorium on new towns	Legislative action, localized treatment
Water quality - floatables	More effective screening, floating booms around perimeter of project	
Visual Impacts	Fence screens, buffer zone with trees	
Odor	Proper Operation - tank covers and scrubbers	

TABLE 10-8 (continued)

Option # 4b2 - [Primary at Nut Island; Primary at Deer Island]
Principal Advantages of Option: Existing system can be upgraded with minimum dislocation.

Environmentally unpleasant	Legal fund for ensuring future compliance	
	Buffer park or "beautify plant so that it looks and smells like a park	
	Reward from State aid fund, i.e. 5% increase from Cherry Sheet	
	Supplement fire and police	
	Beach Patrol	
	Demolish Prison	Finding a new site
	Open Shirley Gut	Bridge
	Run plant properly	Competent employees
Construction traffic	Barge	

Option # 2b1, [Headworks at NI, DI, Primary/Secondary at Long Island; 5a2 - Headworks at Nut Island Primary at DI, LI]

Principal Advantages of Option: Main benefit of cleaning Harbor mainly for beaches. Dont have to work around existing MDC facilites. Move treatment plant away from communities. Removal of Moon Island CSO.

Construction Traffic	Remove L.I. Bridge/Barge Remove prison Reactivate recreational projects	Need Fire Station
Noise/Air quality	Ferry of different work shifts Payment in lieu of taxes	

Option # 5a2 - [Headworks at NI, Primary at DI, LI]

Principal Advantage of Option: Removal of adverse impacts on residents of Nut Island; Possible addition of recreation area to Hough's Neck; divides impacts across three communities.
(same as option 2b1)

10.3 Citizens Advisory Committee (CAC) Recommendations

10.3

RECOMMENDATIONS ON WASTEWATER TREATMENT FACILITIES

FOR

BOSTON HARBOR

Citizen Advisory Committee
Supplementary Draft Environmental Impact Statement
Boston Harbor Wastewater Facilities Siting

August 1984

Prepared with the assistance of:

Barry Lawson Associates, Inc.
P.O. Box 648
Concord, Massachusetts 01742

C.E. Maguire, Inc.
One Davol Square
Providence, Rhode Island 02903

I. Introduction: The Role of the Citizen Advisory Committee

The Boston Harbor Wastewater Treatment Facilities Siting Citizen Advisory Committee (CAC) was established in the Fall of 1983 to assist the United States Environmental Protection Agency and the consultant under contract, C.E. Maguire Inc., in the preparation of the Supplementary Draft Environmental Impact Statement(SDEIS) for the siting of wastewater treatment facilities in Boston Harbor. Barry Lawson Associates, Inc. was contracted by C.E. Maguire, Inc. to coordinate public participation for the project. The CAC is a major element of the comprehensive public participation program designed for the SDEIS by Lawson Associates. The following advisory functions were considered for the CAC when it was established:

- providing a direct link to the wider community interested in and affected by waste treatment in Boston Harbor;
- assisting in the development, implementation and monitoring of the public participation program;
- commenting on the progress and conclusions of the SDEIS;
- providing information to others about the project and its likely impacts;
- assisting the project team in gathering and understanding the concerns and opinions of the publics affected by the project;
- advising the project staff on the scope of the study and offering members' representative perspectives on the viability of options being considered.

The CAC members were nominated from a cross-section of environmental, community, government, and business interest groups. The underlying factor uniting the members of this group was a desire to ensure that Boston Harbor returns to being a healthy, useful, and beautiful resource for the benefit of all, and that undesirable impacts of wastewater facilities construction and operation be minimized and borne as equitably as possible. The CAC has worked diligently to perform all of the functions considered for the group when it was established.

There is general agreement within the CAC that the present wastewater treatment situation in Boston Harbor is deplorable. The factors outlined in Chapter 3 (Purpose and Need for Action) of this document are of great concern to the CAC. Boston Harbor and the communities surrounding it are being continually polluted because of poor planning, inadequate maintenence, and improper operation of an out-dated and over-burdened wastewater system. The members of the CAC view the harbor as a valuable economic, recreational, residential, and esthetic resource that is well worth cleaning up and preserving, and are equally concerned about the impacts of construction of wastewater treatment facilities on the communities where they will be built and operated.

The CAC has met once per month and a task force subcommittee has met at two week intervals between committee meetings. Members have been continually briefed by the engineering consultant on the progress of the study while it was underway. The CAC offered advice on factual details and data accuracy directly to C.E. Maguire, Inc. and this advice is incorporated into the analysis and conclusions of the SDEIS.

This portion of the appendix will describe the major concerns and recommendations of the CAC regarding the larger issues of wastewater treatment in Boston Harbor.

The opinions and recommendations of the CAC must be viewed with the realization that they arise from a group that has worked long and hard with EPA, the consultants, and members of the communities and groups represented in order to gain a full and balanced understanding of the problems facing those who must determine siting for wastewater treatment facilities in Boston Harbor. It is the hope of the CAC that these ideas will have impact on the decisionmakers for this necessary and important project.

II. Recommendations

1) Planning and Growth

The construction of wastewater treatment facilities for the MDC sewer system is of obvious importance, but is only one component of a broader planning and improvement program which must be undertaken if the current situation in Boston Harbor is to be remedied. The following planning issues must be addressed if the construction of new treatment facilities or the rehabilitation of old facilities is to have any lasting positive effect:

-- a long term, integrated plan for improving Boston Harbor must be developed and the issues of combined sewer overflows, dry weather overflows, extraneous sources of flow, and all sources of pollution must be considered in this plan;

-- expansion of the present system to communities not currently included in the system should not be allowed;

-- expansion within communities in the system beyond the system's ability to provide adequate service should not be allowed;

-- a prioritized schedule of projects should be developed to ensure implementation of short term and long term projects is coordinated and integrated so that improvements to the harbor begin soon and continue into the future;

-- the possibility of building satellite treatment plants to reduce flow to the current treatment system and to allow expansion of communities must not be abandoned. Siting possibilities for satellite plants should not be limited to those included in the EMMA study, and new technologies should be examined as possible solutions to upstream problems;

-- disposal of sludge produced by the proposed facilities must be studied and planned for. Public input must be sought before the facilites are constructed. Alternative modern sludge treatment methods should be examined and pre-treatment of industrial wastes should be more extensive to remove toxic products from sludge and make it more useful as a fertilizer. Current pre-treatment efforts are not acceptably implemented and enforced. Planning for land disposal of sludge must be coordinated with water supply managers to protect the watershed where disposal will take place.

-- some members of the group feel that, because of project timing, additional State funds should continue to be made available for upgrading existing MDC treatment plants without further delay. Sewage rates should be increased as soon as possible to build up funding for the proposed facilities. These two items will show good faith for implementation on the part of the Commonwealth and the MDC or whatever agency assumes control and will enhance public awareness of the situation.

2) Facility Operation

The following recommendations are made regarding the operation of the proposed facilities in an attempt to avoid the types of management and operation problems currently taking place in the MDC treatment facilities:

-- establish a fiscally independent, self supporting metropolitan water resources authority similar to the body proposed in Massachusetts House of Representatives Bill HR 5915 with modifications to ensure more representation of communities where facilities will be sited;

-- facilities must be designed for optimum continual performance at normal and peak flows;

-- facilities must be designed with a planned lifetime and replacement or refurbishment at the end of this lifetime must be provided for;

-- operation, maintenence, and repair of facilities must be carried out by trained professionals and must be budgeted as part of the project (some members of the CAC have suggested that the facilities should be operated by private firms under contract). If secondary treatment is the chosen option, a higher degree of training and sophistication will be required of the operating personnel;

-- operations issues such as noise, odor, visual esthetics and traffic created by facility employees, chemical deliveries, and sludge removal must be planned for and mitigated with the communities where the facilities will be built before construction takes place.

3) Facility Siting Options

The field of options recommended by the consultant and EPA at the time this document was produced was still quite large. The CAC has chosen to provide decision makers with a list of factors influencing siting decisions rather than examining each potential option individually. These factors will come into play at any site chosen and it is the intent of the CAC that describing the factors of major concern will provide decision makers with a gauge of public opinion to measure their decisions. Not all of the factors listed below are the views of <u>all</u> members; those that are not are so noted.

Neighborhood Concerns - CAC members representing the communities of Winthrop and Quincy are generally opposed to any new facility development within their communities. Members of both communities feel that their neighborhoods are currently overburdened by the operation of the present facilities and Winthrop members point out that they also are impacted by Logan Airport and the Suffolk County House of Correction. From a neighborhood viewpoint, favorable siting would occur with plant locations at a greater distance from residential sections than now existing at Deer or Nut Islands.

Mitigation and Compensation - there is a general consensus that the communities where facilities will be built must be compensated in some way for unavoidable adverse impacts generated by the construction and operation of facilities. Efforts must be made to mitigate as many impacts as possible and to provide substantial, guaranteed, long-term compensation for remaining impacts. Citizens of the communities involved must be allowed to take an active part in determining mitigation/compensation plans, plans must be in place before construction begins, and mechanisms must exist to modify plans if projected conditions change. A representative body should be formed to ensure that the interests of impacted residents are continually taken care of and a mechanism of appeal should be established to provide unsatisfied residents with a means of resolution.

The CAC wishes to emphasize that sewage treatment is the responsibility of all communities in the MDC region and that just compensation be made to those communities which bear the burden of treatment facility impacts.

Long Island - division within the group exists concerning Long Island as a potential site. Some members feel that the recreational potential, the historic and archaeological value, and the relatively untouched condition of portions of Long island warrant protection and preservation, while the sites on Deer and Nut Islands are already greatly impacted and (with adequate mitigation measures) would not be greatly changed by further construction.

Other members of the group, particularly those representing Quincy and Winthrop, feel strongly that neighborhood concerns greatly outweigh the recreational, archaeological, and conservation potentials of Long Island and would rather see a project impact "bones, trees, and arrowheads" than the health and safety of living people.

There is consensus that if Long Island is not considered as a viable option because of its recreational/historic value, assurances must be made that the island will indeed be preserved indefinitely. The CAC does not want to see the island spared from development as a wastewater treatment facility only to be developed as residential or industrial land by the City of Boston.

<u>Satellites</u> - the prospect of satellite treatment plants should not be abandoned. There is concern among some CAC members that the list of sites considered for satellite plants, which arose from the 1978 EMMA study, was too restricted and that more sites could be evaluated. [A proposal by Quincy Shores Associates regarding satellite plants was examined as part of the evaluation]. Satellites could play a valuable role in reducing flows to Boston Harbor facilities and allowing future expansion of community systems.

<u>Other Sites</u> - it is the opinion of a few members of the group that the list of options considered for this project was not extensive enough and that other places, in particular Moon Island, should have been seriously studied as possible sites, because they could offer sites where immediate action could take place with a minimum of community and neighborhood impact.

<u>Fast-Track Improvements</u> - under no circumstances should a "no action" option be considered after the current fast-track improvements are complete. The upgrading to 1968 standards of wastewater treatment plants now in place should never be accepted as a long term solution to the problems of Boston Harbor.

4) Levels of Treatment

The members of the CAC share an enthusiastic concern for the water quality of Boston Harbor, but temper their enthusiasm with knowledge of the limitations of time, money, and technology and a realization of the trade-offs involved. It is a general conclusion within the group that the dumping of sludge and untreated sewage into Boston Harbor must stop as soon as possible.

-- some group members feel that pending decision on MDC's 301(h) waiver application should be granted allowing upgraded primary treatment with long outfalls because any untreated sewage produced by wastewater treatment facility malfunction would be carried out of the harbor.

-- other members see the project resulting from this SDEIS as an opportunity to upgrade to secondary treatment, an opportunity which they feel will be precluded if primary plants are built.

-- concerns exist among some members about the effects of long outfalls on Massachusetts Bay.

-- primary treatment is unacceptable without long outfalls and adequate pumping capability.

-- some members feel that the expense of constructing secondary treatment plants along with long outfalls is justified and should be considered.

-- concerns exist about sludge disposal and there are further concerns regarding the additional sludge produced by secondary treatment. Additional planning and investigation into using sludge as a resource (fertilizer) is called for.

-- a few members feel that the MDC cannot finance and operate the plants they have now and so are hesitant to recommend secondary treatment if it will be administered by MDC in its present form.

-- alternatives to chlorination as a disinfection method should be investigated.

-- sludge incineration should not be considered because of its negative impacts on air quality.

5) Construction Impacts

The construction or rehabilitation of a wastewater treatment facility will undoubtedly affect neighboring residential areas at any of the proposed sites. Members of the CAC share the view that mitigation of construction impacts is of extreme importance. They are very concerned about the safety and comfort of people living in the affected area. They also realize that any undesirable conditions created by construction must be tolerated for the relatively long construction period of five to ten years. The following are the group's suggestions :

-- every effort should be made to reduce construction related highway traffic through residential communities. Roads in the potentially impacted communities (Quincy and Winthrop), although busy at times, do not currently carry much heavy trucking. Roads leading to the proposed site carry very little truck traffic. There is great concern about the safety of other drivers and pedestrians if narrow, residential roads are pressed into service as truck routes.

-- barging should be used to transport personnel and materials to the construction site whenever possible.

-- mass transit should be utilized by construction and operation personnel as an effort to reduce traffic.

-- periods of traffic activity to the construction site should be timed so as to not interfere with normally busy traffic times in neighborhoods.

-- an organized method of compensation for possible damages to property (private and public) caused by trucking or construction must be established before construction begins. A mechanism of compensation must be developed to account for the decrease in property value and the increase in difficulty of selling real estate before and during the relatively long construction period.

-- effective measures must be established to minimize noise, dust, odors, and mitigate other construction-related nuisances.

-- a mechanism must exist for public input in the mitigation/compensation plans and an opportunity to change those plans in response to changes in construction operations must exist.

III. Summary

The Citizen's Advisory Committee is greatly concerned with the environmental quality of Boston Harbor, the islands in the harbor, and the surrounding communities. The CAC has a strong desire to see an integrated, prioritized plan developed for improving the sewage system and the harbor. There is also a desire to see this plan, and the building of a wastwater treatment facilities as part of this plan, carried out in a manner that minimizes adverse effects on communities most impacted and the region as a whole. There is a need for building quality facilities and ensuring mitigation and compensation, even if the economic cost to the region is greater than for building marginal facilities in a less responsible manner. The CAC sincerely hopes that the concerns and recommendations put forth in this document are considered by the decision makers, and will offer additional advice when a final siting option is chosen.

The members of the CAC wish to thank the Gillette Company for their kind hospitality and the use of their conference rooms as meeting places for the Citizen's Advisory Committee.

The Citizen Advisory Committee
Supplementary Draft Environmental Impact Statement
Boston Harbor Wastewater Facilities Siting

Co-Chairpersons:

Ms. Lorraine M. Downey
Boston Conservation Commission
Boston Harbor Associates
Boston Harbor Citizens'
Advisory Committee

Mr. George Marsh
Friends of Boston
Harbor Islands

Members:

Ms. Eugenie Beal

Mr. Richard C. Boutiette
Department of Public Works
Wakefield, Massachusetts

Mr. Robert M. Calder
Boston Shipping Association

Mr. Terry N. Fancher
Community Development Manager
South Shore Chamber of
Commerce, Inc.

Mr. Phillip Goodwin
Mass. Bay Yacht
Club Association

Ms. Blossom Hoag
Sierra Club -
Greater Boston Group

Mr. Waldo Holcombe
Boston Harbor CAC
Neponset Conservation
Association

Ms. Frances H. Lavallee
Boston Harbor Water Quality
Committee

Mr. Andrew Locke

Mr. Tom Morell
Massachusetts Lobstermans'
Association

Ms. Lois Murphy
Nut Island CAC

Mr. Robert Noonan, Chairman
Winthrop Board of Selectmen

Ms. Anne Porter
Point Shirley Association
Deer Island CAC

Mr. Frank Powers
Quincy Bay Flounder Fleet

Ms. Peggy Riley
Deer Island CAC

Mr. T. Rollins Ross
Boston Facilities Plan
Public Advisory Group

Ms. Andrea Sault
Nut Island CAC

Mr. Anthony Termine
The Gillette Company

Mr. Verne Porter
City of
Newton, Massachusetts

Mr. Joseph B. Walsh, Senator
Special Commission on the
Development of Boston Harbor

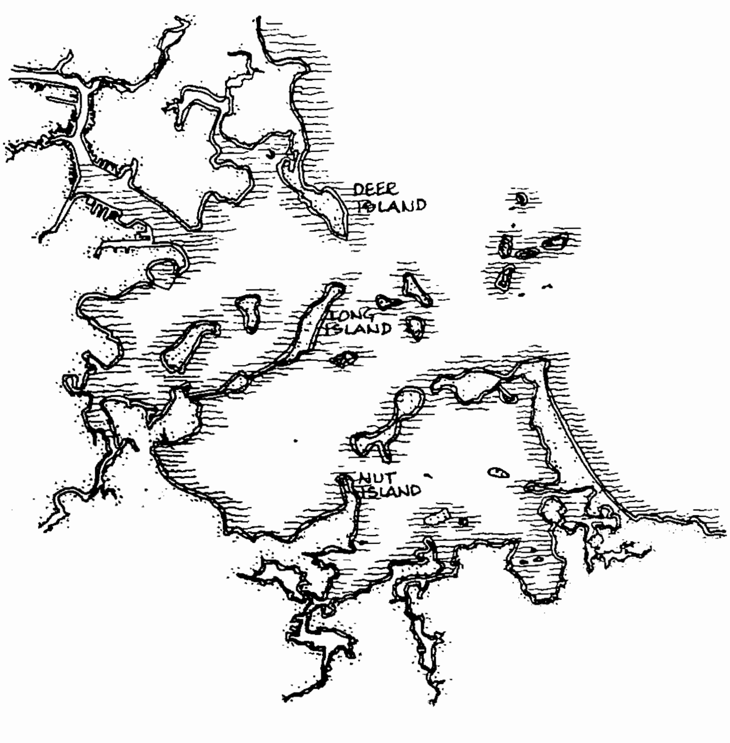
Mr. Jack Walsh, Chairman
Nut Island CAC

Ms. Nancy Wrenn
Boston Harbor CAC

Ms. Ethel Shepard
Metropolitan Area Planning
Council

Mr. Eric Thomson
Utility Contractors of
New England
Boston Harbor CAC

11.0 PERMITS AND MARINE RESOURCE IMPACTS



11.1 Federal and State Permits Checklist

FEDERAL AND STATE PERMITS AND REGULATIONS CHECKLIST

1. Discharge Permit: U.S. EPA (under the Clean Water Act), and Massachusetts Division of Water Pollution Control (DWPC) (per the Massachusetts Clean Waters Act).

   A. The Federal Clean Water Act and EPA regulations require National Pollution Discharge Elimination System (NPDES) permits.

   B. A treatment facility's effluent may contain pollutants, as defined in the "Clean Water Act"; the discharge of pollutants into the waters of the Commonwealth without issuance of an individual discharge permit is prohibited.

2. Water Quality Certificate: Massachusetts Department of Environmental Quality Engineering (DEQE), Division of Water Pollution Control (DWPC).

   A. The certification insures that the project meets State water quality standards.

   B. The project requires Federal and/or State permits for discharge to waters, and therefore requires this certification.

   C. This certificate is also a prerequisite for construction permits.

3. Order of Condition: The Boston Conservation Commission, Quincy Conservation Commission, and (possibly) Winthrop Conservation Commission, as well as DEQE (per the Wetlands Protection Act)

   A. If the project's activities extend to within 100' of protected areas, as set forth in the Wetlands Protection Act, an "Order of Condition" must be obtained. Construction may proceed subject to the conditions of the Order.

   B. Protected areas that are potentially impacted by this project are marine fisheries, areas containing shellfish, storm damage prevention and flood control areas.

4. Dredging and Disposal of Dredged Material Permit: DEQE Division of Waterways.

   A. This permit is required for all dredging and dredged materials disposal in the tidewaters of the Commonwealth.

   B. The construction of piers and/or pipelines will require some dredging activity.

   C. U.S. Army Corps of Engineers permit is also required.

5. Waterways License: DEQE (per the "Waterways License Act")

   A. A license is required for structures built seaward of the high tide line.

   B. The piers and possibly the outfalls may be included under this Act.

   C. U.S. Army Corps of Engineers permit may also be required.

6. Coastal Zone Management (CZM) Consistency (Determination) Certificate: Massachusetts Executive Office of Environmental Affairs, CSM Office (EOEA).

   A. Proposed activities must comply with the policies of the Massachusetts coastal management program.

   B. The CZM consistency certification is required for the Corps of Engineers' Section 10 and 404 permits, NPDES permits, and federal funding of a project.

7. DEM Land Use Review: Massachusetts Department of Environmental Management (DEM). The Commissioner of DEM is empowered to review and aprove new development on all of the islands within the boundaries of the Boston Harbor Islands State Park which encompasses all of the sites being considered for treatment facilities.

8. Massachusetts Environmental Policy Act (MEPA):

   A. The MEPA Unit reviews the environmental impacts of state activities, including permitting, approvals, and funding, as well as of other projects which meet its criteria.

   B. In the case of this project, the SDEIS also serves as an Environmental Impact Report (EIR) required by MEPA.

9. Clean Air Regulations: DEQE.

   Regulating air pollution in the Commonwealth of Massachusetts requires approval and/or registration with DEQE for such items as incinerators, fossil-fuel utilization facilities, fuel content and emissions, and construction and demolition.

10. Landfill Approval: Massachusetts DEQE Division of Water Pollution Control (per the Massachusetts Clean Water Act), and DEQE, Division of Hazardous Wastes.

    A. Non-hazardous sewage sludge-only landfills are exempt from the general landfill regulations, and are regulated under the general authority of the Massachusetts Clean Water Act which provides for the abatement of public nuisances.

B. An ash landfill may fall under this jurisdiction. Any new sludge landfill must be lined and have a leachate collection and treatment system.

11. Hazardous Waste/Materials Regulations: U.S. EPA (per the Resource Conservation and Recovery Act); Massachusetts DEQE (per Chapter 21 C of M.G.L.)

    A. Any activity which involves the generation, transportation, storage, treatment, or disposal of any hazardous waste is subject to EPA's RCRA regulations, and DEQE's regulations under 310 CMR 30.

    B. Chlorine is a hazardous material. Therefore, the transportation and storage of chlorine must satisfy the requirements of U.S. Department of Transportation (40 CFR, Part 6) regulations.

    C. Barging of chlorine would also be subject to the regulations of the U.S. Department of Transportation and the Coast Guard (the Coast Guard would also supervise barging activity during construction).

12. State Building Code: Department of Public Safety.

13. Wetlands Restriction Program: DEQE.

14. Tideland Construction.

15. State Traffic Signal Warrant: Department of Public Works (necessary to install a new traffic signal).

11.2 Actions Requiring Permits Under Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act and Section 103 of the Marine Protection, Research and Sanctuaries Act

11.2 ACTIONS REQUIRING PERMITS UNDER SECTION 404 OF THE CLEAN WATER ACT, SECTION 10 OF THE RIVERS AND HARBORS ACT, AND SECTION 103 OF THE MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT

11.2.1 Overview

All of the alternatives to existing treatment facilities will require some construction in waters of the United States and will therefore require a Section 404/Section 10 permit from the U.S. Army Corps of Engineers. At a minimum, these alternatives require the construction of an effluent diffuser at whatever outfall site(s) is chosen. If short outfalls are chosen for effluent discharge under secondary treatment, outfall pipelines would likely be placed in bottom sediments. Long outfalls and inter-island conduits may be either rock tunnels or pipelines placed in bottom sediments.

In addition, it is likely that some type of dock, on piles or solid fill, will be required for the movement of materials to any island site selected for treatment plant construction.

Some of these activities, such as dredging for dock access, will require the disposal of dredged material. Disposal of these sediments beyond the territorial sea (three nautical miles off shore) would require a Corps of Engineers ocean dumping permit in accordance with EPA's regulations under Section 103 of the Marine Protection, Research and Sanctuaries Act.

Finally, options which call for an expanded primary treatment plant at Nut Island might require approximately 3 acres of filling in Quincy or Hingham Bay.

With seven siting options still under consideration, the marine related facilities associated with them are only at the conceptual stage of development. Recent final and draft facilities plans prepared for the MDC show a number of different alternatives for marine construction. As such, this EIS does not address the specific marine related impacts of a particular siting option. Lack of this detail, however, would not likely affect the siting decision because the types of marine construction impacts associated with all the sites appear to be similar (except for possible filling at Nut Island) and would not favor any particular option over another. This assumption is generally supportable due to the likelihood that all of the marine construction sites are characterized by similarly contaminated sediments which are common in Boston Harbor. In the past, these contaminated conditions have not precluded previous harbor projects, since environmental evaluations found the excavation and disposal of sediments from these projects to be acceptable.

An exception to this recently surfaced when test results from four projects in Boston Harbor (three in Dorchester Bay and one in Winthrop Bay) indicated that ocean disposal of dredged material would not be acceptable. These projects consisted of dredging and disposal of sediments from the South Boston Yacht Club, the Dorchester Yacht Club, and the Savin Hill Yacht Club/UMass Pier, as well as the Winthrop Harbor channel and basin. Biological testing showed a significantly high level of PCBs were bioaccumulated in test organisms exposed to the materials to be dredged (a summary of the results is presented at the end of this section). Ocean disposal of these materials is considered unacceptable, thus delaying the dredging of these projects until acceptable disposal options are found. This illustrates that site specific information could potentially affect the implementability of any SDEIS site option chosen. For a complete discussion of this issue, refer to Section 5.4.

Once specific proposals for marine construction have been developed, additional environmental evaluation and permit application(s) would be submitted by the MDC to the U.S. Army Corps of Engineers for environmental review by the Corps and EPA. In preparing the permit application(s), the MDC will be required to evaluate alternatives to their proposed action, including both alternative marine construction sites and alternatives not requiring discharges of dredged or fill material to "waters of the United States" or the ocean. Physical, chemical and biological testing of materials to be discharged will also be required.

11.2.2 Legislative/Regulatory Framework[1]

Clean Water Act - Section 404

Section 404 of the Clean Water Act established a national program to control the discharge of dredged or fill material into the "waters of the United States". "Waters of the United States" include all waters which may be used for interstate or foreign commerce, their tributaries and all adjacent waters, including wetlands (33 CFR Section 323.2).

Key requirements for allowing fill to be placed in waters under the jurisdiction of Section 404 are: that there must be a clear need to place fill or dredged material in the water resource, that alternatives must be thoroughly examined, and that the least damaging practicable alternative must be adopted.

Under Section 404(a), a permit system was established for administration by the Corps of Engineers. Section 404(b) required EPA, in consultation with the Corps, to develop environmental criteria to guide the permitting decisions. These criteria are discussed below.

Under Section 404(c), EPA may overrule a Corps decision to allow a discharge if EPA determines such discharge will have an unacceptable adverse effect on municipal water supplies, shellfish beds, fishery areas, wildlife or recreational areas. EPA 404 staff regularly review

---

1 Excerpted in part from:
EPA, 1983 Environmental Review of Construction Grants Projects Under 205 (g).

Corps permit applications by examining the projects for conformance with the 404(b) guidelines.

EPA Guidelines for Specification of Disposal Sites for Dredged or Fill Material [40 CFR 230] and Administered by the Corps of Engineers [33 CFR 320-330]

On December 24, 1980, EPA issued a Final Rule establishing substantive criteria for use in evaluating discharges of dredged or fill material under Section 404 of the Clean Water Act [45 FR 85336]. They reflect the 1977 amendments to the Clean Water Act, were developed in conjunction with the Corps, and although entitled "Guidelines," have the force of regulations. The 1980 guidelines stress the overall 404 program's goal of preventing any discharges that would have an unacceptable adverse impact on the aquatic ecosystem, including wetlands, either individually or cumulatively.

Section 230.10, Restrictions on Discharge, defines the four independent requirements which must be met to comply with the guidelines. They are:

- there must be no less environmentally damaging, practical alternative available;
- the discharge must not violate applicable water quality standards or jeopardize an endangered species;
- the discharge must not result in a significant degradation of the aquatic environment;
- all reasonable measures must be taken to minimize impacts to the aquatic environment.

Section 230.5 of the guidelines establishes a general procedure for evaluating whether a particular discharge site may be approved. Section 230.11 establishes "factual determinations" which are to be used in determining whether or not a proposed discharge satisfies the conditions for compliance with the guidelines.

The guidelines point out that the level of documentation in the factual determinations and findings of compliance should reflect the significance and complexity of the discharge activity.

Rivers and Harbors Act - Section 10

Section 10 of the Rivers and Harbors Act of 1899 established a permit program administered by the Corps which regulates the placement of structures in navigable waters and is concerned with their effect on navigation.

A major distinction between Section 404 and Section 10 is the difference between "waters of the United States" and "navigable waters". As noted above, "waters of the United States" under Section 404 extends the upstream jurisdiction beyond the limits of traditional navigability.

In most situations where activities involve both Section 404 and Section 10 permits in the same waters, the Corps will consolidate their permit review in a single process. For areas not defined as "navigable waters," only Section 404 permits apply for the disposal of dredged or fill materials. Section 10 permits, however, will be required for the placement of any structure, such as an outfall pipe, in navigable waters even without any discharge of dredged or fill material.

Section 404 and/or 10 permits are required for any wastewater treatment plants or sewer lines located in or crossing water bodies or wetlands.

Evaluation of Proposed Dredged Material Discharge Into Ocean Waters Under Section 103.

Where dredged materials are proposed to be transported for their discharge into "ocean waters" (beyond the three mile territorial sea boundary), a permit must be obtained in accordance with Section 103 of the Marine Protection, Research, and Sanctuaries Act. Section 103 permits are administered by the U.S. Army Corps of Engineers, under EPA issued regulations and criteria (40 CFR 220-229). The environmental review of Section 103 permit applications is conducted independently by the Corps and the EPA under criteria set forth in 40 CFR Section 227. This includes the ecological evaluation conducted in accordance with an implementation manual published jointly by the EPA and Corps of Engineers. The EPA is responsible for designating ocean disposal sites to manage where open disposals are to be regulated. Permit applications are also independently reviewed by the National Marine Fisheries Service, as well as state resource agencies and other interests.

The evaluation of permit applications for ocean dumping includes the consideration of:

- presence of prohibited materials,
- adverse impacts to the benthic environment, based largely on biological testing (bioassays and bioaccumulation),
- adverse impacts to the water column, as determined by bioassays and compliance with applicable water quality criteria,
- general compatibility of material to be disposed with the proposed disposal site,
- need for ocean dumping,
- alternatives to ocean dumping,

- impacts on esthetic, recreational, and economic values and or other ocean users, and

- site management.

While these evaluation categories apply to all ocean dumping proposals, special provisions and exemptions apply to Section 103 permit applications for the discharge of dredged materials. The regulatory process for review of Section 103 permit applications, including procedures for granting a waiver is laid out under 40 CFR Part 225. Dredged material exemptions from certain environmental impact evaluations are itemized under 40 CFR 227.1: "applicability". These include exemptions from evaluation under Sections 227 7: "limits for specific wastes" (certain solvents, radioactive materials, biological pests, acid or alkaline materials, and oxygen consuming materials), 227.8: "limits on disposal rates of toxic wastes", and 227.11: "insoluble wastes"

When a Section 103 or any other permit application is received by the Corps of Engineers, a public notice is sent to federal and state authorities and other potentially affected parties. The notice describes the proposed ocean dumping activity and the Corps' tentative determination on whether or not an EIS will be prepared. The thirty day comment period on the public notice provides an opportunity to raise issues and concerns for the Corps to consider in its evaluations.

Interim Final Rule for Regulatory Programs of the Corps of Engineers [33 CFR 320-330]

On July 22, 1982, the Corps published Interim Final Regulations [47 FR 31794] to update previous regulations governing the Corps' regulatory programs in order to reflect changes to the Clean Water Act, judicial decisions, Executive Orders and policy changes since 1977. These regulations establish policies, procedures and criteria for evaluation and issuance of Section 404/Section 10/Section 103 permits.

A key policy of the Corps' permit program is that a project must be found to be in the "public interest", in order to be permitted. The preamble to the Corps' 1982 regulations indicates that the Corps' public interest review goes hand-in-hand with EPA's Guidelines [40 CFR 230] and that, at the end of the public interest review, a permit would be denied if it did not conform to the EPA guidelines.

Applicability of Other Federal Legislation to the Permit Process

The Corps of Engineers must comply with several other Federal statutes during its permit evaluation process.

Any applicant for a Corps permit must obtain a State Water Quality Certification as required under Section 401 of the Clean Water Act before a Corps permit can be issued. Corps permit applications are routinely reviewed by the National Marine Fisheries Service and by the U.S. Fish and Wildlife Service pursuant to the Fish and Wildlife Coordination Act (FWCA) and the Endangered Species Act. An applicant must also receive a "consistency determination" from the State Coastal Zone Management Agency pursuant to the Coastal Zone Management Act (CZMA). (Note that additional requirements in Massachusetts include a Division of Wetlands and Waterways license, local conservation commission Order of Conditions, and MEPA compliance.)

The Corps also must comply with the National Environmental Policy Act (NEPA) and could require the preparation of an EIS or supplemental documents if significant environmental issues need to be addressed during the permit review process.

Environmental Review Responsibilities Under 205(g) of the Clean Water Act

Section 205(g) of the Clean Water Act provides funds to the States for administration of delegated construction grants activities. These delegated activities include many aspects of the environmental review of proposed projects.

In actual practice, the Corps does not conduct a full Section 404 and/or a Section 10 permit review during the facilities planning process because sufficient details for the review are not normally available until the engineering and design stages. However, it is not necessary for a municipality to have an approved Section 404/Section 10 permit to apply for an EPA wastewater facility construction grant. Normally, the Corp's permit process takes from two to six months and can result in substantial delays and costly redesign if alternatives and mitigating measures have not been adequately addressed. Therefore the Corps strongly recommends that the grant applicant and State take the Section 404/Section 10 requirements into consideration during the development of the facilities plan and environmental information document (EID) and that the Grantee initiate discussions for the Section 404/Section 10 application process with the Corps during the project design phase.

EPA's Guide, Construction Grants 1984 indicates that the facilities plan and EID should evaluate alternatives identified by the Corps if a Section 404/Section 10 permit is needed. The process for complying with Section 404 during 205(g) review is aimed at reducing the potential for permit denials at the end of the design phase when extensive engineering design changes would be costly and time-consuming.

11.2.3 Features of SDEIS Options Involving Marine Construction

Marine construction features of the SDEIS options which may have an adverse affect on water quality, marine life, and navigation and that may require permit review consist of:

1. underwater trench excavation for pipelaying, disposal of excavated materials, pipeline bed preparation and fill, anchoring devices, and backfill,

2. tunnel shaft and diffuser placement and construction, disposal of excavated materials and possible development of an off-shore island for tunnel access,

3. pier and wharf construction,

4. dredging for access to docks, and possible excavation for solid fill docks, disposal of dredged and excavated material,

5. staging areas and marine transport facilities for construction workers and materials, conduit section fabrication and sludge transport, and

6. filling in Quincy or Hingham Bays to enlarge Nut Island.

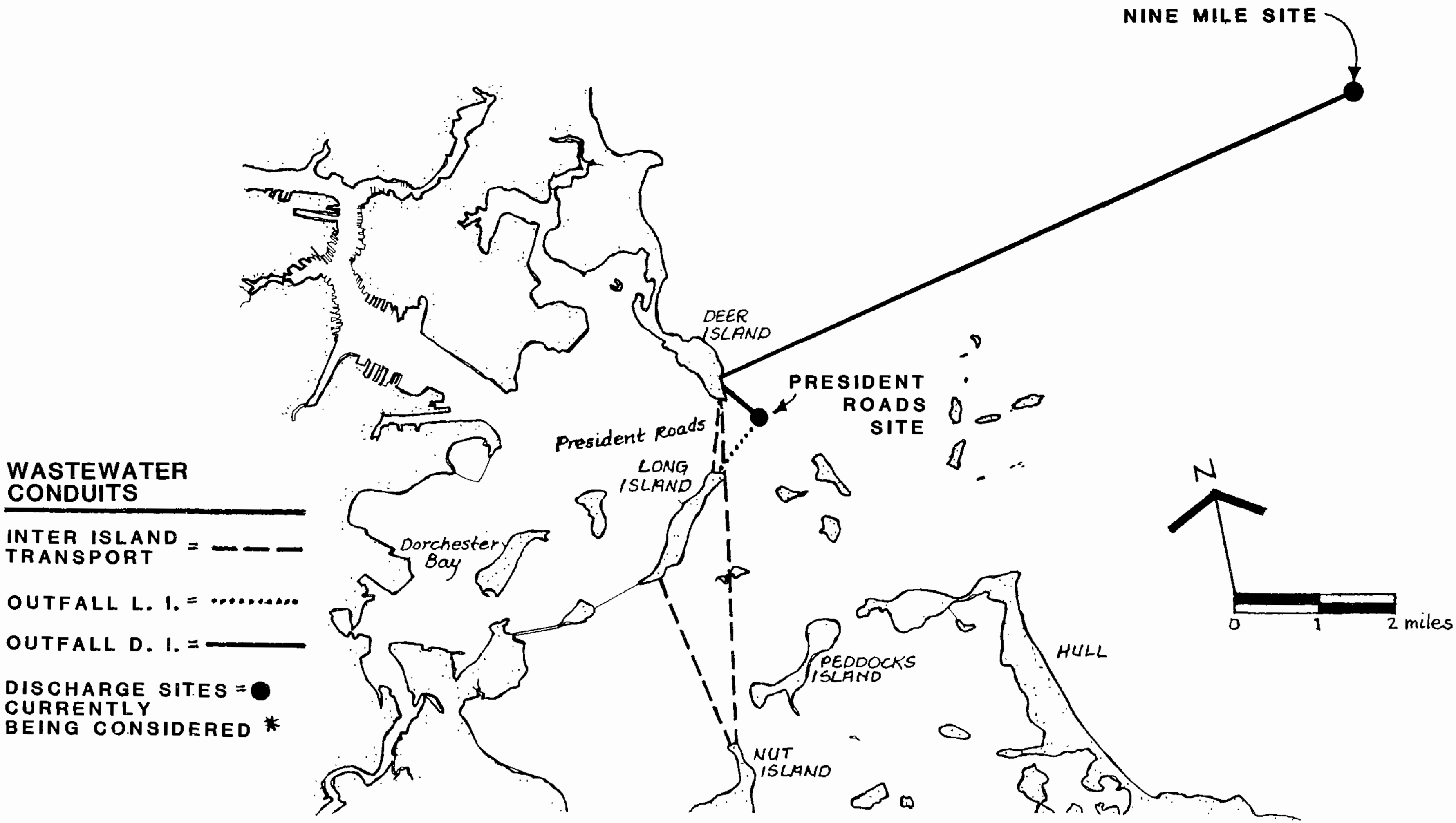
The matrix below is a general summary of construction types and methods which have been identified in MDC's recent facilities plans. Figure 11.2-1 shows alternative inter-island sewage transport routes and outfall sites that were considered. Figure 11.2-2 shows several alternative locations of piers presently being considered and the location of proposed filling at Nut Island.

MATRIX OF GENERAL CONSTRUCTION TYPES AND METHODS

	Treatment Plant Sites			Outfall Sites	
Type/Site	Deer Is.	Long Is.	Nut Is.	President Rd.	Nine Mile
Interisland Transport Conduits	Preferred Method: Tunneling* (Alternate Method: Trenching)			—	—
Outfall Conduits	Tunneling or Trenching		—	Trenching* (Tunneling)	Tunneling* (Trenching)
Tunnel Shafts	Down-Hole Excavation (Up-Hole Reaming from Tunnel)				
Diffusers	—			Trenching	Trenching and Special Caissons
Docks	Piers (Wharves)			—	—
Dredging for Dock Areas	Clam Shell Dredge (Dipper Dredge)			—	—
Landfill	—	—	Diked Area (Open Area)	—	—

—— = Not applicable

* = Metcalf & Eddy, 1982, Nut Island Site Options Study.

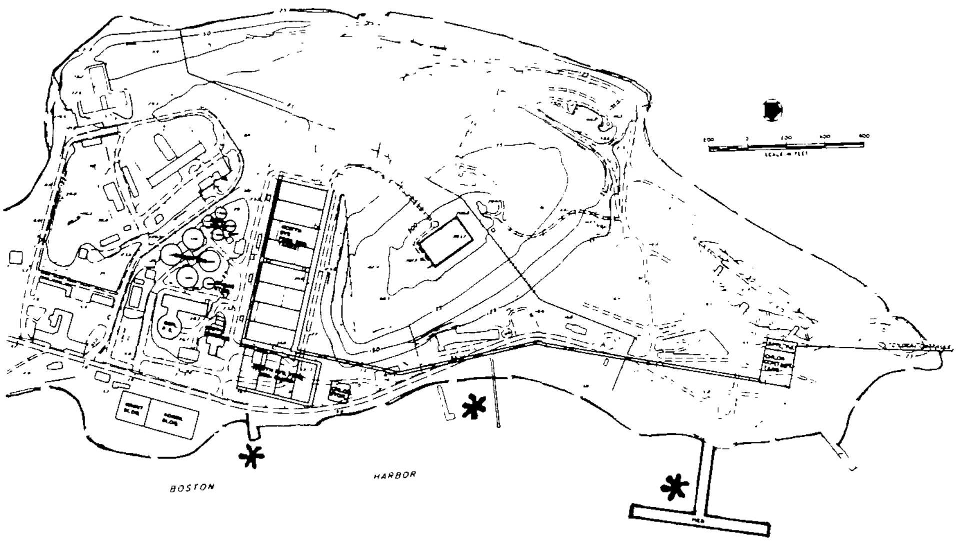


* NOTE: Alternative discharge sites were evaluated in unpublished Draft – Deer Island Facilities Plan 1984, by Havens & Emerson / Parsons & Brinckerhoff and the Oceanographic Study of various Outfall Siting Options for the Deer Island Treatment Plant, 1984 by EG&G.

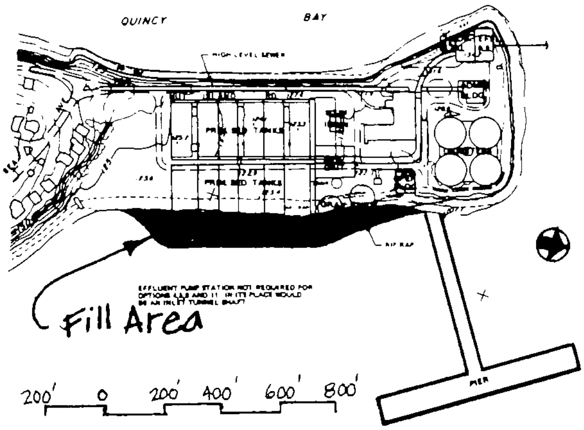
SOURCE: 1982 Nut Island Site Option Study, and October 1984 301(h) Waiver Application both by Metcalf & Eddy Inc.

WASTEWATER CONDUIT ROUTE OPTIONS PROPOSED IN MDC FACILITY PLANS

fig. II.2-1

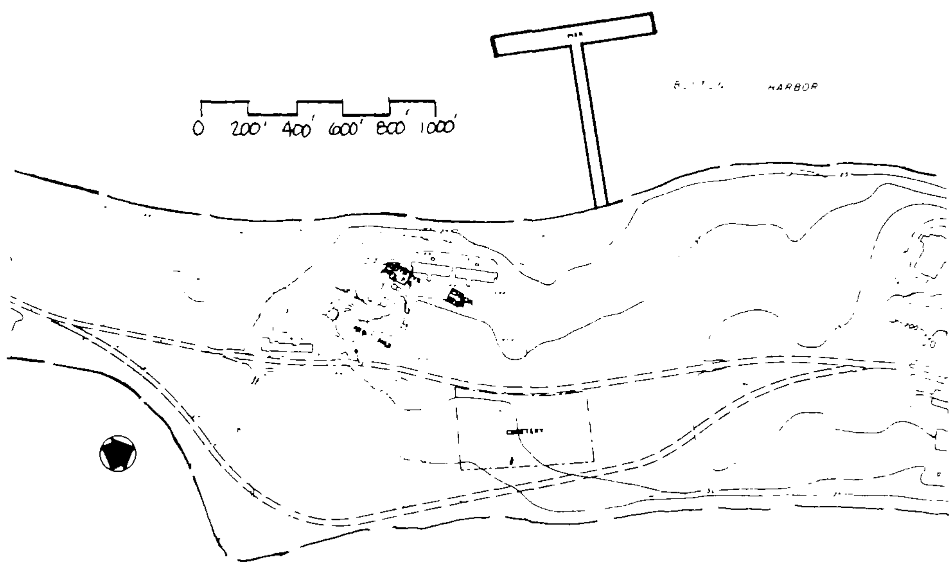


DEER ISLAND



NUT ISLAND

* Alternate Marine Facility Locations.
Source: Havens & Emerson/Parsons, Brinkerhoff, 1984, Deer Island Facilities Plan. Appendix E. Figure 3-29.



LONG ISLAND

Pier Alternatives Appearing in MDC's 1982 Nut Island Site Options Study

(from fig. 7-3)

fig. 11.2-2

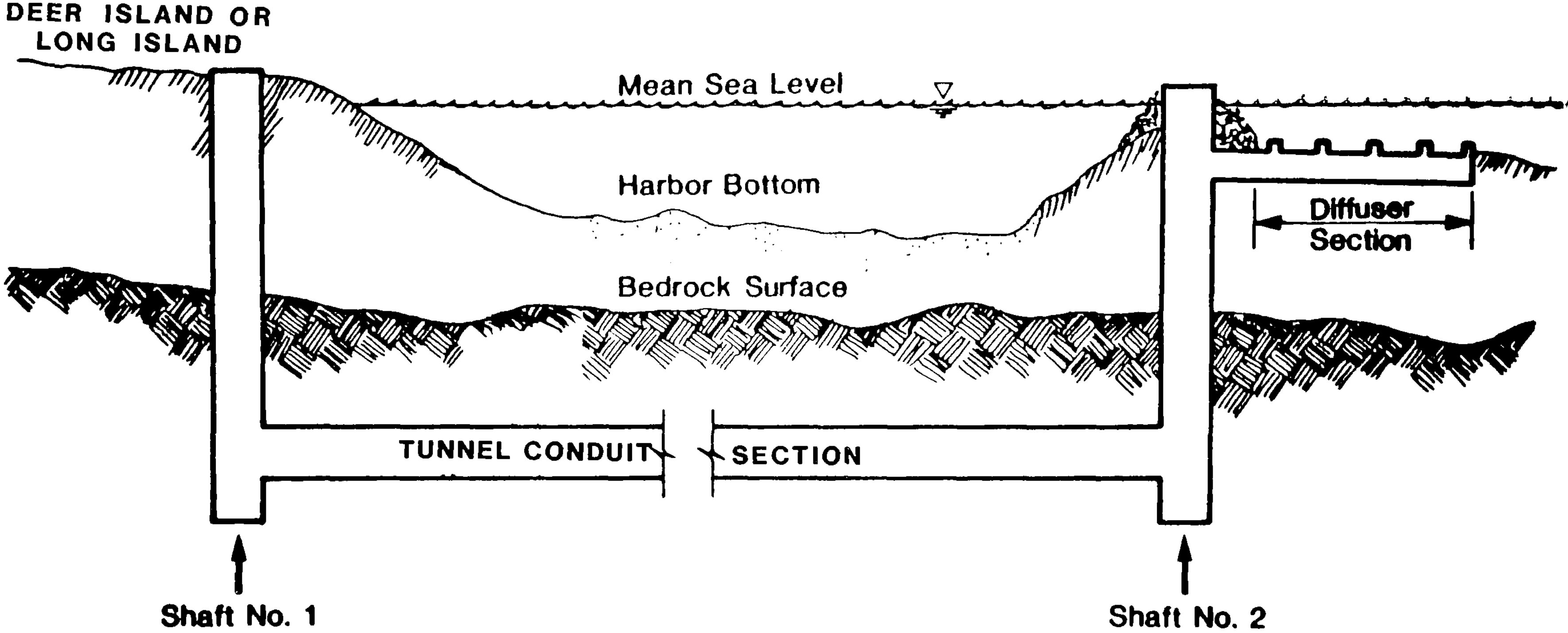
Alternative Outfall Sites and Inter-island Transport Routes.

Alternatives considered by the MDC for inter-island transport and discharge of wastewater are summarized in Figure 11.2-1. The basic choice is between bedrock tunnels and pipelines placed in bottom sediments by the trenching method. According to MDC's facilities plans, alternatives were selected on the basis of analysis of technical, environmental and economic factors. MDC's selection of alternatives included consideration of construction factors such as interference with shipping lanes, designated anchorages and existing utilities, water depth, conduit size and construction methods (Metcalf & Eddy, 1982, Nut Island Site Options Study, Pages 6-7 to 6-28 and Havens & Emerson/Parsons Brinkerhoff, 1984, draft manuscript of Deer Island Facilities Plan, Chapter D3).

Conduit Construction by the Tunneling Method. Tunnel excavation by either drilling and blasting of the material or by grinding the material with a tunnel boring machine was considered to be the most desirable construction method by Metcalf & Eddy because it provides least disturbance of sediments and no interference with existing infrastructure. Excavated material can be removed via a land site shaft and used as landfill or disposed offshore at an approved site. A general profile of a tunnel for the transport of effluent to a discharge site is shown in Figure 11.2-3.

Tunnel shafts are required at tunnel ends and may be needed at intermediate locations for hydraulic reasons or for construction purposes. Shaft excavation on land would be made from the ground surface down (down-hole) and the excavated materials would be used to landfill or be transported to an approved disposal site.

Off-shore shafts could be excavated in the same manner as land based shafts or by reaming upward (up-hole) from the tunnel. Excavated materials could be removed landward through the down hole, or disposed offshore adjacent to the shaft, if proven to be environmentally acceptable. At an offshore location it may be cost effective to build a



Source: Havens & Emerson/Parsons, Brinkerhoff, 1984, draft manuscript of Deer Island Facilities Plan. Chapter D3.

TYPICAL TUNNEL CONFIGURATION fig. II.2-3 small island to facilitate construction of the shaft and the diffuser. Should it prove environmentally acceptable, such an island would remain a permanent feature of the harbor.

Conduit Construction by the Trenching Method. The trenching method of construction would require dredging and backfilling which may have an adverse affect on water quality, marine life and navigation. The conduit would be placed on a relatively level and firm grade to provide firm footage to resist the scouring action of tides and currents. To provide a firm bedding for the pipe, crushed rock fill material must be imported and placed by controlled means without free fall through the water column. Excess trench excavation material would be left in-place along the trench alignment or completely removed and transported to approved disposal sites. Underwater pipelaying is a highly skilled technique in coordinating workers, equipment and supplies in the face of extreme uncertainties of the elements. A general construction technique based on state-of-the-art methods and equipment would be as follows (see Figure 11.2-4).

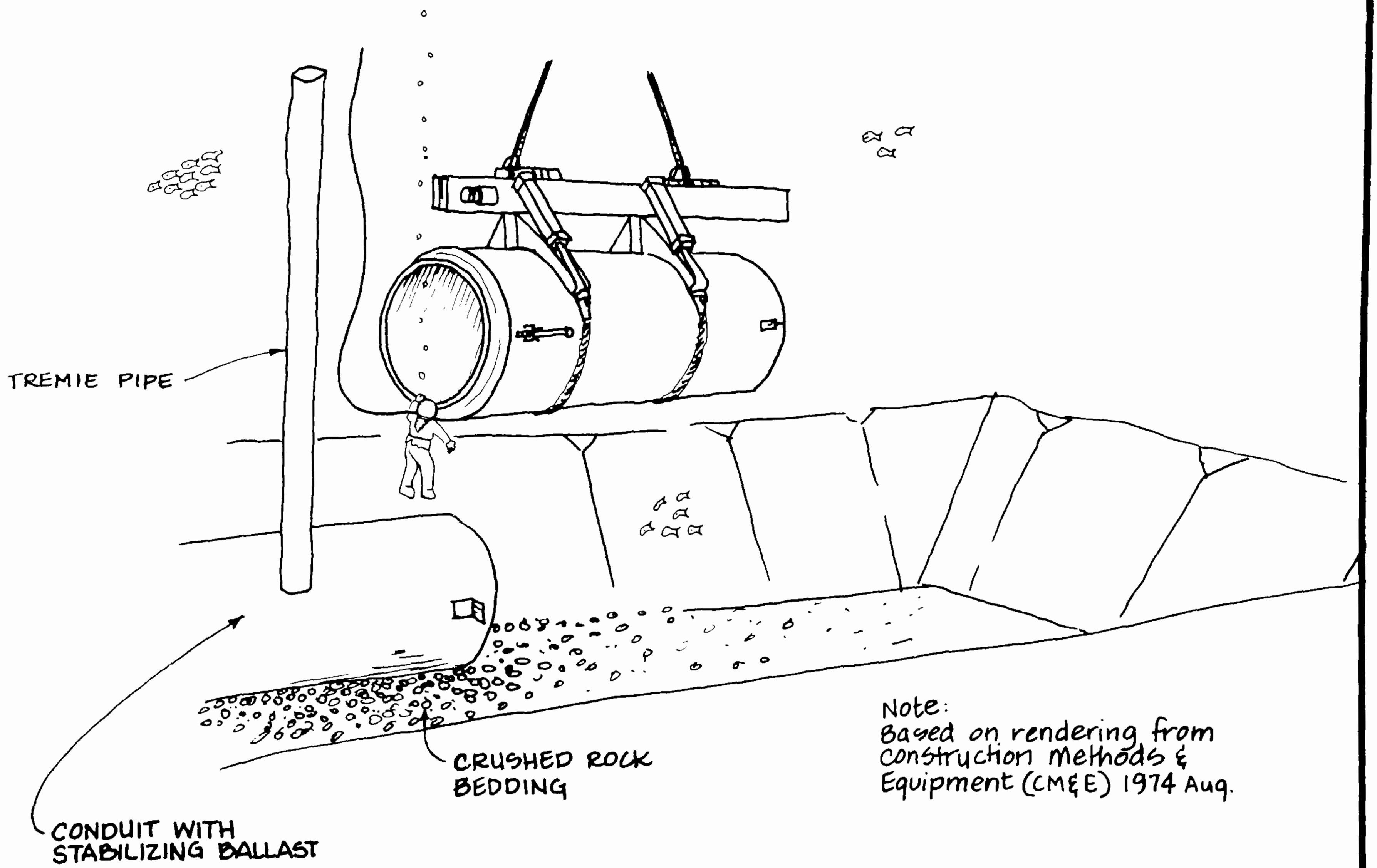
a. Dredge the trench no more than a few hundred feet ahead of pipelaying.

b. Lower pipe section over the side of a barge, and suspend it just above the trench bottom to permit divers to align and join the section.

c. Place a rock fill ballast on both sides of pipe to provide a firm pipe bedding.

d. Backfill the remaining portion of the trench.

Diffuser. An effluent diffuser will be required for any outfall option; it could be constructed by the trenching method or by specialized techniques using a large pneumatic caisson. Disturbance of the water column would be similar to that which may be caused by conduit construction by the trenching method.



UNDER WATER - TRENCHING METHOD fig. 11.2-4

Dock. Wharfs and piers will be required for support of land and water based construction and are currently being considered for barging of sludge. Wharves use anchored bulkheads to confine fill. Piers are deck structures supported by driven piles. A recent conceptual dock design is shown in Figure 11.2-5. To minimize environmental impacts, the design of docks should include features which minimize changes in current velocities and provide for controlled construction of underwater fill.

Dredging. Dredging will be required to provide adequate draft for docking. The dredging method should be restricted to dredging by clam shell bucket to minimize disturbance of the ocean bottom and suspension of sediments. Dredge material disposal must be at an approved disposal site. Presently, the only EPA approved site for the disposal of dredged material near Boston Harbor is the Marblehead Disposal Site or "Foul Area" about 17 miles northeast of Deer Island (Figure 11.2-6). The dredged material would undergo testing, including bioassays, to determine the acceptability of disposal at this site.

Landfill. Construction of land at Nut Island may be required for upgraded primary treatment there (Figure 11.2-2). This could be accomplished with least disturbance by placement of the fill within a diked area. Dike design would incorporate temporary sheet pile wall and rock fill dikes constructed ahead of landfilling.

11.2.4 Marine Impacts of SDEIS Options with Respect to Section 404, Section 10 and Section 103 Actions.

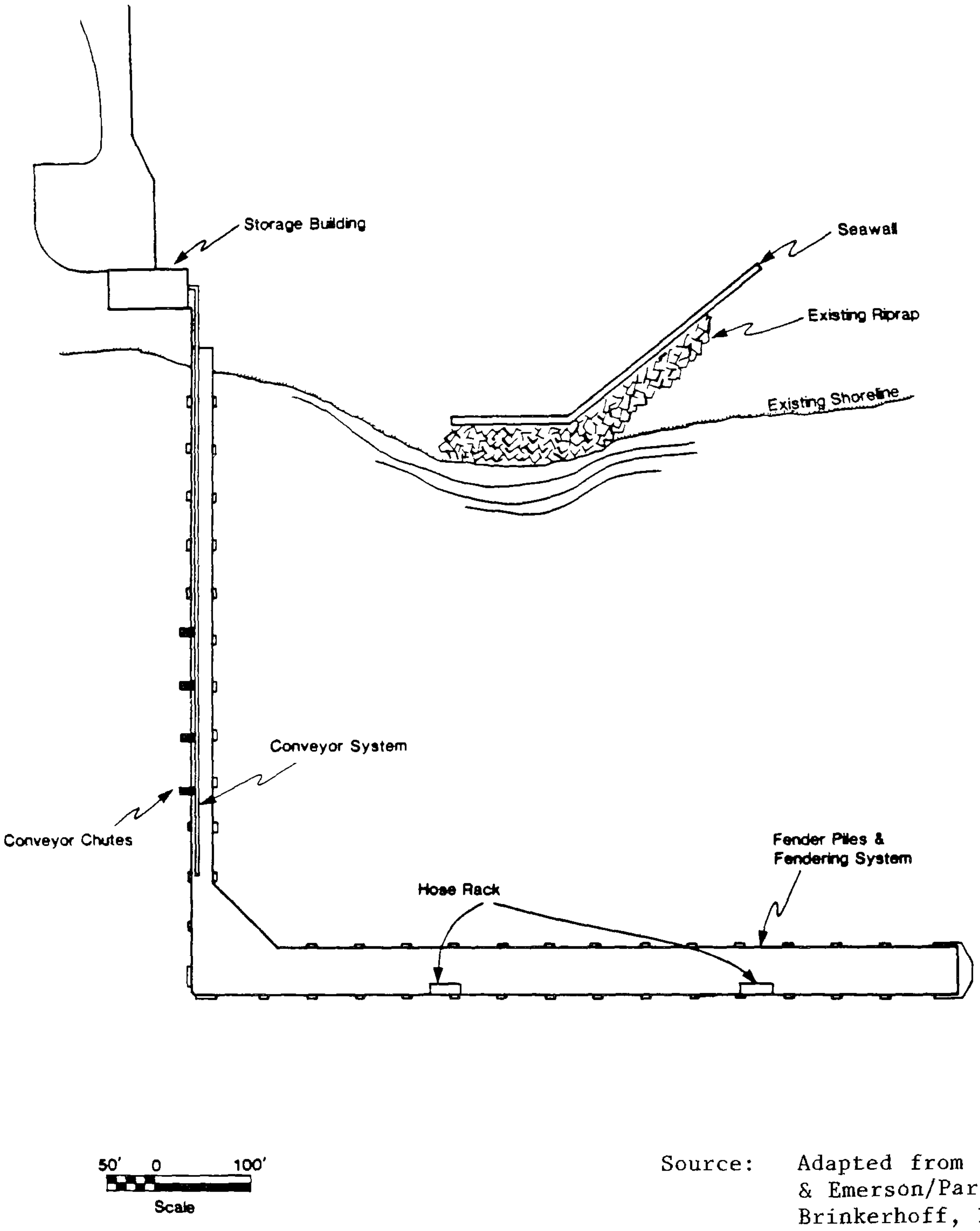
Once detailed facility planning and design has developed specific construction proposals, permit applications would be submitted to the Army Corps of Engineers for Corps and EPA review. All of the actions described above (11.2.3) would require evaluation under Section 404/Section 10. Actions which include the discharge of dredged materials beyond the three mile territorial sea boundary would also be evaluated under Section 103 of the Marine Protection, Research and Sanctuaries Act.

While the specific requirements for environmental review of Section 404 and Section 103 permit applications differ, the intent, substance and methods of environmental review are similar. Review of Section 404 and 103 permit applications requires consideration of:

- the need for dredging/filling,
- alternatives to dredging/filling and disposal,
- alternative sites for dredging/filling and disposal
- compliance with water quality criteria, after initial dilution and dispersion,
- effects on marine life,
- effects on human uses.

The marine impacts of dredging and dredged material disposal are related to increased turbidity, reduced dissolved oxygen, increased sedimentation and the release of toxic chemicals, principally metals, from disturbed sediments into the surrounding waters. These effects, alone or in combination, might lead to lethal and sublethal effects in local marine life and bioaccumulation of toxicants in marine organisms to levels which may exceed environmentally acceptable limits, or otherwise may be harmful to the humans that eat them.

Of all the potential dredge or fill actions, inter-island trenching within Boston Harbor poses the greatest threat to harbor marine resources. This is because of the large quantities of sediments which would be excavated during the laying of the pipeline(s), and the chemical quality of these sediments. The principal resources which might be affected include harbor shellfish and lobster. Compared to

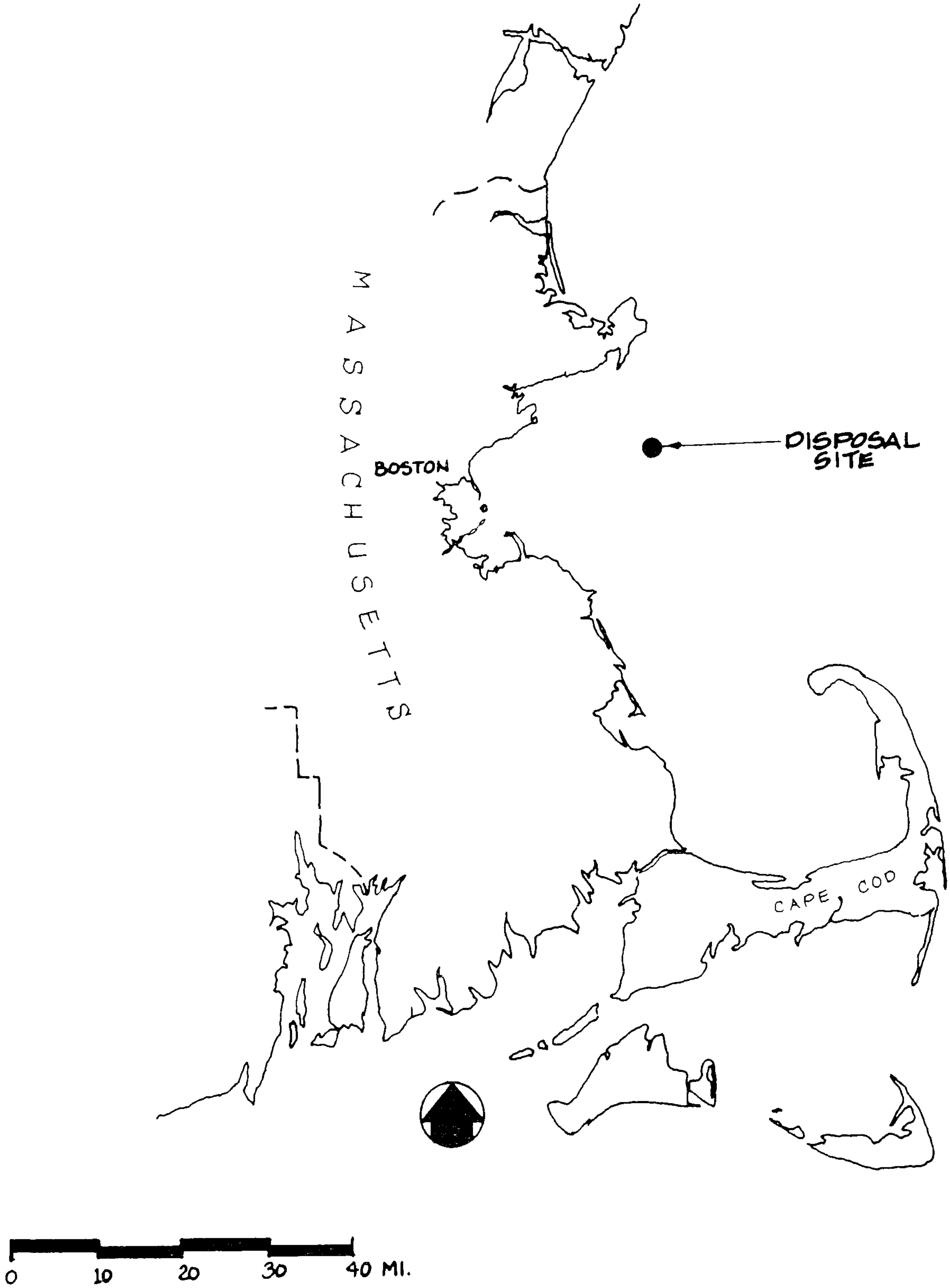


Source: Adapted from Havens & Emerson/Parsons Brinkerhoff, 1984, draft Deer Island Facilities Plan.

BOSTON HARBOR
FACILITIES SITING
S D E I S

PLAN - MODIFIED FULL SERVICE MARINE FACILITY

fig. 11.2-5



BOSTON HARBOR
FACILITIES SITING
SDEIS

MARBLEHEAD DISPOSAL SITE OR "FOUL AREA" FOR BOSTON HARBOR DREDGE MATERIALS

C.E. maguire, inc.

fig. 11.2-6

tunnel alternatives, inter-island trenching alternatives would likely undergo a more extensive, in-depth environmental evaluation should they be proposed by the MDC.

The sediments of Boston Harbor which are likely to be disturbed during dredging contain relatively high concentrations of heavy metals (see separate SDEIS report: Boston Harbor Water Quality Baseline). The metals concentrations in sediments at any island site would probably cause the sediment to be classified as category two or three material under Massachusetts DWPC criteria (described in the SDEIS Boston Harbor Water Quality Baseline). This would limit the approvable methods of marine construction and disposal of dredged and excavated materials. Generally, the metals concentrations are higher near Deer and Long Islands than near Nut Island.

Physical and chemical evaluation of the material to be discharged/disturbed is the first step in assessing the environmental impacts of the proposed action. Physical parameters such as particle size help determine settling characteristics, effects on ambient turbidity and light penetration through the water column. Chemical tests are used to determine the presence of toxic chemicals. Biological testing (bioassays/bioaccumulation) is required on nearly all materials proposed for ocean disposal.

The site which has recently undergone such an analysis and which lies closest to the island sites is the anchorage between President Roads and Deer Island Flats. The bioassays conducted for this Section 103 permit had the following results: (ERCO, 1981):

> Liquid phase bioassay: "Mean survival of organisms exposed for 96 hr. to 100% phase was 50.0 - 66.7% (copepods), 73.3 - 83.3% (mysid shrimp), and 80.0 - 96.7% (Atlantic silversides)". Mean survival of organisms exposed for 96 hours to culture water control was 93.3% for copepods, 93.3% for mysid shrimp and 96.7% for Atlantic silversides.

Suspended particulate phase bioassay: "Mean survival of organisms exposed for 96 hr. to 100% phase was 50.0 - 80.0% (copepods), 73.3 - 83.3% (mysid shrimp), and 76.7 90.0% (Atlantic silversides)" Mean survival of organisms exposed for 96 hours to culture water control was 93.3% for copepods, 93.3% for mysid shrimp, and 96.7% for Atlantic silversides.

Solid phase bioassay: "Mean survival of organisms exposed for 10 days to dredged material was 86.0 - 91.0% (grass shrimp), 98.0 - 100% (hard clams), and 91.0 95.0% (sandworms)". Mean survival of organisms exposed for 10 days to culture water control was 99.0% for grass shrimp, 100.0% for hard clams, and 97.0% for sandworms. Mean survival of organisms exposed to reference sediment (from disposal site) was 86.0% for grass shrimp, 100.0% for hard clams and 91.0% for sandworms.

Bioaccumulation studies: Tests using hard clams, grass shrimp, and sandworms exposed to dredged materials for 10 days showed the potential for significantly higher bioaccumulation of mercury and petroleum hydrocarbons in hard clams compared to bioaccumulation in organisms exposed to reference sediments from the disposal site. Other metals and PCB's were not significantly accumulated in these species.

These tests led to the conclusion that, "with regard to its toxicological effects ... the dredged material is ecologically suitable for discharge to the Boston Dump Site" (also known as the Marblehead disposal site). Also, "the probability of harmful accumulation of [mercury and] petroleum hydrocarbons in the human food chain is judged to be negligible."

This suggests that although adverse water quality and biologic effects may result from the disposal of dredged materials from President Roads, they are not significant with respect to disposal at the Boston dump site. As President Roads is one of the more contaminated areas of the harbor with respect to toxic chemicals, the permitting of dredging in this area suggests that the disposal of dredged material from near Deer, Long and Nut Island could be accomplished without significant adverse impacts at the Marblehead dump site. However, recent data from Winthrop Harbor shows significant bioaccumulation of PCBs in clams exposed to harbor sediments (Mass. Division of Waterways 1984 404b permit application).

Data for Nereis virens, Mercenaria mercenaria and Palaeometes pugio exposed to Winthrop Harbor dredged sediments shows 90% or greater survival. This is not considered statistically different from reference samples. Results of bioaccumulation studies did show statistically significant bioaccumulation in several instances, as explained below (excerpted from Mass. Division of Waterways 1984 404b permit application for dredging in Boston Harbor):

> Review of mercury data shows 90% of all data points falling below the required detection limit of 0.20 mg/kg. Lowest levels were reported in Mercenaria exposed to the Reference sediments (0.06 mg/kg), highest levels were observed in Mercenaria exposed to the treatment sediment (0.28 mg/kg). Evaluation of the data set, comparison of body burdens between Reference and Treatments, show no significant accumulation of mercury in Nereis and Palaemonetes; significant differences in mercury body burdens were observed for Mercenaria.
>
> Levels of PCBs show body burdens ranging from 0.003 to 1.67 mg/kg with 43% of the values falling below the required detection limit of 0.04 mg/kg. Highest overall levels were observed in Nereis exposed to sediments from Winthrop while lowest levels were reported for Mercenaria exposed to reference sediment Statistical evaluation of the data show significant differences in PCB body burdens in Mercenaria and Nereis. No significant change in PCB body burdens in Palaemonetes.

No statistically significant bioaccumulation was found for cadmium, DDT or aromatic petroleum hydrocarbons.

These data from Winthrop Harbor and the President Roads anchorage show that two relatively close sites (about 1-1/2 miles apart) may have significantly different sediment characteristics. Site specific evaluations will be necessary once MDC's facilities planning develops specific marine construction proposals. Evaluation of the actual sediments to be excavated and disposed is necessary for each location in order to assess the environmental acceptability for their handling and disposal.

REFERENCES

"Construction Methods and Equipment"; August, 1974.

EG&G, 1984. Oceanographic Study of Various Outfall Siting Options for the Deer Island Treatment Plant. Prepared for Havens & Emerson/Parsons Brinkerhoff as part of the 1984 Deer Island Facilities Plan.

EPA Region I and Metcalf & Eddy, 1983. Environmental Review of Construction Grants Projects Under 205(g).

ERCO, 1981. Ecological Evaluation of Proposed Oceanic Discharge of Dredged Material from President Roads, Boston Harbor. Prepared for the New England Division of the U.S. Army Corps of Engineers.

Havens & Emerson/Parsons Brinkerhoff, 1984. Deer Island Facilities Plan, Volume I: Fast Track Improvements. Prepared for the Metropolitan District Commission.

Havens & Emerson/Parsons Brinkerhoff, 1984. Draft Deer Island Facilities Plan. Unpublished draft prepared for the Metropolitan District Commission.

Massachusetts Division of Waterways, 1984. 404(b) permit application for dredging in Boston Harbor submitted to New England Division of the U.S. Army Corps of Engineers.

Metcalf & Eddy, Inc., June 1982. Nut Island Wastewater Treatment Plant Facilities Planning Project, Phase I, Site Options Study, Volumes I and II. Prepared for the Commonwealth of Massachusetts, Metropolitan District Commission.

11.3 Water Quality Impacts (Boston Harbor Water Quality Baseline Report Available Under Separate Cover)

11.3 WATER QUALITY IMPACTS

11.3.1 Context: NEPA and 301(h)

The water quality impacts of the SDEIS alternatives do not affect the treatment plant siting decisions which are the focus of this EIS. This is because water quality impacts are common among all secondary treatment alternatives and among all primary treatment alternatives. While water quality impacts do not affect the siting decision, the daily discharge of 500 million gallons of domestic and industrial wastewater is "significant" under the National Environmental Policy Act (NEPA) definition (40 CFR Section 1508.27) Therefore, the water quality impacts must be described in this EIS in accordance with NEPA.

EPA is now considering the MDC's application for a waiver from the secondary treatment requirements of the Clean Water Act (see Section 1 of the SDEIS). This 301(h) waiver application calls for upgraded primary treatment facilities and an effluent discharge nine miles off Deer Island into Massachusetts Bay. Moving the discharge location out of Boston Harbor is expected to improve harbor water quality significantly. EPA's decision document on the 301(h) waiver application will provide a description of the water quality and biological impacts of primary effluent discharges to Massachusetts Bay. The water quality impacts of primary treatment options are not discussed in this SDEIS; EPA's 301(h) waiver decision document will be discussed in the Final EIS. Generic descriptions of primary treatment and primary effluent are provided as needed to better understand the impacts of secondary treatment options, particularly as these secondary treatment options provide improvements over existing primary treatment discharges to Boston Harbor.

11.3.2 Summary of Conclusions

Any of the alternatives (except no action) will provide significant harbor water quality benefits. However, without further reduction of toxic metals and pesticides in the wastewater flowing to the proposed treatment facilities, water quality criteria for toxicants could be exceeded on occasion under any alternative.

Generally, the long term impacts of effluent discharges on the benthic environment include nutrient and toxicant enrichment of overlying waters, marine life, and sediments in areas where effluent solids settle after discharge. Offshore discharges in Massachusetts Bay will impact harbor resources less than in-harbor discharges. Conversely, in-harbor discharges will have less of an effect on offshore resources. The most significant potential adverse impact of any of the alternative effluent discharges is the public health question posed by the accumulation of toxic chemicals in edible marine life. The significance attached to this potential impact, relative to other discharge impacts, is attributable to the large number of people potentially affected, the intensity of potential health effects, and the uncertain level of risk associated with fish consumption.

Note that significant water quality impacts may result from actions involving marine construction and the discharge of dredged materials and tunnel spoils to offshore marine waters. Due to the undeveloped nature of these actions they are discussed separately in section 11.2 of this SDEIS.

As explained below, the long term water quality impacts of the SDEIS options depend on:

1. the quality of effluent, and

2. the site(s) of discharge.

The MDC's 301(h) waiver application calls for primary treatment with a discharge nine miles off Deer Island into Massachusetts Bay. The MDC Nut Island Site Options Study's preferred option for secondary treatment calls for discharge to President Roads. These MDC preferred options offer a basic choice between a higher quality discharge in the harbor and a lower quality discharge far outside the harbor. Either choice will yield water quality benefits to the harbor The effects of a primary discharge offshore are being considered by EPA in their evaluation of the 301(h) waiver application. If the waiver is granted, it will indicate EPA's provisional concurrence with the MDC's assertion that the proposed discharge will not interfere with the protection of marine life and recreational resources. The following discussion summarizes the water quality impacts of secondary effluent discharges.

A. Quality of Effluent

1. Compared to primary treatment plants, secondary treatment plants provide significantly greater removal of bacteria, organic matter, solids, metals and many other toxic chemicals from wastewater

2. Together, the effluents from the existing treatment plants are the largest source of suspended solids discharged to the harbor annually These solids contain concentrations of PCB, pesticides, and metals[1] and therefore may be significant sources of these toxic chemicals in harbor sediments and bottom dwelling marine life, especially in the vicinity of the discharge point.

3. Deer Island and Nut Island effluents also contain toxic compounds in concentrations which exceed EPA criteria for the protection of saltwater aquatic life. These are as summarized in Table 11.3-1.

---

1 Analysis of filtered effluent solids has found total PCB from 4.8-25 mg/kg (ppm), total endosulfan from 1.7 - 2.73 mg/kg, 4, 4' DDT from <0.02 - 0.80 mg/kg, dieldrin from <0.02 - 1.0 mg/kg, endrin from 0.092 - 0.28 mg/kg (June 1984 301(h) waiver, Vol. 4, p5-92 and 93), 1979 301(h) data show >25% of silver, cadmium chromium and copper was contained in the solids fraction.

Table 11.3-1

Priority Pollutants in MSD Effluent Which Exceed EPA Criteria for the Protection of Saltwater Aquatic Life.

Pesticide Compounds:	Average Value Exceeds Chronic/Average Criteria	One or More Values Exceed Acute/Max Criteria	Average Value Exceeds Acute Criteria
4-4 DDT	√	√	
Dieldrin	√	√ *	
Endosulfan	√	√	√
Endrin	√		
Heptachlor	√	√ *	
PCB	√	√	
Metals:			
Cadmium	✔	?	
Chromium	√ ✔	?	
Copper	√ ✔	√ ✔	√ ✔
Lead	√ ✔	√	
Mercury	√ ✔	√ ✔	
Nickel	√ ✔	√ ✔	✔
Silver		√ ✔	√ ✔
Zinc	√ ✔	√ ✔	√ ✔
Others:			
Cyanide	√	√	√
Chlorobenzene		√	

KEY:

√ = priority pollutant sampling for 301 (h) Waiver Application.

✔ = average annual metals data from weekly Sampling.

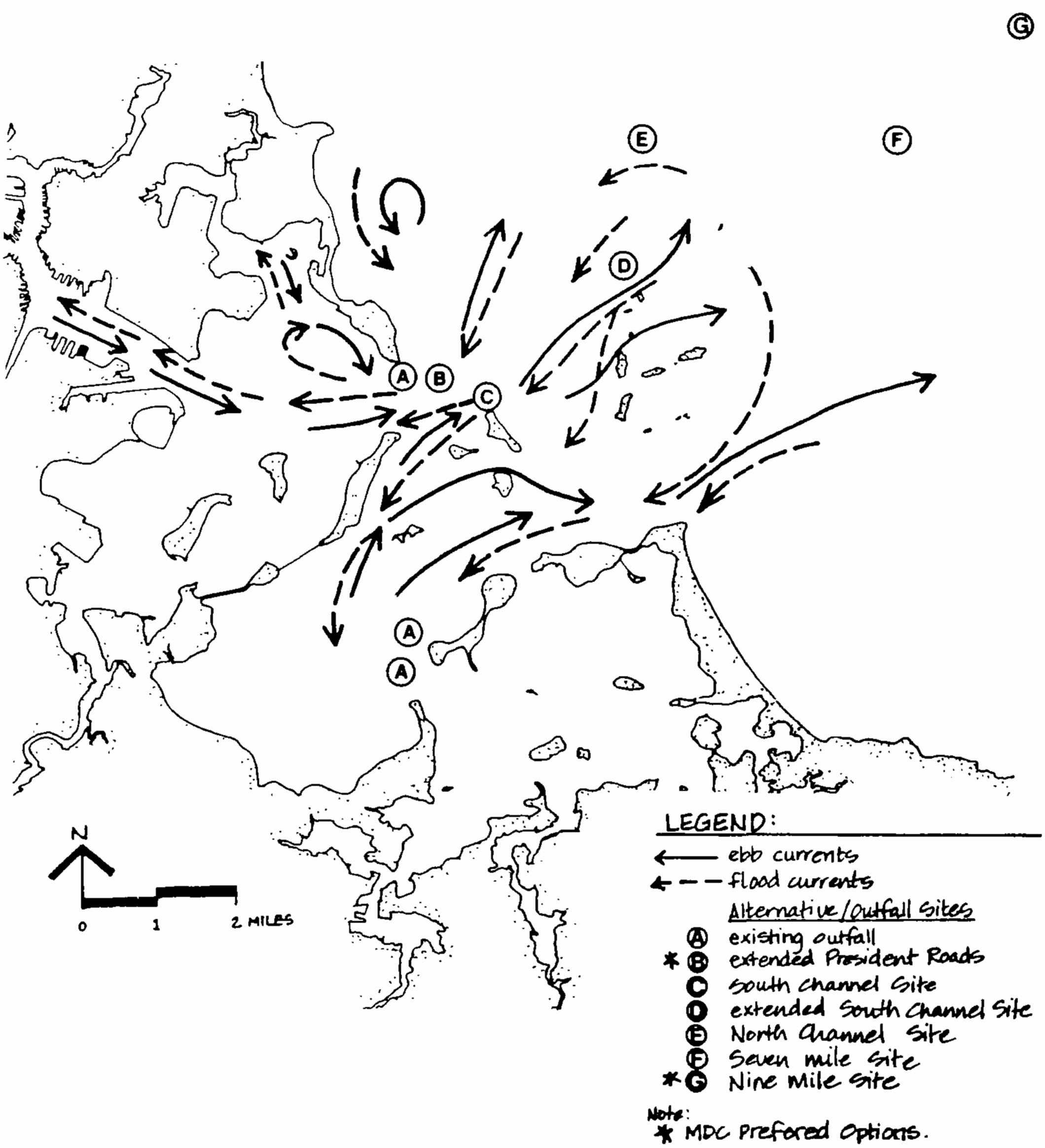
* = assuming worst case concentration = limits of reported detection.

B. Site of Discharge(s)

1. All final SDEIS alternatives (except no action) call for discharge of both north and south system flows from either Deer Island or Long Island. All alternatives call for south MSD flows to be conveyed from Nut Island to either Deer Island or Long Island before discharge.

2. Because Deer Island and Long Island are close to one another, there is relatively little difference in the cost of constructing an outfall from either island to any one of the outfall sites which have been considered for the discharge (<6% difference in total plant cost; outfall sites shown in Figure 11.3-1).

3. Generally, for any given effluent diffuser, the amount of initial dilution achievable at a site is dependent on current velocity and water depth. On this basis alone, of all disposal sites suggested, the President Roads site is likely to provide the highest initial dilution of secondary effluent (the significantly higher currents in President Roads outweighing the slightly greater depths available outside the harbor). These differences in initial dilution are not great, may lie within the range of error of the calculation method, and may not be statistically different. Also, the narrow width of President Roads will limit the length of a diffuser placed perpendicular to the current. The length of a diffuser is not limited by such constraints outside the harbor. With the longer effluent diffusers which may be constructed offshore, and the greater depth, higher initial dilutions may be achievable than in President Roads. Massachusetts DEQE requires the evaluation of such site and design alternatives during detailed design of the treatment facilities.



Adapted from:
EG&G 1984
Fig. ES-1.

GENERAL TIDAL CIRCULATION IN VICINITY OF EXISTING AND ALTERNATIVE OUTFALL SITES

C.E. Maguire Inc.

fig. II.3-1

At the President Roads outfall site, the concentrations of toxic pollutants in secondary effluent may occasionally exceed EPA water quality criteria for the protection of salt-water aquatic life even after initial dilution (Tables 11.3-9 through 11.3-12 and 11.3-16). These occurrences are expected to be limited to periods of minimum tidal flushing and unpredictable peak concentrations of toxicants. Over time, industrial pretreatment and control of banned chemicals may lower toxic pollutants discharged to the sewer system so that effluent discharges never exceed aquatic life criteria after initial dilution.

4. After initial dilution, an effluent plume undergoes far field dispersion. Comparison of outfall sites with respect to far field dispersion shows that the farther a site is from Boston Harbor, the less it will impact the Harbor's water and sediment quality. During wet weather, the effects of urban runoff and combined sewer overflows are likely to dominate the bacterial quality of the harbor, no matter where the treatment plant(s) effluent is discharged.

   Any of the alternatives to the existing facilities will improve recreation and commercial shellfishing in the harbor due to reduced bypassing of untreated sewage (see Section 1 Purpose and Need for Action). Secondary treatment will provide better protection of public health during dry weather through improved disinfection effectiveness. However, recreational use of the harbor and the harvest of shellfish will still be limited by other sources of bacteria including dry and wet weather overflows from the sewer system, and urban stormwater.

   Impacts on commercial and recreational fisheries also include probable increases in the populations of pollutant tolerant species in areas receiving organic enrichment from the waste-water. However, the toxic chemicals in the effluent solution and solids may possibly cause avoidance, stress, disease, and increased mortality in some fish. Any effluent discharge will contribute to the bioconcentration of toxic chemicals in food fish and thereby contribute to the as yet undetermined health risk to humans eating these fish. By removing more of these toxic pollutants (through industrial pretreatment, for example) higher levels of wastewater treatment may lessen long-term ambient concentrations which are bioconcentrated in fish, and thereby lessen the health risk to humans.

These impacts are discussed in greater detail beginning on page 11.3-29 (Section 11.3.3 B), after the following analysis of wastewater characteristics and initial dilution.

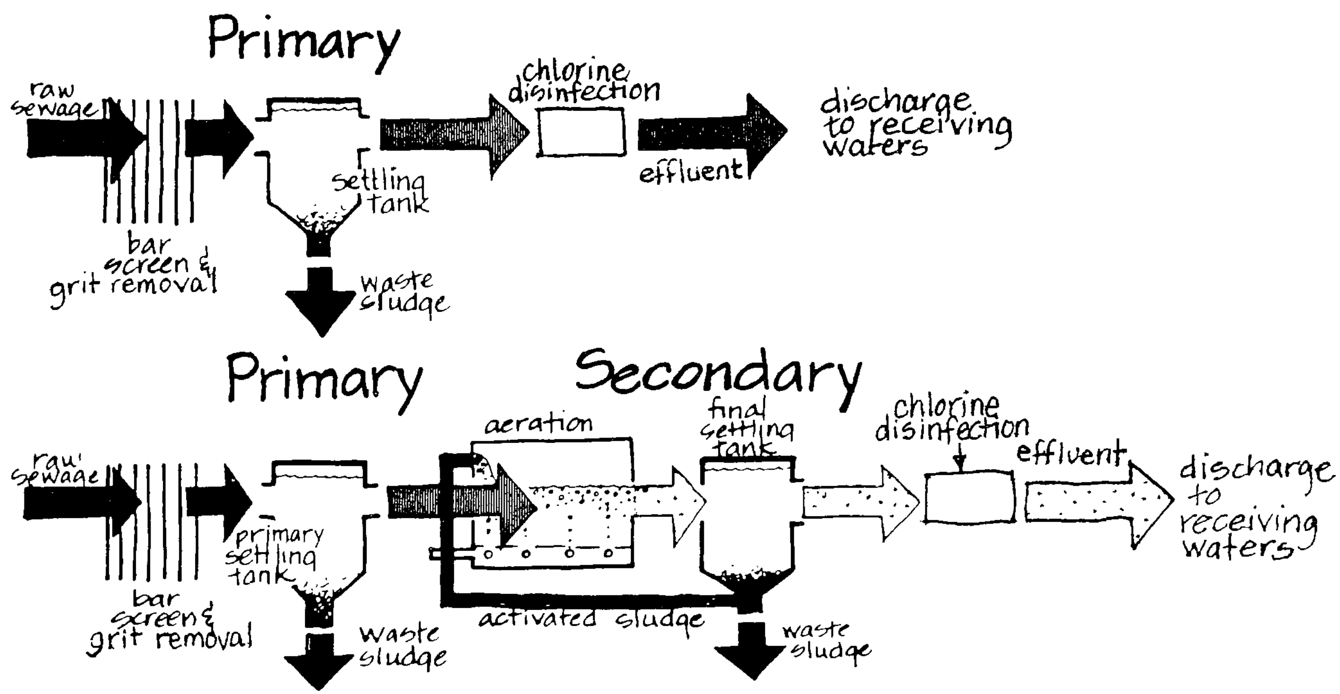
11.3.3 Wastewater Characteristics

A. General Considerations: Primary vs. Secondary Effluent

This subsection considers generic differences between primary and secondary effluent. The purpose is to provide a basis for evaluating the water quality impacts of secondary treatment with discharges to President Roads. The impacts of primary treatment with a discharge nine miles into Massachusetts Bay are being evaluated by EPA separately in its consideration of the MDC's 301(h) Waiver Application (June and October 1984). These separate findings will be incorporated into the Final EIS and EPA's Record of Decision on the EIS.

"The major goal of primary treatment is to remove from wastewater those pollutants which will either settle (such as heavier suspended solids) or float (such as grease) . . . Soluble pollutants are not removed" (EPA-625/5-76-012). Secondary treatment plants provide primary treatment first, and then secondary (biological) treatment (Figure 11.3-2). Secondary treatment provides microbial breakdown of suspended solids and removal of soluble pollutants. Bacteria, encouraged by aeration, consume dissolved and solid organic matter as a food source. Some of the pollutants are converted to non-polluting gases such as carbon

Primary & Secondary Treatment Plants



c.e. maguire inc.

fig. II.3-2

dioxide. Others are retained in the bacteria. The bacteria eventually die, settle to the bottom of secondary settling tanks, and are removed for disposal as secondary sludge (Figure 11.3-2).

The principal advantages of secondary treatment as compared to primary treatment, are:

1. better effluent disinfection,

2. significantly greater reduction of the wastewater's biochemical oxygen demand (BOD), and suspended solids (SS or TSS),

3. additional, often significant, removal of toxic chemicals in the wastewater, and

4. compliance with the basic requirements of the Federal Clean Water Act (separate from any 301(h) waiver considerations).

The principal disadvantages of secondary treatment as compared to primary treatment are:

1. significantly greater capital and operating costs (in this SDEIS primary treatment alternatives are closer in cost to secondary treatment options because of the high cost of a nine mile outfall proposed under primary options),

2. greater land area required for treatment facilities,

3. significantly greater sludge volumes produced with generally higher concentrations of toxic chemicals, and

4. more complex mechanically

The relative pollutant removal efficiencies of secondary treatment plants are compared with those of primary treatment plants in Tables

11.3-2 through 11.3-6. These tables show that secondary treatment plants provide significantly greater removal of most pollutants than primary treatment plants.

There is, however, considerable variability in pollutant removal efficiencies between individual treatment plants of any given type. Comparison of Tables 11.3-2 through 11.3-6 shows this variability. Table 11.3-5 suggests that mean and median percent removals for biological plants (trickling filter and activated sludge) are generally similar. Note, however, that the median percent removals reported in Table 11.3-5 are much lower than median percent removals reported in Table 11.3-3. While both these tables are based on treatment plant data (rather than laboratory simulations), differences between the data bases may account for the differences in median percent removals. For example, Table 11.3-3 presents more recent data (early 1980s vs. mid-1970s) which might indicate changes in plant performance and/or methods of chemical testing.

Considering metals removal specifically, "numerous field studies demonstrated that the influent metals concentration, and the efficiency with which metals are removed varies widely between plants". (Patterson and Kodukula, 1984. Footnotes omitted.) In a recent pilot plant study (laboratory simulation) conducted by EPA (Petrasek and Kugelman, 1983):

> "Metals removals were computed by using both mean concentrations and median removals obtained from frequency distributions. For those metals with large standard deviations in the influent samples, substantial differences in the removal efficiencies were apparent. For those metals with better behaved data, both calculations yielded approximately the same removal. Because of the variability of metals concentrations usually observed, careful considerations should be given to the use of mean, median, or modal concentrations for the computation of removal efficiencies, and to the development of percent removal frequency distributions."

Similarly, "most of the organic priority pollutants are present in municipal wastewaters at relatively low concentrations (less than 10 ug/l) . . . accurate assessment of the fate and removability of these materials is difficult, if not impossible, when influent concentrations are low." (Petrasek et. al. 1983) In contrast, high percent removals for most volatile organic compounds, including many solvents, are consistently reported for secondary treatment plants. This is probably due to volatilization (evaporation) in the secondary treatment aeration tanks.

TABLE 11.3-2

COMPARISON OF TYPICAL PRIMARY AND SECONDARY TREATMENT PLANT CONVENTIONAL POLLUTANT REMOVAL EFFICIENCIES AND SLUDGE GENERATION RATES

Parameter	Primary Treatment	Primary and Secondary Treatment
Total Coliform Bacteria % removed[1]		
unchlorinated	25-50%	80-95%
chlorinated (nominal)	90-95%	98-99%
chlorinated (best)	99.5%-99.9%	99.9%
BOD_5 % removed	25-40%	85-95%
TSS % removed	50-75%	90%
Total Nitrogen % removed	5-10%	10-30%
Total Phosphorous % removed	10%±	10%[2]
Sludge mass removed per 1,000 gallons of wastewater	1.245 lbs.	1.951 lbs.

Note: All values from Metcalf & Eddy, 1979 Wastewater Engineering, unless otherwise noted.

[1]FWPCA, 1969. Note the bacteria removal efficiencies are probably overestimated in these figures, particularly for primary effluent, in light of recent evidence on suspended solids interference with disinfection effectiveness (EPA Sponsored 2nd National Symposium on Municipal Wastewater Disinfection, Jan. 26-28, 1982).

[2]EPA 625/5-76-012. Note that "Except for the amount taken up for incorporation into cell tissue, the additional removal achieved in conventional biological treatment is minimal because almost all the phosphorus present after primary sedimentation is soluble . . [however] . . . the degree of phosphorus removal at some activated sludge plants is considerably higher than would be predicted on the basis of the requirements for organism growth." (Metcalf & Eddy, 1979 Wastewater Engineering. p. 745-748).

TABLE 11.3-3 MEDIAN PERCENT REMOVALS OF SELECTED POLLUTANTS THROUGH PUBLICLY OWNED TREATMENT WORKS BY PROCESS[1]

Parameter	Primary[2]		Secondary (Activated Sludge)	
BOD	(12)	19	(22)	90
TOTAL SUSP. SOLIDS	(12)	45	(22)	90
CADMIUM	(6)	15	(6)	85
CHROMIUM	(12)	27	(22)	84
COPPER	(12)	22	(22)	84
CYANIDE	(12)	27	(22)	62
LEAD	(1)	57	(2)	82
MERCURY	(8)	10	(8)	76
NICKEL	(9)	14	(15)	34
SILVER	(4)	20	(5)	83
ZINC	(12)	27	(22)	81
BENZENE	(8)	25	(10)	77
BIS (2-ETHYLHEXYL) PHTHALATE	(12)	0	(8)	62
BUTYL BENZYL PHTHALATE	(4)	62	(2)	94
CHLOROFORM	(11)	14	(20)	62
DI-N-BUTYL PHTHALATE	(3)	36	(6)	68
DIETHYL PHTHLATE	(1)	56	(2)	91
ETHYLBENZENE	(12)	13	(10)	90
METHYLENE CHLORIDE	(12)	0	(14)	48
NAPHTHALENE	(4)	44	(6)	92
PHENOL	(11)	8	(15)	89
TETRACHLOROETHYLENE	(12)	4	(20)	82
TOLUENE	(12)	0	(21)	93
TRICHLOROETHYLENE	(12)	20	(20)	90
1,1,1-TRICHLOROETHANE	(10)	40	(17)	88
1,2-TRANS-DICHLOROETHYLENE	(9)	36	(19)	80

Number in ( ) is number of plants with calculated removals.

Only plants with average influent concentrations greater than three times the most frequent detection limit of each pollutant are included in calculations.

[1]Source: EPA, 1982. Fate of Priority Pollutants in Publicly Owned Treatment Works, Final Report, Table 11. Plant sizes range from 7 to 200 mgd; note that these removal efficiencies may not be achievable in very large treatment systems such as the MDC's system.

[2]"It should be noted that the primary effluent samples from this study may not be representative of primary treatment plants because secondary treatment plants generate a much greater volume of sludge than primary treatment plants, and many of the sludge processing side streams are returned to the primary tanks. This often causes the influent to the primary tanks to be much higher in organic loading than the influent to a typical primary treatment plant." (p. 68)

REMOVAL DATA SUMMARY FOR PRIMARY, TRICKLING FILTER AND ACTIVATED SLUDGE PLANTS (SELECTED PARAMETERS)

Table 11.3-4

Parameter	Primary Plants (PP) Mean	Primary Plants (PP) Standard Deviation	Primary Plants (PP) Max/Min	No. of Plants	Trickling Filter Plants (TFP) Mean	Trickling Filter Plants (TFP) Standard Deviation	Trickling Filter Plants (TFP) Max/Min.	Trickling Filter Plants (TFP) No. of Plants	Activated Sludge Plants (ASP) Mean	Activated Sludge Plants (ASP) Standard Deviation	Activated Sludge Plants (ASP) Max/Min.	Activated Sludge Plants (ASP) No. of Plants
CD	8	17	76/0	31	20	25	75/0	35	17	27	88/0	44
CR	26	26	80/0	36	37	30	99/0	48	46	34	98/0	54
PB	24	26	88/0	34	37	31	93/0	41	39	32	95/0	49
HG	27	29	75/0	21	30	23	67/0	20	39	32	99/0	34
CU	26	24	77/0	44	54	24	95/0	49	57	24	95/0	63
NI	6	18	92/0	28	21	23	86/0	32	20	21	80/0	44
ZN	31	22	88/0	38	46	22	89/0	52	58	25	99/0	58
FE	40	22	89/0	27	50	26	90/0	30	63	27	98/8	35
MN	15	20	81/0	16	31	23	72/0	21	38	32	93/0	19
P-TOTAL	13	8	24/0	7	26	22	99/0	24	42	25	92/0	36
TKN	22	20	60/0	7	50	27	94/7	20	34	26	92/5	11
NH_3	20	16	64/0	42	41	30	99/0	48	49	31	99/4	47
PHENOL	38	-	50/25	2	50	28	85/0	12	69	31	98/0	16
TOC	24	19	56/0	30	64	18	84/8	23	73	12	89/42	13
COD	26	-	82/0	18	71	-	95/34	36	75	-	94/24	40
SS	51	18	92/17	47	75	19	97/20	66	75	22	99/9	62
BOD	30	22	89/0	52	77	18	96/5	60	84	15	99/18	65

EFFLUENT DATA SUMMARY FOR PRIMARY, TRICKLING FILTER AND ACTIVATED SLUDGE PLANTS (SELECTED PARAMETERS)

Table 11.3-5

Parameter	Primary Plants (PP) Mean	Primary Plants (PP) Standard Deviation	Primary Plants (PP) Max/Min	No. of Plants	Trickling Filter Plants (TFP) Mean	Trickling Filter Plants (TFP) Standard Deviation	Trickling Filter Plants (TFP) Max/Min.	Trickling Filter Plants (TFP) No. of Plants	Activated Sludge Plants (ASP) Mean	Activated Sludge Plants (ASP) Standard Deviation	Activated Sludge Plants (ASP) Max/Min.	Activated Sludge Plants (ASP) No. of Plants
CD (µg/l)	14	9	40/3	35	11	10	66/1	41	50	277	1970/1	48
CR "	188	406	2600/6	40	235	563	3200/3	52	202	515	2520/5	60
PB "	156	272	1700/10	37	116	276	1800/5	45	67	68	350/3	51
HG "	1.0	1.3	5.0/0.1	23	1.0	2.0	10.0/0.1	22	6.0	32	200/0.1	37
CU "	191	278	1700/10	48	133	283	1800/3	54	92	195	1600/8	68
NI "	165	387	1700/6	33	198	336	1533/7	38	165	387	1700/6	56
ZN "	550	658	3600/30	49	316	464	2800/40	57	238	257	1400/10	66
FE "	1520	1020	5000/400	30	2910	11000	65600/100	34	747	1170	6800/100	37
MN "	176	112	390/30	22	136	130	580/20	28	144	200	940/10	23
P-TOTAL (mg/l)	12.9	22	77/1.3	10	9.02	3.8	18.3/3.3	27	5.2	2.7	10.4/1.0	40
TKN "	24.4	11.6	47/8.5	-	16.8	11.9	47.8/1.2	21	19.0	9.6	34/1.5	12
NH_3 "	20.2	34.6	256/2.1	63	16.6	17.2	115/0.03	65	11.1	7.6	27.5/0.07	63
PHENOL (µg/l)	16	23	53/0.1	-	209	772	3000/0.03	13	135	473	2000/0.02	16
TOC (mg/l)	142	84.2	539/52	35	54.3	26.3	129/23	23	35.3	22.4	95.0/10	14
COD "	346	-	768/58	19	133	-	361/18	38	86	-	275/14	42
SS "	93	62	314/15	54	43	37	228/5	66	37	39	185/2	64
BOD "	167	111	650/20	58	48.6	47.3	245/4.0	61	28.3	40.7	230/2.0	65

Source: EPA, 1977 (-430/9-76-017c).
Federal Guidelines, State and Local
Pretreatment Programs.

TABLE 11.3-6
CHARACTERIZATION OF PRIMARY AND BIOLOGICAL
PLANT PERFORMANCE

Parameter	Primary Plants (PP) Percent Removal (50% ≥)/(mean)	Primary Plants (PP) Effluent Concentration (50% <)/(mean)	Biological Plants (BP) Percent Removal (50% ≥)/(mean)	Biological Plants (BP) Effluent Concentration (50% <)/(mean)
CD (µg/l)	7/8	11/14	9/18	10/30
CR "	16/26	90/188	41/42	50/218
PB "	20/24	110/156	41/38	60/92
HG "	22/27	0.6/1.0	38/35	0.6/3.5
CU "	18/26	110/191	56/56	50/113
NI "	6/6	75/165	16/21	65/182
ZN "	26/31	300/550	52/52	160/277
FE "	35/40	1300/1518	59/57	600/1827
MN "	8/15	160/176	28/35	90/140
P-TOT (mg/l)	ID/13	10/13	32/34	6/7
TKN "	ID/22	ID/24	40/42	17/18
NH_3 "	17/20	13/20	37/45	12/14
PHEN (µg/l)	ID/38	ID/16	68/60	2.5/175
TOC (mg/l)	20/24	125/142	71/69	45/25
COD "	18/26	340/346	75/73	100/110
SS "	50/51	78/93	80/75	30/40
BOD "	28/30	140/167	85/81	28/39

Notes:

ID = Insufficient data reported.
PP = Two plant data base.
BP = Eleven plant data base.

Source: EPA, 1977; Federal Guidelines, State and Local Pretreatment Programs.

B. Conventional Pollutants in MSD Wastewater

Table 11.3-7 presents estimated annual average concentrations of conventional pollutants for MDC's existing primary effluent, typical/improved primary, and typical secondary treatment plant effluents. MDC values are expected to vary from typical values because of the MDC's high wastewater flow and the high percentage of that flow which is infiltration and inflow. Note that bacterial concentrations in effluent vary widely for any treatment plant (see recent Deer Island and Nut Island plant bacterial data in the separate SDEIS report: Boston Harbor Water Quality Baseline). Also note that COD, total nitrogen and total phosphorus values for existing treatment plants are based on very small sample sizes and cannot, therefore, be considered statistically valid. At any specific time, actual effluent values are likely to vary from these averages.

C. Metals in MSD Wastewater

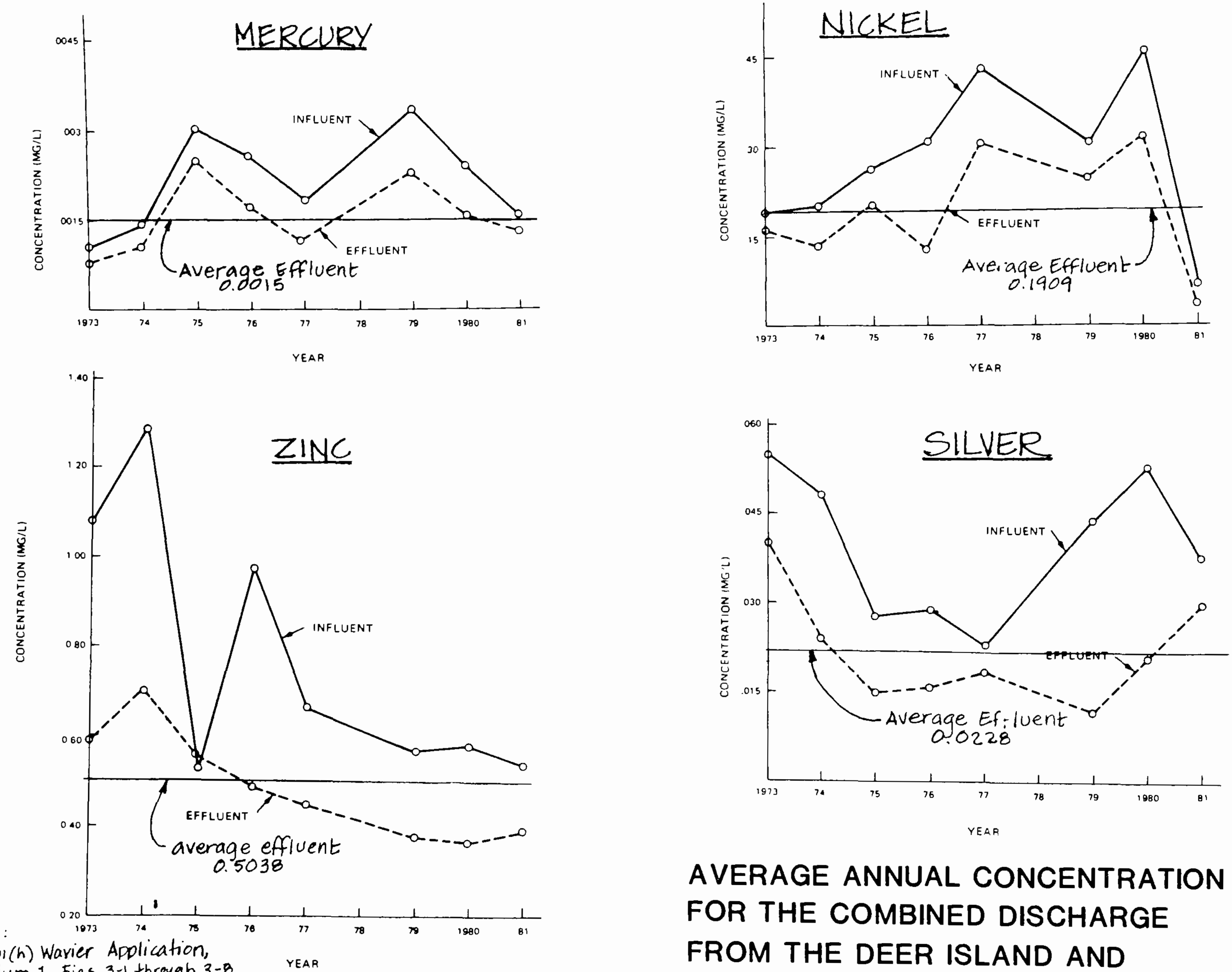
Daily grab samples of Deer Island and Nut Island wastewater are combined each month by the MDC and analyzed for metals content. Figures 11.3-3 and 11.3-4 depict combined Deer Island and Nut Island annual average metals concentrations from these data, along with the mean effluent concentration for the period 1973-1981. (Note that averages for 1978 are missing from the original data and that these data do not reflect emergency raw wastewater discharges or regular sludge discharges.) Table 11.3-8 shows the mean annual average metals concentration in the influent and effluent for both Deer Island and Nut Island treatment plants. Comparison of this data with average metals concentrations reported in Table 11.3-5 shows that the MSD effluent concentrations are generally within the typical range of other primary treatment plant effluents.

TABLE 11.3-7 EXISTING AND PROJECTED MSD TREATMENT PLANT AVERAGE ANNUAL EFFLUENT CONCENTRATIONS FOR CONVENTIONAL POLLUTANTS*

Parameter/Units	Primary Plant Existing MDC	Primary Plant Typical/ Improved	Typical Secondary Plant
Total Coliforms, after chlorination No./100 ml			
reported	966 (1)		
worst case (2)		$5x10^{11}$	10^{11}
best case (3)		1000	1000
BOD_5, mg/l	104 (4)	108 (5)	30 (6)
COD, mg/l	508 (7)		80 (8)
TSS, mg/l	77 (4)	65 (5)	30 (6)
Total Nitrogen mg/l	26.5 (9)		18 (8)
Total Phosphorus mg/l	4.3 (9)		9 (8)

*Values do not reflect higher concentrations of pollutants in occasional discharges of poorly treated wastewater, existing sludge and scum discharges or the effects of atypical infiltration and inflow.

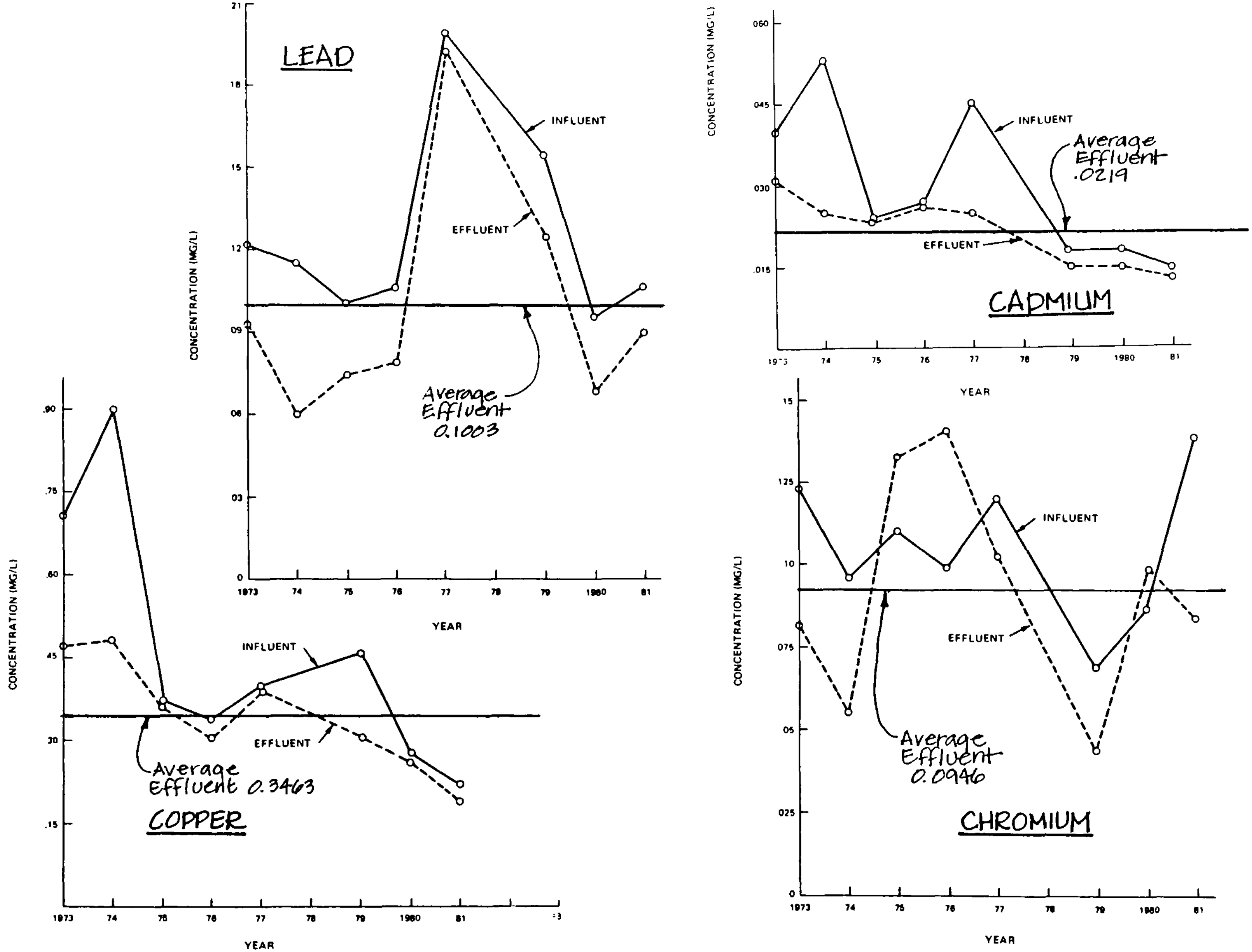
1. 1984 Deer Island Facilities Plan, Table E-2 assuming 1982 data and 75% DI and 25% NI of total flow.
2. Assuming raw wastewater load = 10^{12} total coliforms/litre (representing 100% residential wastewater); chlorination disinfection effectiveness: primary = 95%, secondary = 99%.
3. ERT, 1979, p. 5-9. This probably underestimates the concentration in primary effluent due to suspended solids interference with disinfection effectiveness. These values reflect disinfection effectiveness greater than 99.9999% and/or very low influent concentrations.
4. Prorated data from 1984 301(h) Waiver Application, Table II-A3.3.
5. 1984 301(h) Waiver Application, Table II-A3.4 using 1990 flows.
6. Typical limits required by State/EPA issued discharge permits (NPDES permits); median concentrations reported for secondary treatment plants are: BOD 28 mg/l, SS 30 mg/l (see Table F-4), and mean concentrations reported range from BOD 20 mg/l, SS 20 mg/l (EPA-625/5-76-012) to BOD 39 mg/l, SS 40 mg/l (see Table F-4).
7. Average COD (chemical oxygen demand) from 1983 Mass. DWPC sampling of 7/11, 7/12, 7/13, prorated DI 75%, NI 25%. This value is likely to vary from actual average annual COD due to the small number of samples on which it is based.
8. EPA-625/5-76-012.
9. Averages from 1983 Mass. DWPC sampling program (6 samples at each plant) prorated DI 75%, NI 25%. These values are likely to vary from actual annual averages due to the small number of samples on which they are based.



Source: 1982 301(h) Wavier Application, Addendum 1, Figs. 3-1 through 3-8.

AVERAGE ANNUAL CONCENTRATION FOR THE COMBINED DISCHARGE FROM THE DEER ISLAND AND NUT ISLAND TREATMENT PLANTS

fig. II.3-3



Source: 1982 301(h) Waiver Application, Addendum 1, figs. 3-1 through 3-8.

AVERAGE ANNUAL CONCENTRATION FOR THE COMBINED DISCHARGE FROM THE DEER ISLAND AND NUT ISLAND TREATMENT PLANTS

fig 11.3-4

AVERAGE METALS CONCENTRATIONS IN COMBINED DEER ISLAND AND NUT ISLAND INFLUENT

	Mean Concentration[1] Deer Island		Mean Concentration[2] Nut Island		Combined Influent (DI 75%, NI 25%)
	Influent	Effluent	Influent	Effluent	
Cadmium	0.0355	0.025	0.0128	0.0128	0.03
Chromium	0.1237	0.1068	0.0618	0.0578	0.11
Copper	0.45	0.3487	0.475	0.339	0.46
Lead	0.1435	0.116	0.0616	0.0532	0.12
Mercury	0.0017	0.00136	0.0039	0.002	0.0023
Nickel	0.1795	0.1568	0.5383*	0.2931	0.27
Silver	0.0479	0.0266	0.0207	0.0117	0.025
Zinc	0.935	0.56	0.4275	0.335	0.81

all concentrations given in mg/l

1 1982 301(h) Waiver Application, Addendum 1 Table 3-9

2 ibid, Table 3-10

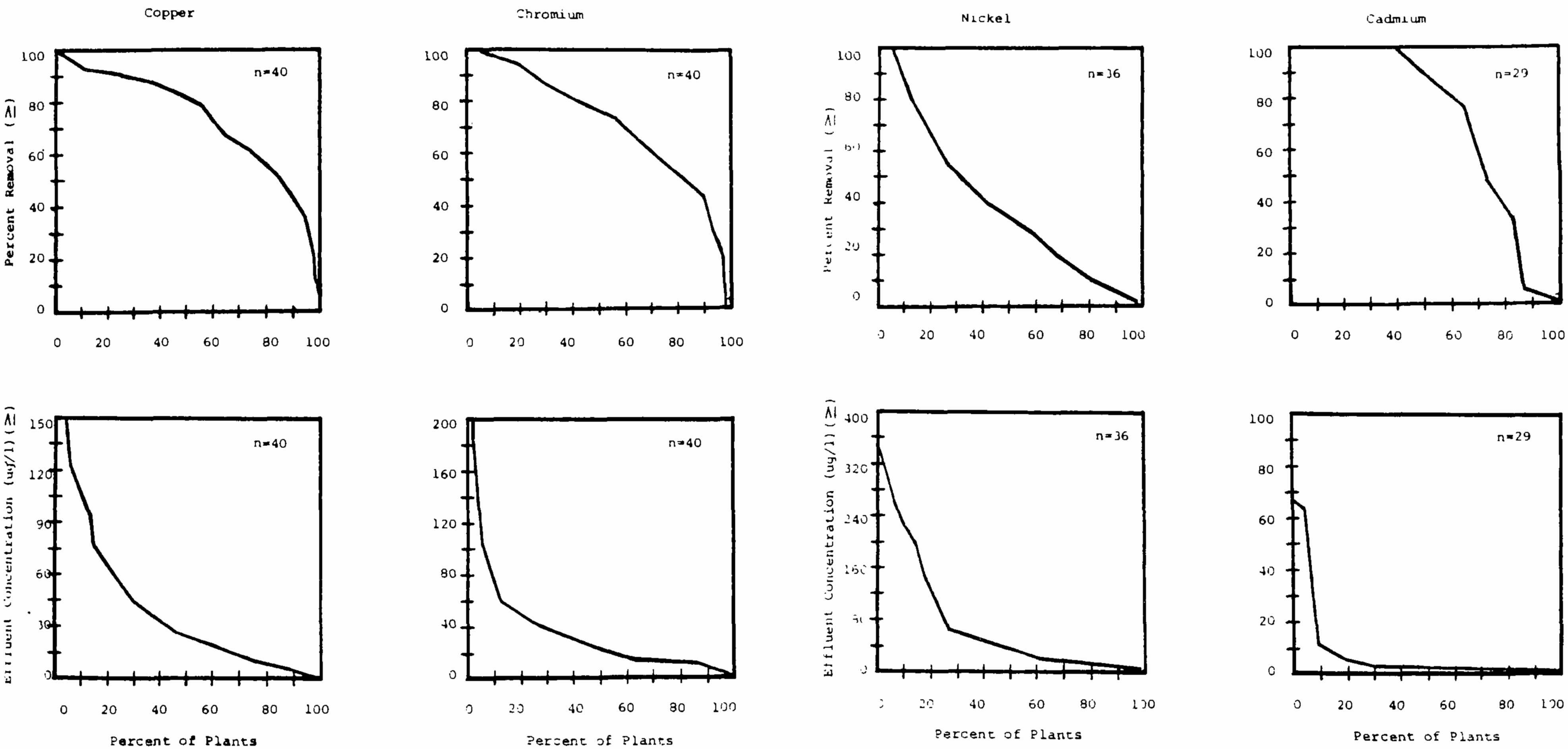
* Table 3-10 of the text cited above reported a concentration of 410 mg/l in 1975. This however has been averaged as 0.410 which may be the actual sample concentration.

Table 11.3-8

Source: EPA, 1982; Fate of Priority Pollutants in POTW's, Appendix B.

CUMULATIVE DISTRIBUTION CURVES

CUMULATIVE DISTRIBUTION CURVES

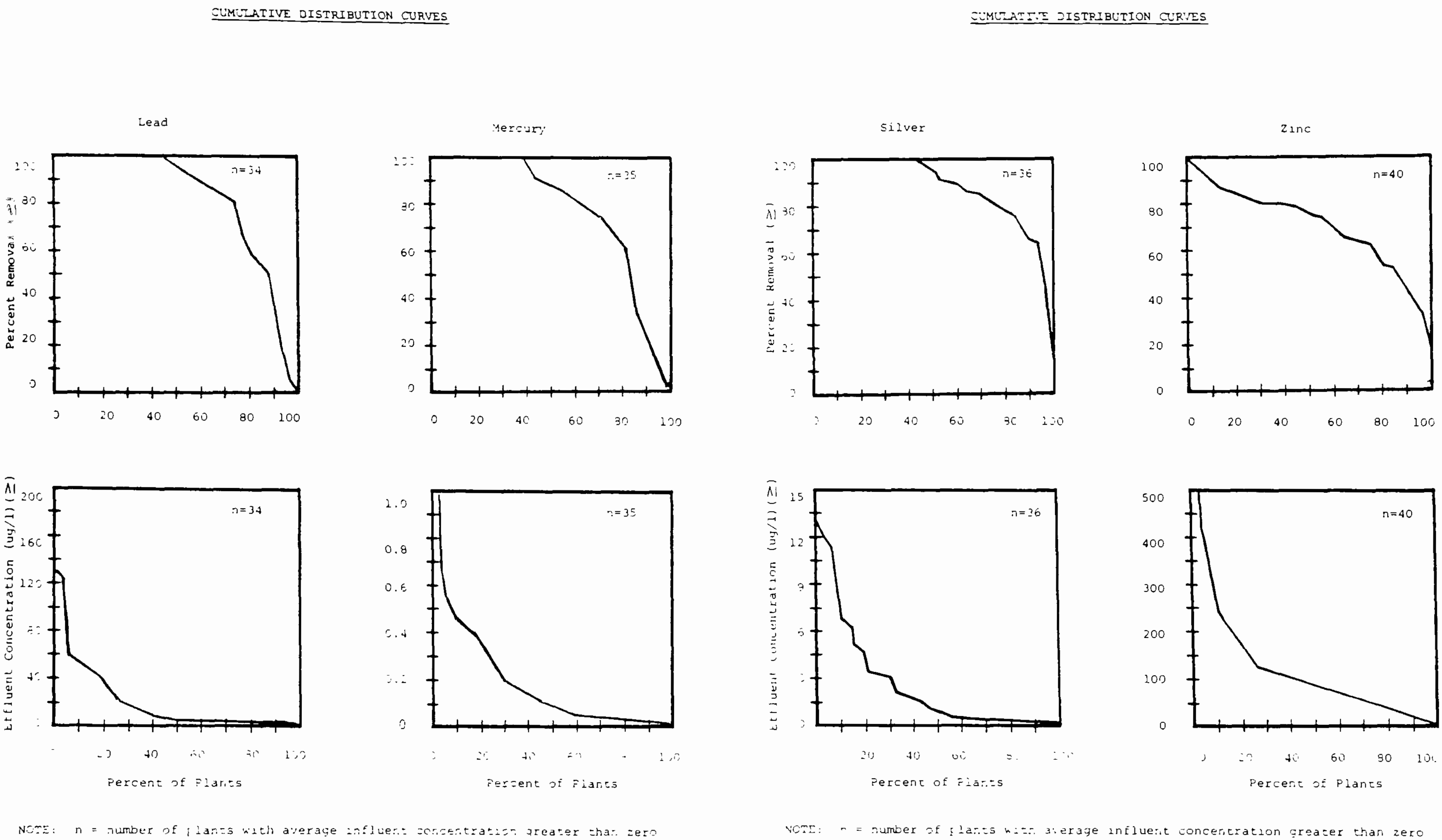


NOTE: n = number of plants with average influent concentration greater than zero

NOTE: n = number of plants with average influent concentration greater than zero

POLLUTANT REMOVAL EFFICIENCIES IN PUBLICLY OWNED TREATMENT PLANTS

fig. 11.3-5



Source: EPA, 1982; Fate of Priority Pollutants in POTW's, Appendix B.

POLLUTANT REMOVAL EFFICIENCIES IN PUBLICLY OWNED TREATMENT PLANTS

fig. 11.3-6

The effluent metals concentrations obtainable with secondary treatment plants are depicted in the cumulative distribution curves shown in Figures 11.3-5 and 11.3-6. Note that the data base includes several different types of secondary treatment plants. Also note that, except for nickel, half of the secondary treatment plants provided greater than 70% removal of metals listed.

Tables 11.3-9 and 11.3-10 show the estimated mean metals concentrations in secondary and existing primary treatment plant effluents, the EPA water quality criteria for the protection of saltwater aquatic life, and the various dilutions needed for the effluent to meet these criteria. Table 11.3-9 shows the estimated secondary effluent concentrations obtained through the use of mean MSD influent concentrations (Figures 11.3-3 and 11.3-4) and median percent removal rates for activated sludge plants reported in Table 11.3-3. The statistical validity of these estimates is unknown due to the absence of distribution statistics for the influent data. (See discussion under 11.3.3 A above.) Table 11.3-10 shows average MSD primary treatment plant effluent concentrations (Figures 11.3-3 and 11.3-4) for comparison with projected secondary effluent concentrations in Table 11.3-9. Comparison shows secondary treatment plant effluent would require much less dilution to meet the water quality criteria than existing primary effluent.

In these tables the dilution necessary to meet a water quality criterion assumes the background concentration is equal to zero. Higher dilution would be required for effluent discharges to meet the criteria where background concentrations are detectable. Where newly proposed criteria (Federal Register, Feb. 4, 1984) are lower than existing criteria, the proposed values are used for the purpose of a "worst case" analysis.

Table 11.3-11 shows the metals data obtained during the priority pollutant sampling conducted for the 301(h) Waiver Application. Comparison of this table with Table 11.3-10 shows the 301(h) Waiver data has much lower concentrations of metals than the historical data

Table 11.3-9

Metal	mg/l Mean Influent Concentration Combined D.I. 75% & N.I. 25% (1)	Secondary Treatment Plant Median % Removal (2)	mg/l Estimated Effluent Concentration	Saltwater Aquatic Life Criteria: Chronic	Saltwater Aquatic Life Criteria: Chronic Avg.	Saltwater Aquatic Life Criteria: Acute	Saltwater Aquatic Life Criteria: Acute Max.	Dilutions: min. dilutions to meet chronic criteria (Col. 3 ÷ Col. 4)	Dilutions: min. dilutions to meet acute criteria (Col. 3 ÷ Col. 5)
Cadmium	0.03	85%	.0045		.012* .0045		.038*	0	NA
Chromium	0.11	84%	.0176		.054* .018	10.3	1.20*	NA	NA
Copper	0.46	84%	.0736		.002*		.0032*	36.8*	23.0*
Lead	0.12	82%	.0216	.025	.0086*	.668	.220*	2.5*	NA
Mercury	0.0023	76%	.00055		.0001		.0019*	5.5	NA
Nickel	0.27	34%	.1782		.0071		.140	25.1	1.3
Silver	0.025	83%	.0043	--			.0023	—	1.8
Zinc	0.81	81%	.1539		.058		.170	2.7	NA

* Based on proposed criteria (Federal Register, Feb. 4, 1984)
Note: where existing criterion is lower than proposed criterion, both values are shown.

NA = Not applicable, effluent concentration < criterion.

(1) 1982 301(h) Waiver Application Addendum 1, Table 3-9.

(2) Table 11.3-3

ESTIMATED AVERAGE METALS CONCENTRATIONS IN MSD SECONDARY TREATMENT PLANT EFFLUENT AND WATER QUALITY CRITERIA

from daily sampling. Some of the 301(h) Waiver data is more recent than the daily sampling data and may therefore reflect more recent conditions. On the other hand, relatively few samples make up the 301(h) Waiver data, and at least some of the 301(h) sampling results are reported to be low because of wet weather influences.

The impacts associated with these metals concentrations are discussed below under Near Field Effects and Far Field Effects.

Table 11.3-10. Metals in primary effluent found in concentrations greater than EPA criteria for the protection of saltwater aquatic life using average annual data from daily sampling. Note that criteria may be met after initial dilution.

	MEAN EFFLUENT CONCENTRATIONS					CRITERIA					
	1 Deer Island		2 Nut Island		3	4		5		6	7
	a Table III H2.10 (1984) Avg. Conc. at Deer Is. mg/l	b Avg. Metals Conc.& mg/l	a Table III H2.10(1984) Avg. Conc. at Nut Is. mg/l	b Avg. Metals Conc.& mg/l	Combined Col. 1b x .75 + Col. 2b x .25 mg/l	Chronic/ Average Criteria mg/l Chron.	Avg.	Acute/Max. Criteria mg/l Acute	Max.	Min. Dilutions to meet chronic criteria (Col. 3/ Col. 4	Min. Dilutions to meet acute criteria (Col. 3/ Col. 5
Cadmium	0.004005	0.025	.0000838	0.0128	.0219		0.012* 0.0045		0.038*	4.87	0.58*
Chromium	0.0243	0.1068	0.0093	0.0578	0.0946		0.054* 0.018	10.3	1.20*	5.25	0.08*
Copper	0.0565	0.3487	0.0359	0.339	0.3463		0.002*		0.0032*	173.15*	108.22*
Lead	0.0323	0.116	0.0139	0.0532	0.1003	0.025	0.0086*	0.668	0.220*	11.66*	0.46
Mercury (1978-1982)	0.0009	0.00136	0.0000151	0.002	0.0015		0.0001		0.0019*	15	0.79*
Nickel	0.0441	0.1568	0.0133	0.2931	0.1909		0.0071		0.140	26.89	1.36
Silver	0.0028	0.0266	0.0013	0.0117	0.0228	--			0.0023		9.91
Zinc	0.2267	0.56	0.2702	0.335	0.5038		0.058		0.170	8.67	2.96

*Based on proposed criteria (Federal Register, Feb. 4, 1984). Note: where existing criterion is lower than proposed criterion, both values are shown.

Sources: Columns 1a and 2a, 1984 301(h) Waiver Application, Table III-H2.10 reported averages for 1984 priority pollutant sampling unless otherwise noted. Columns 1b and 2b, 301(h) Waiver Application, Addendum 1, June, 1982, Tables 3-9 and 3-10, showing average concentrations for the period 1973-1981.

Table 11.3-11. Metal priority pollutants in primary effluent found in concentrations greater than EPA criteria for the protection of saltwater aquatic life using priority pollutant data collected for 301(h) Waiver Application. Note that criteria may be met after initial dilution.

Metal Priority Pollutants	1 Deer & Nut Island Effluent Range (uncombined) ug/l	2 1984 Average Concentration Combined Deer and Nut Island Data ug/l	3 Chronic/ Average Criteria ug/l Chr.	 Avg.	4 Acute/ Maximum Criteria ug/l Acute	 Max.	5 Min. Dilutions for Average Concentration to Meet Chronic/ Ave. Criteria (Col. 2/Col. 3)	6 Min. Dilutions for Maximum Concentration to Meet Acute/ Max. Criteria (Max. Value Col. 1/Col. 4)	Min. Dilutions for Average Concentration to Meet Acute/ Max. Criteria (Col. 2/Col. 4)
Chromium	<3-580	20.61		54* 18	10300	1200	1.14	0.48	0.02*
Copper	2-271	51.42		2.0*		3.2*	25.71*	84.69*	16.07*
Lead	14-54	27.71	25	8.6*	668	220*	3.22*	0.25*	0.13*
Mercury	<0.2-2.6	0.73		0.1		1.9*	7.3	1.37*	0.38*
Nickel	<5-462	36.43		7.1		140	5.13	3.3	0.26
Silver	<1-30	2.50		--		2.3	--	13.04	1.09
Zinc	30-1245	273.63		58		170	4.10	7.32	1.40

*Based on proposed criteria (Federal Register, Feb. 4, 1984).

Sources: Column 1 data, 1978, 1979, 1982, and 1984 priority pollutant raw data as reported in 301(h) Waiver Applications. Column 2 averages from 1984 301(h) Waiver Application Table III-H 2.10; note that some averages reported in Table III-H 2.10 are based on results from earlier years.

D. Other Priority Pollutants in the MSD Wastewater

One hundred and twenty-eight chemicals have been identified by EPA as "priority pollutants". These pollutants are toxic to plants and animals, including humans. (The word "toxic", as used in this discussion, is equivalent to "poisonous" or "disease causing"). The metals discussed above under subsection C are all priority pollutants. Samples of MSD wastewater for priority pollutant testing were taken in 1978, 1979, 1982, and 1984. In total twenty to thirty effluent samples were taken at each treatment plant. Influent data is only available for 5 samples at each plant in 1978.

To evaluate these priority pollutant data, a screening process was used. This process, depicted in Figure 11.3-7 allowed the priority pollutants to be grouped into the following categories:

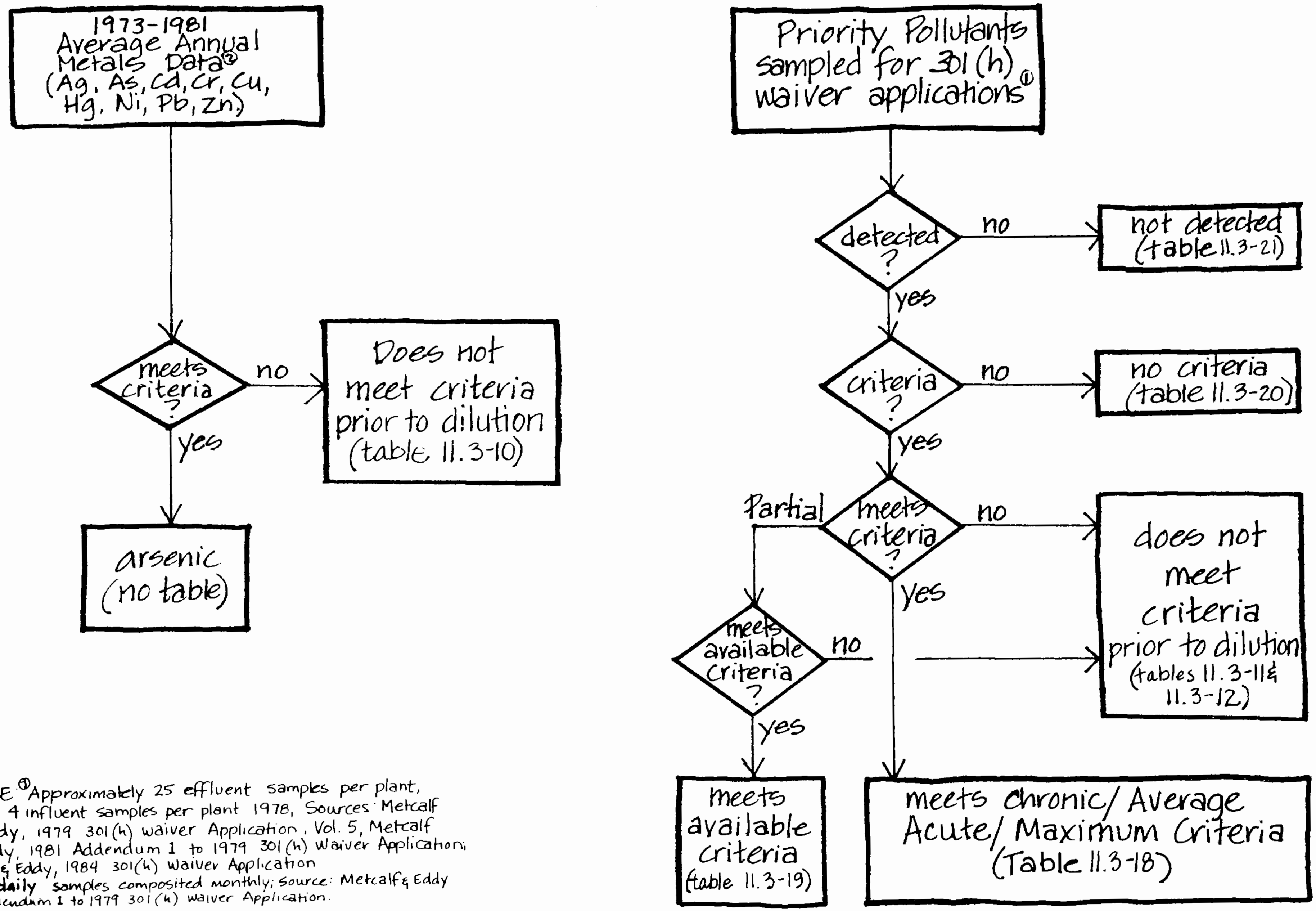
1. Priority pollutants which occur in effluent at concentrations exceeding EPA saltwater aquatic life criteria prior to dilution (Table 11.3-12).

2. Priority pollutants which occur in effluent at concentrations which meet EPA saltwater aquatic life criteria (Table 11.3-18 11.3 Appendix A).

3. Priority pollutants present at concentrations which meet existing and proposed maximum criteria for saltwater aquatic life, but for which no chronic or average criteria exist (Table 11.3-19, 11.3 Appendix A).

4. Priority pollutants detected, but for which no saltwater aquatic life criteria exist (Table 11.3-20, 11.3 Appendix A).

5. Priority pollutants not detected in any of the samples (Table 11.3-21, 11.3 Appendix A).



SOURCE: ① Approximately 25 effluent samples per plant, 1978-84, 4 influent samples per plant 1978, Sources: Metcalf and Eddy, 1979 301(h) waiver Application, Vol. 5, Metcalf and Eddy, 1981 Addendum 1 to 1979 301(h) Waiver Application; Metcalf & Eddy, 1984 301(h) Waiver Application
② From **daily** samples composited monthly; source: Metcalf & Eddy 1981 Addendum 1 to 1979 301(h) waiver Application.

PROCESS FOR SCREENING MSD WASTEWATER PRIORITY POLLUTANT DATA

fig. 11.3-7

TABLE 11.3-12. Non-metal priority pollutants in primary effluent found in concentrations greater than EPA criteria for the protection of saltwater aquatic life. Note that criteria may be met after initial dilution.

Non-Metal Priority Pollutants	1 Deer & Nut Island Effluent Range (uncombined) ug/l	2 1984 Average Concentration Combined Deer and Nut Island Data ug/l	3 Chronic/ Average Criteria ug/l Chr.	 Avg.	4 Acute/ Maximum Criteria ug/l Acute	 Max.	5 Min. Dilutions for Average Concentration to Meet Chronic/ Ave. Criteria (Col. 2/Col. 3)	6 Min. Dilutions for Maximum Concentration to Meet Acute/ Max. Criteria (Max. Value Col. 1/Col. 4)	Min. Dilutions for Average Concentration to Meet Acute/ Max. Criteria (Col. 2/Col. 4)
Pesticide Compounds:									
Heptachlor	ND-<10	0.0369		0.0036		0.053	10.25	188.67	0.70
PCB-1242(1)	ND-2.138	1.0293		0.030	10	5*	34.31	0.43*	0.21*
PCB-1260(1)	ND-0.1924	0.0333		0.030	10	5*	1.11	0.04*	0.01*
PCB-1254(1)	ND-5.2	0.0716		0.030	10	5*	2.39	1.04*	0.01*
PCB-1016(1)	ND-106	38.15		0.030	10	5*	1271.66	21.2*	7.63*
Total PCB's(1)(2)	0.28-2.139	1.136		0.030	10	5*	37.86	0.43*	0.23*
Dieldrin	ND-<10	0.0127		.0019		0.71	6.68	14.08	0.02
4,4 DDT	ND-0.23	0.0313		.0010		0.13	31.3	1.75	0.24
Endrin	ND-0.031	0.0151		.0023		0.037	6.56	0.84	0.41
Endosulfan I	ND-0.398	0.0604		0.0087		0.034	6.94	11.71	1.78
Endosulfan II	ND-0.281	0.0960		0.0087		0.034	11.03	8.27	2.82
Total Endosulfan	ND-0.654	0.0782(4)		0.0087		0.034	8.99	19.24	2.30
Other Compounds:									
Chlorobenzene	ND-170	102.5	129		160		0.79	1.06	0.64
Cyanide (3)	<0.01 - 82.139	39.0791	2.0	0.57*	30	1.0*	68.56*	82.14*	39.08*

*Based on proposed criteria (Federal Register, Feb. 4, 1984).
(1) Limits of detection for 1982 sampling = 50 ug/l.
(2) 1984 data only. 1984 data PCBs associated with solids only, soluble PCBs not detected (<2.50 mg/l).
(3) Cyanide not included in 1979 samples.
(4) Calculated from Endosulfan I and II averages.

Sources: Column 1 data, 1978, 1979, 1982, and 1984 priority pollutant raw data as reported in 301(h) Waiver Applications
Column 2 averages from 1984 301(h) Waiver Application Table III-H 2.10; note that some averages reported in Table III-H 2.10 are based on results from earlier years (e.g., PCB-1016 above)

For the non-metal priority pollutants detected in concentrations greater than EPA criteria, Table 11.3-12 shows the range of concentrations, the average concentration assuming combined Deer and Nut Island effluent, saltwater aquatic life criteria, and dilution required for effluent discharges to meet the criteria. The dilution required to meet the criterion assumes a zero background concentration; higher dilution would be required where background concentrations are detectable.

Looking at Table 11.3-12, the high value shown for PCB-1016 (106 ug/l) may be an outlier, that is, a product of sampling error not representative of actual concentrations. Also, quality assurance data for the 1984 sampling suggests that reported concentrations of priority pollutants may be generally lower than actual effluent concentrations (based on percent recovery in control samples).

Secondary treatment plant effluent concentrations for these priority pollutants have not been estimated due to insufficient influent concentration data. However, experimental data has shown greater than 90% removal of PCB 1254, heptachlor and chlorobenzene, in secondary treatment plant simulators (Petrasek, et. al., 1983 a and b).

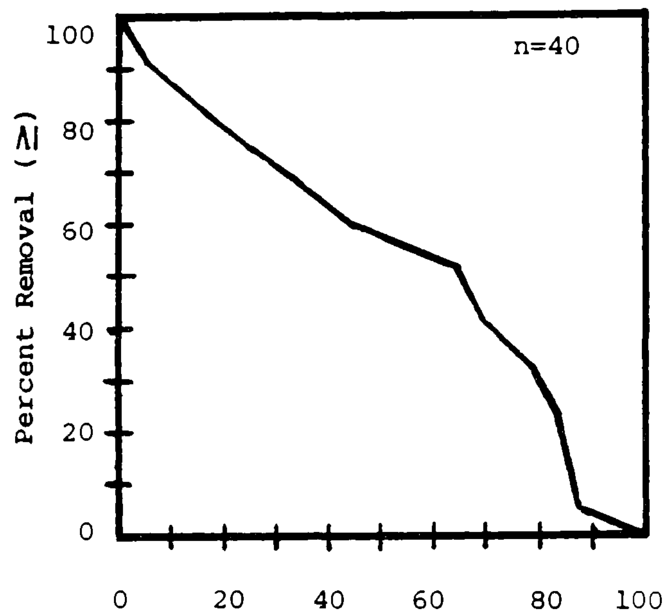
Cumulative distribution curves for cyanide removal in secondary treatment plants are shown in Figure 11.3-8. Assuming influent concentrations of cyanide to a secondary process will be equal to, or greater than, those found presently in Nut and Deer Island effluents, the median percent removal for cyanide of 62% (Table 11.3-3) indicates that secondary treatment plant discharges may exceed average and maximum cyanide criteria for the protection of saltwater aquatic life.

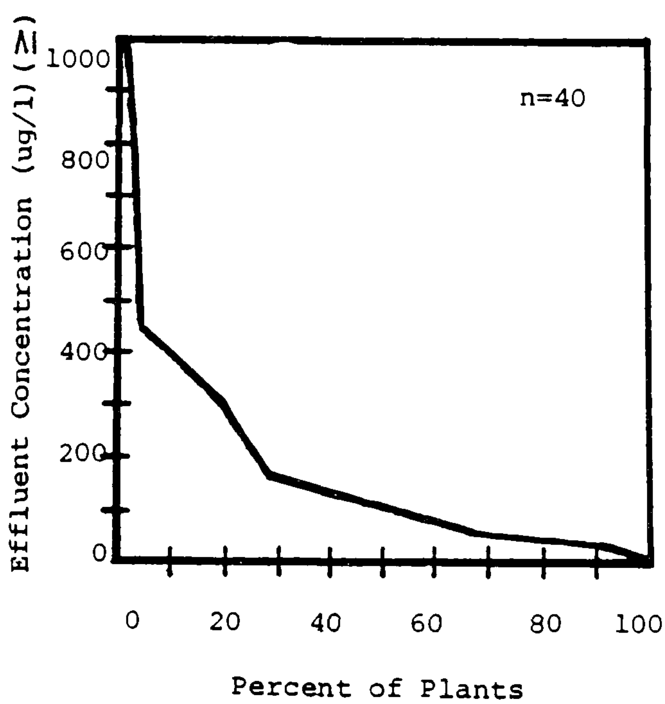
The impacts associated with these pollutant concentrations are discussed below under Near Field Effects, and Far Field Effects.

POLLUTANT REMOVAL EFFICIENCIES IN PUBLICLY OWNED TREATMENT PLANTS

CUMULATIVE DISTRIBUTION CURVES

Cyanide





NOTE: n = number of plants with average influent concentration greater than zero

Source: EPA, Fate of Priority Pollutants in POTW's, Pg. B-6

11.3.4 Near Field Effects

A. Initial Dilution

Wastewater effluent is mostly freshwater. Freshwater is less dense than seawater and will therefore rise after discharge into saltwater. As the effluent mixes with the saltwater, its density increases and its rate of rise slows. This is known as initial dilution. The effluent plume will rise more and more slowly, mixing with the seawater, until its density is the same as the surrounding saltwater. This marks the completion of initial dilution.

Initial dilution is important because Massachusetts Water Quality Standards apply after initial dilution, or outside the "zone of initial dilution" (ZID). Therefore, wastewater effluent may exceed water quality criteria at the point of discharge but still meet water quality standards after initial dilution.

As explained below, the factors which favor (maximize) initial dilution are fast currents, deep water, and long effluent diffusers.

Several sites have been investigated by the MDC for the discharge of treated effluents (Figure 11.3-1). For combined north and south system flows, the President Roads site appears to be the closest site to Deer or Long Islands where a discharge could be environmentally acceptable. This site was therefore chosen for the purpose of estimating initial dilutions during different current and ambient density conditions.

After initial dilutions are estimated for a given site, they are compared with Tables 11.3-9 through 11.3-12 which show the dilution needed to meet EPA criteria for the protection of saltwater aquatic life.

Method of Initial Dilution Modeling

To evaluate the water quality impacts of effluent discharges to Boston Harbor, preliminary estimates of initial dilution (ID) of the discharge were developed. To provide these estimates, an accepted and verified numerical model, which could faithfully replicate the relevant plume relationships, was sought. The plume model MERGE accounts for the effects of current, ambient density stratification and port spacing on plume behavior, and has been extensively verified (EPA 600/6-82-004b) A desktop version of MERGE has been derived based upon a similarity theory and was selected as the cost-effective model of choice for this analysis.

1. Basic Approach

The premise upon which preliminary applications of the model were founded consisted of the following:

i) "Ambient density stratification adversely affects initial dilution. The greatest density gradient over the height-of-rise of the plume will result in the lowest dilution period." (Metcalf & Eddy, 1979, 301(h) Waiver Application, p. B1-22).

"Ambient density stratification in receiving water limits the height of rise of buoyant jets, traps the plume below the surface, and reduces initial dilution by preventing effective use of full depth of water. These effects are more pronounced with increased stratification." (Metcalf & Eddy, 1979, 301(h) Waiver Application p. B1-21).

ii) "Currents ... elongate the trajectory of plumes by carrying them away from the diffuser; as a result, they increase the initial dilution of the buoyant plumes." (Metcalf & Eddy, 1979, 301(h) Waiver Application, p. B1-21).

Two extreme conditions were selected for evaluation. They were:

<u>Condition 1</u>: minimum density stratification with maximum current, and

<u>Condition 2</u>: maximum density stratification with minimum current.

It was assumed, all other input values considered equal, that Condition 1 would provide much greater initial dilution than Condition 2. The results which were obtained from these preliminary runs confirmed this assumption.

This evaluation of the model provided insight as to the resultant variation in initial dilution estimates as affected by simultaneous changes in two key input parameters. Later iterations using the model evaluated the relative change in ID with respect to a change in diffuser characteristics discussed below. This provided a better appreciation of the model's sensitivity to these characteristics.

2. MERGE Model Description

The preliminary ID estimates were obtained from the "desktop" application of MERGE. A set of tables which describe an infinite number of possible diffuser, effluent and ambient flow configurations has been developed based upon the theory of similarity. For this reason, the model requires that a limited number of similarity conditions be satisfied. As explained in the EPA manual (EPA 600/6-82 0046; footnotes omitted):

> The number of similarity conditions is determined by the difference between the number of independent variables and primary variables involved in the problem. Primary variables must include mass, time, and distance. The present problem involves eleven independent variables implying eight similarity conditions. The independent variables, corresponding symbols, units, similarity parameters, and their names are listed in (Table 11.3-13). As the dilution tables are based on a linear equation of state, the effluent and ambient densities p_e and p_a, respectively, replace four independent

variables: the effluent and ambient salinities and temperatures. This effectively reduces the number of similarity conditions by two to six.

It is advantageous to further reduce the number of similarity conditions to minimize the number of tables necessary to represent the flow configurations of interest. From experimental observations, it is found that plume behavior is basically invariant for large Reynolds numbers reducing the number of similarity conditions to five. Finally, the ratio p_e/p_a and the stratification parameter can be combined in a composite stratification parameter, SP, where,

$$SP = (p_a - p_e)/(d_o dp_a/dz)$$

Use of the tables requires the input of the plume variables listed in Table 11.3-13 in the form of the following four similarity parameters:

1. Densimetric Froude Number: $Fr = V/\ g'd_o$,

2. Stratification Parameter: $SP = Pa-Pe/(d_o \ dP_a/dz)$,

3. Current to Effluent Velocity Ratio: $K = Ua/V$

4. Port Spacing: $PS = \frac{S}{d_o}$,

The determination of preliminary values for model input parameters required the evaluation and comparison of siting and sizing criteria as presented in several available sources. These criteria are presented in Table 11.3-14. The comparison of these values led to a preliminary set of criteria for the model. The values of input variables selected for the preliminary applications of MERGE are presented in Table 11.3-15. Note that ambient density and density stratification data are from Boston Lightship (due to lack of data for President Roads during critical periods). Density stratification reported for Boston Lightship in August is close to that reported for President Roads during July, and ambient densities reported for President Roads in July are not significantly different from those reported for Boston Lightship in August with respect to the model's sensitivity (see Figures B1-15 and 16, 1979 301(h) Waiver Application).

Table II.3-13

PLUME VARIABLES, UNITS, AND SIMILARITY CONDITIONS

Variable	Symbol	Units	Dimensionless Sim. Parm	Name
Effluent density	p_e	ML^{-3}	none--primary variable	none
Effluent velocity	v	LT^{-1}	none--primary variable	none
Effective diameter	d_o	L	none--primary variable	none
Ambient density	p_a	ML^{-3}	p_e/p_a	density ratio
Reduced gravity	g'	LT^{-2}	$v/\sqrt{g'd_o}$	densimetric Froude number: Fr
Density stratification	dp_a/dz	ML^{-4}	$p_e/(d_o dp_a/dz)$	stratification parm.
Current velocity	u_a	LT^{-1}	u_a/v	current to effluent velocity ratio: k
Kinematic viscosity	ν	L^2T^{-1}	d_o/ν	Reynolds number: Re
Port spacing	S_1	L	S_1/d_o	Port spacing parm.: PS

Notes: 1. $g' = ((p_a-p_e)/p_e)g$ where g is the acceleration of gravity (9.807 $msec^{-2}$).

2. In the present application a composite stratification parameter, SP, is used in lieu of the density ratio and the stratification parameter. $SP = (p_a-p_e)/(d_o dp_a/dz)$.

3. The diameter, d_o is taken to be the vena contracta diameter.

Source: EPA-600/6-82-004b

TABLE 11.3-14

SITING AND SIZING CRITERIA

SOURCE	FLOW MGD (CAPACITY)	JET VELOCITY	PORT DIAMETER	PORT SPACING	MANIFOLD VELOCITY	DIFFUSER LENGTH
S.O.S.	500 avg 1240 pk	approx. 15 ft/sec	as small as possible but 5" min	such that adjacent plumes do not merge	5-7ft/sec 7.5 pk not <2	Not Specified
DEIS	Not Specified	2.6 ft/sec Average 6 ft/sec pk	12" 8.5"	10'	Not Specified	1000 ft 2000 ft
(1979) Waiver Application	575 avg 1290 pk	Not Specified	5½", 6", 6½"	22' on each side	1.5 to 3.5 ft/sec	7700 ft
(1984) Waiver Application	500 avg 1240 pk	5-8 avg 7-11 pk	5½"-6½"	22' on each side	Not Specified	6560 ft
Grace, R.A. <u>Marine Outfall Systems</u>	Not Specified	Not Specified	Water Depth, h h - 100 to h - 700	Water Depth, h h - 2 to h - 75	2 to 3 ft/sec at pk	Typically a few hundred to a few thousand
Metcalf & Eddy <u>Wastewater Treatment, Disposal</u> & <u>Reuse</u>	Not Specified	16 ft/sec at pk (ex.)	3" to 9"	8' to 15'	2 to 3 ft/s less than 8 to 10 ft/sec	Not Specified
CEM Preliminary	500 avg 1240 pk	2.5-7 ft/sec average 7-17 ft/sec pk	4" to 13"	10' to 20'	2 to 5 ft/sec	1500 ft to 1000 ft

TABLE 11.3-15

PRELIMINARY VALUES OF INPUT VARIABLES

VARIABLE	SYMBOL	VALUE	REFERENCE
Effluent density	$P_{e(March)}$ $P_{e(August)}$	1.00449 g/cm^3 1.00287 g/cm^3	79 301(h) Vol. 1, Table B1-8, "Combined"
Effluent velocity	Vavg Vpeak	2.13 m/sec 5.18 m/sec	assumed
Port diameter	d_o	0.25 m	calculated based on velocity assumption
Ambient density	$P_{a(March)}$ $P_{a(August)}$	1.02576 g/cm^3 1.02491 g/cm^3	79 301(h) Vol. 1, Fig. B1-16 (at 30 m)
Density stratification	$dP_a/dz_{(March)}$ $dP_a/dz_{(August)}$	0.0 kg/m^4 0.07 kg/m^4	79 301(h) Vol. 1, Fig. B1-16 (at 30 m)
Current velocity	$U_{a(minimum)}$ $U_{a(maximum)}$	0.05 m/sec 0.90 m/sec	N.O.A.A. Tidal Current Charts, Boston Harbor
Water depth at discharge	D	21 m to 24 m	Boston Harbor Nav. Chart at President Roads
Port spacing	S,	4.6 m	assumed

3. Diffuser Characteristics

The range of values, as presented in Table 11.3-14, was used to determine the relation between diffuser length, port spacing, port diameter, and jet velocity. These relationships are depicted on the following graphs (Figures 11.3-9 - 11.3-12). Based on general recommendations, the required port diameter for the outfalls should be in the range of 5 to 10 inches, and the ports should be spaced from 10 to 20 feet apart. As can be seen, these requirements can only be met for diffusers of about 3000 feet in length or longer. The 6000 foot long diffuser provided much more flexibility in establishing the port exit velocity.

Subsequent iterations using the model evaluated the changes in initial dilution for various diffuser parameter combinations both within and outside of the recommended ranges. The results of these iterations are presented in Table 11.3-16. Review of these results indicates that significant changes in initial dilution are realized only for significant changes in diffuser length for a given water depth and current velocity. Port spacing, velocity, and diameter do have an effect on the results. However, all of the results for a specific diffuser length fall within a relatively small range.

RELATIONSHIPS BETWEEN EFFLUENT DIFFUSER PARAMETERS

L = 1500'   Qavg = 500 mgd   Qpk = 1240 mgd

SPACING	# PORTS	PORT DIAMETER VELOCITY IN FT/SEC				
		Vavg=3	Vavg=4	Vavg=5	Vavg=6	Vavg=7
5'	300	13"	11"	10"	9"	8"
10'	150	18"	15"	14"	13"	12"
15'	100	22"	19"	17"	15"	14"
20'	75	25"	22"	19"	18"	16"

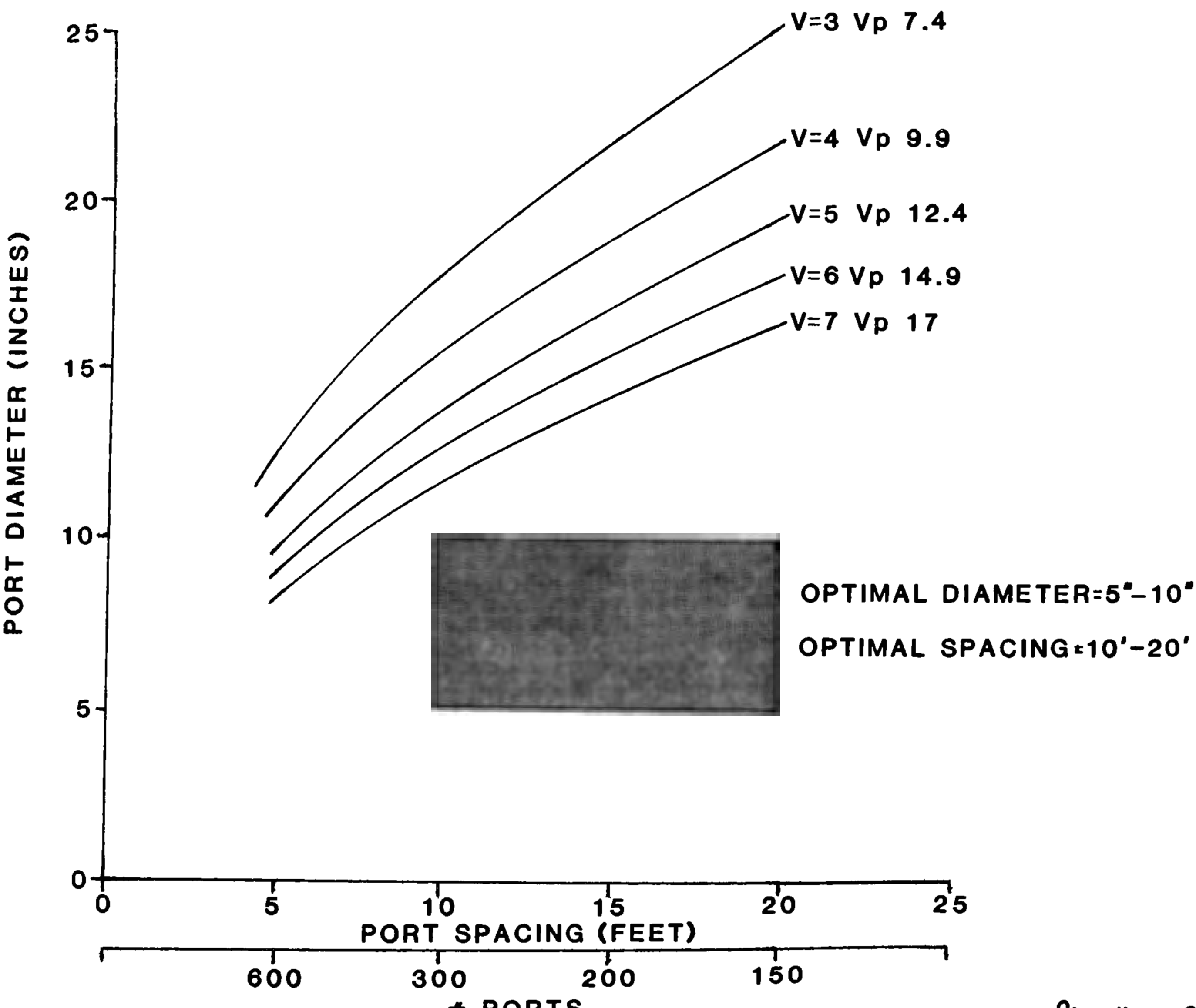


fig. 11.3-9

RELATIONSHIPS BETWEEN EFFLUENT DIFFUSER PARAMETERS

L = 3000' (or 2 @ 1500' or 3 @ 1000')

SPACING	# PORTS	PORT DIAMETER VELOCITY FT/SEC				
		Vavg=3	Vavg=4	Vavg=5	Vavg=6	Vavg=7
5'	600	9"	8"	7"	6"	6"
10'	300	13"	11"	10"	9"	8"
15'	200	15"	13"	12"	11"	10"
20'	150	18"	15"	14"	13"	12"

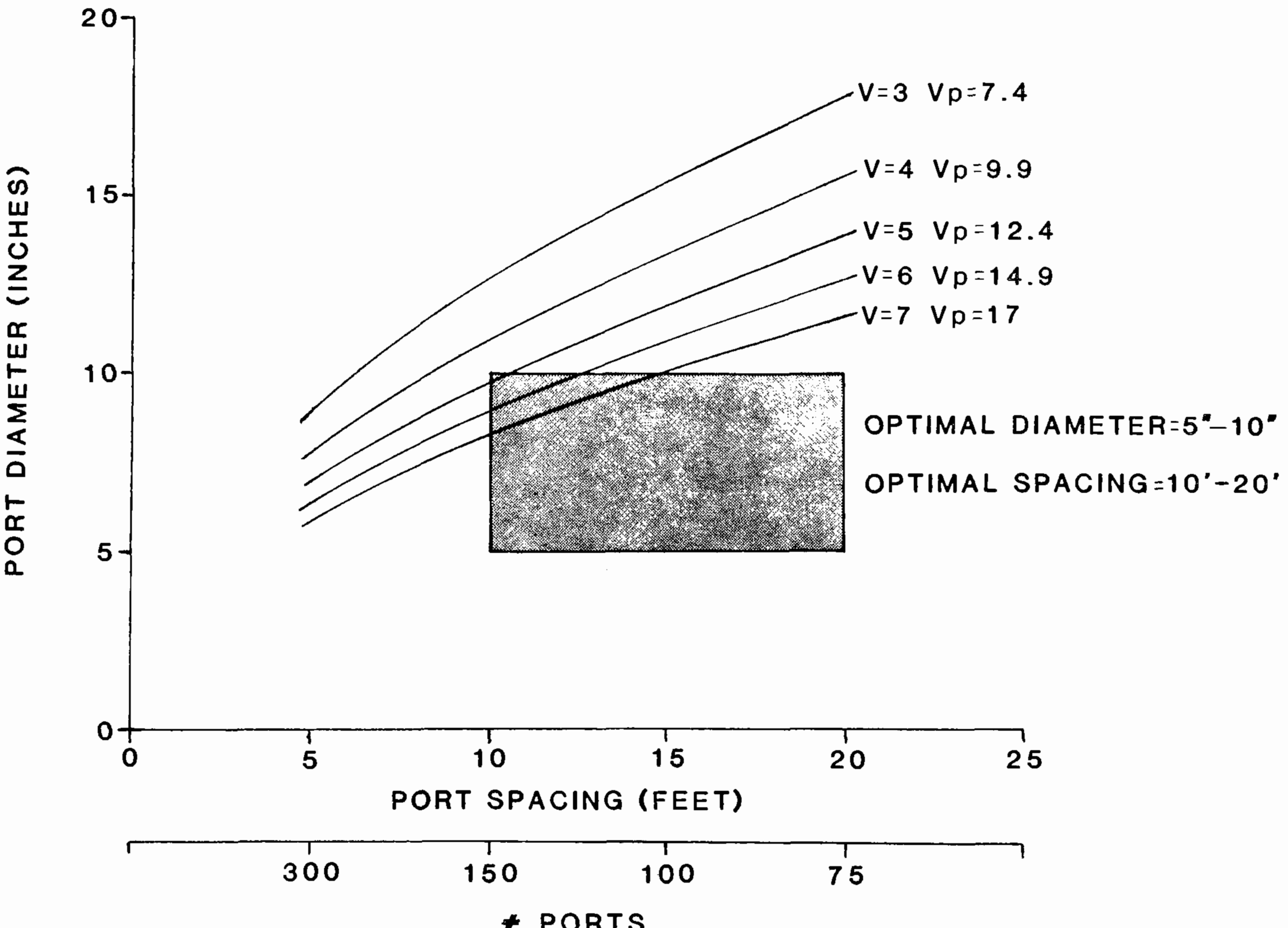
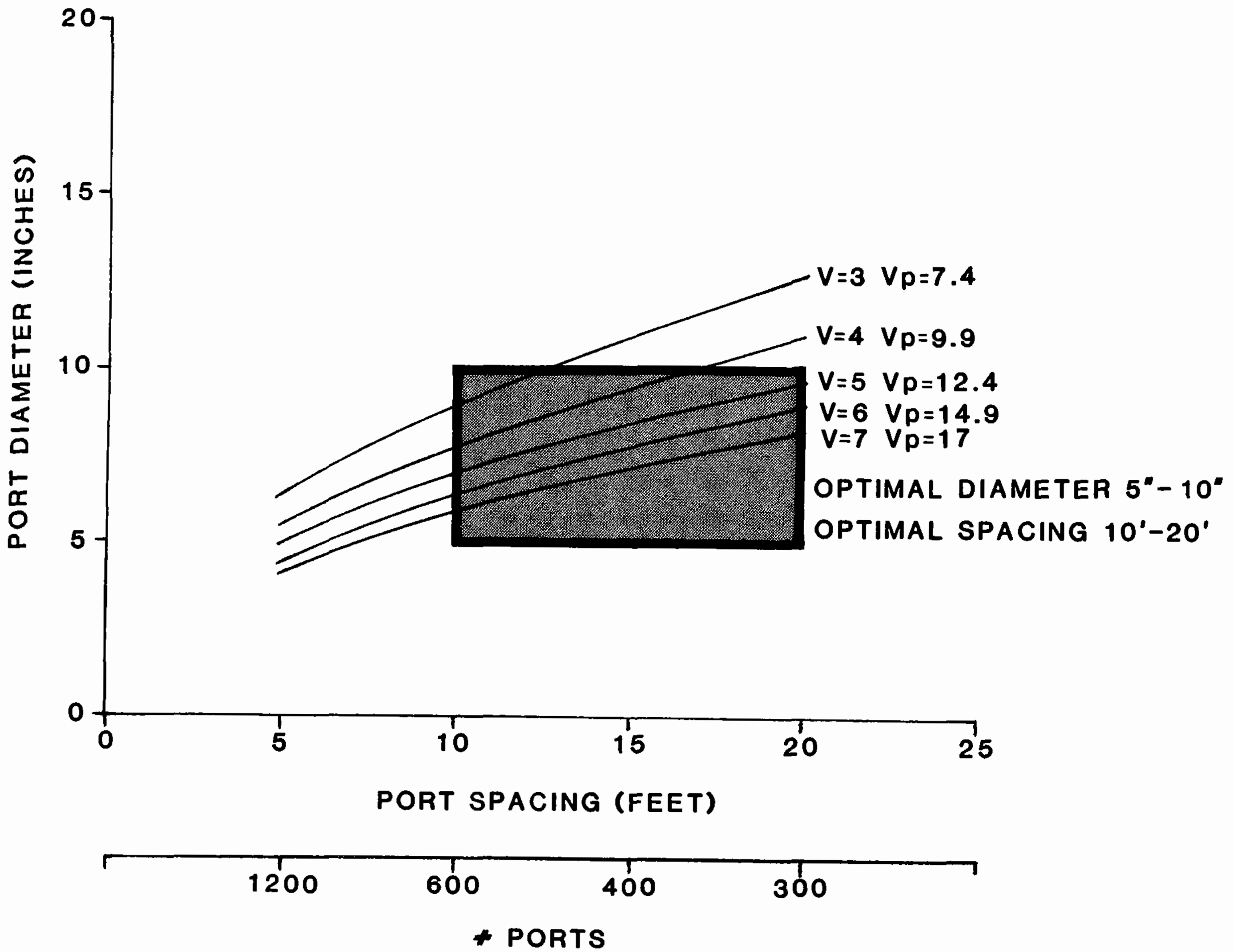


fig. 11.3-10

RELATIONSHIPS BETWEEN EFFLUENT DIFFUSER PARAMETERS

L = 6000' Qavg=500 mgd Qpk = 1240 mgd

SPACING	# PORTS	PORT DIAMETER VELOCITY IN FT/SEC				
		Vavg=3	Vavg=4	Vavg=5	Vavg=6	Vavg=7
5'	1200	6"	5"	5"	4"	4"
10'	600	9"	8"	7"	6"	6"
15'	400	11"	9"	8"	8"	7"
20'	300	13"	11"	10"	9"	8"



RELATIONSHIPS BETWEEN EFFLUENT DIFFUSER PARAMETERS

Assume V = 7 (avg) is good;

SPACING	LENGTH				
	2500'	3000'	3500'	4000'	4500'
10'	9	8	8	7	7
15'	11	10	9	9	8
20'	13	12	11	10	10

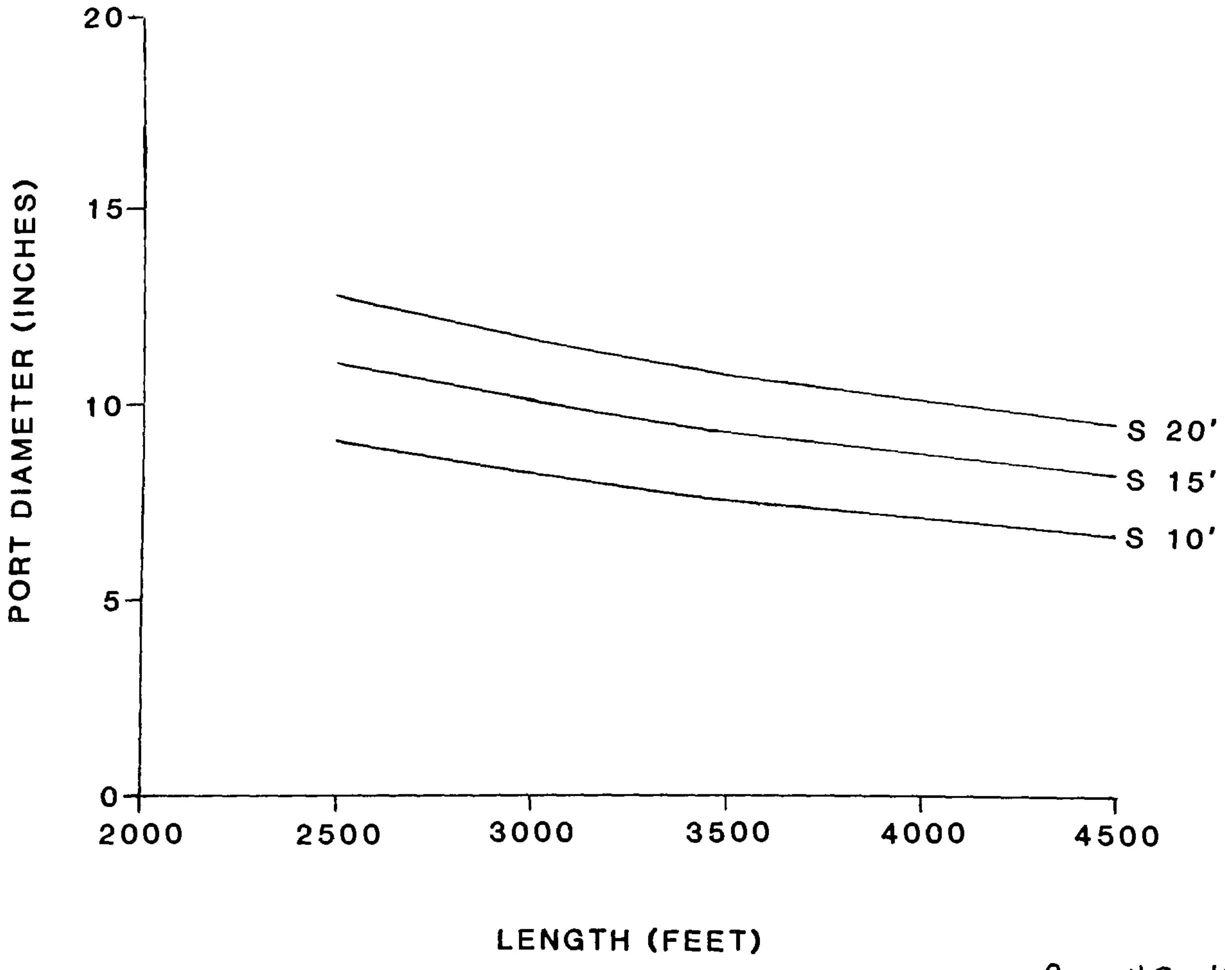


fig. 11.3-12

TABLE 11.3-16

RESULTS OF INITIAL DILUTION MODELING FOR PRESIDENT ROADS SITE

					Worst Case: minimum current velocity, maximum density stratification			Best Case: maximum current velocity no stratification
Trial	Diffuser Length (feet)	Port Diam. (inches)	Avg. Exit Velocity from Port (feet/sec)	Port Spacing (Ft.)	Rise M (meters)	Rise Ft. (feet)	ID.	ID Depth Limited 24M=73 Ft.
1	2000*	10"	7	10	12	36.5	44	81
2	2000	12"	5	10	13	39.5	40	85
3	2000	17"	2.5	10	15	46	26	43
4	3000	8"	7	10	14	43	46	73
5	3000	9"	6	10	14.5	44	46	65
6	3000	10"	7	15	11	33.5	49	176
7	3000	13"	3	10	9	27	34	82
8	6000	4"	7	5	7	21	47	135
9	6000	5"	5	5	9	27	46	107
10	6000	6"	3	5	9	27	65	159
11	6000	6"	7	10	9	27	67	179
12	6000	7"	5	10	11	33.5	65	101
13	6000	8"	7	20	10	30.5	56	135
14	6000	9"	3	10	10	30.5	52	126
15	6000	10"	2.5	10	11	33.5	52	116
16	6000	10"	5	20	11	33.5	47	141
17	6000	13"	3	20	12	36.5	51	114
18	10000	4.5"	7	10	7	21	75	241
19	10000	5"	5	10	7	21	74	206
20	10000	9"	2.5	15	10	30.5	67	223

B. Effluent Discharges and Water Quality Criteria

At times, effluent discharges at any of the sites considered will cause ambient water quality to exceed State and/or Federal water quality criteria. Compared to the continuation of existing treatment plant discharges, any of the alternatives under consideration would provide better conformance to the criteria.

Comparing estimated initial dilutions (Table 11.3-16) with estimated pollutant concentrations (Tables 11.3-9 through 11.3-12) suggests that for secondary treatment plant discharges, during periods of maximum density stratification and above average pollutant loading, EPA's chronic and acute criteria for the protection of saltwater aquatic life may be exceeded for inorganic and pesticide compounds, particularly copper, cyanide, and PCB's.

Although no data is presented for chlorine loading in effluent, concentrations of chlorine produced oxidants after initial dilution may exceed proposed chlorine criteria for the protection of saltwater aquatic life (these criteria would require that average concentration of chlorine produced oxidants should not exceed 7.4 ug/l, and the maximum should not exceed 13 ug/l). Typical chlorine concentrations necessary for disinfection are shown in Figure 11.3-13. Note that this figure shows HOCl concentrations necessary for 99% kill; greater percent kill is generally necessary for effluent discharges to meet State bacterial criteria. This figure shows that lower chlorine dosages may be used where sufficient contact time is available. This suggests that with longer outfalls, lower chlorine concentrations may be used for disinfection, for a given quality of effluent and desired percent kill.

Detailed facility planning and design should consider alternative disinfection methods and practices to minimize chlorine's toxic effects on marine life. Such alternatives should include contact chambers with vertical baffling (to avoid short circuiting), siting outfalls away from shellfish beds and public beaches, seasonal chlorination or no

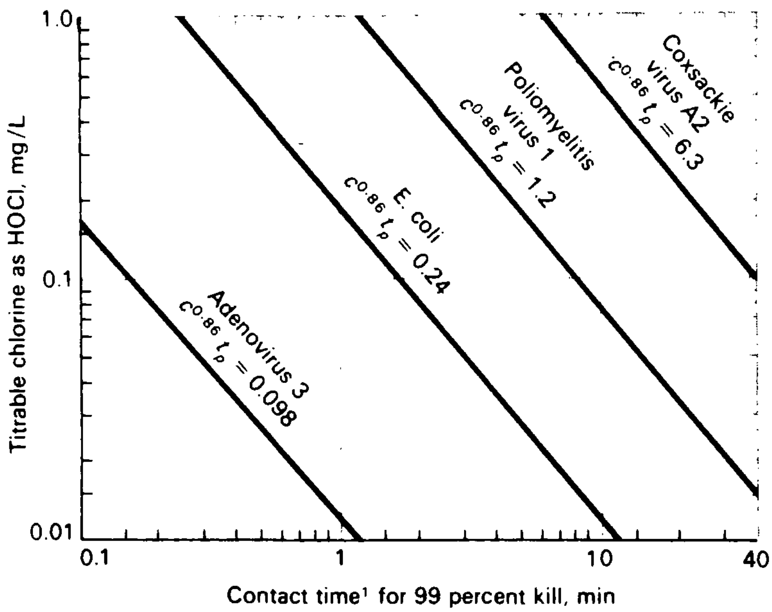


fig. 11.3-13 Concentration of chlorine as HOCl required for 99 percent kill of *E. coli* and three enteric viruses at 0 to 6°C [2]. Note: mg/L = g/m^3.

Source: Metcalf & Eddy Inc. Wastewater Engineering, pg. 302. 1979 chlorination for longer outfall alternatives, and dechlorination. On-site manufacture of sodium hypochlorite from sea water should also be investigated as an alternative to chlorine transport through populated neighborhoods.

Chlorine disinfection of wastewater is also known to cause the formation of chlorinated hydrocarbons such as chloroform (EPA 440/1-82/303 p 69). The facility planning and design evaluation of different chlorine disinfection alternatives should therefore consider the impacts of chlorinated hydrocarbon formation.

C. Toxic Chemical Impacts on Indigenous Marine Life

The contribution of treatment plant effluent to the prevalence of fish diseases in Boston Harbor is unknown, but may be significant given the high mass emissions of effluent solids, the relatively high concentrations of toxicants including chlorinated hydrocarbons in effluent solids, and the preliminary findings of research showing a probable association between toxicants and fish diseases (Metcalf & Eddy; 1984 301(h) Waiver Application, Volume 2, p III-D4.29 through III-D4.45 and Volume 4, p. 5-92 and 5-93). Massachusetts DEQE and the Division of Marine Fisheries are now conducting fish sampling and analysis to determine the extent and causes of fish diseases in Boston Harbor and other Massachusetts coastal areas. Through reduced toxics loading to harbor waters and sediments, any of the alternatives to existing treatment facilities has the potential for improving the health of harbor marine life.

The Tables in 11.3 Appendix B show acute toxicity and bioaccumulation data for local marine species for those toxicants of greatest concern.

11.3.5 Far Field Effects

Far field effects are those which occur or persist beyond the zone of initial dilution. As shown above in Near Field Effects, effluent disposal through a properly designed diffuser will dilute most toxic compounds in the plume to concentrations which will not harm marine life. After initial dilution, the far field marine impacts of effluent disposal are:

1. lowering of ambient dissolved oxygen,

2. nutrient enrichment of water and sediments,

3. bacterial contamination of beaches and shellfish beds,

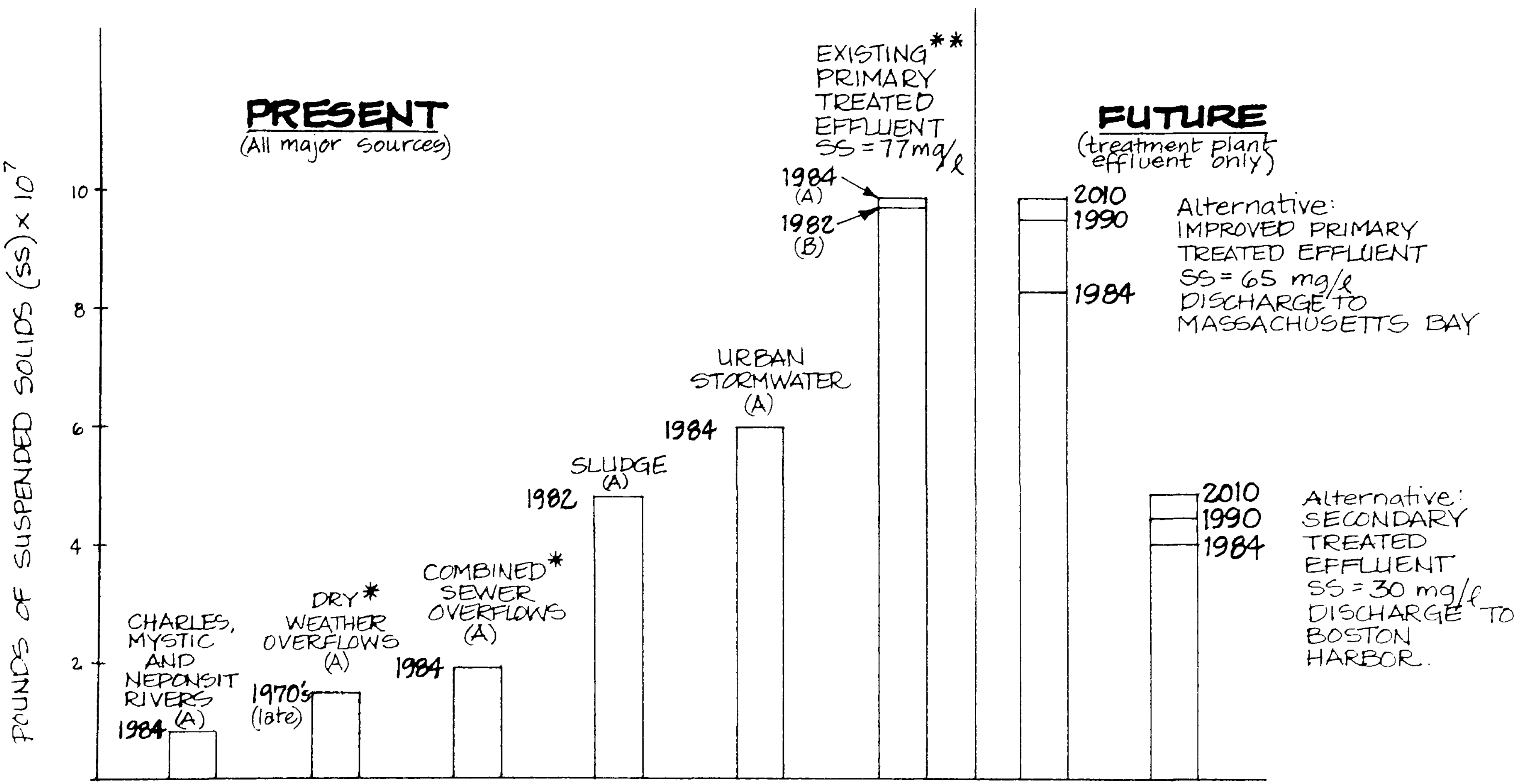
4. toxic chemical enrichment, particularly in areas of sewage solids deposition.

The first two kinds of impacts, oxygen depletion and nutrient enrichment, are not likely to significantly affect recreational or commercial use of Boston Harbor or offshore waters. Nutrient enrichment will affect the distribution and size of indigenous populations without threatening the survival of particular species or community types harbor wide.

The second two kinds of impacts, bacterial contamination and toxic chemical enrichment are both significant. Both are directly related to effluent solids.

Figure 11.3-14 shows estimated annual loadings of solids to Boston Harbor, and projected loadings from an improved primary treatment plant and a secondary treatment plant (see Table 11.3-17 for projections data). Note that existing primary effluent is the single greatest source of suspended solids among all harbor sources. The difference between primary and secondary solids loading is somewhat offset by higher concentrations of some pollutants in secondary effluent solids and secondary sludge solids (sludge will not, however, be discharged to the harbor in the future). Under current plans any new primary effluent discharges are expected to be located about nine miles into Massachusetts Bay, and therefore would pose significant reductions in the solids discharged to the Harbor when compared to existing

EXISTING & PROJECTED ANNUAL SUSPENDED SOLIDS LOADINGS FROM BOSTON HARBOR SOURCES



SOURCES:
(A) 1984 D.I 201 PLAN Table E-3
(B) 1984 301(h) WAIVER APPLICATION Table II A3.3
(C) 1984 301(h) WAIVER APPLICATION Table II A3.4

** Does not include bypassed sewage.
* Note that ongoing efforts continue to reduce loadings from these sources.

fig. II 3-14

TABLE 11.3-17

SUSPENDED SOLIDS MASS EMISSION PROJECTIONS

Year (Source)	Average Plant Flow in mgd		Average SS Concentration in mg/l	Average Annual SS Load lbs. x 10^7
1982 (1)	Deer	295	90	8.09
	Nut	124	46	1.74
	Combined	419	77	9.83
1984 (2)	Deer	304	72	6.67
	Nut	117	91	3.24
	Combined	421	77	9.91
	Combined	421	65*	8.34
	Combined	421	30**	3.85
1990 (3)	Combined	485	65	9.60
	Combined	485	30**	4.43
2010 (4)	Combined	500	65	9.90
	Combined	500	30**	4.57

*SS concentration assumed for improved primary (1984 301(h) Table II-A3.4)
**SS concentration assumed for secondary treatment.

Sources:

(1) 1984 DI 201 plan Table E-3.

(2) 1984 301 (h) Waiver Application Table II-A3.3.

(3) 1984 301 (h) Waiver Application Table II-A3.4.

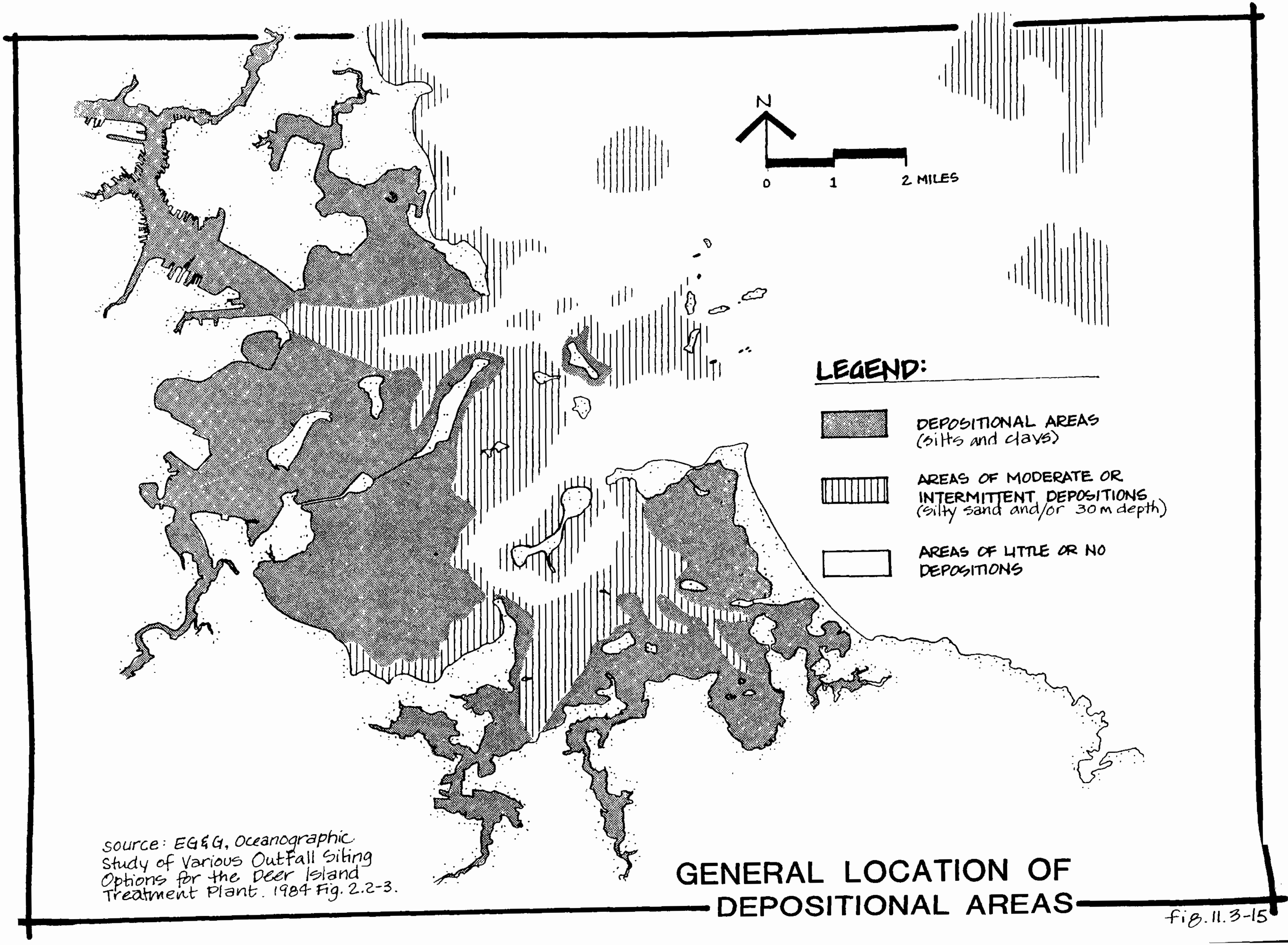
(4) Site Options Study, 1984 301 (h) Waiver Application.

conditions. Likewise, secondary treatment will also pose significant reductions in solids loading to the harbor by virtue of its higher pollutant removal efficiency.

Solids in primary effluent are generally larger than in secondary effluent. Bacteria and viruses trapped inside sewage solids may be physically protected from chlorine's disinfecting action. This is often referred to as suspended solids interference with disinfection effectiveness. As the effluent is diluted, solids will break apart and release the bacteria. Although the marine environment is inimical to indicator bacteria such as the coliform group, viral spores may survive for days or more. Disinfection effectiveness and the location(s) of effluent discharge are therefore significant to water contact recreation and commercial shellfishing.

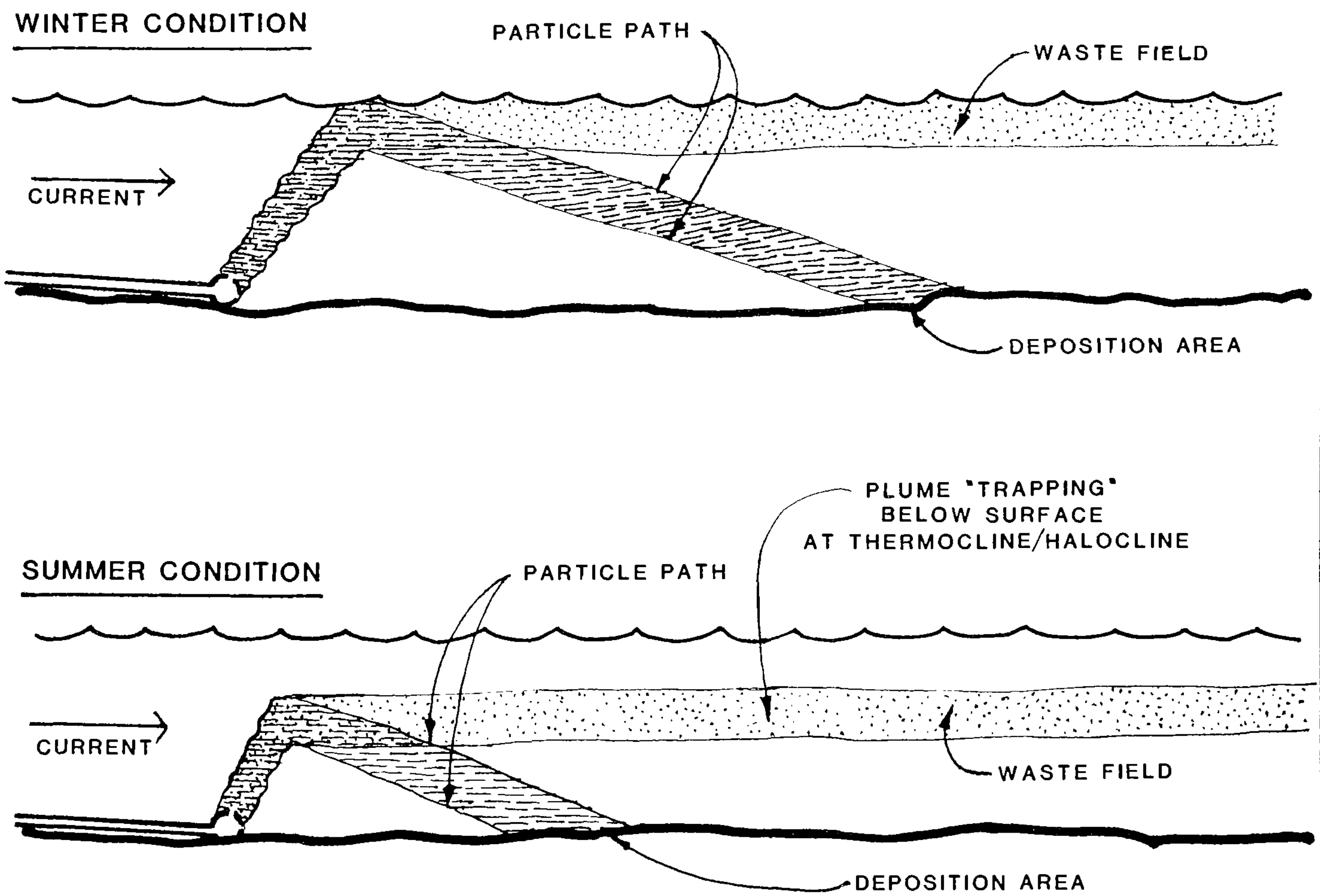
Figure 11.3-1 shows the general tidal circulation pattern in the Boston Harbor area along with outfall sites considered. Recognizing the effect of current velocity and turbulence on plume dispersion, this figure shows which areas would be directly affected by recently discharged effluent. The further offshore the discharge site, the less likely it is to affect beaches and harbor shellfish.
In Boston Harbor, toxic chemical enrichment of bottom sediments and overlying waters will be most significant in areas of solids deposition (Figure 11.3-15). For discharges outside the harbor, slower current velocities make seasonal plume trapping a more significant factor in determining the area and rate of solids deposition (Figure 11.3-16). To the extent that lighter organic solids contain higher concentrations of toxic pollutants, total solids deposition rates may be misleading indicators of relative toxics loading. After initial settling, long-term toxics dispersion will occur through chemical release, bioturbation, bioaccumulation, and wave induced resuspension of sediments.

Toxic compounds in sediments may accumulate in marine organisms to levels which threaten the organism's health, and possibly the health of humans which eat them. Fish disease and bioaccumulation of toxic



GENERAL LOCATION OF
DEPOSITIONAL AREAS

fig. II.3-15



Source: TetraTech Inc., Draft Technical Evaluation of 301(h) Waiver Application., p.65

EFFECT OF TEMPERATURE / SALINITY STRATIFICATION ON EFFLUENT PLUME

fig II.3-16

compounds in Boston Harbor food fish have been documented (see separate SDEIS report: Boston Harbor Water Quality Baseline). The contribution of treatment plant effluent to fish disease or toxic accumulation in fish is unknown but is a continuing concern. The health risk to humans who consume local marine life is presently unquantified.

Limited sampling has found PCB concentrations in edible fish tissues as high as 0.8 ppm. The Food and Drug Administration has recently lowered the tolerance limit for PCB in food from 5.0 ppm to 2.0 ppm stating: "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." (BNA Environmental Reporter, 6/1/84 citing FDA commissioner Mark Novitch).

To the extent that treatment plant effluents contribute to existing toxics concentrations in edible marine life, any of the alternatives under consideration would lessen the potential public health threat associated with consuming fish which live in Boston Harbor.

Some of these impacts will be evaluated by EPA in their consideration of MDC's proposal for the discharge of primary effluent approximately nine miles offshore (301(h) Waiver Application) and in their evaluation of MDC's plans for sewage sludge disposal.

11.3.6 Elimination of Emergency Bypassing of Untreated Wastewater

Recently, equipment problems have caused bypassing of untreated wastewater at Deer, Moon and Nut Islands (see separate SDEIS report: Boston Harbor Water Quality Baseline). With the implementation of currently programmed "fast track" improvements to existing facilities, and subsequently the long term improvements considered in this EIS, such bypassing from Deer Island and Nut Island will be virtually eliminated, and Moon Island overflows will be greatly reduced.

However, with any treatment plant, equipment or operator failure may require temporary bypassing of poorly treated sewage. Therefore, under the provisions of EPA's Construction Grants Program Handbook of Proceedures (10/1/84) treatment plants are designed with backup equipment, excess capacity and emergency bypass structures at key points in the treatment processes. With the alternatives under consideration in this EIS, assuming EPA funding, treatment facilities will be designed for emergency discharge of partially treated wastewater to the main outfall system. However, major loss of pumping capacity would lead to raw sewage discharges "upstream" of the treatment plants at overflow points.

Power failure and subsequent loss of pumping capacity is a major cause of raw wastewater discharges attributed to existing treatment facili ties (see Section 1 and the separate SDEIS report: Boston Harbor Water Quality Baseline).

New treatment facilities, wherever they are located, will have both outside utility company power and on-site power generation. With the back up systems required by EPA's construction grants requirements, raw wastewater discharges due to power failures will be minimized. For example, discharges from Moon Island, now estimated at 40 to 60 occurrences per year, are expected to decrease to about 12 storm related overflows per year after power related pumping problems and other equipment malfunctions are corrected at Deer Island. (CDM 1984)

REFERENCES

Camp Dresser & McKee Inc. 1984. Draft Report to the Metropolitan District Commission Sewerage Division on Discharges from Moon Island. Prepared for the Metropolitan District Commission, Commonwealth of Massachusetts.

EG&G, 1984. Oceanographic Study of Various Outfall Siting Options for the Deer Island Treatment Plant. Prepared for Havens & Emerson/Parsons Brinkerhoff as part of the 1984 Deer Island Facilities Plan.

EPA, 1976. Quality Criteria for Water.

EPA, no date (-625/5-76-012). Environmental Pollution Control Alternatives: Municipal Wastewater.

EPA, 1977 (-430/9-76-017c). Federal Guidelines, State and Local Pretreatment Programs.

EPA, 1982 (-440/1-82/303). Fate of Priority Pollutants in Publicly Owned Treatment Works.

EPA, 1982 (-600/6-82-004b). Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants.

ERT, Inc., 1979. Water Quality Goals, Objectives, and Alternatives in the Boston Metropolitan Area -- A Case Study. Prepared for the NSF, EPA, OMB, and CEQ.

Federal Water Pollution Control Administration (FWPCA), 1969. A Practical Guide to Water Quality Studies of Streams.

Grace R.A. 1978. Marine Outfall Systems, Planning, Design and Construction. Prentice-Hall, Inc., Englewood Cliffs, NJ.

Greeley and Hansen. 1978. Environmental Impact Statement on the Upgrading of the Boston Metropolitan Area Sewerage System Volumes One and Two, prepared for: U.S. Environmental Protection Agency, Region I, Boston, Massachusetts.

Havens & Emerson/Parsons Brinkerhoff. 1984. Deer Island Facilities Plan, prepared for: Metropolitan District Commission Sewerage Division.

Havens & Emerson/Parsons Brinkerhoff, 1984. Draft Deer Island Facilities Plan. Unpublished draft prepared for the Metropolitan District Commission.

Massachusetts DEQE, DWPC, 1983. Boston Harbor 1983 Water Quality and Wastewater Discharge Data.

Metcalf & Eddy, Inc., 1984. The Commonwealth of Massachusetts Metropolitan District Commission Application for Modification of Secondary Treatment Requirements for Its Deer Island and Nut Island Effluent Discharges into Marine Waters. (1984 301(h) Waiver Application).

Metcalf & Eddy, Inc., June 1982. Nut Island Wastewater Treatment Plant Facilities Planning Project, Phase I, Site Options Study, Volumes I and II. Prepared for the Commonwealth of Massachusetts, Metropolitan District Commission.

Metcalf & Eddy, Inc., 1982. The Commonwealth of Massachusetts Metropolitan District Commission Application for Modification of Secondary Treatment Requirements for Its Deer Island and Nut Island Effluent Discharges into Marine Waters. (1982 301(h) Waiver Application).

Metcalf & Eddy, Inc., 1979. The Commonwealth of Massachusetts Metropolitan District Commission. Application for Modification of Secondary Treatment Requirements for its Deer Island and Nut Island Effluent Discharges into Marine Waters. (1979 301(h) Waiver Application).

Metcalf & Eddy, Inc., 1979. Wastewater Engineering Treatment, Disposal, Reuse. McGraw Hill Book Company, Boston.

National Oceanic and Atmospheric Administration (NOAA), 1982. Navigational Chart of Boston Harbor No. 13270, 47th edition, November 20, 1982.

National Oceanic and Atmospheric Administration (NOAA), 1979. Boston Harbor Tidal Current Charts. Fourth Edition 1974.

Patterson, J.W. and P.S. Kodukula, 1984. Metals Distributions in Activated Sludge Systems. JWPCF, Vol. 56. No. 5, p. 432-441.

Petrasek, A.C. Jr., et. als., 1983 a. Removal and Partitioning of Volatile Organic Priority Pollutants In Wastewater Treatment. Presented at the Ninth U.S.-Japan Conference on Sewage Treatment Technology, Tokyo, Japan, September 13-29, 1983. EPA MERL Cincinnati Contribution No. 50.

Petrasek, A.C. Jr., et. als., 1983 b. Fate of Toxic Organic Compounds in Wastewater Treatment Plants. JWPCF, Vol. 55, No. 10, p. 1286-1296.

Petrasek, A.C. Jr., and I.J. Kugelman, 1983. Metals Removals and Partioning in Conventional Wastewater Treatment Plants. JWPCF, Vol. 55, No. 9, p. 1183-1190.

Appendix A

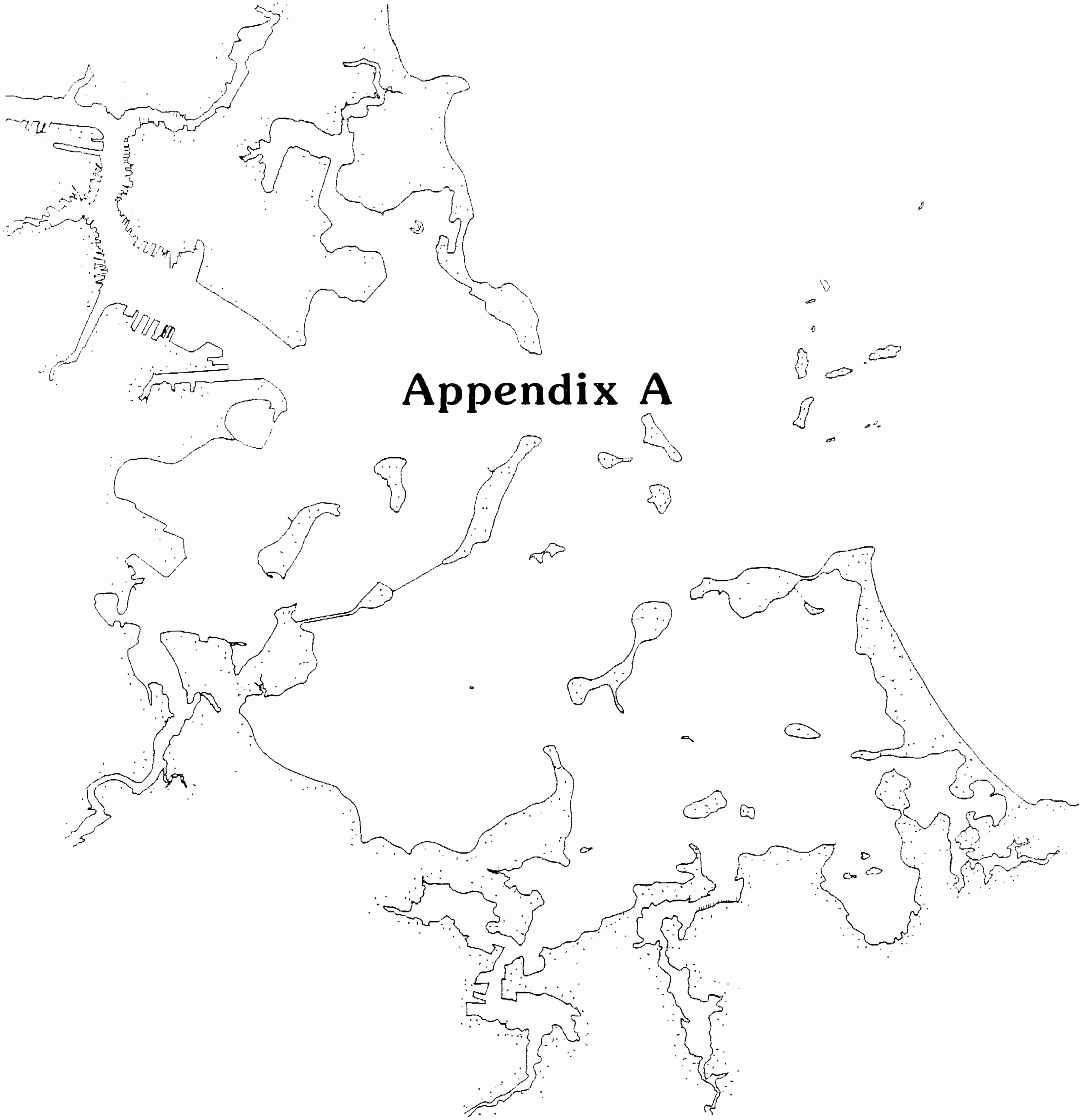


TABLE 11.3-18 MSD WASTEWATER:

PRIORITY POLLUTANTS THAT DO NOT EXCEED CRITERIA FOR THE PROTECTION OF SALTWATER AQUATIC LIFE

Priority Pollutant	Range of Concentrations (ug/l) Reported*				Criteria for the Protection of Saltwater Aquatic Life	
	Influent: Deer Is.	Influent: Nut Is.	Effluent: Deer Is.	Effluent: Nut Is.	Chronic/ Average Criteria	Maximum Criteria
Dichlorobromomethane	ND	ND	ND-13	ND	6,400	6,000**
Trichlorofluoromethane	ND-<10	ND-<10	ND-<10	ND-<10	6,400	6,000**
Chlorodibromomethane	ND-<10	ND	ND-<10	ND	6,400	6,000**
Acenapthene	ND-<10	ND-<10	ND-<10	ND-<10	710	485**
1,2,4-trichlorobenzene	ND-29	ND	ND-<10	ND-22	129	80**
Hexachlorobenzene	ND	ND	ND-<6	ND-<10	129	80**
Fuoranthene	ND-<10	ND-<10	ND-<10	<1-<10	16	20**
Toluene	18-290	<10-138	ND-1300	ND-110	5,000	3,150**
Arsenic	<3.9-<18.7	6.0-19.3	0.3-<30	7.1-<30	63**	120**
Cadmium (4)	6.3-19.8	2.5-3.9	<1.0-6.0	<1.0-3.2	12**	38**
Chromium (4)	38-500	31.6-87	6-580	<3-84	54**	1,200**
Selenium	<2.3-<6.9	<2-2.7	4.5-30	2.2-<20	54	410
Chlordane (5)	ND	ND	ND-<10	<0.04-<10	0.004	0.09

*ND= Reported as "not detected"; limits of detection not reported for 1978, 1979 and 1982 sampling.
**Proposed criterion.

(1) Both existing and proposed (2/7/84) criteria were applied to these data. See Table __ for pollutants which do not exceed the acute/maximum criterion, but have no chronic criterion.

(2) Maximum criterion = Final Acute Value/2 as proposed by EPA (Federal Register, Vol. 49, No. 26, p. 4553, 2/7/84).

(3) 1978 data reported for 1,2,3 trichlorobenzene.

(4) Average annual data from weekly composits shows these.

(5) Limits of detection exceed criterion.

Sources: Metcalf & Eddy, Inc., 1979, 1982, 1984. The Commonwealth of Massachusetts Metropolitan District Commission Application for Modification of Secondary Treatment Requirements for Its Deer Island and Nut Island Effluent Discharges into Marine Waters. (1979, 1982, and 1984 301(h) Waiver Applications).

TABLE 11.3-19 MSD WASTEWATER:

PRIORITY POLLUTANTS WHICH DO NOT EXCEED

MAXIMUM/ACUTE CRITERIA FOR THE PROTECTION OF WALTWATER

AQUATIC LIFE, AND FOR WHICH NO EPA AVERAGE/CHRONIC CRITERIA EXISTS

Priority Pollutant	Maximum Concentration (1) (ug/l)	Range of Concentrations (ug/l) Influent and Effluent, Both Plants*
1,1,1-trichloroethane	15,600	ND-84
Benzene	2,550	ND-16
Ethylbenzene	215	ND-29
2-Nitrophenol	2,425	ND-<10
2,4-dinitrophenol	2,425	ND-80
Phenol	2,900	ND-120
1,2-Dichlorobenzene	985	ND-575
1,3-Dichlorobenzene	985	ND-570
1,4-Dichlorobenzene	985	ND-570
Napthalene	1,175	ND-28
Nitrobenzene	3,340	ND-54
Carbon tetrachloride	25,000	ND-<10
Diethylphthalate	1,472	ND-22
Trichloroethylene	1,000	ND-79
Pentachlorophenol	26	<10-<13
1,1,dichloroethylene	112,000	ND-4.9
Thallium	1,065	1.1-<20
Isophorone	6,450	ND-10
Dimethylphthatate	1,472	ND-<10
1,2 dichloroethane	56,500	ND-81
1,2 trans-dichloroethylene	112,000	ND-44
1.3 cis-dichloropropene	395	ND-23
Hexachloroethane	470	ND-35
2,4 - dinitrotoluene	295	ND-10
N-nitrosodiphenylamine	1,650,000	ND-270

Priority Pollutant	Maximum Concentration (1) (ug/l)	Range of Concentrations (ug/l) Influent and Effluent, Both Plants*
N-nitrosodi-n-propylamine	1,650,000	ND-<10
Bis (2-ethylhexyl) phthalate	1,472	ND-140
Butyl benzyl phthalate	1,472	ND-37
Di-n-octyl phthalate	2,472	ND-16
1,1,2,2,tetrachloroethane	4,510	ND-11
Aldrin (2)	1.3	ND-<10
4,4' DDE (2)	7	ND-<10
Beta-BHC (2)	0.17	ND-<10
Delta-BHC (2)	0.17	ND-<10
Gamma-BHC (2)	0.17	ND-<10
Alpha-BHC (2)	0.27	ND-<10
2-chloronapthalene (2)	3.75	ND-<10
Toxaphene (2)	0.07	ND-<10
Anthracene	150	ND-<10
Phenanthrene	150	ND-<10
Flourene	150	ND-24
Benzo(a)Pyrene	150	ND-<10
Chrysene	150	ND-<10
3,4-benzofluoranthene	150	ND-<10
Benzo(k)fluoranthene	150	ND-<10
Acenaphthylene	150	ND-<10
Benzo(9hi)perylene	150	ND-<20
Fluorene	150	ND-24
Dibenzo(a,h)anthracene	150	ND-<20
Ideno(1,2,3-cd)pyrene	150	ND-<20
Pyrene	150	ND-<10
Benzo(a)anthracene	150	ND-<10

*ND= Reported as "not detected"; limits of detection not reported with 1978, 1979, and 1982 sampling.

(1) Maximum concentration = final acute value/2 as proposed by EPA (Federal Register, Vol. 49 No. 26, p. 4553, 2/7/84), or existing maximum concentration.

(2) Limits of detection exceed criterion.

Sources: Metcalf & Eddy, Inc., 1979, 1982, 1984. The Commonwealth of Massachusetts Metropolitan District Commission Application for Modification of Secondary Treatment Requirements for Its Deer Island and Nut Island Effluent Discharges into Marine Waters

TABLE 11.3-20

MSD WASTEWATER:

PRIORITY POLLUTANTS WITH NO CRITERIA FOR THE

PROTECTION OF SALTWATER AQUATIC LIFE

	Range of Concentrations (ug/l) Reported*			
Priority Pollutant	Influent: Deer Is.	Influent: Nut Is.	Effluent: Deer Is.	Effluent: Nut Is.
1,1,Dichloroethane	ND-<10	ND-<10	ND-<10	ND-<10
Chloroform	ND-90	<10-16	ND-390	ND-36
Methylene chloride	83-360	63-146	ND-260	ND-250
2-4-6 trichlorophenol	ND	ND-<10	ND-<10	ND-<10
Parachlorometa cresol	ND-<10	ND-<10	ND-<10	ND-<10
2-chlorophenol	ND-<10	ND-<10	ND-<10	ND-<10
2,4-dichlorophenol	ND-<10	ND-<10	ND-<10	ND-<10
2,4-dimethylphenol	ND-<10	ND-<10	ND-<10	ND-<10
4,6-dinitro-o-cresol	ND	ND	ND-<10	ND-<10
Benzidine	ND-120	ND	ND-<20	ND-<20
3,3-dichlorobezidine	ND	ND-<10	ND-<20	ND-<20
2,6-dinitrotoluene	ND-<10	ND-<10	ND-<10	ND-<10
1,2-diphenylhydrazine	ND-<10	ND-<10	ND-<10	ND-<10
4'-chlorophenyl phenyl ether	ND	ND	ND-<10	ND-<10
4-bromophenyl phenyl ether	ND	ND-<10	ND	ND-<10
Bis(2-chloroisopropyl ether)	ND	ND-18	ND-<6	ND-287
Bis(2-chloroethoxy) methane	ND	ND	ND-14	ND-10
Bromoform	ND	ND-<10	ND-<10	ND-<5
Chloroethane	ND	ND	ND-<10	ND-<5
Antimony	4.5-11.1	<5.0-<7.8	6.8-<20	5.0-<20
Asbestos	0.3-3.7	1.4-9.1	0.4-5.5	3.7-11
Beryllium	<1.0-<1.3	<1.0-<1.3	0.1-<1.25	0.0-<1.25
Tetrachloroethylene	<10-15	ND-24	ND-72	ND-64
Endrin aldehyde	ND	ND	ND-<10	ND-<10
Heptachlor epoxide	ND	ND	ND-<10	ND-<10

*ND= Reported as "not detected"; limits of detection not reported with 1978, 1979, and 1982 sampling.

Sources: Metcalf & Eddy, Inc., 1979, 1982, 1984. The Commonwealth of Massachusetts Metropolitan District Commission Application for Modification of Secondary Treatment Requirements for Its Deer Island and Nut Island Effluent Discharges into Marine Waters (1979, 1982, and 1984 301(h) Waiver Applications).

TABLE 11.3-21 MSD WASTEWATER:

PRIORITY POLLUTANTS REPORTED AS NOT DETECTED (1)

		Saltwater Aquatic Life Criteria	
	Limits of Detection, 1984 Samples (2) ug/l	Chronic/ Average Criteria, ug/l	Maximum Criteria (3) ug/l
BASE-NEUTRAL COMPOUNDS			
Bis (chloromethyl) ether	<0.5-<6	--	--
Bis (2-chloroethyl) ether	<6	--	--
Hexachlorobutadiene	<6	--	16
Hexachlorocyclopentadiene*	<6	--	3.5
N-nitrosodimethylamine	<6	--	1,650,000
2,3,7,8 tetrachlorodibenzo-p-dioxin	<20	--	--
ACID COMPOUNDS			
4-nitrophenol	<10	--	2425
VOLATILE COMPOUNDS			
Acrolein*	<20-<100	--	27.5
Acrylonitrile	<20-<100	--	--
1,1,2-trichloroethane	<0.5-<3	--	--
2-chloroethylvinyl ether	<0.5-<3	--	--
1,2-dichloropropane	<0.5-<3	10,300	15.20
1,3 trans-dichloropropene	<0.5-<3	--	395
Methyl chloride	NS	--	--
Methyl bromide	NS	--	--
Dichlorodifluoromethane	<0.5-<3	6,400	6,000
Vinyl chloride	<0.5-<3	--	--

		Saltwater Aquatic Life Criteria	
	Limits of Detection, 1984 Samples (2) ug/l	Chronic/ Average Criteria, ug/l	Maximum Criteria (3) ug/l
PESTICIDE COMPOUNDS			
4,4-DDD	<0.01	--	--
endosulfan sulfate	<0.01	0.0087(4)	0.034(4)
PCB-1221*	2.5	0.030	5
PCB-1232*	2.5	0.030	5
PCB-1248	NS	0.030	5

NS = Not sampled in 1984.

*Limits of detection reported for 1984 exceed existing or proposed criteria.

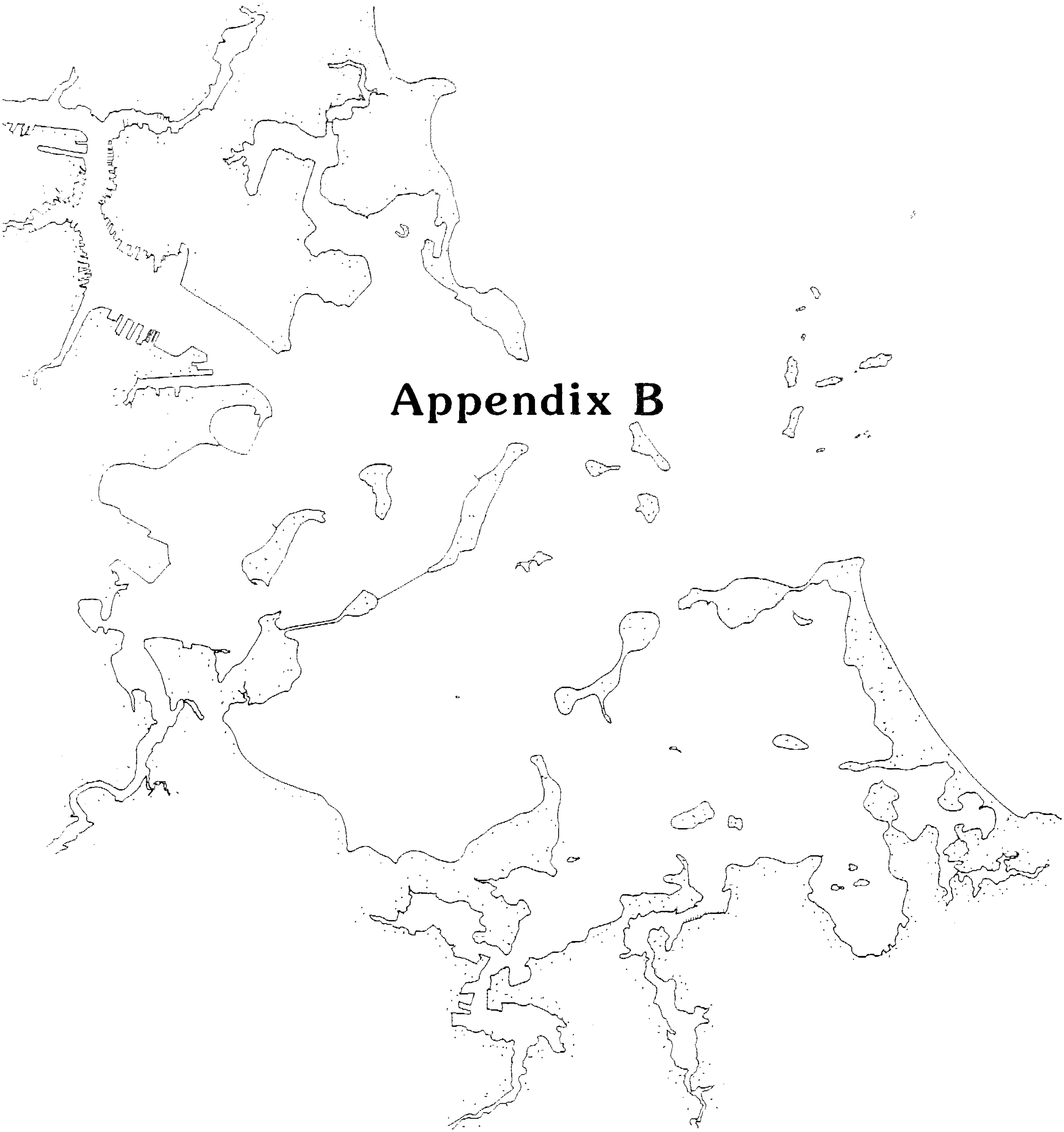
(1)(2) Limits of detection not reported with 1978, 1979 or 1982 sampling.

(3) Maximum criterion = final acute value/2 as proposed by EPA (Federal Register, Vol. 49, No. 26, P 4553, 2/7/84), or existing maximum criterion.

(4) Criteria for Endosulfan.

Sources: Metcalf & Eddy, Inc., 1979, 1982, 1984. The Commonwealth of Massachusetts Metropolitan District Commission Application for Modification of Secondary Treatment Requirements for Its Deer Island and Nut Island Effluent Discharges into Marine Waters. (1979, 1982, and 1984 301(h) Waiver Applications).

Appendix B



Cd Cadmium

● Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
26	Mummichog, *Fundulus heteroclitus*	50,600	-
	Striped killifish, *Fundulus majalis*	21,000	-
25	Fiddler crab, *Uca pugilator*	21,190	-
23	Sand worm, *Nereis virens*	10,100	-
22	Oyster drill, *Urosalpinx cinerea*	6,600	-
21	Blue mussel, *Mytilus edulis*	3,934	-
20	Eastern oyster, *Crassostrea virginica*	3,800	-
17	Blue crab, *Callinectes sapidus*	2,594	-
	Green crab, *Carcinus maenus*	4,100	-
16	Winter flounder, *Pseudopleuronectes americanus*	2,934	-
11	Soft-shell clam, *Mya arenaria*	1,672	-
10	Bay scallop, *Argopecten irradians*	1,480	-

Cd Cadmium

Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
8	Atlantic silverside *Menidia menidia*	779.8	
7	Grass shrimp, *Palaemonetes vulgaris*	760	-
6	Hermit crab *Pagurus longicarpus*	645	-
4	Polychaete worm, *Capitella capitata*	200	-
2	American lobster, *Homarus americanus*	78	-

* Ranked from least sensitive to most sensitive based on Family Mean Acute Value.

Plant values

Species	Chemical	Effect	Result (ug/l)	Reference
Kelp, *Laminana saccharina*	Cadmium chloride	8-day EC50 (growth rate)	860	Markham, et al. 1980
Diatom, *Skeletonema costatum*	Cadmium chloride	96-hr EC50 (growth rate)	175	Gentile & Johnson, 1982

Cd Cadmium

- Bioconcentration data

Species	Tissue	Chemical	Duration (days)	Bioconcentration Factor	Reference
Blue mussel, *Mytilus edulis*	Soft parts	Cadmium chloride	28	113	George & Coombs, 1977
Blue mussel, *Mytilus edulis*	Soft parts	Cadmium chloride	35	306	Phillips, 1976
Bay scallop, *Argopecten irradians*	Muscle	Cadmium chloride	42	2,040	Pesch & Stewart, 1980
Eastern oyster, *Crassostrea virginica*	Soft parts	Cadmium chloride	280	2,600	Zaroogian & Cheer, 1976
Eastern oyster, *Crassostrea virginica*	Soft parts	Cadmium chloride	280	1,830	Zaroogian, 1979
Eastern oyster, *Crassostrea virginica*	Soft parts	Cadmium nitrate	98	1,220	Schuster & Pringle, 1969
Quahog clam, *Mercenaria mercenaria*	Soft parts	Cadmium nitrate	40	83	Kerfoot & Jacobs, 1976
Soft-shell clam, *Mya arenaria*	Soft parts	Cadmium nitrate	70	160	Pringle, et al. 1968
Grass shrimp, *Paleomonetes pugio*	Whole body	Cadmium chloride	42	22	Pesch & Stewart, 1980
Grass shrimp, *Palaemonetes pugio*	Whole body	Cadmium chloride	28	203	Nimmo, et al. 1977b
Grass shrimp, *Palaemonetes vulgaris*	Whole body	Cadmium chloride	28	307	Nimmo, et al. 1977b
Green crab, *Carcinus maenas*	Muscle	Cadmium chloride	68	5	Wright, 1977
Green crab, *Carcinus maenas*	Muscle	Cadmium chloride	40	7	Jennings & Rainbow, 1979a

Cl Chlorine

● Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
20	Blue crab, *Callinectes sapidus*	796	--
18	Northern pipefish, *Syngnathus fuscus*	270	--
17	Grass shrimp, *Palaemonetes pugio*	220	--
16	Three-spinestickleback, *Gasterosteus aculeatus*	167	--
14	Hermit crab, *Pagurus longicarpus*	146	--
3	Atlantic silverside, *Menidia menidia*	37	--
1	Eastern oyster, *Crassostrea virginica*	26	--

*Ranked from least sensitive to most sensitive based on Family Mean Acute Value

Chlorobenzene

- Plant values

Species	Chemical	Effect	Result (ug/l)	Reference
Alga, *Skeletonema costatum*	chlorobenzene	Chlorophyll *a* 96-hr EC50	343,000	
Alga, *Skeletonema costatum*	chlorobenzene	Cell numbers 96-hr EC50	341,000	

Cr Chromium

Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
15	Blue crab, *Callinectes sapidus*	93,400	-
14	Mummichog, *Fundulus heteroclitus*	91,000	-
13	Soft-shell clam, *Mya arenaria*	57,000	-
12	Starfish, *Asterias forbesi*	32,000	-
9	Atlantic silverside, *Menidia menidia*	15,280	-
8	Hermit crab, *Pagurus longicarpus*	10,000	-
5	Polychaete worm, *Capitella capitata*	6,325	-
1	Polychaete worm, *Nereis virens*	2,000	-

* Ranked from least sensitive to most sensitive based on Family Mean Acute Value.

Bioconcentration data

Species	Tissue	Chemical	Duration (days)	Bioconcentration Factor	Reference
		Hexavalent Chromium			
Blue mussel, *Mytilus edulis*	Soft parts	Sodium dichromate	84	192	Zaroogian, 1982
Eastern oyster, *Crassostrea virginica*	Soft parts	Sodium dichromate	84	125	Zaroogian, 1982
		Trivalent Chromium			
Blue mussel, *Mytilus edulis*	Soft parts	Chromic chloride	168	86	Capuzzo & Sasner, 1977
Eastern oyster, *Crassostrea virginica*	Soft parts	Chromic nitrate	140	116	Shuster & Pringle, 1969
Soft-shell clam, *Mya arenaria*	Soft parts	Chromic chloride	168	153	Capuzzo & Sasner, 1977

Cu Copper

● Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
17	Green crab, *Carcinus maenus*	600	-
14	Polychaete worm, *Nereis diversicolor*	363.8	-
11	Atlantic silverside, *Menidia menidia*	136	-
10	Winter flounder, *Pseudopleuronectes americanus*	129	-
8	American lobster, *Homarus americanus*	69	-
4	Soft-shell clam, *Mya arenaria*	39	-
3	Eastern oyster, *Crassostrea virginica*	128	
2	Summer flounder, *Paralichthys dentatus*	28	-
1	Blue mussel, *Mytilus edulis*	5.8	-

* Ranked from least sensitive to most sensitive based on Species Mean Acute Value.

Cu Copper

Plant values

Species	Chemical	Effect	Result (ug/l)	Reference
Alga, *Skeletonema costatum*		14-day EC50 (growth rate)	50	Erickson, et al. 1970
Alga, *Nitschia closterium*		96-hr EC50 (growth rate)	33	Rosko & Rachlin, 1975

Bioconcentration data

Species	Tissue	Duration (days)	Bioconcentration Factor	Reference
Alga, *Asterionella japonica*	-	25	309	Riley & Roth, 1971
Polychaete worm, *Nereis diversicolor*	-	24	203	Jones, et al. 1976
Polychaete worm, *Eudistylia vancouveri*	-	33	1,006	Young, et al. 1979
Bay scallop, *Argopecten irradians*	-	112	3,310	Zaroogian, 1982
Bay scallop, *Argopecten irradians*	-	112	4,160	Zaroogian, 1982
Eastern oyster, *Crassostrea virginica*	-	140	28,200	Shuster & Pringle, 1969
Eastern oyster, *Crassostrea virginica*	-	140	20,700	Shuster & Pringle, 1969
Quahog clam, *Mercenaria mercenaria*	-	70	88	Shuster & Pringle, 1968
Soft-shell clam, *Mya arenaria*	-	35	3,300	Shuster & Pringle, 1968
Blue mussel, *Mytilus edulis*	-	14	90	Phillips, 1976

Cyanide

Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
6	Winter flounder, *Pseudopleuronectes americanus*	372	-
3	Atlantic silverside, *Menidia menidia*	59	-
1	Rock crab, *Cancer irroratus*	4.893	-

* Ranked from least sensitive to most sensitive based on species mean acute value.

DDT

● Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
16	Eastern oyster, *Crassostrea virginica*	7.9	-
14	Hermit crab, *Pagurus longicarpus*	6.0	-
13	American eel, *Anguilla rostrata*	4.0	-
12	Mummichog, *Fundulus heteroclitus*	3.9	-
11	Grass shrimp, *Palaemonetes pugio*	2.0	-
7	Striped killifish, *Fundulus majalis*	1.0	-
4	Striped bass, *Morone saxatilis*	0.53	-
3	Atlantic silverside, *Menidia menidia*	0.4	-

*Ranked from least sensitive to most sensitive based on species mean acute value.

● Plant values

Species	Chemical	Effect	Result (ug/l)	Reference
Diatom, *Skeletonema costatum*		Reduced photosynthesis (1-day)	10	Wurster, 1968
Neritic dinoflagellate, *Peridinium trochoideum*		Reduced photosynthesis (1-day)	10	Wurster, 1968

Bioconcentration data

Species	Tissue	Lipid (%)	Chemical	Bioconcentration Factor	Duration (days)	Reference
Eastern oyster, *Crassostrea virginica*	Whole body	-		42,400	252	Lowe, et al. 1970
Eastern oyster, *Crassostrea virginica*	Whole body	-		76,300	168	Lowe, et al. 1970

Dieldrin

Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
21	Grass shrimp, *Palaemonetes vulgaris*	50.0	-
19	Eastern oyster, *Crassostrea virginica*	31.2	-
17	Striped bass, *Morone saxatilis*	19.7	-
16	Hermit crab, *Pagurus longicarpus*	18.0	-
15	Threespine stickleback, *Gasterosteus aculatus*	14.2	-
12	Mummichog, *Fundulus heteroclitus*	8.9	-
11	Grass shrimp, *Palaemonetes pugio*	8.6	-
8	Striped killifish, *Fundulus majalis*	5.0	-
7	Atlantic silverside, *Menidia menidia*	5.0	-
2	American eel, *Anguilla rostrata*	0.9	-

* Ranked from least sensitive to most sensitive based on species mean acute value.

Bioconcentration data

Species	Tissue	Lipid (%)	Chemical	Bioconcentration Factor	Duration (days)	Reference
Eastern oyster, *Crassostrea virginica*	edible tissue	-		8,000	392	Parrish, 1974
Crab, *Leptodius floridanus*	whole body	-		400	16	Epifanio, 1973

Endosulfan

- Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
11	Eastern oyster, *Crassostrea virginica*	157	-
9	Grass shrimp, *Palaemonetes pugio*	1.31	-
3	Striped bass, *Morone saxatilis*	0.10	-

* Ranked from least sensitive to most sensitive based on species mean acute value.

Endrin

- Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
21	American oyster, *Crassostrea virginica*	14.2	-
20	Hermit crab, *Pagurus longicarpus*	12	-
18	Grass shrimp, *Palaemonetes vulgaris*	1.8	-
15	Threespine stickleback, *Gasterosteus aculeatus*	1.1	-
14	Mummichog, *Fundulus heteroclitus*	0.95	-
13	Grass shrimp, *Palaemonetes pugio*	0.65	19
11	American eel, *Anguilla rostrata*	0.6	-
8	Striped killifish, *Fundulus majalis*	0.3	-
4	Striped bass, *Morone saxatilis*	0.094	-
3	Atlantic silverside, *Menidia menidia*	0.05	-

* Ranked from least sensitive to most sensitive based on species mean acute value.

Endrin

- Plant values

Species	Chemical	Effect	Result (ug/l)	Reference
Alga, *Skeletonema costatum*		^{14}C uptake reduced	>10	Menzel, et al. 1970
Alga, *Skeletonema costatum*		Growth reduced first 5 days of test	100	Menzel, et al. 1970
Natural phytoplankton communities		46% decrease in productivity; ^{14}C	1,000	Butler, 1963

- Bioconcentration data

Species	Tissue	Lipid (%)	Chemical	Bioconcentration Factor	Duration (days)	Reference
American oyster, *Crassostrea virginica*	Edible portion	-		1,670-2,780	7	Mason & Rowe, 1976
Grass shrimp, *Palaemonetes pugio*	Edible portion	-		1,490	10	Tyler-Schroeder, 1979
Grass shrimp, *Palaemonetes pugio*	Edible portion	-		1,600	145	Tyler-Schroeder, 1979

Heptachlor

● Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
17	Threespine stickleback, *Gasterosteus aculeatus*	112	-
16	Hermit crab, *Pagurus longicarpus*	55	-
15	Mummichog, *Fundulus heteroclitus*	50	-
14	Striped killifish, *Fundulus majalis*	32	-
12	American eel, *Anguilla rostrata*	10	-
7	Atlantic silverside, *Menidia menidia*	3	-
6	Striped bass, *Morone saxatilis*	3	-
5	American oyster, *Crassostrea virginica*	1.5	-
4	Grass shrimp, *Palaemonetes vulgaris*	1.06	-

Ranked from least sensitive to most sensitive based on species mean acute value.

● Plant values

Species	Chemical	Effect	Result (ug/l)	Reference
Alga, *Skeletonema costatum*	Heptachlor (99%)	EC50, reduction in growth as measured by absorbance	93	U.S. EPA, 1980

Pb Lead

Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
10	Soft-shell clam, *Mya arenaria*	27,000	-
9	Atlantic silverside, *Menidia menidia*	>10,000	-
6	Eastern oyster, *Crassostrea virginica*	2,450	-
5	Quahog clam, *Merconaria mercenaria*	780	-
1	Blue mussel, *Mytilis edulis*	476	-

* Ranked from least sensitive to most sensitive based on Family Mean Acute Value.

Bioconcentration data

Species	Tissue	Chemical	Duration (days)	Bioconcentration Factor	Reference
Blue mussel, *Mytilus edulis*	Soft parts	Lead nitrate	40	650	Schulz-Baldes, 1974
Blue mussel, *Mytilus edulis*	Soft parts	Lead chloride	37	200	Talbot, et al. 1976
Blue mussel, *Mytilus edulis*	Soft parts	Lead nitrate	130	2,570	Schulz-Baldes, 1972
Blue mussel, *Mytilus edulis*	Soft parts	Lead nitrate	130	2,080	Schulz-Baldes, 1972
Blue mussel, *Mytilus edulis*	Soft parts	Lead nitrate	130	796	Schulz-Baldes, 1972
Eastern oyster, *Crassostrea virginica*	Soft parts	Lead nitrate	140	536	Zaroogian, et al. 1979
Eastern oyster, *Crassostrea virginica*	Soft parts	Lead nitrate	49	68	Pringle, et al. 1968
Eastern oyster, *Crassostrea virginica*	Soft parts	Lead nitrate	70	1,400	Shuster & Pringle, 1969
Quahog clam, *Mercenaria mercenaria*	Soft parts	Lead nitrate	56	17.5	Pringle, et al. 1968

Hg Mercury

● Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
	Divalent Inorganic Mercury		
24	Winter flounder, *Pseudopleuronectes americanus*	1,678	-
23	Mummichog, *Fundulus heteroclitus*	453.0	-
22	Soft-shell clam, *Mya arenaria*	400	-
21	Fourspine stickleback, *Apeltes quadracus*	315	-
18	Atlantic silverside, *Menidia menidia*	115.7	-
17	Haddock, *Melanogrammus aeglefinus*	98	-
16	Bay scallop, *Argopecten irradians*	89	-
14	Sand worm, *Nereis virens*	70	-
12	Starfish, *Asterias forbesii*	60	-
11	Hermit crab, *Pagurus longicarpus*	50	-
10	American lobster, *Homarus americanus*	20	-
8	Green crab, *Carcinus maenas*	17	-
7	Polychaete worm, *Capitella capitata*	14	-
4	Eastern oyster, *Crassostrea virginica*	7.558	-
3	Blue mussel, *Mytilus edulis*	5.8	-
2	Quahog clam, *Mercenaria mercenaria*	4.8	-

* Ranked from least sensitive to most sensitive based on Family Mean Acute Value.

Hg Mercury

Plant values

Species	Chemical	Effect	Result (ug/l)	Reference
	Divalent Inorganic Mercury			
Seaweed, *Ascophyllum nodosum*	Mercuric chloride	10-day EC50, growth	100	Stromgren, 1980
Seaweed, *Fucus vesiculosus*	Mercuric chloride	10-day EC50, growth	45	Stromgren, 1980

Bioconcentration data

Species	Tissue	Chemical	Duration (days)	Bioconcentration Factor	Reference
		Divalent Inorganic Mercury			
Eastern oyster (adult), *Crassostrea virginica*	Soft parts	Mercuric chloride	74	10,000	Kopfler, 1974
American lobster (adult), *Homarus americanus*	Tail muscle	Mercuric chloride	30	129	Thurberg, et al. 1977
		Methylmercury			
Eastern oyster (adult), *Crassostrea virginica*	Soft parts	Methylmercuric chloride	74	40,000	Kopfler, 1974
		Other Mercury Compounds			
Eastern oyster (adult), *Crassostrea virginica*	Soft parts	Phenylmercuric chloride	74	40,000	Kopfler, 1974

Ni Nickel

Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
17	Mummichog, *Fundulus heteroclitus*	350,000	-
16	Soft shell clam, *Mya arenaria*	320,000	-
15	Starfish, *Asterias forbesi*	150,000	-
14	Polychaete, *Neanthes arenaceodentata*	49,000	-
13	Crab, *Pagurus longicarpus*	47,000	-
12	Sand worm, *Nereis virens*	25,000	-
9	Atlantic silverside, *Menidia menidia*	7,960	-
6	American oyster, *Crassostrea virginica*	1,180	-
2	Hard clam, *Mercenaria mercenaria*	310	-

Bioconcentration data

Species	Tissue	Chemical	Bioconcentration Factor	Duration (days)	Reference
American oyster, *Crassostrea virginica*	Soft parts	Nickel sulfate	384	84	U.S. EPA, 1980b
American oyster, *Crassostrea virginica*	Soft parts	Nickel sulfate	299	84	U.S. EPA, 1980b
Mussel, *Mytilus edulis*	Soft parts	Nickel sulfate	416	84	U.S. EPA, 1980b
Mussel, *Mytilus edulis*	Soft parts	Nickel sulfate	328	84	U.S. EPA, 1980b

PCBs

- Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
3	Eastern oyster, *Crassostrea virginica*	20	-
2	Grass shrimp, *Palaemonetes pugio*	12.5	-
1	Brown shrimp, *Penaeus aztecus*	10.5	-

* Ranked from least sensitive to most sensitive based on species mean acute value.

- Plant values

Species	Chemical	Effect	Result (ug/l)	Reference
Diatom, *Rhizosolenia setiger*	Aroclor® 1254	No growth in 48 hr. Reduced growth thereafter	0.1	Fisher & Wurster, 1973
Diatoms, *Thalassiosira pseudonana* and *Skeletonema costatum*	Aroclor® 1254	Reduced growth and carbon fixation in 48 hr	10	Fisher, 1975

PCBs

Plant values

Species	Chemical	Effect	Result (ug/l)	Reference
Diatom, *Skeletonema costatum*	Aroclor® 1254	Reduced growth	10	Mosser, et al. 1972a
Diatom, *Skeletonema costatum*	Aroclor® 1254	Reduced cell division	10	Harding & Phillips, 1978
Diatom, *Chaetoceros socialis*	Aroclor® 1254	Reduced cell division	10	Harding & Phillips, 1978
Diatom, *Nitzschia longissima*	Aroclor® 1254	No effect on cell division	100	Harding & Phillips, 1978
Phytoplankton populations	Aroclor® 1254	Toxicity in 24 hrs	15	Moore & Harriss, 1972
Phytoplankton populations	Aroclor® 1242	Toxicity in 24 hrs	6.5	Moore & Harriss, 1972
Natural phytoplankton community	Aroclor® 1254	Decreased diversity, species ratio altered	100	Laird, 1973
Phytoplankton communities	Aroclor® 1254	Reduced biomass and size	1	O'Connors, et al. 1978

Bioconcentration data

Species	Tissue	Lipid (%)	Chemical	Bioconcentration Factor	Duration (days)	Reference
Polychaete, *Nereis diversicolor*	Whole body	-	Phenochlor® DP-5	800	14	Fowler, et al. 1978
Eastern oyster, *Crassostrea virginica*	Edible portion	-	Aroclor® 1016	13,000	84	Parrish, et al. 1974
Eastern oyster, *Crassostrea virginica*	Edible portion	-	Aroclor® 1254	101,000	245	Lowe, et al. 1972
Eastern oyster, *Crassostrea virginica*	Edible portion	-	Aroclor® 1254	>100,000	Field data	Duke, et al. 1970; Nimmo, et al. 1975
Grass shrimp, *Palaemonetes pugio*	Whole body	-	Aroclor® 1254	27,000	16	Nimmo, et al. 1974
Blue crab, *Callinectes sapidus*	Whole body	-	Aroclor® 1254	>230,000	Field data	Nimmo, et al. 1975

Ag Silver

- Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
9	Fourspine stickleback, *Apeltes quadracus*	550	-
8	Winter flounder, *Pseudopleuronectes americanus*	500	-
6	Atlantic silversides, *Menidia menidia*	210	-
4	Bay scallop, *Argopecten irradians*	33	-
3	Hard shell clam, *Mercenaria mercenaria*	21	-
2	American oyster, *Crassostrea virginica*	20	-
1	Summer flounder, *Paralichthys dentatus*	4.7	-

* Ranked from least sensitive to most sensitive based on species mean acute intercept or species mean acute value.

- Plant values

Species	Effect	Result (ug/l)	Reference
Alga, *Skeletonema costatum*	96-hr EC50, chlorophyll *a*	170	U.S. EPA, 1978
Alga, *Skeletonema costatum*	96-hr EC50, cell numbers	130	U.S. EPA, 1978

Zn Zinc

● Species mean acute values and acute-chronic ratios

Rank*	Species	Species Mean Acute Value (ug/l)	Species Mean Acute-Chronic Ratio
24	Mummichog, *Fundulus heteroclitus*	70,600	-
22	Starfish, *Asterias forbesi*	39,000	-
21	Polychaete, *Nereis diverscolor*	24,600	-
20	Winter flounder, *Pseudopleuronectes americanus*	9,460	
19	Sandworm, *Nereis virens*	8,100	-
18	Soft shelled clam, *Mya arenaria*	6,330	-
16	Atlantic silverside *Menidia menidia*	3,640	-
15	Mussel, *Mytilus edulis planulatus*	3,380	-
14	Polychaete, *Capitella capitata*	2,440	-
5	Hermit crab, *Pagurus longicarpus*	400	-
4	Lobster, *Homarus americanus*	321	-
3	Oyster, *Crassostrea virginica*	310	-
1	Hard shelled clam, *Mercenaria mercenaria*	166	-

* Ranked from least sensitive to most sensitive based on species mean acute intercept or value.

Zn Zinc

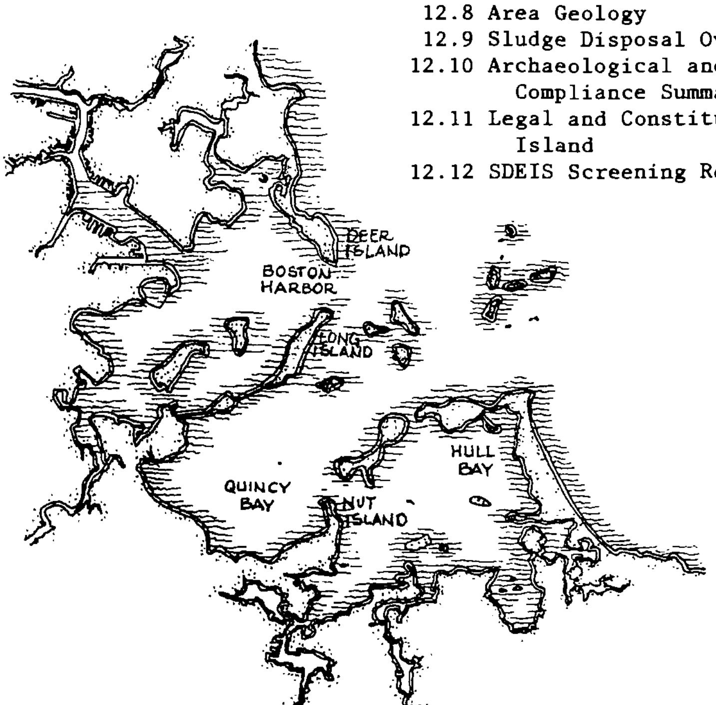
Plant values

Species	Chemical	Effect	Result (ug/l)	Reference
Kelp, *Laminaria digitata*	Zinc sulfate	Growth inhibition	100	Bryan, 1969
Alga, *Skeletonema costatum*	Zinc sulfate	Growth inhibition	200	Braek, et al. 1976
Alga, *Skeletonema costatum*	Zinc sulfate	Interaction with copper on growth	50	Braek, et al. 1976
Alga, *Thalassiosira rotula*	Zinc sulfate	Decrease in cell numbers	100	Kayser, 1977

Bioconcentration data

Species	Tissue	Chemical	Bioconcentration Factor	Duration (days)	Reference
Alga, *Enteromorpha prolifera*	-	Zinc sulfate	1,530	12	Munda, 1979
Polychaete (adult), *Nereis diversicolor*	-	Zinc sulfate	20	34	Bryan & Hummerstone, 1973
Oyster (adult), *Crassostrea virginica*	-	Zinc chloride	16,700	140	Shuster & Pringle, 1969
Soft-shell clam (adult), *Mya arenaria*	Soft parts	Zinc chloride	85	50	Pringle, et al. 1968
Soft-shell clam (adult), *Mya arenaria*	Soft parts	Zinc chloride	43	112	Eisler, 1977b
Mussel (adult), *Mytilus edulis*	Soft parts	Zinc chloride	225	13	Phillips, 1977
Mussel (adult), *Mytilus edulis*	Soft parts	Zinc chloride	500	21	Pentreath, 1973
Mussel (adult), *Mytilus edulis*	Soft parts	Zinc chloride	282	35	Phillips, 1976
Crab (adult), *Carcinus maenas*	Muscle	Zinc chloride	8,800	22	Bryan, 1966

12.0 BASELINE ENVIRONMENTAL REPORTS AND IMPACT ANALYSES



12.1 Land Use and Demographics

TABLE OF CONTENTS

12.1 LAND USE AND DEMOGRAPHICS

12.1.1 Summary

Two of the three alternative sites, Deer Island and Nut Island, are currently occupied by primary wastewater treatment plants operated by the MDC. Deer Island is also the site of the Deer Island House of Corrections for Suffolk County run by the City of Boston, and the location of an abandoned military installation, Fort Dawes. Nut Island is occupied exclusively and entirely by a wastewater treatment plant. Long Island, the third proposed site, is occupied by the Long Island Chronic Disease Hospital operated by the City of Boston. A former military installation, Fort Strong, is located at the northern part of the Island. The remainder of the island is largely undeveloped and unused.

Houghs Neck in Quincy, Point Shirley in Winthrop, and Squantum in Quincy are neighborhoods in close proximity to Nut Island, Deer Island, and Long Island, respectively. These neighborhoods would be most affected by proposed treatment plant construction and operation.

All three neighborhoods are predominantly residential. Point Shirley has a population of about 1,000 residents; Houghs Neck and Squantum have about 4,000 and 3,000 residents, respectively. Of the island sites, the Nut Island site is closest to residential neighborhoods; approximately 180 homes lie within half a mile of the site. In comparison, about 80 homes and the prison lie within a half mile of the Deer Island site and only the hospital lies within a half mile of the Long Island site.

12.1.2 Existing Development and Activities on the Island Sites

12.1.2.1 Deer Island

Deer Island ceased to be an actual island when, in 1936, Shirley Gut became filled in. The island is within the corporate boundary of the City of Boston. The City owns about half of the 210 acre island. The MDC owns about 75 acres and leases another 5 acres or two parcels from the U.S. Navy. The United States government own the remainder of the area encompassing about 25 acres. Figures 12.1-1, 12.1-2 and 12.1-3 show the island and its present land uses and ownership.

The Deer Island House of Correction is a complex of 20 structures (one of which was constructed in 1852) occupying approximately 40 acres. The prison, which has an inmate population of approximately 400 and a total staff of 200 guards and employees, has deteriorated over the years and has been under a Court Order to upgrade its detention facilities. Studies by the City have shown that the most cost effective approach to upgrading would be to build a completely new prison rather than to rehabilitate the existing collection of old structures. Construction of a new prison on Deer Island or at some other site has been considered by the City. Relocation elsewhere on the island is presently considered a possibility for a new prison, however, no final decisions on prison relocation or new construction have been made.

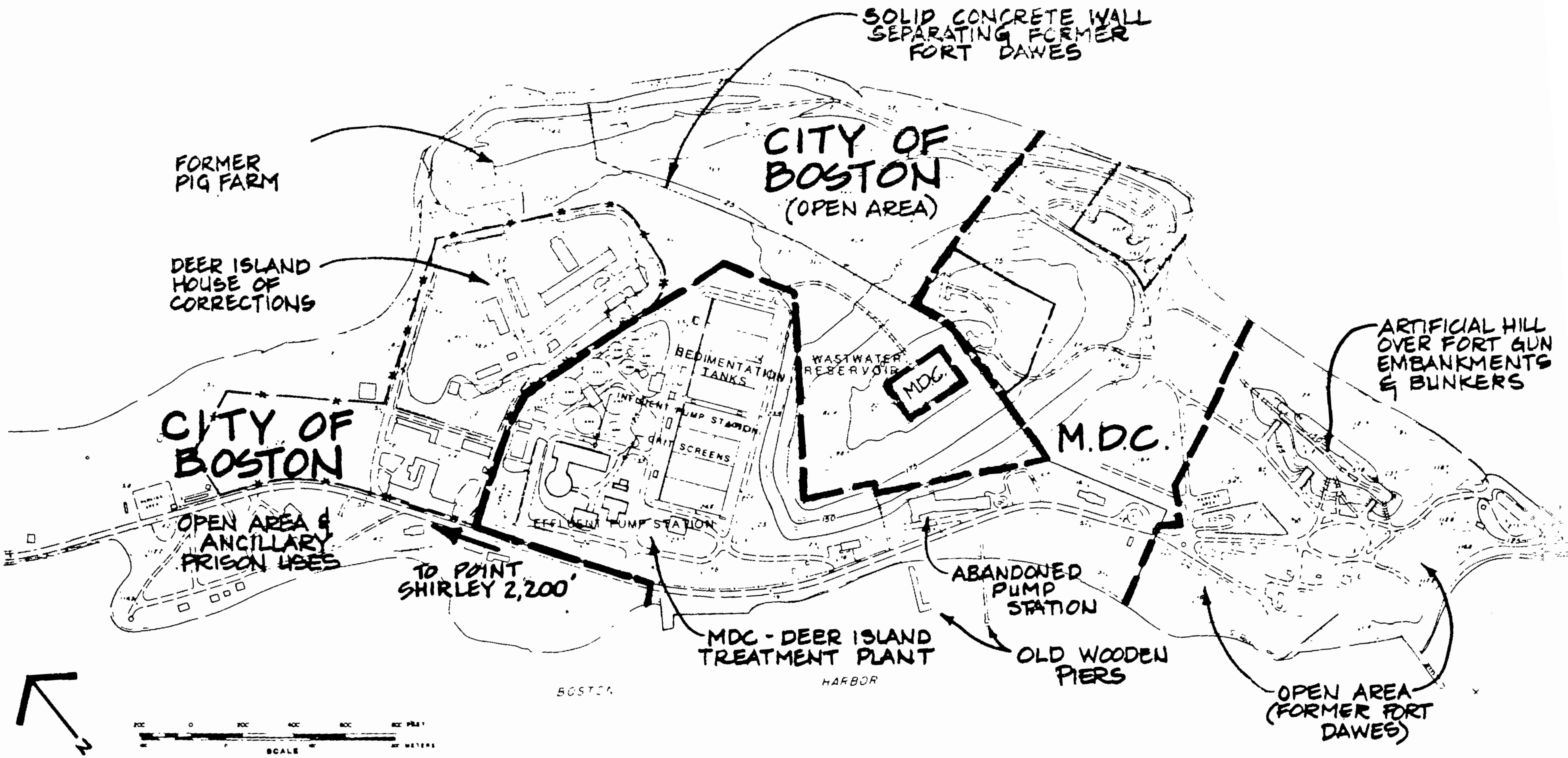
The MDC sewage treatment plant is the other major active land use on Deer Island. The original sewage pumping station was established in 1889. The existing plant was designed in the 1950's and completed in 1968. Wastewater treatment facilities occupy about 26 acres. There are approximately 20 employees at the facility (over four shifts).

Fort Dawes was established in 1941 at the southern tip of Deer Island as part of the defenses for President Roads in Boston Harbor. It is essentially abandoned today. The land area of Fort Dawes remains under U.S. Government ownership. Remains include concrete bunkers and gun emplacements. This site is being proposed for excessing by the U.S. government.

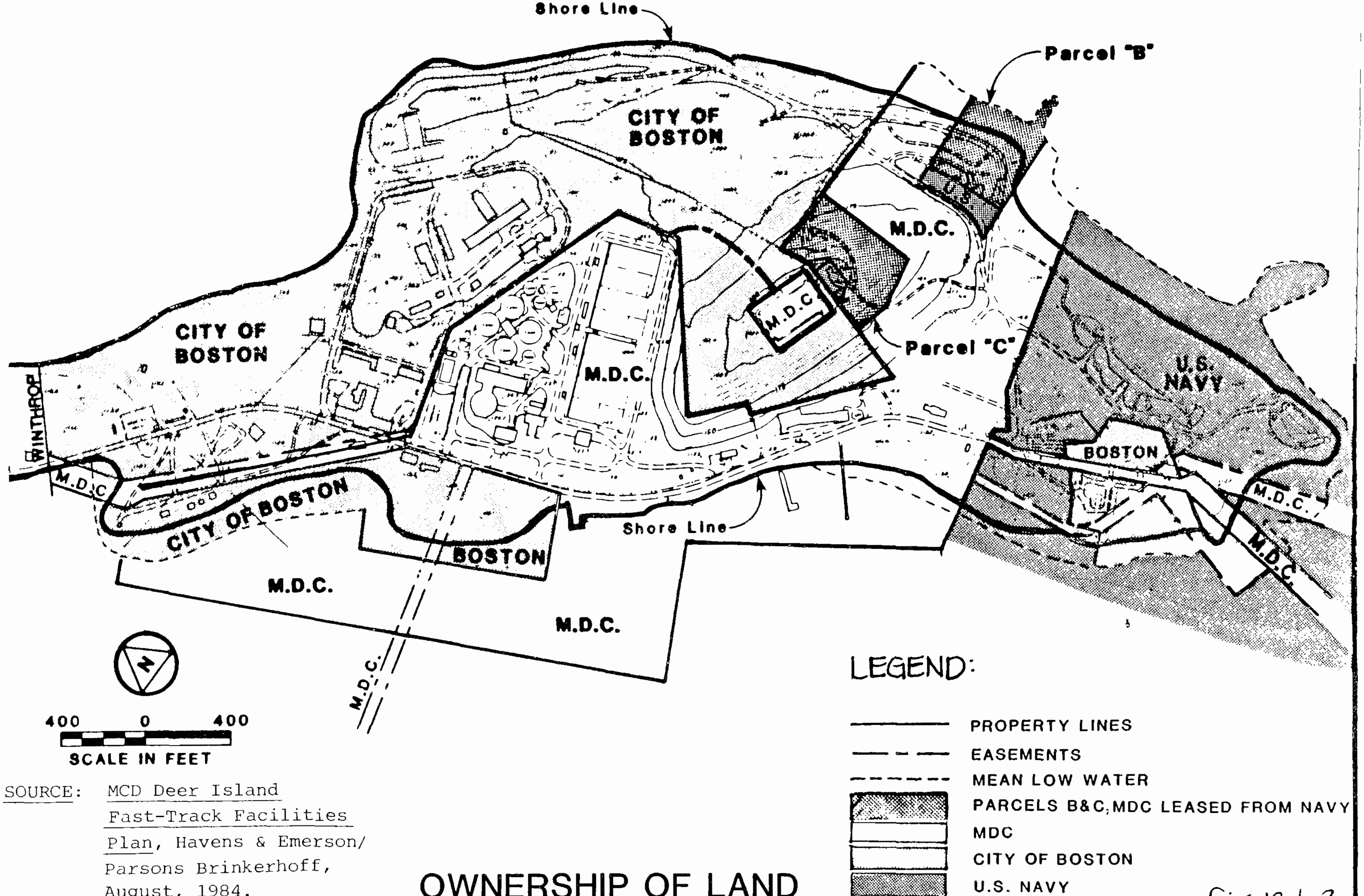
Deer Island is zoned "B-1, General Business" by the City of Boston, allowing all commercial and residential uses, but excluding industrial or other non-conforming uses without a variance. The

Deer Island

fig. 12.1-1



EXISTING CONDITIONS DEER ISLAND SITE



SOURCE: MCD Deer Island Fast-Track Facilities Plan, Havens & Emerson/ Parsons Brinkerhoff, August, 1984.

OWNERSHIP OF LAND ON DEER ISLAND

fig.12.1-3

existing non-conforming uses of the prison and treatment plant predate the zoning classifications.

12.1.2.2 Long Island

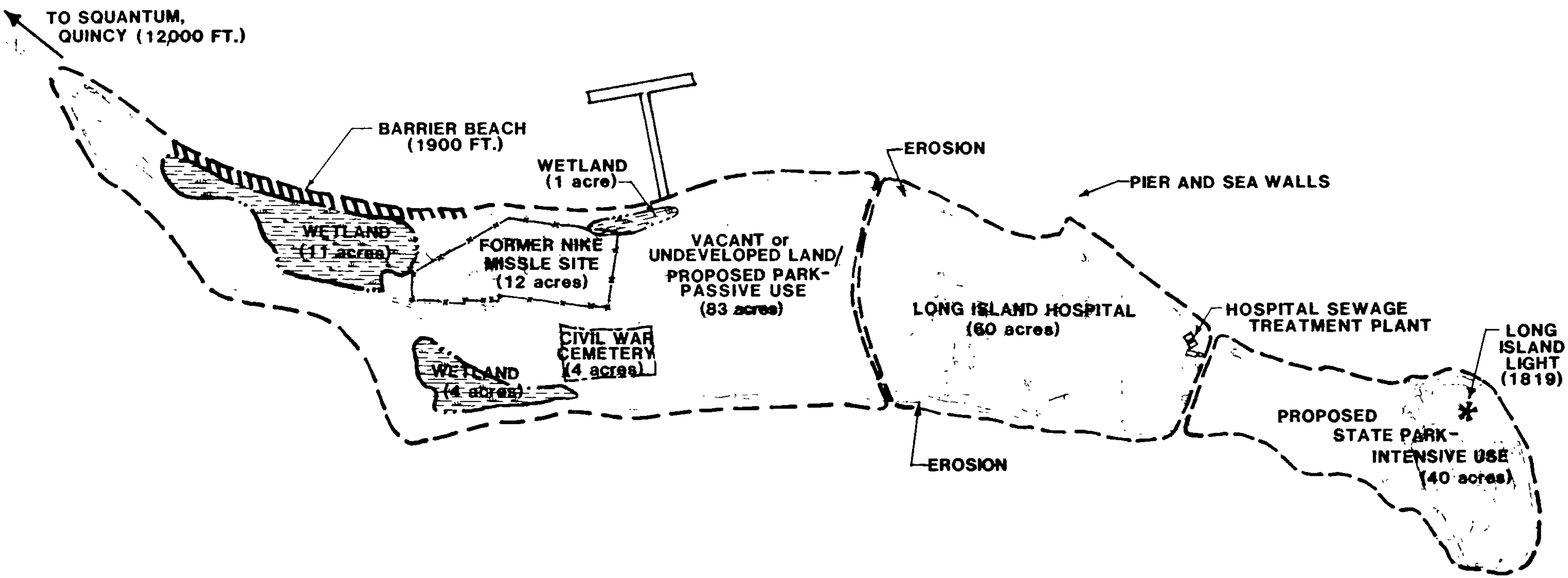
Long Island, approximately 213 acres in area, is the largest island in Boston Harbor. It is owned by the City of Boston and is connected to Moon Island and Quincy by a two-lane bridge built in 1951. Figures 12.1-4 and 12.1-5 show the island and its present land uses.

The Long Island Chronic Disease Hospital, operated by the City of Boston, Department of Health and Hospitals, occupies about 60 acares of the middle of the island. The hospital facility is used to treat alcoholics and provides care for the chronically ill, homeless, and elderly. A staff of approximately 400 serve a patient population listed as approximately 400. This island site has been used to care for and house the City's indigent and sick since 1882. Some of the structures in the Hospital's 28 building complex date from this period. Some are unused and in disrepair. A preliminary investigation of the potential historical value of these buildings is presented in Section 12.10 of this SDEIS.

Past and present City administrations have proposed closing the Long Island Hospital. The most recent review, released as a report in May 1984, (Boston in Transition) for the administration of Boston Mayor Raymond Flynn, considered a 5-year plan to reorganize the provision of medical and social services to the City's chronically ill, homeless and elderly. This plan proposed closing the Hospital on Long Island in 1989 and consolidating its services with the existing chronic care facilities at the City's Mattapan Hospital. No future use for the hospital facility was identified, and further study was recommended. At the present time, the Mayor's plans for the hospital reportedly include less use for provision of medical care and increased use as a shelter for the City's homeless, compatible with the joint goals of the City and State to develop recreational uses on Long Island (see correspondence in Section 10.1).

Long Island

fig 12.1-4



EXISTING CONDITIONS LONG ISLAND SITE

fig. 12.1-5

The southern part of Long Island is occupied by an abandoned Nike missile base of approximately 12 acres, and a historical cemetery of unknown area (shown as about 4 acres). The balance of the southern part of the island is presently undeveloped and in a natural state.

This area of Long Island also includes about 4 acres of freshwater wetland, about 11 acres of salt marsh and about 1,900 feet of barrier beach.

Long Island has served as a burial ground several times in its history. Archaelogists have found records indicating there may be over 2000 marked and unmarked graves on the island. These include graves of thirty-six British soldiers killed during the Revolutionary War, 79 Civil War veterans, former patients and inmates of the facilities on the island, and possibly many of the former inhabitants of the island. Some of these date from the late 17th to 19th centuries.

The northern part of the island is the location of the former Fort Strong. It contains numerous concrete fortifications that date back to the turn of the century. It was in use until after World War II. A lighthouse that was installed in 1819 is still in operation. This area of Long Island is the primary focus for recreational development proposed by the Massachusetts Department of Environmental Management (DEM) as part of its plan for the Boston Harbor Islands State Park. Passive recreational use is also planned for southern portions of the island (see Section 12.3).

Long Island is currently zoned by the City of Boston (1965 zoning) as "B-1, General Business". This classification allows any commercial use as well as all classifications of residential use. It does not allow industrial uses or other non-conforming uses without a variance from the City of Boston, Zoning Board of Appeals. The hospital on Long Island predates this zoning.

12.1.2.3 Nut Island

Nut Island in Quincy was once a 4-acre island just north of Quincy Great Hill on Houghs Neck. In 1893, the MDC built a road to the island and enlarged it to accommodate a pumping and screening station and outfall. In 1949, the island was again enlarged. The present primary treatment plant and sedimentation tanks were constructed in the following years. The entire 17-acre island is owned by the MDC and is taken up by the wastewater treatment plant. Figures 12.1-6 and 12.1-7 show the island and nearby areas.

Nut Island is zoned by the City of Quincy as "Industrial B, Heavy Industry". This classification allows operation of a wastewater treatment plant as a conforming use.

12.1.3 Land Use in Neighborhoods Affected by the Treatment Plant Alternatives

The Squantum and Houghs Neck neighborhoods of Quincy and the Point Shirley neighborhood in Winthrop would primarily be affected by the proposed treatment plant alternatives. These communities are described below.

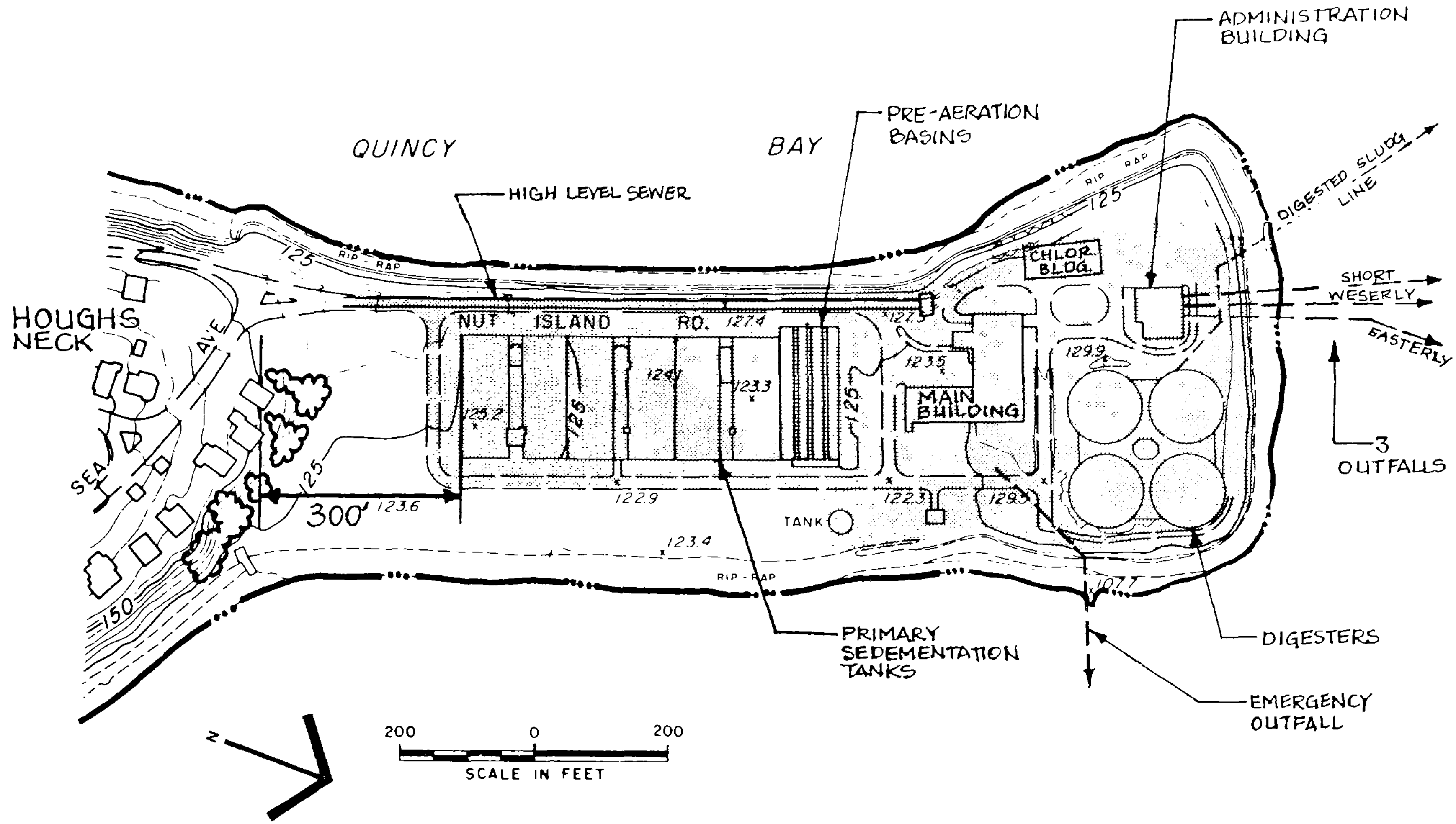
12.1.3.1 Point Shirley, Winthrop

Winthrop is a largely residential town of approximately 19,000 people situated on a peninsula that forms the northern boundary of Boston Harbor. The Point Shirley neighborhood is a narrow peninsula connected to Deer Island. It is located near Logan International Airport. The only route by land to Deer Island passes through Point Shirley.

The neighborhood is predominantly residential with approximately 450 houses and a population of about 1,000. Most of its homes were built as summer cottages which over the years have been winterized and used for year-round residences. A few neighborhood commercial uses are

Nut Island

fig. 12.1-6



= MDC NUT ISLAND WASTEWATER TREATMENT PLANT

Source: Metcalf & Eddy,
Nut Island Wastewater
Treatment Plant Facilities
Planning Project, June 1982

EXISTING CONDITIONS NUT ISLAND SITE

found amongst the residential areas. These commercial uses are located along the main truck route to Deer Island. Approximately 80 homes in the neighborhood are within a half-mile of the treatment plant. Significant community buildings and facilities are listed and shown graphically in Section 12.1.4 below.

Zoning in Point Shirley, and throughout much of Winthrop, is "Residence A, Single Family Use". Prior to 1955, this classification allowed lots with a minimum area of 3,500 square feet. Between 1955 and 1982, the minimum lot size requirement was increased to 5,000 square feet. In 1982, the required lot size for single-family houses in all "Residence A" zones was increased to 7,000 square feet.

Point Shirley residents are significantly affected by the current operations of nearby Logan Airport, the Deer Island House of Corrections, and the Deer Island Wastewater Treatment Plant. Residents of Point Shirley must contend with disruptions caused by daily low flying jet planes, occasional disruptions associated with the prison operations including escaped prisoners, and periodic disruptions caused by faulty operations of the existing treatment plant. Over the years, these have affected the quality of life of area residents by concentrating negative impacts of these major regional facilities at one location in close proximity to residential concentrations.

12.1.3.2 Squantum, Quincy

The Squantum section of Quincy is a peninsula that separates Dorchester Bay from Quincy Bay. It is connected to North Quincy by a causeway. Quincy is a large manufacturing city with a 1980 residential population of 74,743. It enjoys a rich historical and cultural background founded on granite quarrying and shipbuilding.

The Squantum neighborhood which had a 1980 population of 3,080, is a relatively densely-developed residential area. Other than limited neighborhood commercial uses, major land use is single-family resi dential development. A few small apartment buildings and a limited number of two-family houses are in evidence. Significant community facilities are listed and shown graphically in Section 12.1.4.

Zoning in Squantum, updated by the City in 1971, is predominantly "Residence A, Single-Family" Minimum lot size is 7,650 square feet. There are a small number of "Residence B, Multi-Family" units along Dorchester Avenue in Squantum and some "Business-B, Neighborhood Commercial" establishments. The large salt marsh adjacent to East Squantum Street is zoned as open space.

Squantum is also the site of the former Squantum Naval Air Station which has a land area nearly as large as the developed area of Squantum (500 acres). The Naval Air Station site was purchased several years ago by Boston Edison. It remains largely undeveloped and no reuse plans have been proposed for most of it. The Boston Harbor Marina, located on a portion of the Air Station site, will likely be a permanent component of any future development. Construction has recently begun on an approximately 140-unit townhouse condominium complex, which perhaps will set the tone for future development of the site.

Current zoning on the Naval Air Station site is primarily "PUD, Planned Unit Development". Quincy's PUD zone allows any use except heavy industry. Portions of the site are also zoned for light industry, general business, and open space.

Squantum is also near Moon Island, a 45-acre island which is connected to Squantum by a two-lane causeway and sits between the mainland and Long Island. Moon Island is owned by the City of Boston. One-third of the island is taken up by 4 huge granite sewage storage tanks. The tanks were built in 1884 and designed to store 50 million gallons of wastewater to be released on the outgoing tide. The outfall from these tanks is now used to discharge untreated wastewater flows during wet weather when sewage flows normally routed to Deer Island exceed the treatment plant's influent pumping capacity.

The Boston Fire Department operates a fire fighting training facility on the northern end of the island. The Boston Police Department operates an outdoor pistol range on the southern side of the island. Access to Moon Island and Long Island is restricted by a guard at a gatehouse located at the beginning of the causeway to Moon Island.

12.1.3.3 Houghs Neck, Quincy

Houghs Neck is a peninsula forming the southeastern boundary of Quincy Bay. Nut Island is no longer an island but is a 17-acre penninsula that divides Quincy Bay from Hingham Bay Houghs Neck is a densely developed residential area; its housing was developed originally as summer residences. Nearly all homes have since been converted to year-round residences.

Half of the housing stock was constructed prior to 1939. There are some neighborhood commercial uses in the area including food stores, restaurants, marinas and boat rentals. These are located along the major access routes The Quincy Yacht Club, occupying a section of land facing Hingham Bay, and a boat rental business on Houghs Neck provide access for boating and fishing in Quincy and Hingham Bays Significant community facilities are listed and shown graphically in Section 12.1.4.

Zoning in Houghs Neck is predominantly "Residence A, Single-Family" with 7,650 square foot lot minimums. There are some "Residence B, Multi-Family" homes (6,750 square feet minimum lots) and some "Business B, Neighborhood Commercial" establishments.

12.1.4 Community Facilities in Each Neighborhood

In each of the neighborhoods, there are a number of community facilities such as schools, parks, recreation areas, and local businesses that may be affected by proposed construction activities. These are listed below.

12.1.4.1 Point Shirley, Winthrop

Community facilities located along the major access route to Deer Island are numbered and listed below and on the following map, (Figure 12.1-8):

1. Neighborhood commercial uses such as convenience stores are located along Revere Street and at the corner of Shirley Street.

2. Temple Tifereth Israel is located on Veterans Road. BINGO and other activities are scheduled in their adjacent function hall.

3. The Shirley Street Elementary School is located on Shirley Street. Although not directly on Veterans Road, the truck route, the school is within 200 feet of Veterans Road.

4. A park and tot lot is located immediately to the west of Veterans Road.

5. Several neighborhood commercial uses are located at the Washington Avenue and Shirley Street intersection.

6. The Cottage Hill Yacht Club is a prominent boating facility located on Shirley Street.

7. A public boat launching ramp is located south of the Cottage Hill Yacht Club and directly off Shirley Street.

8. Yirrell Beach is a major public beach serving the Point Shirley area.

9. Holy Rosary Church.

10. Point Shirley Association meeting hall.


COMMUNITY FACILITIES OF NOTE-
POINT SHIRLEY, WINTHROP
LEGEND:
1 = Schools
1 = Recreation
2 = churches
2 = commercial
3 = Public Buildings
number references specific uses.
BOSTON
WINTHROP
BOSTON HARBOR
Logan International Airport
LOGAN INTERNATIONAL AIRPORT
Beachmont
Suffolk Downs Station
Drive in Theater
Radio Towers
Short Beach
Belle Isle
Tidal Flat
Grovers Cliff
Ocean Spray
The Five Sisters
Winthrop Beach
Court Park
Cottage Park
Crystal Cove
Cottage Hill
Winthrop Head
Snake Island
Coughlin Park
The Basin
Yirrell Beach
Point Shirley
Deer Island
Sewage Disposal
Little Faun
Fort Dawes
Community Hospital
High Sch
Miller Field
Golf Course
Library
Townhall
BOSTON CORPORATE BOUNDARY
REVERE CORPORATE BOUNDARY
fig.12.1-8

12.1.4.2 Squantum, Quincy

Community facilities in North Quincy and Squantum are also located along the major access route to Long Island. These facilities are numbered and identified below and on the following map (Figure 12.1-9):

1. North Quincy High School is located on the corner of Hancock Street and East Squantum Street.

2,3. Neighborhood commercial uses (convenience stores) are located along East Squantum Street near Botolph Street and on Atlantic Street at East Squantum Street.

4. Moswetuset Hummock is an MDC park that is a popular gathering place for high school age children.

5. The Myles Standish School is a former elementary school that is currently leased to the Quincy Elks. Activities such as BINGO are regularly scheduled here.

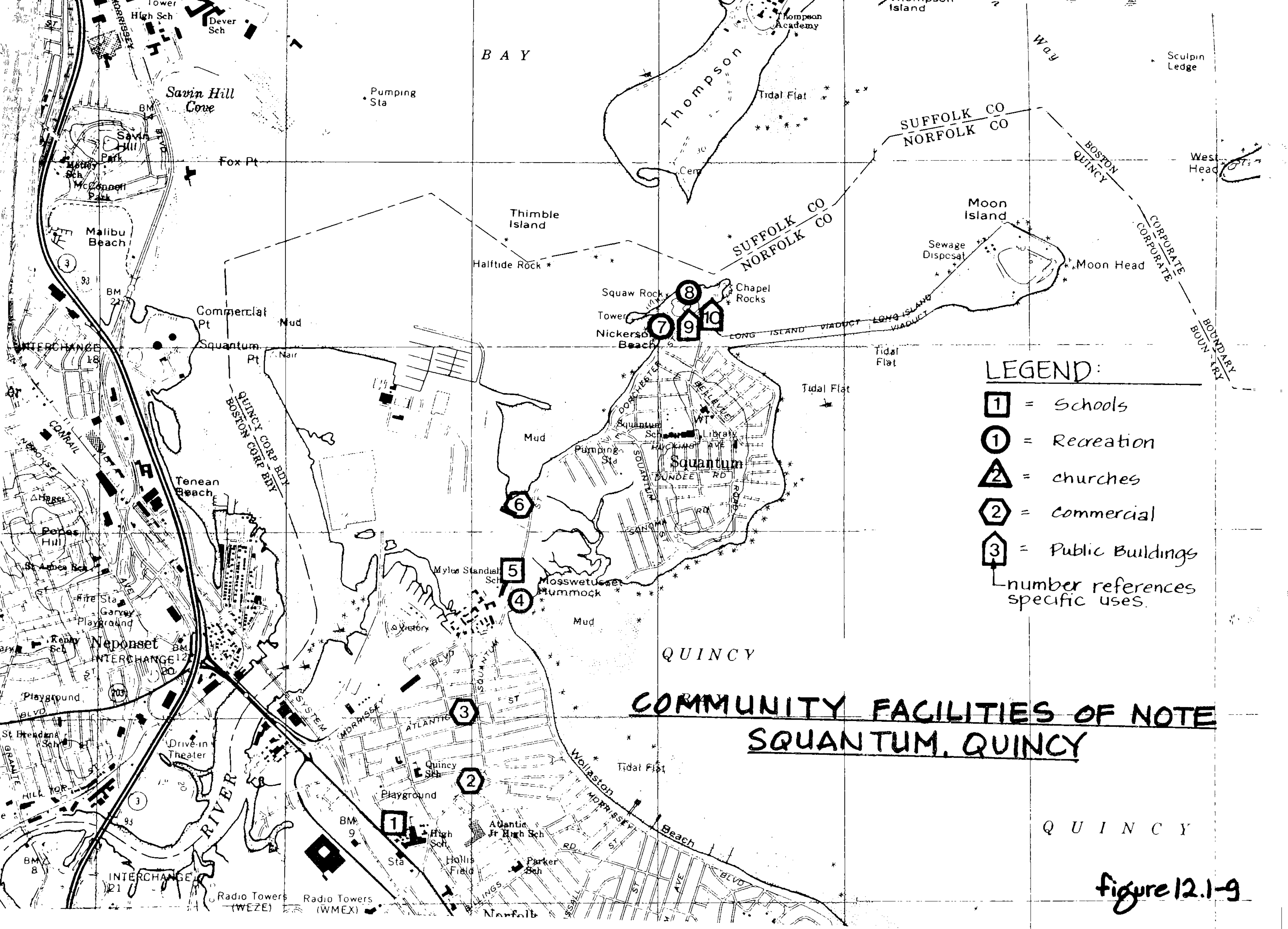
6. Boston Harbor Marina and other business, recreational, and commercial activities are located off East Squantum Street. A commuter boat service to downtown Boston is temporarily in operation during the reconstruction of the Southeast Expressway. The Boston Harbor Marina is the largest marina in Boston Harbor.

7. Nickerson Beach is a small public beach used by residents of Squantum.

8. Squaw Rock is a public park area several acres in size.

9. Two former military buildings (part of the abandoned Nike base) currently house various social service programs.

10. The Robert I. Nickerson American Legion Post #382 is located in a former military structure at Squaw Rock.



COMMUNITY FACILITIES OF NOTE
SQUANTUM, QUINCY
LEGEND:
1 = Schools
1 = Recreation
2 = churches
2 = commercial
3 = Public Buildings
number references specific uses.
BAY
Savin Hill Cove
Savin Hill
Fox Pt
Malibu Beach
McConnell Park
Thimble Island
Halftide Rock
Thompson Island
Thompson Academy
Tidal Flat
Pumping Sta
SUFFOLK CO
NORFOLK CO
BOSTON
QUINCY
CORPORATE
BOUNDARY
Moon Island
Moon Head
Sewage Disposal
Sculpin Ledge
West Head
Squaw Rock
Chapel Rocks
Tower
Nickerson Beach
LONG ISLAND VIADUCT
Commercial Pt
Squantum Pt
Mud
Squantum
Squantum Sch
Library
DORCHESTER ST
BELLEVUE
HUCKINS AVE
DUNDEE RD
SONOMA ST
QUINCY CORP BDY
BOSTON CORP BDY
INTERCHANGE 18
CONRAIL
Tenean Beach
Neponset
INTERCHANGE 20
Myles Standish Sch
Mosswetusset Hummock
Victory
QUINCY
Playground
St Brendans Sch
Drive-in Theater
RIVER
ATLANTIC
MORRISSEY BLVD
Quincy Sch
Atlantic Jr High Sch
High Sch
Hollis Field
Parker Sch
Wollaston Beach
Radio Towers (WEZE)
Radio Towers (WMEX)
INTERCHANGE 21

figure 12.1-9

12.1.4.3 Houghs Neck, Quincy

Community facilities located along the major access route to Nut Island are numbered and identified below and on the following map, (Figure 12.1-10):

1. Our Lady of Good Counsel Church is located on Sea Street near Samoset Avenue.

2. Adams Shore Branch Library.

3. Neighborhood commercial uses such as convenience stores are located at several intersections along Sea Street.

4. Rockland Street playground and field.

5. Most Blessed Sacrament Church.

6. Saint Thomas Aquinas Hall is located close to Sea Street at the Corner of Darrow Street and Manet Avenue.

7. The Atherton Hough School is located on Sea Street and Manet Avenue.

8. Houghs Neck Congregational Church is located on Manet Avenue, close to Sea Street.

9. Houghs Neck Community Center and Manet Community Health Center.

10. Neighborhood Commercial uses are located on Sea Street.

11. Hurley's Boat Rentals is a well known private business providing small boats for fishing to many South Shore and Boston residents.

COMMUNITY FACILITIES OF NOTE - HOUGHS NECK, QUINCY

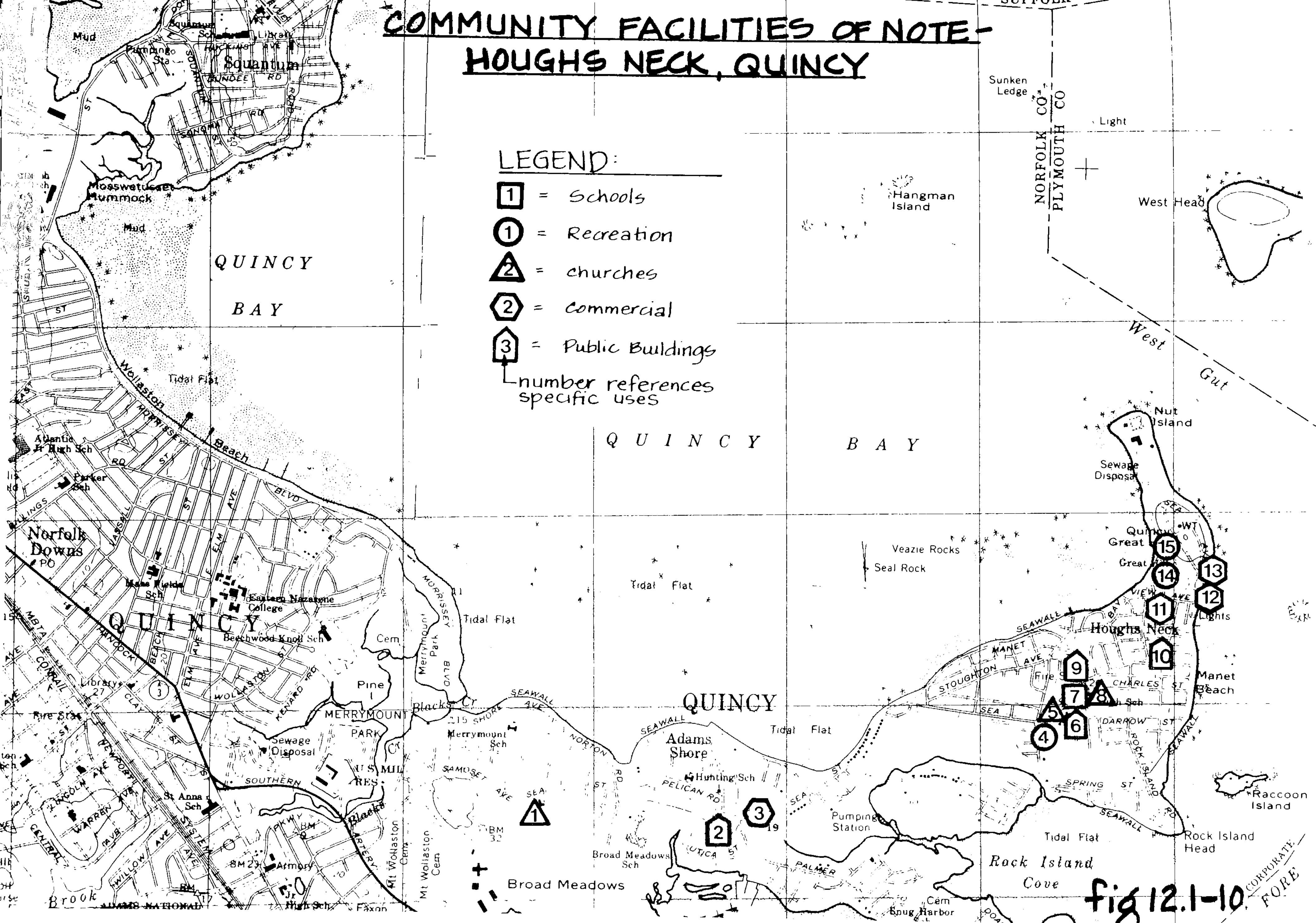


fig 12.1-10

12. Quincy Yacht Club

13. Site of the demolished Great Hill Elementary School has recently been regraded to provide increased open space next to Brill Field.

14. John F. Brill Field is a heavily used playfield.

15. Broad Meadows School is located on block away from Sea Street.

12.1.5 Demographic Data

12.1.5.1 Introduction

Data from the U.S. Bureau of the Census for Squantum, Point Shirley (including Cottage Hill) and Houghs Neck (including Germantown and Adams Shore) was assembled to provide a demographic overview of the affected neighborhoods. The data not only provides population figures, but also a breakdown of population groups, including elderly and school-age children, employment figures, and other socio-economic data. While this data is useful in providing broad statistics on the affected areas, it is not the basis for assessing site specific impacts since census data is highly generalized.

Of greatest interest, from the 1980 Census, are data describing age breakdowns of the population, family type, school enrollment, journey to work, employment, income, and housing. These subjects are highlighted below. Attachment 1 provides census tables centering this information.

12.1.5.2 Population

Total population, as recorded by the Census tract designations (which are not specific to either Houghs Neck or Point Shirley) show Point Shirley (including the Cottage Hill area) at 4,395 persons, Houghs Neck (including the Germantown and Adams Shore neighborhoods) at 9,590 persons, and Squantum at 3,080 persons. Estimates of the number of persons in the respective neighborhoods nearest the sites are approximately 1000 persons in Point Shirley, 4000 persons in Houghs Neck, and 3000 persons in Squantum.

12.1.5.3 Age

The median age of all individuals in Houghs Neck and Point Shirley is 30 years, which is slightly below the median for the Boston SMSA (Standard Metropolitan Statistical Area as defined by U.S. Census) at 31 years. Squantum has a higher median age of 35 years old. The median age for females in Houghs Neck and Squantum is significantly higher than the median age for all individuals. Median female age in Houghs Neck is 33, while it is 38 in Squantum. Pre-school children represent about 4% of the population in each area and in the SMSA. School-age children represent about 22% of the population in the SMSA as well as in Squantum and Point Shirley, and 28% in Houghs Neck.

Those 65 years of age and over comprise 12% of the population in Squantum and Point Shirley, and 14% of the population in the Houghs Neck area.

12.1.5.4 Families

The number of families (defined by the Census as related persons in the same house and averaging 3-plus persons) was 816 in Squantum, 2,435 in Houghs Neck (including Germantown/Adams Shore), and 1,023 in Point Shirley (including Cottage Hill). Of these, about 14%, 25%, and 21% respectively, were headed by single mothers with children under 18 years of age.

12.1.5.5 Employment and Journey to Work

In all three areas, the census reports that 2 or 3 workers per family is common. This indicates a significant number of families with both parents or with parents and children in the labor force.

Most employed persons (16 years of age and older) in each study area drove to and from work. Between 16% and 21% of those driving use carpools. Among those working, 15% in Squantum take public transportation, compared with 21% in Houghs Neck and 26% in Point Shirley. The average travel time to work from these areas was 26 minutes.

12.1.5.6 Income

The average per household income (in 1979) was $24,000 in Squantum, $16,600 in Houghs Neck, and $19,200 in Point Shirley, compared with $22,500 for the Boston SMSA. The median income in the SMSA was $15,000. Twenty percent of the households in the Houghs Neck census tract reported public assistance income, although the combined Census area including Germantown and Adams Shore was partly responsible for this statistic. Six percent reported assisted income in both Squantum and Point Shirley, and nine percent reported such income in the SMSA. Thirty-seven percent of Houghs Neck (including Germantown/Adams Shore) households also reported Social Security income compared with twenty-nine percent in Squantum, nineteen percent in Point Shirley (including Cottage Hill), and twenty six percent in the SMSA.

The percentage of families below the poverty level in Squantum was 3.5 percent; in Point Shirley (including Cottage Hill), it was 8.5 percent; while in Houghs Neck (including Germantown/Adams Shore), it was 15.9 percent. Within the SMSA, 7.3 percent of all families were below this income level. The inclusion of Germantown, an area with a concentration of public and elderly housing, in the Houghs Neck Census Tract, is likely responsible for both the lower and higher numbers in these categories.

12.1.5.7 Housing Characteristics

In 1980, a total of 1,096 housing units were reported in Squantum, 3,527 units in Houghs Neck (including Germantown/Adams Shore), and 1,882 units in Point Shirley (including Cottage Hill). Of these, 82.6 percent in Squantum were owner-occupied, 56.8 percent in Houghs Neck, and 41.8% in Point Shirley. In Squantum, 84 percent were single-family houses. More than half of the homes in Houghs Neck (60 percent) were single-family, while only 34 percent in Point Shirley were single-family. Point Shirley had almost equal numbers of 2-family and 3- to 4-family homes, as well. Houghs Neck also showed significant numbers of multiple unit homes, (influenced by the Germantown and Adams Shore areas).

One-half of the homes in Houghs Neck and Squantum, and three-quarters of the homes in Point Shirley were built 45 years ago or more. Forty-two percent of owners of owner-occupied houses in both Houghs Neck and Squantum have lived in their houses 20 years or more. In Point Shirley, the comparable number is thirty-one percent.

In Point Shirley, a significant percentage of houses were built as seasonal structures. Most have been converted to year round use. Fully one-half of the houses are renter-occupied. Because many of the structures are old and are converted summer homes, the average housing values are reported to be lower in Point Shirley than the average value for houses in the SMSA. In addition, the community's location adjacent to Logan Airport, the Deer Island House of Correction, and Deer Island Wastewater Treatment Plant also tend to suppress house values. The 1980 Census places the median value of owner-occupied housing units in Point Shirley at $43,800. The median value in the SMSA was $56,000 in 1980.

There is a wide range in the housing styles and values in Squantum. For example, along Dorchester Street, the main road to Long Island, houses are generally modest in size and character. Houses on Crabtree Road facing Quincy Bay are larger residences. The median value of houses in Squantum was $49,500, compared with $56,000 in the SMSA. Median house values in Houghs Neck were reported to be $36,100, again influenced by the values in the other neighborhoods included in this figure.

12.1.6 Regional Population Projections

Population change within the Metropolitan Sewerage District (MSD) has traditionally been considered one of the principal factors affecting future wastewater flow. Sewerage facility planning studies of the past devoted considerable effort to the projection of future population so that proposed facilities could be sized accordingly. Typically, such projections used population and per capita water use to estimate sewage flows and size facilities.

Until 1980, almost all population projections showed a continued growth in Boston's regional population. However, the 1980 Census data revealed a demographic change which occurred in the Metropolitan area between 1970 and 1980. For the first time in almost two centuries, population in the Boston Metropolitan Area (defined as the 101 cities and towns in the Metropolitan Area Planning Council, MAPC, district) actually declined. The population totals for the region were reported as 3,013,912 in 1970 versus 2,884,712 in 1980. This represents slightly greater than a four percent decline in population over the decade.

Out-migration has been greater than in-migration in Massachusetts since the 1950's. The net out-migration was especially heavy in the 1970's. Prior to the 1970's the region's substantial net out-migration was masked by large natural increases (births). It was the combination of a decline in natural increases in the Region together with continuing net out-migration that produced the decline in population.

While the Boston region's population declined overall, shift of population within the Metropolitan region continued to be dominated by population outflow from urban areas to lower density suburban communities. Population losses were particularly heavy in such urban communities as Boston, Chelsea, Everett, and Somerville, while population in communities such as Framingham, Quincy and others along the South Shore grew. The commercial building boom in downtown Boston, as well as in the suburbs, has tended to obscure the fact that permanent population in the Metropolitan region is slightly declining.

This SDEIS, therefore, assumes that population within the Metropolitan Sewerage District (MSD) overall, will not change dramatically in the foreseeable future due to either population gain or loss. Growth and expansion that may occur within the MSD will largely result from in-state movement, most likely from urbanized to suburban areas. Therefore, existing, essentially stable, population figures should be used in planning for wastewater flows. Consideration of further shifts in the population within the region (from the northern to the southern MSD systems, for example) is required to develop future wastewater management plans and to limit any future expansion of the currently proposed harbor wastewater treatment plants (see Section 5.6)

ATTACHMENT 1

CENSUS TABLES AND BOUNDARY MAPS

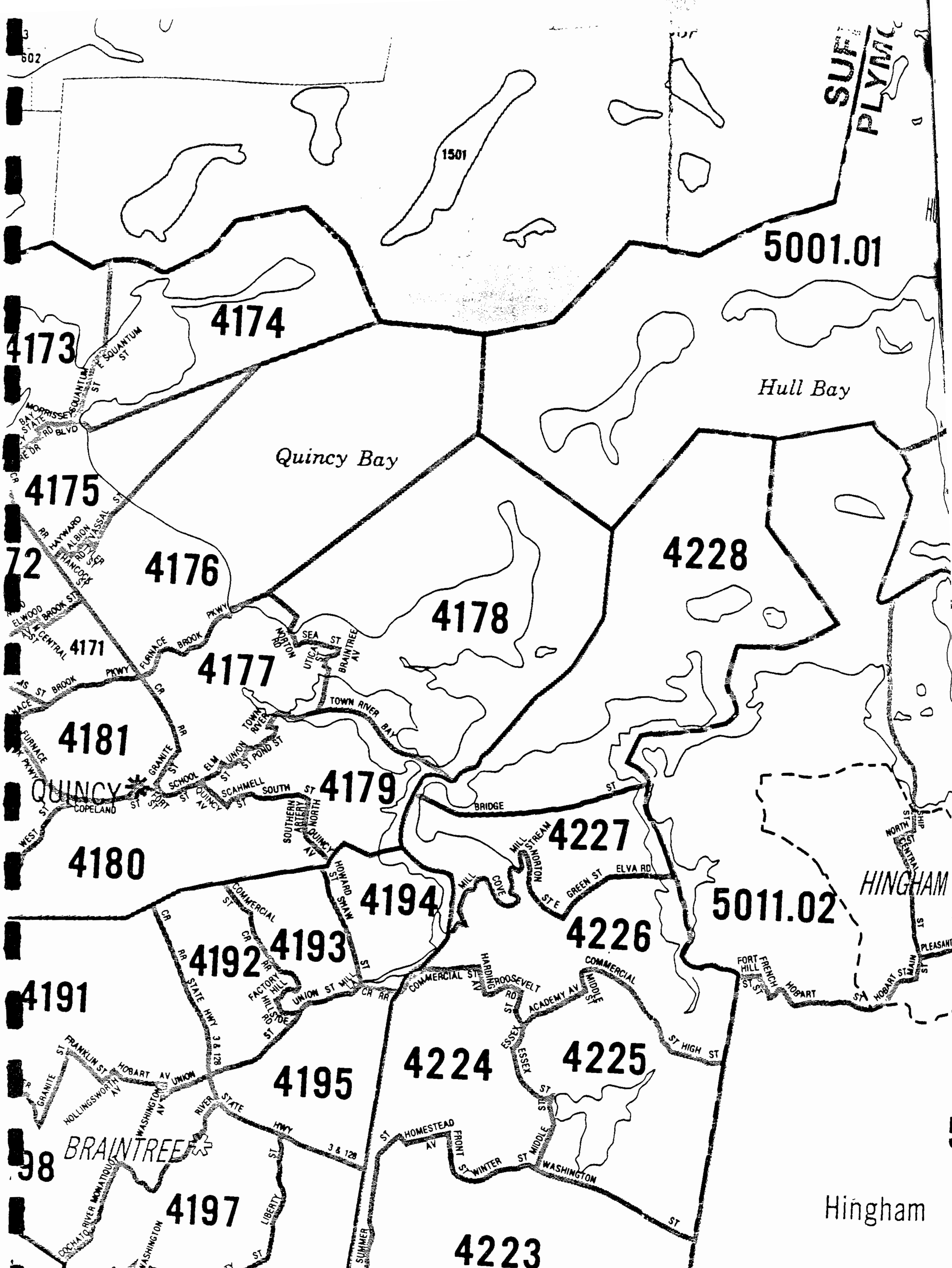
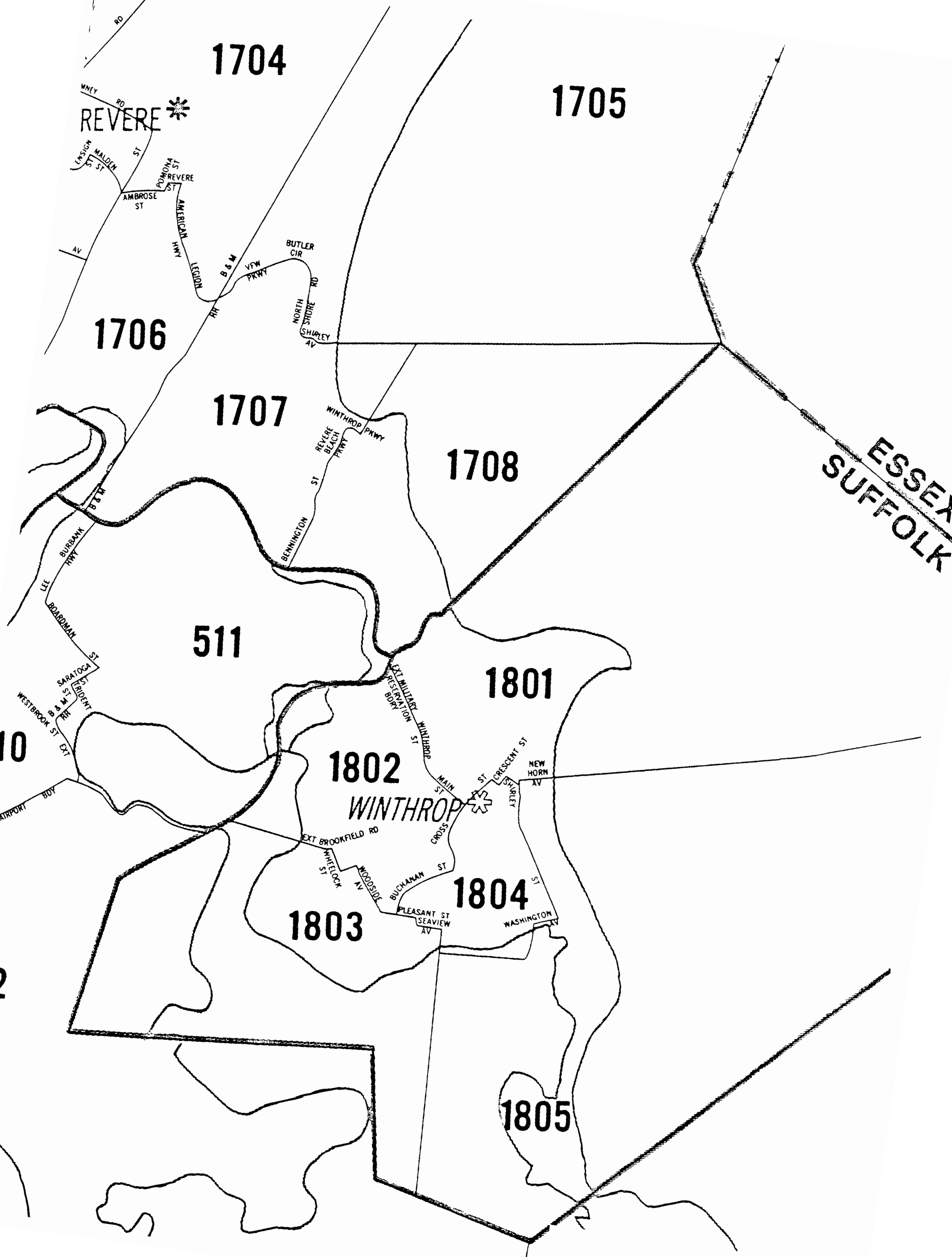


FIGURE A1
CENSUS TRACT MA



1704
1705
1706
1707
1708
511
1801
1802
1803
1804
1805
REVERE
WINTHROP
ESSEX
SUFFOLK
RD
RD
ENSIGN ST
MALDEN ST
ST
AMBROSE ST
POMONA ST
REVERE ST
AMERICAN LEGION HWY
AV
B & M RR
VFW PKWY
BUTLER CIR
NORTH SHORE RD
SHIRLEY AV
WINTHROP PKWY
REVERE BEACH PKWY
ST
BENNINGTON
B & M
BURBANK HWY
LEE
BOARDMAN ST
SARATOGA ST
TRIDENT ST
WESTBROOK ST EXT
B & M RR
AIRPORT BDY
EXT MILITARY RESERVATION BDRY
WINTHROP ST
MAIN ST
ST
CRESCENT ST
SHIRLEY ST
NEW HORN AV
CROSS
EXT BROOKFIELD RD
WHEELOCK ST
WOODSIDE AV
BUCHANAN ST
PLEASANT ST
SEAVIEW AV
WASHINGTON AV

FIGURE A2

Table P-1. General Characteristics of Persons: 1980

[For meaning of symbols, see introduction. For definitions of terms, see appendixes A and B]

Census Tracts	The SMSA	Squantum Tract 4174	Houghs Neck Tract 4178	Point Shirley Tract 1805
AGE				
Total persons	**2 763 357**	**3 080**	**9 590**	**4 395**
Under 5 years	144 969	118	526	190
5 to 9 years	163 531	153	662	246
10 to 14 years	213 683	257	893	287
15 to 19 years	265 391	314	1 080	322
20 to 24 years	286 777	253	866	514
25 to 34 years	469 729	433	1 295	1 014
35 to 44 years	306 375	326	994	429
45 to 54 years	291 081	397	948	406
55 to 64 years	277 077	388	1 050	444
65 to 74 years	197 683	311	743	281
75 years and over	147 061	130	533	262
3 and 4 years	56 408	44	231	60
16 years and over	2 192 265	2 496	7 276	3 624
18 years and over	2 090 286	2 369	6 836	3 490
21 years and over	1 917 479	2 181	6 218	3 285
60 years and over	473 246	627	1 785	751
62 years and over	419 165	552	1 560	661
Median	31.2	35.4	30.6	30.8
Female	**1 453 819**	**1 600**	**5 197**	**2 317**
Under 5 years	70 430	53	258	86
5 to 9 years	79 991	67	331	120
10 to 14 years	104 828	126	446	153
15 to 19 years	132 064	160	553	171
20 to 24 years	146 162	115	445	285
25 to 34 years	241 018	215	694	506
35 to 44 years	159 067	173	547	203
45 to 54 years	151 650	227	507	207
55 to 64 years	148 829	198	603	230
65 to 74 years	118 486	184	442	170
75 years and over	101 294	82	371	186
3 and 4 years	27 383	16	116	26
16 years and over	1 174 771	1 327	4 048	1 929
18 years and over	1 124 808	1 254	3 826	1 854
21 years and over	1 036 684	1 169	3 494	1 752
60 years and over	289 854	361	1 096	462
62 years and over	260 768	322	971	423
Median	32.8	38 8	33.1	31.4
HOUSEHOLD TYPE AND RELATIONSHIP				
Total persons	**2 763 357**	**3 080**	**9 590**	**4 395**
In households	2 660 173	3 080	9 590	4 287
Householder	990 660	1 079	3 363	1 772
Family householder	669 028	816	2 435	1 023
Nonfamily householder	321 632	263	928	749
Living alone	260 641	231	829	567
Spouse	525 596	676	1 727	767
Other relatives	1 033 492	1 272	4 316	1 482
Nonrelatives	110 425	53	184	266
Inmate of institution	35 970	–	.	83
Other, in group quarters	67 214			25
Persons per household	2.69	2.85	2.85	2.42
Persons per family	3.33	3.39	3.48	3.20
Persons 65 years and over	**344 744**	**441**	**1 276**	**543**
In households	318 209	441	1 276	467
Householder	212 382	282	933	290
Nonfamily householder	102 434	109	516	116
Living alone	98 395	105	503	108
Spouse	63 311	114	229	104
Other relatives	37 346	42	94	61
Nonrelatives	5 170	3	20	12
Inmate of institution	23 456	–	–	74
Other, in group quarters	3 079			2
FAMILY TYPE BY PRESENCE OF OWN CHILDREN				
Families	**669 028**	**816**	**2 435**	**1 023**
With own children under 18 years	322 490	337	1 218	437
Number of own children under 18 years	636 295	666	2 596	849
Married-couple families	**525 596**	**676**	**1 727**	**767**
With own children under 18 years	254 711	290	831	339
Number of own children under 18 years	510 962	579	1 832	685
Female householder, no husband present	**116 062**	**114**	**611**	**211**
With own children under 18 years	60 602	41	369	84
Number of own children under 18 years	113 623	75	736	146
MARITAL STATUS				
Male, 15 years and over	**1 042 604**	**1 198**	**3 347**	**1 714**
Single	402 577	422	1 235	710
Now married, except separated	547 466	695	1 787	796
Separated	20 147	12	58	47
Widowed	30 189	32	140	43
Divorced	42 225	37	127	118
Female, 15 years and over	**1 198 570**	**1 354**	**4 162**	**1 958**
Single	396 028	391	1 168	720
Now married, except separated	546 380	693	1 787	798
Separated	33 326	26	155	54
Widowed	153 896	177	684	244
Divorced	68 940	67	368	142

Table P-8. **Ancestry of Persons: 1980**

[Data are estimates based on a sample; see introduction. For meaning of symbols see introduction. For definitions of terms, see appendixes A and B]

Census Tracts	The SMSA	Squantum Tract 4174	Houghs Neck Tract 4178	Point Shirley Tract 1805
Total persons	2 763 357	3 076	9 590	4 395
Single ancestry group	1 551 417	1 502	4 791	2 376
Dutch	5 093	-	-	-
English	203 910	295	625	316
French	57 983	21	144	46
German	45 880	5	172	46
Greek	21 055	37	63	15
Hungarian	4 251	-	13	-
Irish	414 868	698	2 354	699
Italian	279 057	137	559	703
Norwegian	4 391	24	12	25
Polish	45 518	23	119	66
Portuguese	30 618	16	31	13
Russian	55 317	-	20	179
Scottish	27 986	57	148	68
Swedish	17 364	123	191	15
Ukrainian	4 780	-	6	11
Other	323 346	66	334	- 174
Multiple ancestry group	854 155	965	3 494	1 448
Ancestry not specified	357 785	609	1 305	571
Not reported	224 353	409	922	329
Selected multiple ancestry groups:				
English and other group(s)	340 029	387	1 204	461
French and other group(s)	157 155	137	579	171
German and other group(s)	157 576	127	648	173
Irish and other group(s)	442 414	707	2 344	792
Italian and other group(s)	168 903	128	498	434
Polish and other group(s)	63 072	24	241	88

Table P-9. **Social Characteristics of Persons: 1980**

[Data are estimates based on a sample; see Introduction. For meaning of symbols, see Introduction. For definitions of terms, see appendixes A and B]

Census Tracts	The SMSA	Squantum Tract 4174	Houghs Neck Tract 4174	Point Shirley Tract 1805
NATIVITY AND PLACE OF BIRTH				
Total persons	2 763 357	3 076	9 590	4 395
Native	2 483 277	2 905	9 087	4 103
Born in State of residence	1 928 973	2 595	8 489	3 591
Born in different State	525 232	302	583	512
Born abroad, at sea, etc.	29 072	8	15	-
Foreign born	280 080	171	503	292
LANGUAGE SPOKEN AT HOME AND ABILITY TO SPEAK ENGLISH				
Persons 5 to 17 years	529 308	602	2 215	746
Speak a language other than English at home	48 513	40	62	23
Percent who speak English not well or not at all	11.5	17.5	-	34 8
Persons 18 years and over	2 089 338	2 364	6 849	3 459
Speak a language other than English at home	263 198	113	374	288
Percent who speak English not well or not at all	17.0	-	1 6	10 4
SCHOOL ENROLLMENT AND TYPE OF SCHOOL				
Persons 3 years old and over enrolled in school	812 382	939	2 709	979
Nursery school	30 455	5	92	40
Private	21 154	5	20	22
Kindergarten	32 078	57	125	34
Private	3 903	6	9	-
Elementary (1 to 8 years)	313 589	322	1 259	421
Private	40 355	37	103	27
High school (1 to 4 years)	196 567	251	836	299
Private	28 531	66	75	17
College	239 693	304	397	185
YEARS OF SCHOOL COMPLETED				
Persons 25 years old and over	1 689 347	2 013	5 563	2 836
Elementary: 0 to 4 years	37 323	8	38	18
5 to 7 years	65 705	19	180	61
8 years	80 458	58	339	99
High school: 1 to 3 years	201 209	160	1 272	316
4 years	613 035	858	2 569	1 222
College: 1 to 3 years	274 318	599	663	654
4 or more years	417 299	311	502	466
Percent high school graduates	77.2	87.8	67.1	82 6
FERTILITY				
Women 35 to 44 years	158 769	175	547	203
Children ever born	380 492	459	1 614	473
Per 1,000 women	2 397	2 623	2 951	2 330
RESIDENCE IN 1975				
Persons 5 years and over	2 616 689	2 969	9 148	4 128
Same house	1 594 810	2 041	6 864	2 284
Different house in United States	965 698	928	2 239	1 817
Central city of this SMSA	189 921	165	441	259
Remainder of this SMSA	505 530	655	1 534	1 233
Outside this SMSA	270 247	108	264	325
Different SMSA	214 165	108	195	272
Not in an SMSA	56 082		69	53
Abroad	56 181		45	27
JOURNEY TO WORK				
Workers 16 years and over	1 308 435	1 516	4 001	2 278
Private vehicle: Drive alone	733 390	979	2 210	1 224
Carpool	221 992	282	844	373
Public transportation	204 235	230	839	593
Bus or streetcar	110 309	88	464	198
Subway, elevated train, or railroad	89 429	142	375	388
Walked only	114 003	14	56	68
Other means	15 923	-	23	-
Worked at home	18 892	11	29	20
Persons per private vehicle	1.15	1 14	1.19	1.15
Mean travel time to work ... minutes	23.5	24.0	26.1	28 0
Worked in SMSA of residence	1 126 463	1 527	3 633	2 116
Boston city—central business district	82 686	125	193	251
Remainder of Boston city	302 488	524	941	892
Brookline town	14 837	12	56	16
Cambridge city	76 682	41	106	149
Area 05	42 787	12	84	53
Area 06	43 657	-	22	532
Lynn city	31 859		-	45
Area 08	11 864			7
Salem city	16 517			26
Area 10	42 185	-		11
Area 11	47 392	14	-	23
Area 12	48 297	16	8	-
Waltham city	42 554	13	15	-
Area 14	68 693	-	37	59
Area 15	46 598	-	-	-
Area 16	44 732	55	96	-
Area 17	63 739	664	2 024	-
Remainder of Boston, Mass. SMSA	98 896	51	51	52
Worked outside SMSA of residence	68 951	27	115	33
Area 19	13 686		-	-
Brockton, Mass. SMSA	11 263	-	35	-
Worked elsewhere	44 002	27	80	33
Place of work not reported	113 067	130	412	209

Labor Force and Disability Characteristics of Persons: 1980

[Data are estimates based on a sample; see introduction. For meaning of symbols, see introduction. For definitions of terms, see appendixes A and B]

ısus Tracts

ısus Tracts	The SMSA	Squantum Tract 4174	Houghs Neck Tract 4178	Point Shirley Tract 1805
OR FORCE STATUS				
ııs 16 years and over	**2 192 615**	**2 473**	**7 312**	**3 601**
ıbor force	1 405 573	1 628	4 389	2 479
Percent of persons 16 years and over	64.1	65 8	60 0	68 8
Civilian labor force	1 399 302	1 628	4 389	2 475
Employed	1 336 220	1 578	4 054	2 348
Unemployed	63 082	50	335	127
Percent of civilian labor force	4.5	3.1	7 6	5 1
ıale, 16 years and over	**1 175 418**	**1 303**	**4 072**	**1 905**
abor force	633 799	668	2 021	1 155
Percent of female, 16 years and over	53 9	51.3	49 6	60 6
Civilian labor force	633 388	668	2 021	1 155
Employed	607 752	639	1 933	1 104
Unemployed	25 636	29	88	51
Percent of civilian labor force	4 0	4 3	4 4	4 4
With own children under 6 years	125 620	120	493	178
In labor force	49 453	60	242	101
Married, husband present	538 783	739	1 809	815
In labor force	280 012	347	937	445
vilian persons 16 to 19 years	**215 988**	**221**	**883**	**251**
Not enrolled in school	42 711	55	267	51
Not high school graduate	14 018	5	55	14
Employed	6 537	-	23	11
Unemployed	1 878	-	24	-
Not in labor force	5 603	5	8	3
OCCUPATION AND SELECTED INDUSTRIES				
Employed persons 16 years and over	**1 336 220**	**1 578**	**4 054**	**2 348**
Managerial and professional specialty occupations	401 018	498	595	600
Executive, administrative, and managerial occupations	166 293	213	255	276
Professional specialty occupations	234 725	285	340	324
Technical, sales, and administrative support occupations	457 101	587	1 424	900
Technicians and related support occupations	52 563	54	109	94
Sales occupations	128 172	165	303	222
Administrative support occupations, including clerical	276 366	368	1 012	584
ervice occupations	178 759	222	709	395
Private household occupations	5 250	-	7	-
Protective service occupations	28 461	95	127	79
Service occupations, except protective and household	145 048	127	575	316
Farming, forestry, and fishing occupations	6 973	11	10	18
recision production, craft and repair occupations	129 434	166	652	226
Operators, fabricators, and laborers	162 935	94	664	209
Machine operators, assemblers, and inspectors	84 573	49	267	34
Transportation and material moving occupations	36 788	22	165	86
Handlers, equipment cleaners, helpers, and laborers	41 574	23	232	89
Manufacturing	261 429	214	610	219
Wholesale and retail trade	259 816	322	907	458
rofessional and related services	365 564	426	842	559
CLASS OF WORKER				
Private wage and salary workers	1 046 450	1 172	3 124	1 901
Government workers	222 156	342	821	363
Local government workers	123 594	211	518	162
elf-employed workers	64 660	64	99	78
LABOR FORCE STATUS IN 1979				
Persons 16 years and over, in labor force in 1979	**1 534 486**	**1 740**	**4 715**	**2 565**
Percent of persons 16 years and over	70.0	70 4	64 5	71 2
Worked in 1979	1 512 952	1 731	4 629	2 541
40 or more weeks	1 120 724	1 274	3 168	1 967
Usually worked 35 or more hours per week	926 597	1 052	2 544	1 694
50 to 52 weeks	931 813	1 051	2 604	1 584
Usually worked 35 or more hours per week	804 644	912	2 198	1 400
With unemployment in 1979	242 014	276	1 080	481
Percent of those in labor force in 1979	15 8	15.9	22 9	18 8
Unemployed 15 or more weeks	79 669	86	504	204
Mean weeks of unemployment	13.5	12.8	17 8	15 1
DISABILITY STATUS OF NONINSTITUTIONAL PERSONS				
Male, 16 to 64 years	**884 426**	**988**	**2 777**	**1 500**
With a work disability	65 668	75	337	148
Not in labor force	32 637	40	174	68
Prevented from working	27 658	28	114	63
Female, 16 to 64 years	**951 700**	**1 029**	**3 259**	**1 541**
With a work disability	59 662	77	291	98
Not in labor force	42 319	42	246	92
Prevented from working	34 537	29	150	56
Persons 16 to 64 years	**1 836 126**	**2 017**	**6 036**	**3 041**
With a public transportation disability	34 521	19	146	41
With a work disability	31 443	19	133	41
Persons 65 years and over	**321 057**	**456**	**1 276**	**455**
With a public transportation disability	53 151	22	326	76
WORKERS IN FAMILY IN 1979				
No workers	79 674	56	407	117
Mean family income	$9 995	$11 753	$7 405	$8 897
1 worker	203 900	267	709	304
Mean family income	$22 863	$25 054	$14 759	$18 121
2 workers	268 057	330	879	364
Mean family income	$28 860	$26 603	$22 150	$21 953
3 or more workers	120 772	148	485	209
Mean family income	$38 626	$36 967	$33 723	$40 885

Table P-11 Income and Poverty Status in 1979: 1980

[Data are estimates based on a sample; see Introduction. For meaning of symbols, see Introduction. For definitions of terms, see appendixes A and B]

Census Tracts	The SMSA	Squantum Tract 4174	Houghs Neck Tract 4178	Point Shirley Tract 1805
INCOME IN 1979				
Households	990 779	1 088	3 382	1 741
Less than $5,000	121 400	46	727	210
$5 000 to $7,499	70 601	78	387	86
$7,500 to $9,999	67 650	9	199	132
$10 000 to $14,999	136 479	156	456	370
$15,000 to $19,999	132 239	150	337	289
$20,000 to $24,999	121 439	185	475	242
$25,000 to $34 999	168 497	312	504	195
$35,000 to $49,999	108 131	98	255	165
$50 000 or more	64 343	54	42	52
Median	$18 694	$22 206	$13 934	$15 985
Mean	$22 476	$24 058	$16 665	$19 233
Owner-occupied households	535 833	872	2 134	870
Median income	$25 190	$24 542	$20 238	$19 575
Mean income	$28 979	$25 618	$20 522	$22 997
Renter-occupied households	454 946	216	1 248	871
Median income	$12 294	$18 269	$6 831	$13 414
Mean income	$14 818	$17 760	$10 070	$15 472
Families	672 403	801	2 480	994
Median income	$22 848	$24 943	$19 432	$19 813
Mean income	$26 560	$26 963	$19 880	$23 225
Unrelated individuals 15 years and over	482 048	319	1 077	952
Median income	$7 198	$12 143	$4 931	$10 574
Mean income	$9 611	$14 164	$6 616	$10 788
Per capita income	$8 182	$8 553	$5 871	$7 700
INCOME TYPE IN 1979				
Households	990 779	1 088	3 382	1 741
With earnings	801 282	943	2 408	1 503
Mean earnings	$23 115	$23 074	$18 337	$19 571
With Social Security income	256 110	317	1 248	338
Mean Social Security income	$4 157	$4 877	$3 941	$4 091
With public assistance income	89 488	69	671	108
Mean public assistance income	$2 802	$4 220	$2 417	$2 131
MEAN FAMILY INCOME IN 1979 BY FAMILY TYPE				
Families	$26 560	$26 963	$19 880	$23 225
With own children under 18 years	$26 384	$24 532	$18 710	$20 785
Without own children under 18 years	$26 725	$28 572	$21 030	$25 010
Married-couple families	$29 186	$28 282	$22 722	$24 477
With own children under 18 years	$30 098	$26 256	$23 752	$23 484
Without own children under 18 years	$28 324	$29 675	$21 804	$25 348
Female householder, no husband present	$14 680	$15 377	$11 771	$16 588
With own children under 18 years	$10 271	$10 548	$7 571	$3 607
Without own children under 18 years	$19 497	$18 827	$17 970	$21 551
ALL INCOME LEVELS IN 1979				
Families	672 403	801	2 480	994
Householder worked in 1979	528 059	658	1 720	740
With related children under 18 years	336 145	350	1 308	460
Female householder, no husband present	112 118	84	614	188
Householder worked in 1979	63 423	43	311	88
With related children under 18 years	63 207	43	399	73
With related children under 6 years	20 980	16	125	26
Householder 65 years and over	110 042	173	415	212
Unrelated individuals for whom poverty status is determined	428 935	319	1 077	952
65 years and over	110 087	120	585	115
Persons for whom poverty status is determined	2 649 519	3 076	9 567	4 287
Under 18 years	667 741	712	2 718	933
Related children under 18 years	665 181	712	2 699	933
Related children 5 to 17 years	521 829	602	2 182	743
18 to 59 years	1 551 977	1 749	5 080	2 703
60 years and over	449 801	615	1 769	651
65 years and over	320 914	456	1 276	455
INCOME IN 1979 BELOW POVERTY LEVEL				
Families	48 805	28	394	84
Percent below poverty level	7.3	3.5	15.9	8.5
Householder worked in 1979	19 708	20	186	40
With related children under 18 years	37 926	28	339	61
Female householder, no husband present	28 074	16	277	46
Householder worked in 1979	9 151	8	133	20
With related children under 18 years	25 378	16	271	39
With related children under 6 years	12 567	16	102	8
Householder 65 years and over	5 050		28	7
Unrelated individuals for whom poverty status is determined	85 981	18	167	156
Percent below poverty level	20.0	5.6	15.5	16.4
65 years and over	20 182	7	48	30
Persons for whom poverty status is determined	252 197	126	1 442	428
Percent below poverty level	9.4	4.1	15.1	10.0
Under 18 years	86 657	43	726	125
Related children under 18 years	84 624	43	717	125
Related children 5 to 17 years	62 668	36	549	113
18 to 59 years	128 363	68	608	227
60 years and over	37 177	15	108	76
65 years and over	29 158	7	87	46
INCOME IN 1979 BELOW SPECIFIED POVERTY LEVEL				
Percent of persons for whom poverty status is determined:				
Below 75 percent of poverty level	6.6	4.1	8.9	6.8
Below 125 percent of poverty level	13.3	5.8	20.7	13.0
Below 150 percent of poverty level	17.0	11.9	26.1	18.3
Below 200 percent of poverty level	25.3	16.9	38.1	25.6

Table H-1. Occupancy, Utilization, and Financial Characteristics of Housing Units: 1980

[For meaning of symbols, see introduction. For definitions of terms, see appendixes A and B]

Census Tracts	The SMSA	Squantum Tract 4174	Houghs Neck Tract 4178	Point Shirley Tract 1805
Total housing units	1 043 715	1 096	3 527	1 882
Vacant seasonal and migratory	5 785	5	52	48
Year-round housing units	1 037 930	1 091	3 475	1 834
YEAR-ROUND HOUSING UNITS				
Tenure by Race and Spanish Origin of Householder				
Owner-occupied housing units	527 156	905	2 002	786
Percent of occupied housing units	53.2	83.9	59.5	44 4
White	507 784	902	1 989	780
Black	12 713	–		1
American Indian, Eskimo, and Aleut	335	...	–	...
Asian and Pacific Islander[1]	4 146	...	7	4
Spanish origin[2]	3 954	9	10	2
Renter-occupied housing units	463 504	174	1 361	986
White	403 609	171	1 338	976
Black	42 577	–	5	4
American Indian, Eskimo, and Aleut	760	...	6	...
Asian and Pacific Islander[1]	6 797	...	9	4
Spanish origin[2]	15 580	2	8	9
Vacancy Status				
Vacant housing units	47 270	12	112	62
For sale only	4 555	1	16	1
Vacant less than 6 months	3 066	–	10	–
Median price asked	$62 000	$57 500	$28 800	$21 300
For rent	23 474	2	47	35
Vacant less than 2 months	10 268	–	14	27
Median rent asked	$191	$275	$158	$217
Rented or sold, awaiting occupancy	4 804	1	10	7
Held for occasional use	2 678	5	11	6
Other vacant	11 759	3	28	13
Boarded up	3 273		2	2
Lacking Complete Plumbing for Exclusive Use				
Year-round housing units	16 273	4	30	26
Owner-occupied housing units	3 146	–	8	6
Renter-occupied housing units	10 873	2	17	18
Vacant for rent or for sale only	1 006		1	–
Rooms				
Year-round housing units	1 037 930	1 091	3 475	1 834
1 room	24 790	4	5	24
2 rooms	50 279	15	70	73
3 rooms	122 116	80	457	262
4 rooms	170 323	116	789	347
5 rooms	205 310	210	869	404
6 rooms	196 057	362	736	380
7 rooms	124 437	192	366	199
8 or more rooms	144 618	112	183	145
Median, year-round housing units	5.2	5.8	5.0	5 0
Median, occupied housing units	5.3	5 8	5.0	5 1
Median, owner-occupied housing units	6.4	6.0	5.7	6 0
Median, renter-occupied housing units	4.0	3.6	3.9	4 3
Persons in Unit				
Occupied housing units	990 660	1 079	3 363	1 772
1 person	260 641	231	829	567
2 persons	296 380	330	978	570
3 persons	159 572	183	515	276
4 persons	138 784	155	444	168
5 persons	76 459	104	293	106
6 persons	35 194	48	169	58
7 persons	15 670	17	96	20
8 or more persons	7 960	11	39	7
Median, occupied housing units	2.29	2.43	2.37	2.06
Median, owner-occupied housing units	2.91	2.62	2.61	2.52
Median, renter-occupied housing units	1.79	1.50	2.05	1.76
Persons Per Room				
Occupied housing units	990 660	1 079	3 363	1 772
1.00 or less	964 073	1 046	3 202	1 745
1.01 to 1.50	20 386	29	149	25
1.51 or more	6 201	4	12	2
VALUE				
Specified owner-occupied housing units	411 903	831	1 822	477
Less than $10,000	1 825	2	26	–
$10 000 to $14,999	2 913	3	33	3
$15,000 to $19,999	5 868	12	90	7
$20,000 to $24,999	11 375	28	181	24
$25,000 to $29,999	15 227	32	226	37
$30 000 to $34,999	23 052	56	293	50
$35,000 to $39,999	27 040	76	282	64
$40,000 to $49,999	70 407	217	414	123
$50,000 to $59,999	70 220	199	185	84
$60 000 to $79,999	96 989	146	80	71
$80 000 to $99,999	41 431	34	9	12
$100 000 to $149,999	32 611	19	3	2
$150 000 to $199,999	8 461	6	–	–
$200 000 or more	4 484	1	–	–
Median	$56 000	$49 500	$36 100	$43 800
CONTRACT RENT				
Specified renter-occupied housing units	458 319	173	1 350	985
Median	$223	$253	$109	$233

[1]Excludes "Other Asian and Pacific Islander" groups identified in san

Table H-7. Structural, Equipment, and Household Characteristics of Housing Units: 1980

[Data are estimates based on a sample; see Introduction. For meaning of symbols, see Introduction. For definitions of terms, see appendixes A and

Census Tracts	The SMSA	Squantum Tract 4174	Houghs Neck Tract 4178	Point Shirley Tract 1805
Year-round housing units	**1 038 139**	**1 093**	**3 465**	**1 852**
SELECTED CHARACTERISTICS				
Complete kitchen facilities	1 025 559	1 093	3 429	1 827
1 complete bathroom plus half bath(s)	162 715	277	454	191
2 or more complete bathrooms	148 051	147	203	131
Air conditioning	442 784	469	1 085	529
Central system	67 455	-	107	70
Source of water, public system or private company	1 023 701	1 093	3 465	1 852
Sewage disposal, public sewer	876 722	1 073	3 439	1 852
UNITS IN STRUCTURE				
1, detached or attached	480 029	917	2 069	626
2	154 785	49	176	522
3 and 4	142 392	61	726	400
5 to 9	72 283	59	190	135
10 to 49	122 890	7	16	169
50 or more	63 535		288	-
Mobile home or trailer, etc.	2 225		-	-
YEAR STRUCTURE BUILT				
1979 to March 1980	10 673		18	6
1975 to 1978	39 127	-	41	17
1970 to 1974	72 590	16	315	34
1960 to 1969	140 272	54	375	50
1950 to 1959	145 863	279	432	161
1940 to 1949	103 948	313	508	224
1939 or earlier	525 666	431	1 776	1 360
HEATING EQUIPMENT				
Steam or hot water system	620 862	703	1 981	1 299
Central warm-air furnace	263 098	314	946	379
Electric heat pump	14 869	-	23	28
Other built-in electric units	61 801	41	267	33
Other means	76 668	35	245	106
None	841		3	7
Occupied housing units	**990 660**	**1 093**	**3 363**	**1 772**
SELECTED CHARACTERISTICS				
Units with roomers or boarders	15 077	5	54	28
No telephone	37 658	19	51	45
Owner-occupied housing units	**527 141**	**908**	**2 002**	**786**
4 or more bedrooms	148 345	127	463	173
1 complete bathroom plus half bath(s)	140 865	273	446	169
2 or more complete bathrooms	128 136	138	174	105
Renter-occupied housing units	**463 519**	**185**	**1 361**	**986**
2 or more bedrooms	265 302	102	845	576
1 complete bathroom plus half bath(s)	18 969	4	8	22
2 or more complete bathrooms	16 419	9	24	19
HOUSE HEATING FUEL				
Utility gas	324 545	430	1 296	680
Bottled, tank, or LP gas	7 239	-	8	19
Electricity	80 493	41	339	59
Fuel oil, kerosene, etc.	566 772	615	1 649	1 002
Other	11 095	7	71	12
No fuel used	516	-		-
VEHICLES AVAILABLE				
None	199 209	36	849	341
1	411 694	503	1 352	919
2	284 533	430	845	386
3 or more	95 224	124	317	126
YEAR HOUSEHOLDER MOVED INTO UNIT				
Owner-occupied housing units	**527 141**	**908**	**2 002**	**786**
1979 to March 1980	39 462	63	121	68
1975 to 1978	103 617	153	249	188
1970 to 1974	80 477	135	296	120
1960 to 1969	132 086	169	478	165
1959 or earlier	171 499	388	858	245
Renter-occupied housing units	**463 519**	**185**	**1 361**	**986**
1979 to March 1980	145 297	31	345	470
1975 to 1978	168 813	83	460	280
1970 to 1974	68 655	28	321	91
1969 or earlier	80 754	43	235	145
CHARACTERISTICS OF HOUSING UNITS WITH HOUSEHOLDER OR SPOUSE 65 YEARS AND OVER				
Occupied housing units	**223 421**	**316**	**970**	**305**
Owner-occupied housing units	117 744	280	528	217
Lacking complete plumbing for exclusive use	2 944	-	-	11
No vehicle available	87 425	29	506	88
No telephone	6 250	7	6	6
INCOME IN 1979 BELOW POVERTY LEVEL				
Owner-occupied housing units	**22 109**	**23**	**140**	**64**
Percent below poverty level	4 2	2.5	7 0	8 1
Complete plumbing for exclusive use	21 806	23	140	64
1 01 or more persons per room	704		-	14
Lacking complete plumbing for exclusive use	303			-
1 01 or more persons per room	18	-	-	-
Renter-occupied housing units	**77 626**	**11**	**398**	**137**
Percent below poverty level	16 7	5.9	29 2	13.9
Complete plumbing for exclusive use	75 048	11	398	128
1 01 or more persons per room	4 535	7	47	-
Lacking complete plumbing for exclusive use	2 578		-	9
1 01 or more persons per room	251			-

Table H-8. Financial Characteristics of Housing Units: 1980

(Data are estimates based on a sample; see Introduction. For meaning of symbols, see Introduction. For definitions of terms see appendixes A and B)

Census Tracts	The SMSA	Squantum Tract 4174	Houghs Neck Tract 4178	Point Shirley Tract 1805
Specified owner-occupied housing units	**409 071**	**831**	**1 822**	**483**
MORTGAGE STATUS AND SELECTED MONTHLY OWNER COSTS				
With a mortgage	284 942	526	1 113	341
Less than $100	105	-	-	-
$100 to $199	1 965	-	25	16
$200 to $299	21 818	57	216	39
$300 to $399	68 665	130	403	117
$400 to $599	120 743	237-	437	145
$600 or more	71 646	102	32	24
Median	$469	$456	$382	$399
Not mortgaged	124 129	305	709	142
Less than $100	959	-	20	-
$100 to $199	21 522	20	333	26
$200 or more	101 648	285	356	116
Median	$262	$272	$200	$238
HOUSEHOLD INCOME IN 1979 BY SELECTED MONTHLY OWNER COSTS AS PERCENTAGE OF INCOME				
Less than $10,000	50 162	97	461	74
Less than 15 percent	191		-	-
15 to 24 percent	1 869		36	-
25 to 29 percent	3 019	-	47	-
30 percent or more	42 621	97	345	69
Not computed	2 462	-	33	5
Median	50+	50+	48 1	50+
$10,000 to $19,999	82 100	196	383	153
Less than 15 percent	5 376	-	42	12
15 to 24 percent	28 084	67	190	40
25 to 29 percent	14 890	59	63	19
30 percent or more	33 750	70	88	82
Not computed	...	...	...	...
Median	27.5	27.6	23.1	31.1
$20,000 or more	276 809	538	978	256
Less than 15 percent	122 161	200	518	155
15 to 24 percent	110 117	261	393	65
25 to 29 percent	23 712	30	57	31
30 percent or more	20 812	47	10	5
Not computed	...	...	...	...
Median	16.2	16.9	14 5	13 7
Specified renter-occupied housing units	**460 151**	**181**	**1 349**	**986**
GROSS RENT				
Less than $80	23 047		249	-
$80 to $99	12 868	-	159	-
$100 to $149	24 714	6	106	6
$150 to $199	42 724	14	175	120
$200 to $249	70 089	47	196	178
$250 to $299	82 343	28	198	285
$300 to $349	76 488	40	156	159
$350 to $399	48 853	17	71	122
$400 or more	69 362	16	28	95
No cash rent	9 663	13	11	21
Median	$282	$265	$194	$282
One-family house, detached or attached	33 711	30	142	80
Median gross rent	$345	$217	$252	$305
HOUSEHOLD INCOME IN 1979 BY GROSS RENT AS PERCENTAGE OF INCOME				
Less than $10 000	188 533	30	823	310
Less than 15 percent	4 471	-	46	-
15 to 19 percent	9 043	-	97	-
20 to 24 percent	18 102		166	11
25 to 29 percent	14 616	-	131	15
30 to 34 percent	13 222	8	36	38
35 percent or more	116 505	22	326	224
Not computed	12 574		21	22
Median	46 8	50+	28.5	50+
$10 000 to $19,999	153 744	89	332	427
Less than 15 percent	13 341	12	43	13
15 to 19 percent	26 570	27	19	111
20 to 24 percent	38 225	26	112	118
25 to 29 percent	30 454	-	115	93
30 to 34 percent	19 363	13	17	59
35 percent or more	22 688	7	15	29
Not computed	3 103	4	11	4
Median	24.6	20.7	24 4	23.7
$20 000 or more	117 874	62	194	249
Less than 15 percent	52 688	21	100	106
15 to 19 percent	37 223	17	69	52
20 to 24 percent	16 996	5	25	73
25 to 29 percent	5 739	10		11
30 to 34 percent	1 769			-
35 percent or more	488	-		-
Not computed	2 971	9	-	7
Median	15 6	16.6	14 8	16 4

12.2 Traffic and Access

TABLE OF CONTENTS

12.2 TRAFFIC AND ACCESS

BOSTON HARBOR WASTEWATER FACILITIES SITING STUDIES

TRAFFIC AND TRANSPORTATION BASELINE

1.0 Summary

This report describes the existing patterns of access for the three major alternative sites under consideration for treatment of wastewater from the Boston area. Sites at Deer Island, Long Island and Nut Island are considered. Present traffic volumes are compared to roadway capacity as determined from reference sources. Each of the roadways is briefly described and apparent design defects noted.

The analysis indicates that most of the roadways providing access to the sites carry traffic volumes which are presently less than their theoretical capacities. Nonetheless, unsignalized intersections and existing roadway limitations including sharp curves, steep grades, and poor sight distances limit the amount of traffic which can safely be carried through the neighborhoods studied.

Information contained in this report will be used as the basis for projections of future conditions and comparison of the transportation impacts of wastewater treatment facility siting options for Boston Harbor.

2.0 Nut Island

Nut Island is located on the northern tip of the Houghs Neck peninsula in the City of Quincy. In 1893, the original Island was enlarged and connected to Great Hill on Houghs Neck to accommodate an MDC sewage pumping station and outfall.

Access to the Nut Island facility is via Sea Street from Route 3A, also known as the Southern Artery. The Sea Street - Southern Artery intersection can be reached via Route 3A (Hancock Street) or over local Quincy streets (see Figure 1).

BOSTON HARBOR FACILITIES SITING
S D E I S

LEGEND
Designated Access Route

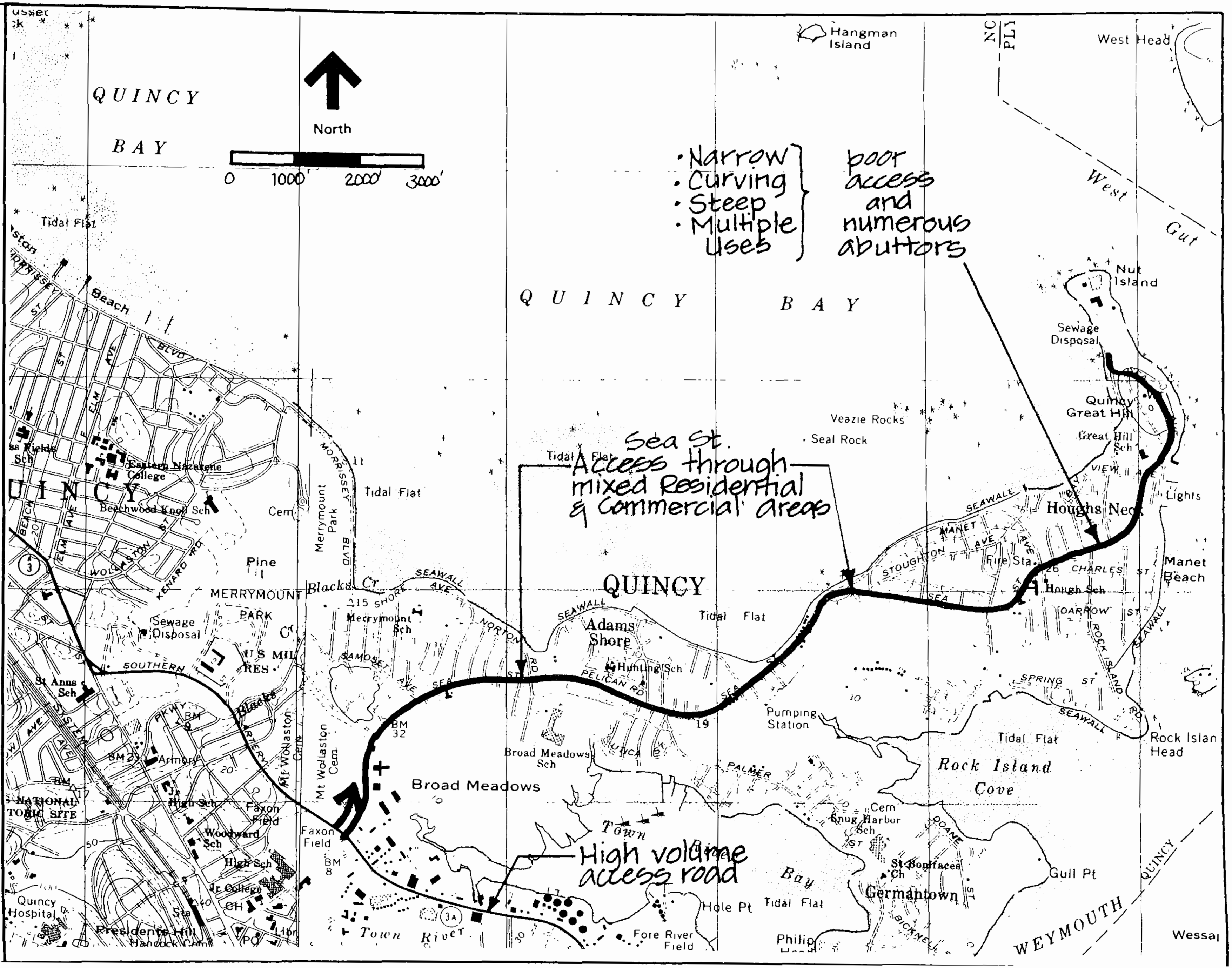


FIGURE 1
MAP OF QUINCY

C E Maguire, Inc.

Sea Street is a four lane roadway. An eastbound left turn lane has been added at Quincy Shore Drive. Sea Street continues as a four lane roadway through the Adams Shore area to Houghs Neck. At Houghs Neck it reduces to a 24 foot, two lane roadway.

All traffic to and from Nut Island must use Sea Street. At its westerly end, Sea Street is a high volume, high capacity highway. One measure of the volume of traffic on a roadway is expressed as average daily traffic (ADT). This refers to the average number of vehicles using the road during a 24-hour period. It is a measure of traffic volume by which all roadway sections can be uniformly described. A volume measure derived from ADT, Design Hour Volume (DHV), refers to the number of vehicles using the whole road during the hour when traffic volume is at peak conditions, commonly called "rush hour". The westerly end of Sea Street had a 1983 ADT of 36,850 vehicles and a two-way DHV of 2950 vehicles per hour. East of the Quincy Shore intersection, the Sea Street 1983 ADT was 20,400 vehicles. At the Rockland Street-Winthrop Street intersection with Sea Street the 1983 ADT was 7,350 vehicles.

The following table presents the 1983 ADT volumes and peak hour volumes (Design Hour Volumes) for locations at which the Massachusetts Department of Public Works (MDPW) has traffic count records.

TABLE I

TRAFFIC COUNT RECORDS IN THE VICINITY OF NUT ISLAND*

Location	Lanes	ADT	Two-Way* DHV	One-Way DHV	One-Way Capacity*
Quincy Shore Drive	4	24,150	1,950	1,365	2,800
Sea St., west of Quincy Shore Drive	4	34,300	2,750	1,925	2,800
Sea St., east of Quincy Shore Drive	4	20,400	1,650	1,115	2,800
Sea St., east of Rockland St. - Winthrop St.	2	7,350	600	-**	***1,600
Southern Artery south at Sea St.	4	32,700	2,600	1,820	2,800
Sea St. at Southern Artery	4+	36,850	2,950	2,065	2,800

* Source: Highway Capacity Manual, 1965.
** Use Two-Way DHV figure for comparison
***Two-Way Capacity

The capacity and Level of Service for the major roadways in the study area was determined from capacity tables in the Highway Capacity Manual (Highway Research Board, Special Report #87, Washington, D.C., 1965). It has been established that a "D" Level of Service provides acceptable operating conditions for an existing roadway facility. Under this classification level traffic is considered to experience some slight delays and speed reductions. The Highway Capacity Manual indicates that a four lane roadway at a "D" Level of Service can accommodate 2800 vehicles per hour on two lanes in one direction. Assuming that 70% of the design hour volume (DHV) occurs in the direction of peak flow, the current one-way peak hour flow on Sea Street west of Quincy Shore Drive for example, would be 1,925 vehicles (70% of 2,750). Since two lanes in one direction can accommodate 2800 vehicles, the existing traffic can be accommodated on the existing 4-lane roadway system.

According to the Highway Capacity Manual, the two lane, two-way portion of Sea Street has a capacity of 1600 vehicles for both directions of travel. The existing DHV through this section of the access route is 600 vehicles per hour. This indicates there is more than sufficient capacity on Sea Street for existing traffic. The above table indicates that all of the major local access roads have excess peak hour capacity to accommodate present traffic flows.

From Sea Street, Sea Avenue provides access to Nut Island over Great Hill. The Avenue ascends and descends the hill at a steep grade. Adjacent land is densely developed for residential use, cars are parked on the street, and the pavement width is 22 feet.

The capacity of Sea Avenue is difficult to measure because of its sharp curve and steep grade. It is a street designed primarily to serve the abutting residences. Because of its sharp curve and steep grade, Sea Avenue should be considered unsafe for large traffic volumes and especially heavy trucks. Photographs of these roads follow.

3.0 Long Island

Long Island is located in Boston Harbor and is connected to Moon Island and Quincy by the Long Island Bridge. Vehicular access is available only by traveling through Quincy to the Squantum area and Moon Island. Moon Island is connected to Squantum by a narrow causeway.

Squantum is a peninsula connected to North Quincy area by a causeway across a large marsh. The causeway, East Squantum Street, intersects with Quincy Shore Drive. Both Quincy Shore Drive and East Squantum Street connect with Route 3A, (Hancock Street) in the City of Quincy.

The major access routes to Long Island are Hancock Street and Quincy Shore Drive from the north, or Hancock Street and East Squantum Street from the south and west. Quincy Shore Drive is a four lane MDC Parkway prohibited to trucks. East Squantum Street, between Hancock Street and Quincy Shore Drive, is a heavily used, narrow roadway

Intersection of Sea Street, Sea Avenue and Island Avenue. Large open paved area promotes unsafe traffic operations,

View north along Island Avenue showing former Great Hill Elementary School, recently demolished.

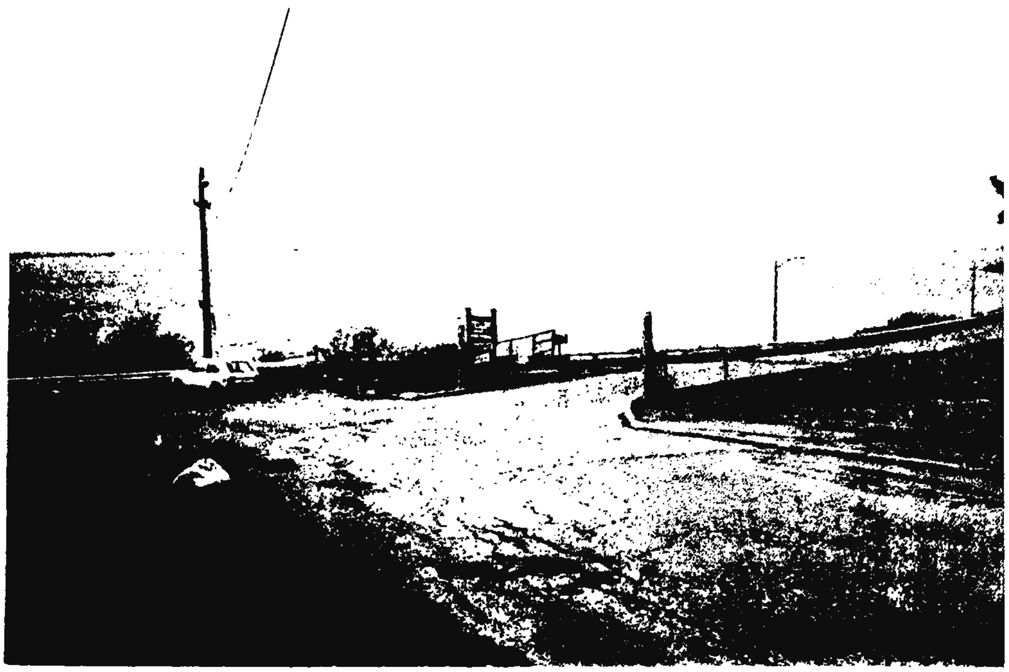
View of south side of Sea Avenue. Note parked cars, curve and grade of street.

View of Island Avenue intersection with Sea Street.

View of north end of Island Avenue from entrance of Nut Island plant.

View of the north side of Sea Avenue. Note the steep hill and resulting poor site distance.

View of Nut Island treatment plant.



View of entrance to Nut Island, Quincy Bay and Boston skyline.

through the densely developed North Quincy residential area. East Squantum Street leads directly to Dorchester Avenue which follows the northerly side of the Squantum Peninsula and directly to the Moon Island Causeway and Long Island Bridge (see Figure 2).

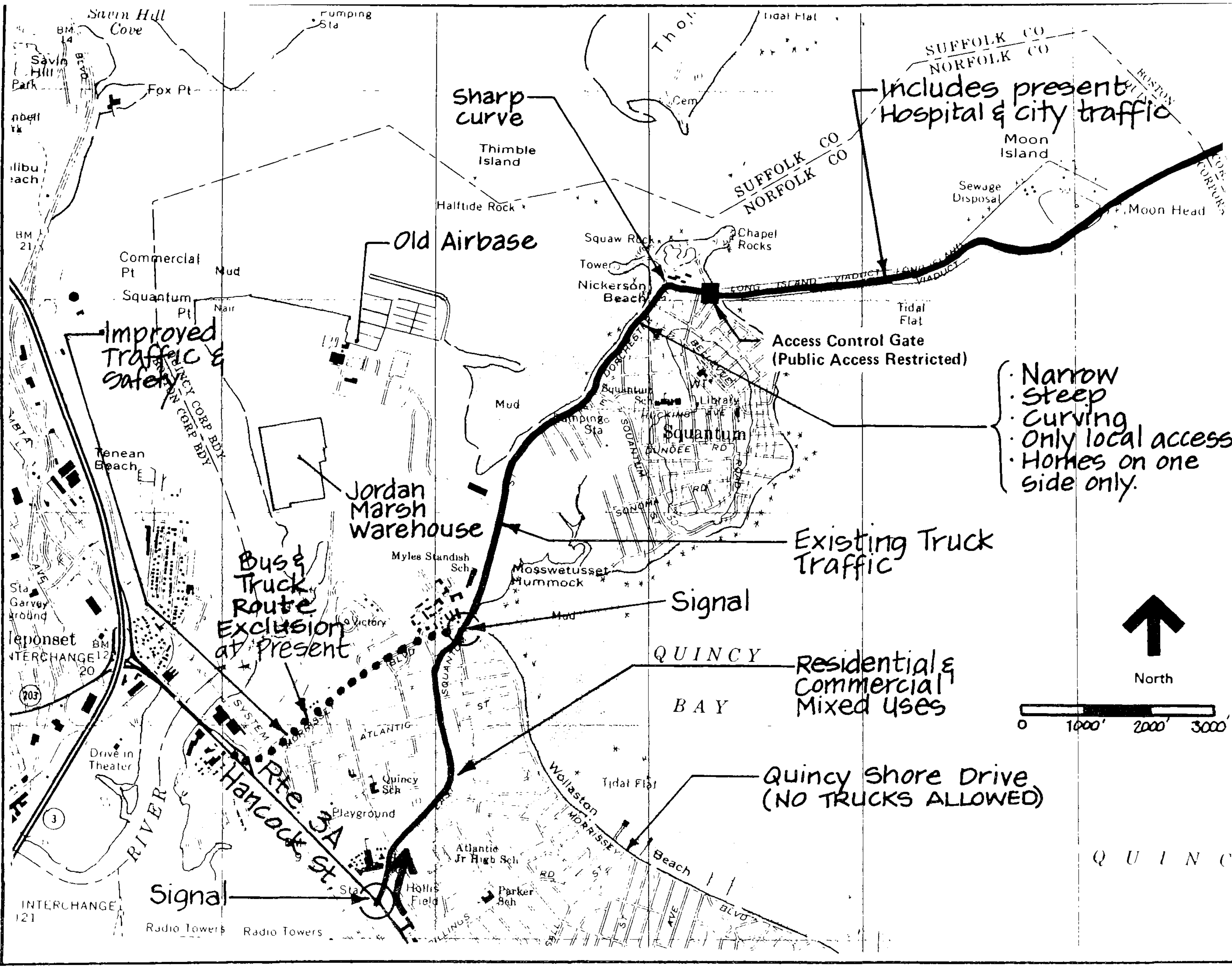
Because of the restriction on truck traffic on Quincy Shore Drive, the only truck route to Long Island is East Squantum Street. The intersections of East Squantum Street with Hancock Street and Quincy Shore Drive are both signalized. Additionally, East Squantum Street has two intersections along its 1½ mile length with flashing signals and pedestrian actuated crossing lights. The width of East Squantum Street varies but is generally 2 lanes. Due to illegal parking near two intersections, there is not always a full lane available in each direction. There are two very sharp curves in that segment of road between Hancock Street and Quincy Shore Drive.

The causeway segment of East Squantum Street is entirely different in character from the section discussed above. Due to the lack of development on the causeway, this section of East Squantum Street is free flowing with one lane in each direction.

East Squantum Street changes to Dorchester Street in Squantum. Dorchester Street fronts on Dorchester Bay and has residential development on only the southeast side of the street. Dorchester Street curves very sharply around a steep grade near Squaw Rock. The sharp turn, narrow street width and steep grade make the area particularly hazardous.

Table II presents Average Daily Traffic (ADT) and Design Hour Volume (DHV) figures derived from Massachusetts Department of Public Works (MDPW) traffic count records updated to 1983. Review of the hourly count records revealed that the DHV is approximately 8 percent of the ADT. This relationship was utilized to develop the DHV figures shown.

BOSTON HARBOR FACILITIES SITING S D E I S



LEGEND

Designated Access to Long Island Route

FIGURE 2

MAP OF SQUANTUM, MOON ISLAND AND NORTH QUINCY

TABLE II

UPDATED TRAFFIC VOLUME ESTIMATES IN LONG ISLAND VICINITY*

Location	Lanes	1983 ADT	Two-Way DHV*	One-Way DHV	One-Way Capacity *
Quincy Shore Drive west of East Squantum St.	4	24,350	1,950	1,365	2,800(1 Way)
Quincy Shore Dr. east of East Squantum St.	4	25,300	2,000	1,400	2,800(1 Way)
E. Squantum St. north of Quincy Shore Dr.	2	10,450	850	-**	1,600(2 Way)
E. Squantum St. south of Quincy Shore Dr.	2	5,200	400	-**	1,600(2 Way)
E. Squantum St. north of Hancock St.	2	8,300	650	-**	1,600(2 Way)
Hancock St. (3A) east of E. Squantum St.	4	21,650	1,750	1,225	2,800(1 Way)

* Source: Massachusetts Department of Public Works;and Highway Capacity Manual,1965.

** Use Two-Way DHV Figures for Comparison

With a two lane, two-way capacity of 1600 vehicles for both directions, it can be seen that the two lane facilities can accommodate more traffic. Assuming a 70%/30% directional split of existing traffic on the 4 lane roadways, the capacity volume of 2800 vehicles for one direction of a four lane facility is more than adequate for the existing demands. Photographs of the local access roads follow.

4.0 Deer Island

Deer Island is located at southern tip of the Point Shirley. Deer Island ceased to be an actual island when Shirley Gut was filled in 1936, connecting Deer Island with Point Shirley and the Town of Winthrop. Although the only land access is through the Town of

View of the sharp curve where Dorchester Street ends and the roadway to the Moon Island causeway begins. This area represents a hazardous area, particularly for heavy trucks.

View of the Gatehouse and access control point to Moon Island and Long Island.

Winthrop, Deer Island is within the corporate limits of the City of Boston.

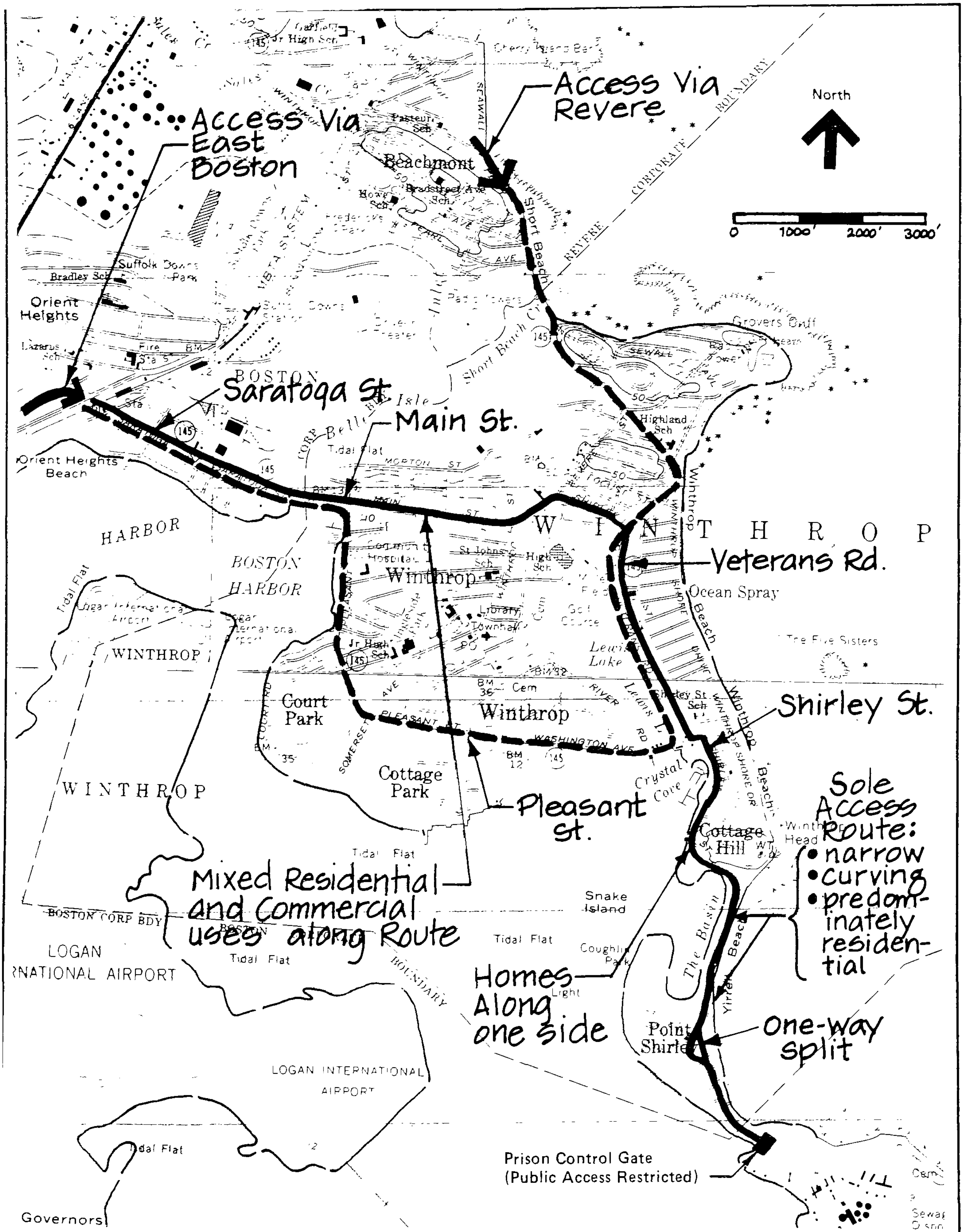
Access to Winthrop is available by only two routes. The major access route is via Saratoga Street in East Boston. This becomes Main Street in Winthrop at the Bridge crossing Belle Isle Inlet. The other route is through Revere via Winthrop Shore Drive. Both roadways are part of Route 145 (see Figure 3).

The Town of Winthrop has designated a truck route through the Town providing a relatively direct route to Deer Island. Both the truck route and Route 145 are shown in Figure 3. The truck route utilizes a segment of Veterans Parkway. This route has minimal impact on the community. It is also accessible from Revere Beach Parkway via Winthrop Avenue and a short section of Winthrop Parkway where truck traffic is not prohibited.

Traffic counts were taken in Winthrop to develop a baseline traffic condition for use in evaluating impacts. Twelve (12) hour turning movement and classification counts were taken on June 13 and 14, 1984 at the Shirley Street and Veterans Road intersections with Washington Street. In addition, mechanical recorder counts were taken between June 11 and June 15, 1984 on Shirley Street south of Revere Street and on Shirley Street between Pontos Street and Petrel Street. The Average Daily Traffic (ADT) for 1984 and the peak hour (Design Hour) volumes developed from the counts are as follows:

TABLE III
UPDATED TRAFFIC ESTIMATES IN VICINITY OF DEER ISLAND

Location	1984 ADT	% Trucks	2-Way 1984 DHV	% Trucks
Washington St.	7,700	5%	625	3%
Veterans Rd.	2,700	6%	225	3%
Shirley St. (south of Washington St.)	6,700	6%	525	7%
Shirley St. (north of Washington St.)	1,900	5%	150	7%
Shirley St. (between Revere & Cross Sts.)	4,200	6%	350	3%
Shirley St. (between Pontos & Petrel Sts.)	4,700	5%	375	3%



BOSTON HARBOR
FACILITIES SITING
S D E I S

LEGEND

Route 145

Designated Access Route

Existing Truck Route to Deer Island

FIGURE 3
MAP OF WINTHROP

C. E. Maguire, Inc.

The two way capacity of these two lane urban streets is approximately 1600 vehicles per hour total for both directions. While the roads have excess capacity, it is usually the intersections that limits the amount of traffic that can use them.

At these unsignalized intersections, the left turn out of northbound Shirley Street into westbound Washington Street and the left turn out of Veterans Road into eastbound Washington Street are heavy. Both appear to be used to a level where additional traffic cannot be accommodated efficiently. Any significant increase in these movements will require that the intersections be signalized.

Analysis of these intersections, assuming traffic signal control revealed that an additional 700 vehicles can be absorbed.

A visual inspection of the truck route through Winthrop revealed several deficiencies. The route is poorly marked and therefore is difficult to follow. Part of the route is directed through residential areas of Winthrop over streets that are narrow and not conducive to heavy trucking. However, there appears to be no better overland alternatives available. Photographs of these conditions on local roads follow.

View northwest along causeway that connects Winthrop with Deer Island.

View along Shirley Street in Point Shirley.

View north along Shirley Street in Point Shirley.

View north along Shirley Street in Point Shirley.

12.2.2 Overview

12.2.2.1 Alternative Transportation Modes for Construction Materials and Workers

The incidence of potential traffic impacts along routes leading to the proposed wastewater treatment plant sites is based on the volume and duration of construction truck, bus and/or auto traffic compared to existing roadway capacity, volume and surrounding uses. Another potential traffic impact may result in the affected neighborhoods closest to the work sites as all are predominantly residential areas with narrow streets, closely abutting homes, and roadways not designed to accommodate heavy trucking. Land uses further from the proposed treatment plant sites along the remainder of the access routes are mixed commercial and residential, and these roadway segments can better accommodate construction traffic. Current traffic on these routes is of a low volume, predominantly automobile, and well below the capacities which the local roads can adequately carry. The description of the areas, including their existing land use, traffic patterns, and access is contained in the first part of this section.

Without mitigation, the projected levels of construction truck and worker auto traffic during four to nine years of construction (at the respective sites) would have major adverse impacts on area residents as well as upon the usage, access and condition of local roads. Because of the unacceptable level of impacts associated with such truck and auto use, alternate methods to transport workers and materials during the construction period will be implemented to the maximum extent feasible.

Table 12.2-1, below, shows the projected volumes and duration of trucking and auto traffic during construction of a consolidated secondary treatment facility (the largest size alternative proposed) if delivery of all materials relied solely on trucks and workers commuted by auto. This table represents the maximum truck volumes which could be expected

TABLE 12.2-1

ESTIMATED "ALL-TRUCKING" AND AUTO TRANSPORT FOR CONSTRUCTION OF A 500 MGD SECONDARY TREATMENT PLANT[1]

Construction Activity and Sequence	Estimated No. of Trucks/Autos per day	Estimated Duration of Activity
Construction Excavation Equipment Delivery	20 (Peak)	5 days
Excavation	490 (Peak)	2 yrs.
Concrete Mix[2]	20 (Avg.) 75 (Peak)	5 yrs. 1 yr.
Reinforcing Steel	1 (Avg.)	5 yrs.
Materials for Job	25 (Avg.)	6 yrs.
Personnel Autos/Trucks[3]	1,300 (Peak) 630 (Avg.)	6-12 mos. 7 yrs.
Supervisory & Inspection Personnel[4]	10-20 (Avg.)	7 yrs.

[1] Includes construction of inter-island tunnels. These estimates are averages based on the total volume of a material, and on estimates made in the MDC Site Options Study (1982).

[2] The wide range in the number of trucks is due to showing the average and peak conditions of concrete pouring. The peak would be experienced for a limited duration over the course of construction (corresponding to the work force peak).

[3] The peak work force is shown to reflect a possible "worst case" peak impact occurring for a 6-12 month period (as per Metcalf & Eddy, Inc. MDC Site Options Study, Vol. II, 1982). The average work force level would be more typical over the duration of construction. The number of autos would vary depending upon the degree of pooling done; it can be assumed that most workers would drive to the job alone.

[4] Such activity is of a minimal level and would involve light trucks and autos.

Source: CE Maguire, Inc.

since it is based on construction of a consolidated 500 MGD primary and secondary treatment facility at one site.

As can be seen from the traffic volumes shown in this table, peak traffic could easily exceed 1,000 autos and 500 heavy trucks per day during construction. Given existing daily traffic volumes in the affected neighborhoods as low as 2,000 to 7,000 vehicles per day (see Section 12.2.1), peak construction traffic relying solely on overland vehicle access would cause significant and unacceptable adverse impacts on the communities around a site. Such impacts would include wear and tear of heavy vehicles passing over local roads not designed to accommodate such traffic, introduction of traffic congestion particularly during peak commuting times, and major disruption from noise and fumes experienced by residents and businesses along these access routes. As shown in the baseline description of existing local roadway conditions (Section 12.2.1 previously), safety concerns and existing roadway limitations in the adjacent communities and neighborhoods closest to the three proposed sites would severely constrain such volumes of construction traffic.

Siting alternatives involving smaller-scale treatment facilities would require somewhat fewer auto and truck trips to a site. However, this reduction in total traffic volumes, based on reduced materials and workforce numbers, would result in shorter <u>duration</u> of construction activity, but would reduce the projected peak daily traffic volumes only to a limited degree.

Based upon these projections of peak traffic impacts and the existing conditions of local roadways closest to the sites, it was concluded by EPA and the Commonwealth that an all-trucking method of construction transport should be avoided to the maximum extent feasible. Moreover, previous comments from residents of the affected communities, State agencies, and the MDC indicated that trucking should be minimized in favor of other available transportation methods.

Similarly, it was found that since individual auto (or light truck) travel by construction workers would be a further potential disruption to local conditions, due to the large numbers of workers involved, particularly during peak work periods, direct commuting by workers to construction sites should be avoided to the maximum extent feasible.

The principal transportation alternatives to direct trucking of materials and commuting to the site by workers are barging of construction materials and busing of construction personnel. These are discussed below.

a. Barging

Barging of construction materials is an available and feasible method of transport, particularly in the case of a large-scale project such as the MDC harbor treatment facilities. Barging would involve the use of tug boats and barges to convey most construction materials from a barge terminal (or terminals) to a pier facility at the construction sites. Materials handling equipment, such as cranes and forklifts, would be employed at the piers to move materials from truck trailers to barges (and vice versa). A roll-on, roll-off (RO/RO) operation, whereby trailers are loaded and unloaded directly to the barges, may also be employed. Whatever the specific materials handling methods employed, barging (in combination with other techniques for materials storage and staging as discussed in Section 5.3 of Volume 1) is an effective alternative that would pose no significant impact on the communities adjacent to the proposed sites and could be accommodated at existing waterfront industrial terminal/pier locations or a new terminal facility, whichever proves most cost-effective and environmentally acceptable. The specific impacts of such added facilities at prospective locations will be addressed during final facility design.

Barging of construction materials is estimated to add between $20 million and $40 million (current dollars) to the cost of the project. This cost is based on the additional equipment (piers, barges, tugs, and handling equipment) and labor necessary to conduct full-scale barging operations in Boston Harbor at one or more treatment plant sites. Barges typically can hold 2,000 to 3,000 cubic yards of material compared with heavy trucks that have a 25 to 30 cubic yard capacity. One barge trip can, therefore, replace 80 to 120 truck deliveries. A minimum barging operation would involve one tug boat and two to four barges operating between one or more construction sites on a daily basis. This level of barging would add an insignificant number of commercial boat trips to existing levels of harbor boat traffic, and would pose no impact to commercial or recreational boating traffic (as per personal communication with U.S. Coast Guard).

An all-barging solution, with no trucking whatsoever, would be impractical, however, and not likely to be undertaken by a contractor. This is due to several factors. Chief among these are accepted construction practices which indicate that trucking of excavation equipment would be the first major on-site construction activity undertaken. Delivery of heavy equipment and machinery on-site is, therefore, needed at the start of a job. Table 12.2-1 indicates a maximum of 20 truckloads over a one-week time span that would be needed to bring this equipment on-site. If this equipment were to be barged to the site, all on-site piers and a central staging/terminal area would have to be obtained and constructed. Tugs and barges would have to be purchased, and handling equipment would be required to be in place before the first equipment deliveries to a site could be made and excavation work begun. This would delay the start of site work, adding time and costs to the project. Since the duration and volume of trucking for this initial on-site activity are relatively modest and manageable (with traffic controls), it is recommended that trucking be used to carry out this minimal start-up activity. At the end of this equipment's use on the job (approximately one week), it could either be trucked or barged off-site. An additional factor involves the need for some materials, due to their size, fragility, or unscheduled delivery requirements, to be delivered by truck.

Based on such circumstances, a maximum commitment to barging would still result in minimal truck volumes, ranging from approximately 4 to 8 trucks per day on average, for the duration of construction. Because an initial commitment to barging would allow a great deal of flexibility in scheduling of barge trips, any increased peak demand for materials delivery could be accommodated by barging without need to significantly alter the minimal additional trucking required.

b. Busing

Transportation of construction workers by bus is the most reasonable alternative to individual worker auto travel. Another alternative is to provide ferry service for construction workers, however, the potential limitations of such service, involving weather and higher costs of operations, make this transport mode less feasible than busing. Ferry service will, nonetheless, be considered to the maximum extent feasible.

Under a shuttle busing method, workers would assemble at a large parking area such as Orient Heights MBTA Station, Wonderland, or Logan Airport for Deer Island, and the UMass-Boston Campus, Naval Air Station site or the Expo Center for Nut Island or Long Island. From there, workers would be taken by shuttle buses to the work site. Each bus could hold about 50 workers and departures may be staggered to lessen any effects on local traffic. The addition of buses on local roads is not expected to result in significant congestion (see Section 12.2.3).

Busing may require that construction workers be paid for their time on the buses. This would be in addition to the costs of bus operations for a four to nine-year period. Buses would either be leased or bought by the Contractor for the duration of construction. They may be kept on site or can leave and return as needed. Preliminary cost estimates for busing of construction workers range from $10 million to $20 million (current dollars).

A recommendation to bus construction workers is also supported by an analysis of available parking areas on or near the proposed work sites. Additionally, discussions were held with area contractors to determine general construction practices and feasible methods to accomplish such a transport method. In examining the likelihood of construction workers driving directly to the work site, two issues were examined. One was the availability of sufficient area on-site to accommodate parking for construction personnel. Another was the likelihood and effects of construction workers parking along local residential streets within walking distance of the work site.

With regard to on-site parking, between 4 acres (average work force levels) and 9 acres (peak work force levels) would be needed for construction of secondary treatment facilities; primary facilities would require between 4 and 5 acres. Given the existing site constraints at all sites, a contractor would not be expected to provide on-site parking for construction workers. These involve adjacent on-site land uses or environmentally sensitive areas, particularly under secondary treatment alternatives, plus the likely premium to be placed on available on-site open space for necessary storage and laydown area. Under a primary treatment option on Deer Island or Long Island, available open area may be found on-site; however, consideration of the impacts of construction worker traffic on local neighborhoods would make worker commuting undesirable. At Nut Island, limited area under either primary or headworks facilities would preclude on-site parking.

Construction worker parking along local streets in Winthrop and Quincy is also constrained due to the narrowness of these roadways and their residential character. The anticipated opposition to worker on-street parking from local residents and public officials also limits this option.

At Deer Island, Point Shirley streets are between 1/2 and 1 mile away from the site, a distance not conducive to workers parking in the neighborhood and walking to the site. Streets are narrow and may not safely accommodate construction worker parking. Attempts to use these local streets for large scale parking may impede existing and construction truck deliveries, violate local parking regulations, and could pose access problems for local residents A security gate at the prison controls access to the site.

At Long Island, local street parking in Squantum is over 3 miles from the site and access to the island is controlled at a security gate located before the causeway to Moon Island. Construction workers would not conceivably park in Squantum and walk to the site.

At Houghs Neck street parking on Quincy Great Hill is within walking distance of the treatment plant site. However, workers parking on the narrow streets of Houghs Neck would pose access problems for construction trucks and residents alike. Local parking regulations would also be expected to limit worker on-street parking.

Limitations to local on-street parking at all sites, therefore, suggest busing of construction workers is a feasible alternative. Additionally, if an agreement were reached to pay workers for their bus travel time, this would be a very strong incentive to use shuttle bus service in lieu of driving to a site. Other worker concerns, such as transport and security for craftsmen's tools could readily be accommodated by a contractor on the job. In discussions with area contractors (personal communications), it was determined that a shuttle bus method was feasible within the framework of a large-scale construction project such as this one. Likewise, any concerns and special requirements of unions and workers that might arise could be addressed. The cost of such methods would be added to the project costs for construction.

Table 12.2-2 presents an estimated mix of barge, truck and bus transport that would minimize adverse construction traffic impacts along access routes to construction sites. These transport figures are presented for facilities sized at the following treatment levels: Consolidated secondary treatment - 500 MGD; consolidated primary treatment - 500 MGD; split primary treatment - 350 MGD (north system), 150 MGD (south system); and headworks. Also note that construction of headworks facilities assumes <u>no barging</u>, since construction of the necessary on-site piers to accommodate barges would induce significant

TABLE 12.2-2

TABLE 12.2-2

COMBINED TRUCK & BARGE LOADS & BUSES — BY TYPE & SIZE OF TREATMENT FACILITY[1]

Construction Activity & Sequence	treatment option / transport mode	Secondary (500 MGD)[2]		Primary (500 MGD)[2]		Primary (350 MGD)[2]		Primary (150 MGD)[2]		Headworks	
		Truck	Barge	Truck	Barge	Truck	Barge	Truck	Barge	Truck	Barge*[5]
CONSTRUCTION EXCAVATION EQUIPMENT	PEAK	20/day (5 days)	None	15/day (5 days)	None	15/day (5 days)	None	10/day (5 days)	None	5/day (5 days)	None
EXCAVATION AND/OR DEMOLITION[3]	AVG.	None	5/day (2 yrs)	None	4/day (2 yrs)	None	3/day (2 yrs)	None	1/day (2 yrs)	2/week (1-2 yrs)	None
CONCRETE: AGGREGATE	AVG.	None	1-3/week (5 yrs)	None	2/week (4 yrs)	None	2/week (3 yrs)	None	1/week (3 yrs)	2/day (3 yrs)	None
CEMENT	AVG.	4/day (5-6 yrs)	None	3/day (4 yrs)	None	3/day (3 yrs)	None	2/day (3-4 yrs)	None	2/day (3 yrs)	None
REINFORCING STEEL	AVG.	1/week (5-6 yrs)	1/month (4 yrs)	1/week (3 yrs)	1/month (3 yrs)	1 week (3 yrs)	1/month (3 yrs)	1/week (2-3 yrs)	1/month (2 yrs)	2/day (3 yrs)	None
MATERIALS FOR JOB	AVG.	3/day (5-6 yrs)	3/day (4 yrs)	3/day (4 yrs)	3/day (3 yrs)	3/day (3 yrs)	3/day (2 yrs)	2/day (3-4 yrs)	2/day (2 years)	2/day (3-4 yrs)	None
PERSONNEL[4]	PEAK	26-28 Buses per day (1 yr.)	None	13-15 Buses per day (1 yr.)	None	9 Buses per day (1 yr.)	None	3 Buses per day (1 yr.)	None	2 Buses per day (6 mo. to 1 yr.)	None
	AVG.	12-14 Buses per day (5-6 yrs.)	None	12-14 Buses per year (5-6 yrs.)	None	6 Buses per day (5 yrs.)	None	2 Buses per day (4 yrs.)	None	2 Buses per day (3-4 yrs.)	None

CE MAGUIRE, INC.

1 This summary table provides maximum totals for construction vehicles (combined) under four major treatment scenarios. These totals wouldn't necessarily occur on a regular basis, but rather are the estimated average"levels derived from analyzing construction volumes and delivery practices.

2 Average design flows.

3 It is recommended that these spoils materials be retained onsite wher ver possible.

4 Estimates based on single site peak workforce as reported in MDC, Site Options Study, Table 8-4 "...(p.8-12), including varying workforce requirements for construction of tunnels; average workforce levels based on Site Options Study, Vol.II, Table 3-9.

5 For headworks alternatives it is assumed that no barging will occur due to the additional construction necessary for barge piers versus trucking alone.

construction activity and duration at a site, more so than the minimal construction necessary to build a headworks. It may be necessary, however, to include barging and piers with headworks facilities if tunnel conveyance of wastewater flows is chosen. The analysis of traffic impacts in the SDEIS and the conclusions presented in Section 4.0 of Volume 1 assumes a mix of barges, trucks, and buses as presented in this table.

It is not possible to project total daily vehicle trips as an absolute figure since some trips are on a daily basis, while others are weekly or monthly over varying durations of construction activity (based on the extent of a particular activity and its total material volume). The traffic analysis is based, therefore, on individual truck volumes over local roads according to the separate construction stages projected in this table. For example, for a consolidated 500 MGD secondary plant, impacts are analyzed separately for a maximum of 20 trucks per day (peak) for one week's duration, followed by consideration of the impacts of a projected eight trucks per day (average) for a period of 5 to 6 years. Peak truck traffic during this stage of construction would not be expected to increase greatly, since barging would accommodate peak levels of materials delivery. Worker transport involves a <u>peak</u> of about 26 to 28 buses carrying workers to and from a site each day for 6 months to 1 year, and 12 to 14 buses on <u>average</u> for 5 to 6 years. Construction of smaller-sized facilities would not significantly alter the projected daily truck totals, due to the predominance of barging for materials delivery. Rather, construction of smaller facilities would reduce the duration of an activity. The number of daily buses would be significantly reduced for smaller-sized facilities.

12.2.3 Construction Traffic Impacts By Site

Local access roads in the vicinity of the three proposed treatment facility sites have excess capacity to accommodate the projected volumes of trucks and buses during construction (as discussed in previous sections). The focus of this analysis is whether or not these roadways are adequate to safely accommodate this type of construction traffic at an acceptable level of impact, given the residential character of the neighborhoods closest to the sites, and the narrow streets along portions of the access roads.

12.2.3.1 Deer Island Construction Traffic Impacts

Deer Island can be reached by two routes along local access roads which are several miles long from the regional network point of entry. Either local route requires travel along streets in either East Boston or Revere leading into Winthrop and to Deer Island (Figure 3). Saratoga Street through East Boston and Winthrop Parkway through Revere are the external roadways of State Route 145 which pass through Winthrop on Main Street, Pleasant Street, Washington Avenue, Veterans Road, and Winthrop Parkway. Although Route 145 proceeds through Winthrop and into Revere, commercial vehicles cannot use this road in its entirety. Winthrop Parkway through Revere is prohibited to commercial vehicles, thus it could not be used without exception for truck access into Winthrop. In addition to this numbered route, a truck route has been established from East Boston through Winthrop to Deer Island. That route follows Main Street, Shirley Street, Veterans Road and then back to Shirley Street. It is assumed that this route, because of its easier access and designated truck use, will be the preferred traffic route to the Deer Island site.

All the above named roadways are two-way, two-lane streets except for a short segment of a one-way pair in Point Shirley, Eliot Street and Shirley Street. The traffic volume data, as presented in Section 12.2.1, revealed that the local roadways had no capacity problems; however, analysis of the turning movement at the Veterans Road/Washington Avenue and Shirley Street/Washington Avenue intersections revealed the left turns are currently operating at capacity during peak traffic periods. Since any increase in truck and bus traffic will increase the number of vehicles making left turns, the intersections will have to be signalized to permit all traffic to pass through safely and efficiently. In addition, it will probably be necessary to prohibit parking on the one-way roadway sections along the route to ensure that the smooth flow of traffic is not impeded.

As mentioned previously, the truck route through Winthrop has, in some instances, been assigned to residential streets because there are no other alternatives available. The mixed residential-commercial character of the route, and indeed throughout much of Winthrop and East Boston, suggests that the existing traffic flows through those communities already include significant numbers of both light and heavy trucks on a daily basis (estimates of local truck traffic are between five and seven percent of total peak hourly daily traffic).

An increase in trucking and busing along the route may require additional traffic signals and/or crossing guards to ensure safe operations during peak periods of high truck and bus activity. The parking practices along Shirley Street, south of Washington Avenue, should be reviewed to ascertain whether any changes are warranted because of the increase in wider truck and bus vehicles.

Considering the possible traffic levels of consolidated secondary treatment facilities, the estimated 20 trucks per day at the outset for a 5-day period followed by an average of 8 trucks per day for an active construction period of approximately seven years will generate a slight impact as far as added volume to existing roadway capacities is concerned.

In Point Shirley, because of the predominantly residential character of the neighborhood and the narrow streets closest to the site, potential moderate impacts may occur involving disruption to residential abutters. Noise, diesel fumes, and the perceived recurring construction activity will be a disruptive element in the neighborhood. An additional 26 construction worker buses daily (peak for one year) and 12 buses (average for six years) would add to these annoyances. The greatest potential for moderate adverse impacts occurs as a result of the busing activity during the approximately one year peak period. Some mitigation such as staggered travel and traffic supervision at rush hours would minimize any disruption that might occur.

The potential adverse impacts at this site would involve about 190 homes and 15 businesses which abutt the approximately 2.3-mile access route through Point Shirley (including the segment of road leading from Cottage Hill) to the Deer Island site. The associated effects of the other alternatives would result in a lesser level of impacts from those noted above.

Based on comments received expressing concern about traffic impacts along the greater length and higher residential density (combined with commercial mixed uses) of local routes through East Boston and Winthrop, a more detailed description of local roadway effects in that area is provided below. The following descriptions are keyed to the map in Figure 4 so that each road segment described can be followed. It should be pointed out that even with this site's greater associated local roadway length and density of abuttor uses, the existing relatively higher traffic volumes along these local roadways (compared to the other sites) are readily accommodated given these roadways' high traffic capacities. Moreover, the existing mix of autos and trucks through these two communities is sufficiently high at present, so that residents and visitors alike must exercise caution when either walking or driving these routes. Therefore, the addition of relatively small numbers of construction vehicles, compared with existing traffic volumes, would not be an appreciable change, in terms of traffic conditions, from the current conditions.

1. All truck traffic approaching Winthrop for access to the Deer Island Sewerage Treatment Plant will have to use McClellan Highway for access to Bennington Street (Route 145) and then to Saratoga Street

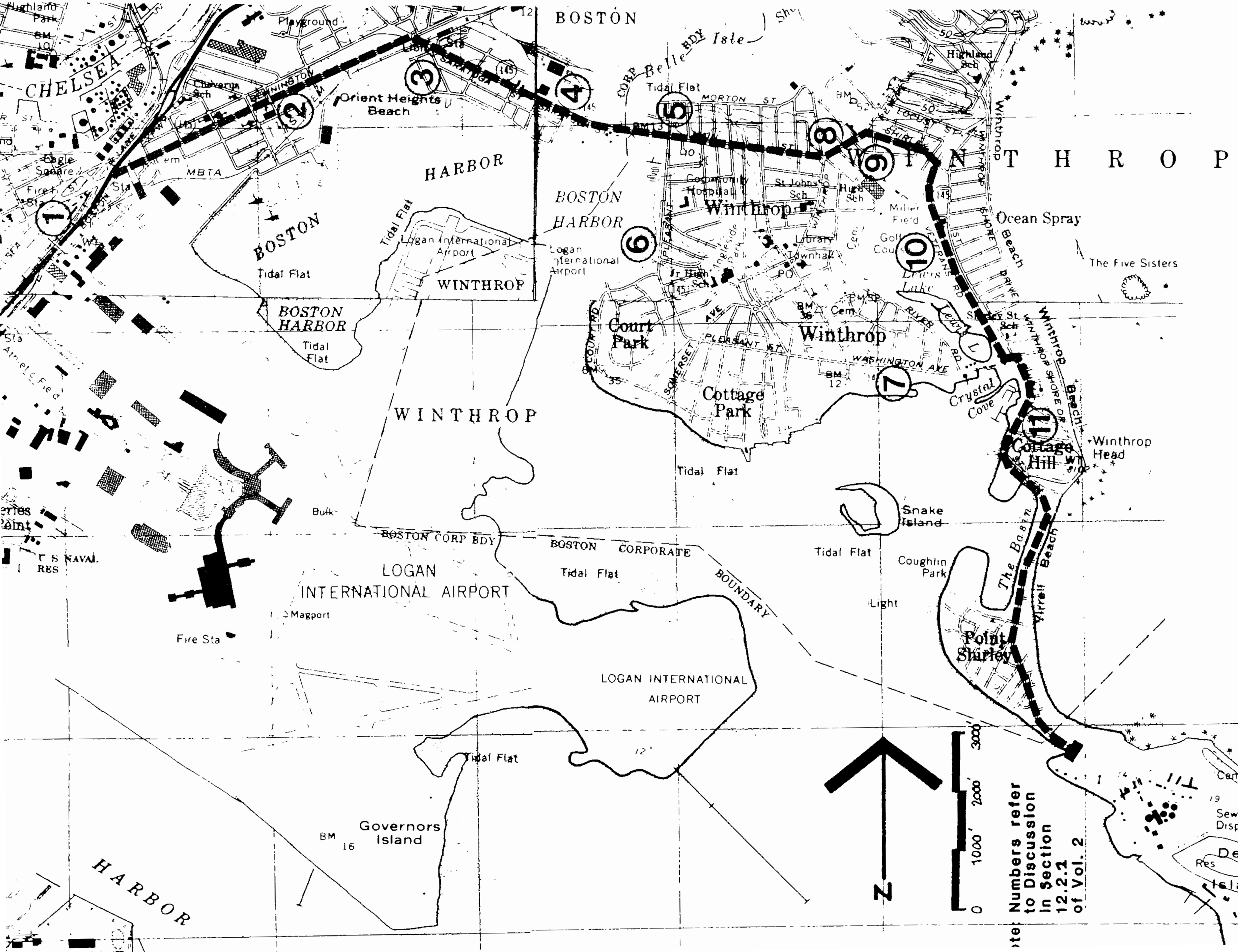


fig. 4. CONDITIONS ALONG DEER ISLAND TRAFFIC ROUTE

in East Boston. McClellan Highway is a six lane divided highway with partial control of access and signal control at the cross streets left open. The addition of twenty trucks per day to this high truck volume roadway would not be an appreciable increase or create any additional adverse impact.

2. Bennington Street (Route 145), accessible via ramps at the McClellan Highway interchange, is a four (4) lane divided highway with provisions for parking along both sides. The roadway, which passes mainly through a residential area of East Boston, contains five (5) signalized intersections to Saratoga Street. This high volume facility can absorb the projected 20 trucks per day with only negligible effects resulting from the additional traffic.

3. The first location along this route that may pose some difficulties to truck traffic is the right turn from Bennington Street into Saratoga Street and onto the bridge over the MBTA tracks. This bridge is fairly narrow (approximately 36 feet) and the two lane westbound approach does not leave much width (approximately 14 feet) to accommodate the turning trucks. It is assumed that, although this turning radius appears tight, this movement will be accomplished without undue difficulty since numerous trucks presently are using Route 145 for access to Saratoga Street and on into Winthrop on a daily basis (estimated to be 20 to 30 trucks hourly during weekdays), and if necessary traffic supervision can be provided.

4. Saratoga Street is a two lane roadway approximately 36 feet wide with parking permitted along the south side. Adjacent land use is predominantly residential until it approaches the Belle Isle Inlet where it becomes commercial and light industrial.

5. Across the Belle Isle Inlet Bridge Saratoga Street becomes Main Street. Just across the inlet is the Pleasant Street intersection where Route 145 is directed south on Pleasant Street and the Deer Island Truck Route is directed east on Main Street. This intersection is traffic signal controlled with the eastbound Main Street

traffic having a continuous right into southbound Pleasant Street. If delays to through traffic are unacceptable to the truck drivers, they may choose to use Route 145 as the access route to Deer Island. This will have to be discouraged by strict enforcement.

6. The Deer Island Truck Route should be designated by advance signing on the Main Street approach to Pleasant Street and reiterated by well placed signs at the intersection. The use of the Pleasant Street - Washington Avenue route (Route 145) by trucks should be discouraged. The pavement width is approximately 32 feet with one lane in each direction; parking is prohibited along both sides of Pleasant Street. Such roadway widths and distance are acceptable for the traffic levels proposed. Pleasant Street is predominantly residential but does have the Winthrop Hospital on the east side between Tilston Road and Lincoln Street. A very sharp curve occurs near Sargent Street where the roadway becomes an east-west facility.

7. Washington Avenue is the extension of Pleasant Street from Winthrop Street to Shirley Street. Washington Avenue services a mixed land use with the south side being predominantly residential while the north side becomes commercial at its easterly end. Washington Avenue ends at the designated Deer Island Truck Route.

8. As stated previously, at the Main Street Pleasant Street intersection the Deer Island Truck Route is directed easterly along Main Street. Main Street has a curb to curb pavement width of approximately 38 feet and is utilized as a two lane roadway with parking permitted along the south side for most of its length. The Hermon Street intersection is signalized, as is the Winthrop Street - Revere Street intersection. This latter intersection is on flashing operation although the installation appears to have been designed for "stop and go" control. At the Winthrop Street intersection the Truck Route swings northeasterly on Revere Street. Signage for the truck route is not evident at this location and can only be verified at the next major intersection, Shirley Street; this condition can easily be corrected. The Revere Street Shirley Street inter-

section does have a Deer Island Truck Route sign directing trucks east on Shirley Street.

9. Revere Street has a pavement width of approximately 40 feet and functions as a two lane facility with parking permitted along both sides except for one block on the south side where parking is prohibited.

10. Shirley Street is basically a residential street, 30 feet wide with parking permitted on the south side only to Veterans Road. The Deer Island Truck Route is directed south on Veterans Road to Washington Avenue where it dog-legs onto Shirley Street which proceeds to Deer Island. The Shirley Street - Veterans Road intersection is controlled by a signal flasher that shows red to Shirley Street. Veterans Road is a two-way facility with parking prohibited on the east side to Washington Avenue except for the last block where one hour parking is permitted on Saturdays. Washington Avenue, between Veterans Road and Shirley Street, is utilized as a bus loading and holdover area. This is not expected to be a problem with the addition of construction vehicles as this block of Washington Avenue has been widened to accommodate such traffic.

11. Shirley Street south of Washington Avenue has short term parking along both sides to Perkins Street. South of Perkins Street parking is permitted on one side of the designated truck route. The route through Point Shirley neighborhood is predominantly residential and not generally experiencing high traffic volumes. Streets are narrow and parking occurs on-street.

The addition of a maximum of 20 trucks per day for one week followed by about 8 trucks daily for the duration of construction (5 to 7 years) should not create any significant problems along any of the local roads identified above. Potential traffic impacts in these areas would be slight. At Point Shirley, the narrow roadways and residential character of the neighborhood would result in moderate impacts to abuttors from the added volume of trucks and buses. Any potential difficulties encountered because of double-parked vehicles or loading/unloading operations along the narrow sections of this truck route could be monitored and mitigated by traffic control personnel during periods of peak construction traffic.

Alternatives which site less than secondary treatment facilities on Deer Island (see Table 12.2-2 in the previous part of this section) would result in comparable, though somewhat lesser, truck volumes and construction durations than those noted above. Reduced bus volumes by about half would also result. Under these lesser sized alternatives at Deer Island, roadway capacities in the community overall would not be adversely impacted, while any disruptive effects on residents and abutters in Point Shirley from traffic noise and odors, particularly during peak construction periods, would be slight and of limited duration. Mitigations discussed above would help to alleviate the disruptive effects of this traffic. (See Section 4.3.3)

Options which reduce facilities at Deer Island to a headworks/pump station have only slight traffic impacts since the smaller scale facilities proposed would result in the least truck and bus volumes for the shortest duration. The awareness on the part of residents that this alternative involves a major reduction in treatment facilities would be expected to minimize the degree of annoyance perceived.

12.2.3.2 Long Island Construction Traffic Impacts

Access to Long Island is via East Squantum Street over local Quincy streets from the Expressway (Route 3) or via Hancock Street (Route 3A) (see Figure 2). Better vehicle access would be afforded via Quincy Shore Drive (Morrissey Boulevard) due to this roadway's wider streets and shorter distance to the site, but this MDC parkway is prohibited to commercial vehicles including trucks and buses. Approval is needed from the MDC to use this roadway. It is anticipated that such restriction can be temporarily removed; however, if this cannot be accomplished, traffic impacts to a greater number of residential abuttors along the existing truck route would result.

No capacity problems are expected along local roadways, although many of the signal controlled intersections are currently operating at capacity during the peak traffic periods. The potential impacts along the existing access route are not a function of volume or capacity, but rather one of potential disruption to abuttors due to roadway conditions.

Overall, projected truck and bus traffic generated by construction alternatives at Long Island (see Table 12.2-2 of Section 12.2.2) would result in slight to moderate adverse impacts. The traffic effects of constructing a 150 MGD primary plant would be slight, as the projected four trucks daily (average) over four years would translate to one truck every 15 minutes over a one-hour period. This level of trucking could be accommodated on local roads with no significant adverse effects. The peak of 10 trucks daily for five days is also manageable with only slight adverse impacts for the brief duration of this activity. The 2 to 3 buses daily would pose no adverse impacts to local roadway conditions or residential abuttors.

In the case of a larger 500 MGD secondary plant on Long Island, potential adverse impacts would be moderate. The average traffic volumes would be seven trucks and fourteen buses daily. The existing capacity of local roads is sufficient to handle construction traffic under these conditions. This increase in traffic over existing conditions will result in only slight increases in noise, odors, or disruption to abuttors and can be minimized by addition of traffic mitigations as noted below. The truck peak of 20 vehicles daily for five days will result in moderate impacts and will require additional traffic controls including staggered departures and traffic supervision to minimize any adverse effects. The effects of up to 28 buses per day for a one-year peak would pose the greatest potential disruption along local roads resulting in moderate impacts, and will also require traffic control measures to minimize potential moderate adverse impacts for this limited duration.

An advantage of Long Island's access route is the minimal abutting development along both sides of East Squantum Street north of Quincy Shore Drive, with only one side of Dorchester Street (east side) having residential development. Moreover, if trucking and busing could be allowed on a portion of the MDC's Quincy Shore Drive (as noted above), potential disruptive aspects of heavy trucking and peak bus traffic upon residents and abutters through residential areas of North Quincy could be minimized. This also would lessen, somewhat, the likelihood of competing local traffic.

The potential adverse impacts at Long Island, with allowance of trucking and busing along the MDC parkway, would potentially affect a total of about 225 homes and apartment buildings through Squantum and North Quincy for approximately 3.5 miles. If use of Quincy Shore Drive is not possible, the number of homes potentially affected would increase to about 260 with several businesses along a length of approximately 4.5 miles.

One location in Squantum appears to have a potential for adverse traffic constraints. Dorchester Street, through Squantum as it approaches the Squaw Rock Park after the pavement reduces to a 24-foot width, has a fairly steep grade as well as a sharp curve to the right. Residents in this location will experience increased noise and diesel fumes from trucking and buses because the construction traffic will have to negotiate the hill and curve in a very low gear, shifting repeatedly Speeds in the area during construction will have to be reduced to 15 or 20 mph to ensure safe operations. It is recommended that this roadway be widened and improved along this segment to accommodate the requirements of heavy trucks and the projected peak number of buses.

It is recommended, further, that the pavement structure of Dorchester Street, as well as along East Squantum Street, be analyzed to ascertain whether the pavement needs to be reinforced or replaced, or whether it is adequate for the projected truck and bus traffic. In the event that the truck restriction cannot be temporarily lifted to allow use of Quincy Shore Drive, the portion of East Squantum Street between Hancock Street and Quincy Shore Drive will probably require augmentation of the pedestrian signals with crossing guards at times of heavy trucking and bus activity.

Any adverse traffic volumes that may occur during peak traffic hours may be lessened by judicious scheduling that brings in trucks and buses either in staggered fashion or during off-peak traffic periods. For those times when peak traffic is unavoidable, police supervision at key intersections may be necessary on a periodic basis over the course of construction.

Traffic signs in the area will have to be upgraded. All major intersections, grades, and curves will have to be identified by standard warning signs and other traffic control devices as may be appropriate and acceptable in conformance with local and State requirements.

Another issue common to all Long Island siting options involves the use of the bridge connecting Long Island to Moon Island and the Quincy mainland. This bridge was built around 1951 and is of steel beam construction with concrete supports. A recent inspection of the structure by engineers for the City of Boston[1] concluded that the overall bridge span was in fair condition but has deteriorated below its design standard. It is estimated that rehabilitation of the bridge would cost approximately $2 million (1984). With rehabilitation as proposed, the structural integrity and capacity of this bridge will accommodate heavy construction vehicles during the proposed construction period.

12.2.3.3 Nut Island Construction Traffic Impacts

Vehicle access to Nut Island is through Quincy via local roads from the Route 3 Expressway or the Southern Artery (Route 3A). The main local access to Nut Island is via Sea Street and Sea Avenue in the Houghs Neck section of Quincy (see Figure 1).

---

1 H.W. Lochner, Inc., Engineers for the Boston Public Facilities Department, Inspection of Long Island Bridge, (July, 1984).

Examination of construction transport estimates (Table 12.2-2 previously) reveals that the average numbers of trucks at Nut Island that will be generated by construction activities vary between 8 per day over a three year period during construction of a headworks to 4 per day for five years for a 150 MGD upgraded primary treatment plant. Note that the truck volumes for a headworks option are higher than for a primary treatment option because no barging of materials is anticipated with the headworks option (as noted previously).

The potential for adverse construction traffic impacts on residents is slight at Nut Island under either a headworks or primary treatment alternative. This is due to the small number of trucks (4 to 8 trucks on average) and shuttle buses (2 to 3 buses) projected at this site daily. This traffic would pose little prolonged impact to the approximately 270 homes and 20 businesses along the 2.5-mile stretch of roadway passing through Houghs Neck. Potentially disruptive elements of construction traffic, including noise and diesel fumes, may be felt during recurring brief periods of time over the course of the construction period.

Initial truck traffic for equipment delivery on-site would generate about 5 trucks per day for 5 days under a headworks option, to a maximum of 10 per day for 5 days for a primary treatment plant. The impacts of such small numbers of trucks are also slight in terms of the local roadway's capacity to accommodate their travel. For example, if the estimated daily truck traffic occurred in a one hour period, the 5 trucks would mean one truck every twelve minutes for one hour only (twice per day), a relatively low volume of trucking which would pose only slight disruptive effects on abutters.

The disruptive impacts generated by heavy trucking, although slight, could include recurring noise, vibrations, odors and dust. Noise and odors would be the most significant impacts of trucking on nearby residences and businesses. At Sea Avenue, where roadway grades will require trucks to travel at slower speeds and in a lower gear, greater noise and diesel fumes will be generated as the trucks pass. This would represent a relatively brief period of annoyance recurring over the construction period. Because the area is densely developed, the roadway grades cannot be significantly reduced or the alignments altered without extensive damage to the abutting properties.

Although the projected daily truck volume is a slight increase in terms of existing roadway traffic, the three to five-year duration of construction activity by heavy trucks could eventually damage the Sea Street pavement which already exhibits surface deficiencies. The pavement structure of Sea Street should be analyzed to determine its structural integrity. Roadway repaving and repair work may be necessary both prior to and following the start of construction.

Buses carrying construction workers to and from the site would also regularly travel through Houghs Neck and Quincy. For headworks options at Nut Island, two buses would be required to transport workers to and from the construction area. Operation of two buses would have no adverse effect on area traffic flows and their impact on abutting Houghs Neck residents would be slight. For construction of a primary plant (150 MGD), 2 buses would be the average number required over the 5 year construction period with an increase to 3 buses for the approximately one year peak workforce period. The affects of this number of buses would, similarly, be slight.

Since the major pedestrian crossings along the access route to Nut Island are protected by traffic signals (most are pedestrian actuated), pedestrian safety does not appear to be a problem during the construction period; however, some additional safety measures such as warning signs and crossing guards during times of heaviest truck or bus traffic may be appropriate. Schools near the site are a particular safety concern (see map in Section 12.1) and may require special crossing guards during those hours when children are walking to or from school. (See Mitigation Measures, Section 4.3 of Volume 1.)

The four-lane section of Sea Street should not be adversely impacted by the projected truck and bus traffic. Existing capacity and safety of the roadway should be maintained and is adequate to accommodate the low volume of construction traffic projected. The two-lane section of Sea Street as well as Sea Avenue will require that drivers exercise care and adhere to the accepted "rules of the road" to ensure that safety is maintained at all times. Again, it may be necessary to provide added safety measures such as flashing signals, signs or signalmen during periods of peak construction activity and heaviest truck traffic.

The existing bus turnaround area at the intersection of Sea Avenue, Sea Street, and Island Avenue, for example, may require additional supervision to ensure safety and smooth traffic flows during certain high usage periods of the day. Because of the low volume of projected truck activity, truck trips could be scheduled at other than peak traffic hours to minimize potential disruption of neighborhood commuter traffic.

Because the potential impacts of truck and bus traffic along the access route appear to be slight and of a relatively short (3 to 5 year) duration, very few special actions will be required to mitigate the potential impacts generated. Actions that can be taken include: upgrading traffic signs along the route, identification and clear marking of the access route to eliminate confusion; provision of warning signs to identify all steep grades, curves, and major intersections for drivers; and, if conditions warrant, special actions such as traffic supervisors during school hours or in summer months (See Mitigation Measures, Section 4.3).

12.2.4 Operations Traffic Impacts

The relatively low volume of truck and auto traffic occurring daily over the twenty-year course of plant operations would be a slight impact on areas adjacent to treatment facilities at any site. Table 12.2-3, following, indicates the existing operations traffic at each site, followed by the projected additional traffic under the various treatment levels. Current daily truck and bus traffic, as shown, is significant at all sites and would continue at a comparable level from operations of proposed treatment facilities. Projected treatment plant staff auto traffic would also be comparable to present levels of auto traffic at each site. Roadway conditions would not be adversely affected by the auto travel by staff at any site.

TABLE 12.2-3

EXISTING & PROJECTED TRAFFIC LEVELS

Existing Conditions	DI[1]	NI	LI[2]
Trucks (Daily)	12-14[3]	2-3[3]	5-7[4]
Staff Autos (Max. Daily Shift)	65/60[5]	35	180[6]
Buses (Daily)	Every 24 minutes[7]	Every 20 minutes[8]	15 buses[9]

Proposed Treatment Facilities[10]	HDWKS. Pump Sta	350 MGD	500 MGD[11]	HDWKS.	150 MGD	150 MGD	500 MGD[12]
Trucks (Daily)	2-3	3-5	4-7	1-2	2-3	2-3	4-7
Staff Autos (Max. Daily Shift)[13]	14	53	93	8	37	28	86

1. Includes traffic at the DI House of Corrections which is about equal to the current figures reported for the DI treatment plant, (MDC, Site Options Study, 1982, Vol. II, Pgs. 2-36).

2. Existing traffic associated with Long Island Hospital operations, involving autos, buses and trucks. Source: MDC, Site Options Study, 1982; MDC, Deer Island Facilities Plan (1984, Unreleased); and personal communication with Long Island Hospital Plant Superintendent (11/15/84).

Table 12.2-4

CONSTRUCTION AND OPERATIONS WORKFORCE LEVELS AND ASSOCIATED VEHICLE NUMBERS

SDEIS Option	Site/Facilities (Acreage)	Peak Construction Workforce[1] Outfalls & Treatment	Tunnels	Totals	No. of Buses[2]	Total Avg.Constr. Workforce[3]	No. of Buses[2]	Total Staffing Workforce[4]	Maximum Staff Daily Shift and Staff Autos[5]
1a.2	DI/Primary & Secondary (115A)	1240	70	1310	26	630	13	227	93
	NI/Headworks (2A)	25	45	70	2	55	1	20	8
1b.2	DI/Primary & Secondary (115A)	1180	70	1250	25	560	19	215	86
	NI/Primary (18A)	80	45	125	3	95	2	83	37
2b.1	DI/Headworks & Pumping (5A)	65	35	100	2	85	2	34	14
	NI/Headworks (2A)	25	50	75	2	85	2	20	8
	LI/Primary & Secondary (96A)	1240	165	1405	28	720	14	219	90
2b.3	DI/Primary (52A)	395	35	430	9	285	6	118	53
	NI/Headworks (2A)	25	50	75	2	65	2	20	8
	LI/Primary & Secondary (82A)	1180	165	1345	27	690	14	209	86
4a.2	DI/Primary (62A)	585	70	655	13	590	12	136	60
	NI/Headworks (2A)	25	45	70	2	55	1	20	8
4b.2	DI/Primary (52A)	395	70	465	10	305	6	118	53
	NI/Primary (18A)	80	45	125	3	95	2	83	37

3. Includes both light and heavy trucks, and chlorine deliveries.

4. Includes large tractor-trailer delivery trucks (approximately 5-10 per week) and oil truck deliveries (2 per week).

5. Figures are separate for DI Prison/MDC Staff; based on current MDC staff practice of 1.33 occupants per auto and prison staff practice of mostly individual travel. Maximum MDC daily shift corresponds to the 7 A.M. to 3 P.M. main work shift; the remaining two MDC maintenance shifts are estimated to have small numbers of staff.

6. Total daily staff (24 hours) results in approximately 300 autos per day.

7. Public bus service to Deer Island and through Point Shirley is from the Orient Heights MBTA station and is served by the Rapid Transit Bus Company; buses leave daily (weekdays) every 24 minutes between the hours of 5:20 AM and 12:15 PM. Additionally, a shuttle bus also serves Deer Island daily, leaving from Winthrop Beach to the site.

8. Public bus service to Nut Island and through Houghs Neck is from Quincy Center and is served by the MBTA; buses leave daily (weekdays) every 20 minutes between the hours of 4:45 AM and 1:18 AM. Buses go to the Sea Street landing just below Quincy Great Hill.

9. Bus service to Long Island currently involves 8 MBTA buses daily used to shuttle as many as 200 homeless to the hospital for overnight stays. This service has been in operation since February, 1983. Additionally, 7 buses are used by the hospital to shuttle their staff to the site.

10. Includes only operations of wastewater treatment facilities; no sludge operations are included.

11. Applies to both primary and secondary treatment plants.

12. Secondary treatment plant only.

13. Assumes one occupant per auto.

Table 12.2-4 (cont.)

CONSTRUCTION AND OPERATIONS WORKFORCE LEVELS AND ASSOCIATED VEHICLE NUMBERS

SDEIS Option	Site/Facilities (Acreage)	Peak Construction Workforce[1] Outfalls & Treatment	Tunnels	Totals	No. of Buses[2]	Total Avg. Constr. Workforce[3]	No. of Buses[2]	Total Staffing Workforce[4]	Maximum Daily Shift and Staffing Autos[5]
5a.2	DI/Primary (52A)	395	35	430	9	285	6	118	53
	NI/Headworks (2A)	25	50	75	2	65	2	20	8
	LI/Primary (18A)	80	165	245	5	675	14	63	28
5b.2	DI/Headwork & Pumping (5A)	65	35	100	2	85	2	34	14
	NI/Headworks (2A)	25	50	75	2	65	2	20	8
	LI/Primary (52A)	585	165	750	15	675	14	102	46

Notes:

[1] From M&E, Site Options Study, Vol. 1, Table 8-4 (pg. 8-12).

[2] Based on capacity of 50 people per bus.

[3] From M&E, Site Options Study, Vol. 2, Table 3-9 (pg. 3-16); includes figures for either tunnel or pipeline construction whichever is greater.

[4] From M&E, Site Options Study, Vol. 1, Table 7-15 (pg. 7-45).

[5] Based on estimated one person per auto for maximum daily shift (corresponding to 7 AM to 3:30 PM shift); data from M&E, Site Options Study, Vol. 2 Note that current MDC employee practice at the treatment plants is that staff commute in a ratio of 1.33 persons per auto.

Source: CE Maguire, Inc. (November, 1984)

12.3 Recreation Resources and Visual Quality

TABLE OF CONTENTS

Page No.

Page No.

Page No.

Page No.

BOSTON HARBOR SDEIS

BASELINE INFORMATION: RECREATION RESOURCES

AND VISUAL QUALITY

12.3.1 Recreation Resources

12.3.1.1 Existing Environment and History of the Boston Harbor Islands

The recreational potential and visual quality of Boston Harbor and its islands are in large part influenced by the natural environment and past and present human use. Recognizing this, the following discussion reviews the origins and existing environment of the harbor and islands and discusses how human use of the islands have altered them.

A. Geology

Boston Harbor is part of the Boston Basin (or Lowland), a low, flat plain generally at an elevation of less than 50 feet above mean sea level. Formed millions of years ago by geologic activity, the basin is surrounded by a ridge of bedrock which includes the Blue Hills to the south, and the bedrock hills to the west and north of the city. The bedrock in these areas has been partly smoothed and covered in glacial drift from recent glacial activity, the last of which ended about 10,000 years ago.

Within the Boston Basin, drumlins (long, oval hills formed of glacial drift) are very common. Over 100 of these geological phenomena are found in the Boston Area (see Figure 1). Some of the drumlins have become islands due to the rise in sea level in the post glacial period (4000-2000 BP).* The drumlins are the most distinctive topographic features in the relatively flat Boston Basin and include several that were sites of revolutionary battles, such as Bunker Hill.

---

* MHC Reconnaisance Survey Report, 1982

Drumlins of Boston Harbor

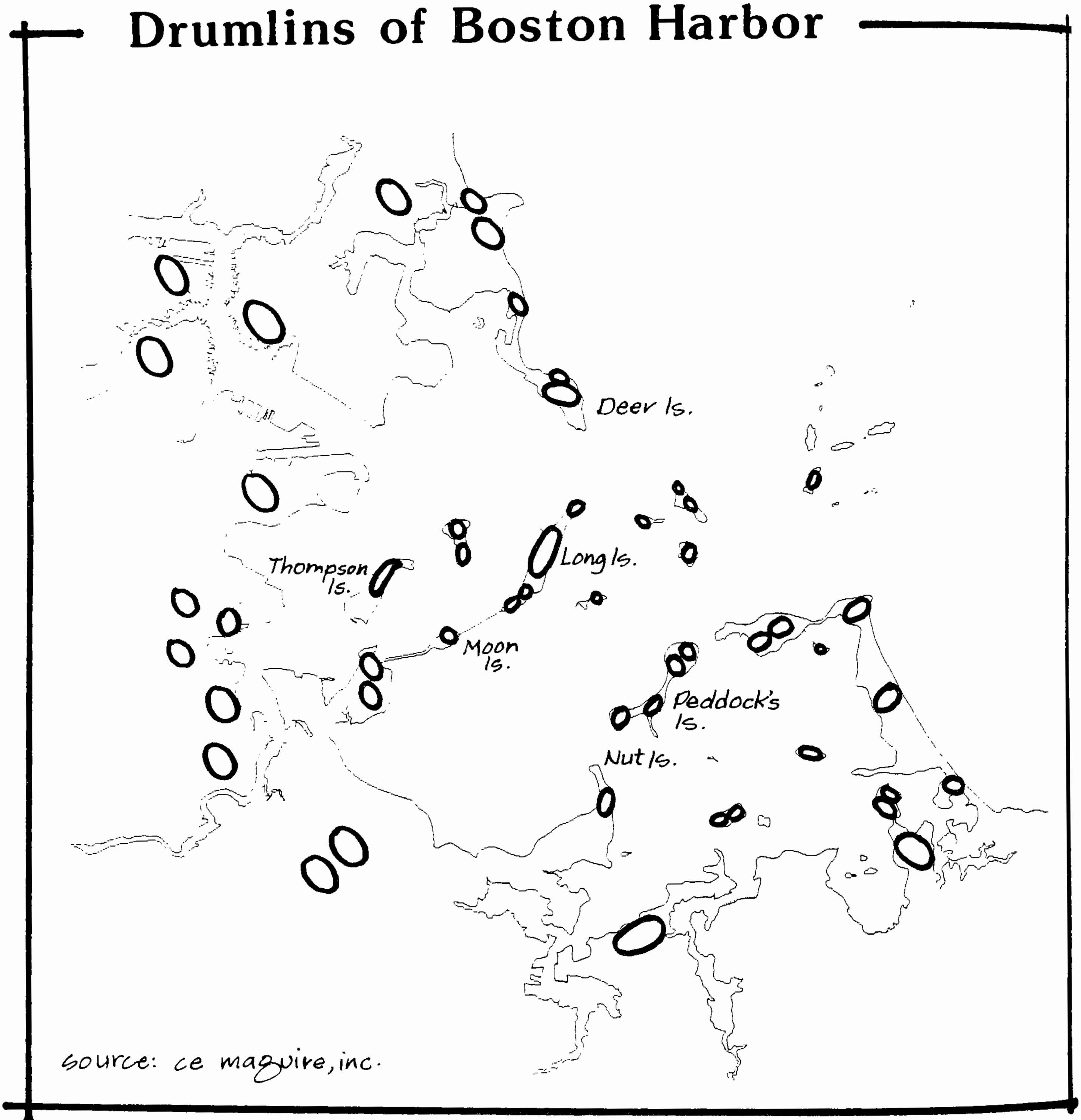


figure 1

The structural geology of the Harbor Islands follows the regional northeast/southwest trend of the Boston Basin.* The exposed bedrock of the Brewster Islands is apparently linked with the granite bedrock of the Quincy formation. This perhaps indicates that all the Boston Harbor Islands have a bedrock core overlain by debris.* This loose, unconsolidated debris that covers the islands is at the mercy of the elements. As a result, all the islands, and especially the headlands, have been extensively altered by the natural forces of storms and erosion since their formation.

B. Vegetation

The vegetation of the Boston Harbor Islands has been significantly altered by man. Records from early colonists indicate that the islands were at the time of settlement covered in forests of native trees which were cleared to allow for agricultural use and for firewood.

During the Great Depression (of the 1930's), the Civilian Conservation Corps planted 100,000 pine trees on the Islands only to have most of them removed for military fortification construction during World War II.**

Currently the upland vegetation on the Harbor Islands is dominated by herbaceous and shrub species--typically grasses, brambles, and sumac. In some places the vegetation is thick and virtually impenetrable. Common shrubs include bayberry, poison ivy, rose, and blackberry. Trees include maples, birch, apple, pine, poplar, peach, choke cherry, oaks and elms.

---

* MHC Reconnaisance Survey Report, 1982

** MAPC, p. 17.

C. Wildlife

Birds are the most abundant form of wildlife found on the islands. The high grasses, tall rocky cliffs, and thick brush provide an abundance of food and sites to breed and find cover.

As for mammalian life, rats are the most numerous of all. Other mammals include cotton tail rabbits, raccoons, grey squirrels, and skunks.

The shorelines and intertidal areas surrounding the Harbor Islands support an abundance of marine invertebrates, some of which are important food sources for terrestrial (as well as marine) animals.

Perhaps due to the lack of pesticide spraying, there is an unusual abundance of insect life on the islands. The Comprehensive Plan (1972) recorded wasps, bees, grasshoppers, beetles, butterflies, and caterpillars*.

The abundance of fish in the Harbor and a year-round fishing season attracts many sport and recreational fisherman. Typical fish caught include winter flounder, mackerel, striped bass, smelt, and codfish. In addition, soft-shell clams, blue mussels, crabs, and lobsters are also found in great quantity.

D. Cultural History

D.1 General

All of the Boston Harbor Islands have been greatly altered by human activity. Prior to the arrival of European settlers, Indians had raised crops on some of the Islands and fished off their shores.** With the advent of European settlers came a variety of new uses (such

---

* Metropolitan Area Planning Council, Boston Harbor Islands Comprehensive Plan, 1972.

** Kales, p.6.

as military fortifications) and the continuation of old ones (such as agriculture).

The cultural history of the islands is important for several reasons. First, the artifacts that are still extant on the islands have great recreational, historic, and educational value. Second, because the artifacts are fascinating to observe and study, they exert a tremendous influence on the conceptual plans for future recreational use of the islands. Third, many of the artifacts have authentic archaeological value and, therefore, may affect the time tabling for implementation of any future use on the islands, be they for recreation or wastewater treatment facilities.

D.2 Land Uses on the Harbor Islands Since 1630

Since the advent of European settlement, there have essentially been four different land uses on the Harbor Islands: agriculture, recreation, public facilities, and military fortification.

Agricultural use of the islands predominated from about 1630 to the eighteenth century. Land was cleared of trees and either planted to crops or grazed upon by cattle.

In the eighteenth century, some islands became popular recreation sites. Guest houses, inns and resorts were built. Illegal gambling and boxing matches were other recreational pursuits staged on the islands to avoid the watchful eyes of the authorities.

The era of public facility construction on the harbor islands dates from the early eighteenth century and peaks during the final two decades of the nineteenth century. It was during this time that many "undesirable" public facilities, such as poor houses, quarantine hospitals, reform schools, prisons, wastewater treatment facilities, and waste handling facilities were constructed. Present day ownership patterns still reflect much of this era.

The military use of the harbor islands dates from colonial times, but it was not until after the American Revolution that permanent military forts and gun emplacements were constructed, replacing hastily mounted guns that were previously in place. Historically, Long Island and Lovell's Island, and to a lesser degree Deer Island, have been the first line of defense for President Roads. George's Island has served to control Nantasket Roads. Outer Brewster Island, Greater Brewster Island, Gallops Island, Peddock's Island, and Bumpkin Island have also in the past served as military installations.

After the Second World War, the military importance of the islands declined and in 1946 the Federal government began to decommission facilities and abandon their upkeep. Islands were sold to public agencies for recreational purposes. Unfortunately, most of the historical structures that were on the islands have been destroyed, primarily due to vandalism and arson. This is a major impediment to the reuse of facilities for recreation purposes, especially in terms of the islands' archaeological potential.

D.3 History of Long Island

Shortly after the founding of the Massachusetts Bay Company, Long Island (which was granted to Boston in 1634) was cleared and leased to about 40 tenant farmers. The existing lighthouse on Long Island Head drumlin was constructed in 1819 and is an example of Federal Period design. In 1850, plans were prepared to subdivide the island for a residential community. The lots, however, were not sold and the plan failed. At about the same time and for 37 years following, a colony of fishermen lived on the island. Before the outbreak of the Civil War, a battery of guns were constructed on Long Island Head drumlin. During the Civil War, a conscript camp was set up on Long Island. Closer to the southern end of the island there is a memorial to 79 Civil War dead who were reinterred on the island's cemetery. The camp, which was renamed Fort Strong in 1867, was extensively renovated in 1899 when several batteries of six- and twelve-inch guns were built. During World War I, 1500 men were quartered in the Fort. Fort Strong was declared surplus in 1946. The City of Boston destroyed some of the old military structures in 1968 - the rubble of which litters part of the Head.

Long Island Hospital began its history as a hotel, which was built when the island was a popular resort. Ten years after the hotel was built, in 1882, the City of Boston purchased the hotel to house the poor, paupers, unwed mothers, and later, homeless men. Today, the Hospital consists of about 20 buildings covering about 60 acres of the island. The hospital provides care for the homeless, the elderly, and the "chronically" ill.

D.4 History of Deer Island

During King Phillip's War, colonists first detained and later imprisoned captured Indians on the island. In the 18th and 19th centuries, Deer Island, like Long Island, was also used for agriculture and was the site of a resort hotel. In the middle of the 19th century, at the time of the great wave of Irish immigrants, the island was used as a quarantine hospital. In 1852, a poorhouse was constructed on the island and later converted into the Suffolk County House of Correction. In 1938, Shirley Gut, which separated Deer Island from Point Shirley was practically filled in. The U.S. Army decided in 1940 not to dredge the Gut to simplify access for the construction of Fort Dawes. Deer Island has remained connected to Winthrop since then.

A sewage pumping station was constructed on Deer Island in 1889 by the Metropolitan Sewage District. In 1968, the facility was expanded and upgraded into the existing Deer Island Wastewater Treatment Facility.

During World War II, Fort Dawes was constructed at the southerly tip of the island. A 12-foot high concrete wall was built to separate the Fort from the remainder of the island. Since the end of the war, the Fort has been abandoned and has fallen into disrepair.

D.5 History of Nut Island

Nut Island was once a 4-acre island located just offshore from Quincy's Great Hill. In colonial times cattle grazed on the pastures of the island. At one time, it rose "sharply on one side into a tall, slightly concave highland, the top of which is fairly rounded and covered with green grass and summer flowers, and slopes down again to the water on the other side."* In 1876, a foundry company constructed an immense gun emplacement on the island. By 1893, the MDC took over the island and began both sculpting and enlarging it for a wastewater treatment facility. The primary treatment plant, which covers most of the island and replaced the previous facility, was completed in 1950.

D.6 History of Moon Island

In colonial times, Moon Island was put into agricultural use for both grazing by animals and growing crops. In 1878, Boston began construction of a giant 7½ foot diameter sewer from Columbus Park to Squantum beneath Dorchester Bay, and from Squantum to Moon Island under the connecting causeway. On Moon Island itself, the city constructed four huge granite storage tanks, with a combined capacity of 50 million gallons, to hold raw sewage. Twice a day gates were opened permitting the detained wastewater to flow into the Harbor with the outgoing tide. When the project was completed in 1884, the Moon Island facility received world-wide attention and Boston was hailed as having one of the finest sewage disposal systems anywhere.

In 1959, the Boston Fire Department built a fire fighting training facility on the northern end of the island. The Boston Police Department constructed a pistol range on the island the following year.

---

* King's Handbook of Boston Harbor, 1882.

12.3.1.2 The Affected Environment: Long, Deer, Moon and Nut Islands

The four harbor islands that will be affected by the current SDEIS planning effort are described in ths section. These descriptions serve to highlight the natural and man-made features of these islands likely to be affected.

A. Long Island

Long Island is the largest of the Boston Harbor Islands, being 213 acres in size. The island is connected to the mainland by a two-lane bridge that is nearly 35 years old. Long Island is located near the exact geographic center of Boston Harbor.

A.1 Topography

The topographic features of Long Island is shown in Figure 2. Both the large central drumlin and the drumlin at the head reach an elevation of about 90', and are the island's dominant features. From their summits, there are spectacular views of the entire harbor.* The two drumlins at the West Head are lower in elevation and densely forested; consequently, views from them are not readily obtainable, nor are they as commanding.

The side slopes of the central drumlin and the head are fairly steep. Erosion caused by tides and storms have carved the drumlin at the head into a steep cliff. Between these two drumlins there is a flat area formerly used as the parade ground of Fort Strong, located at the head. Finally, the two small drumlins give the West Head a softer, rolling character.

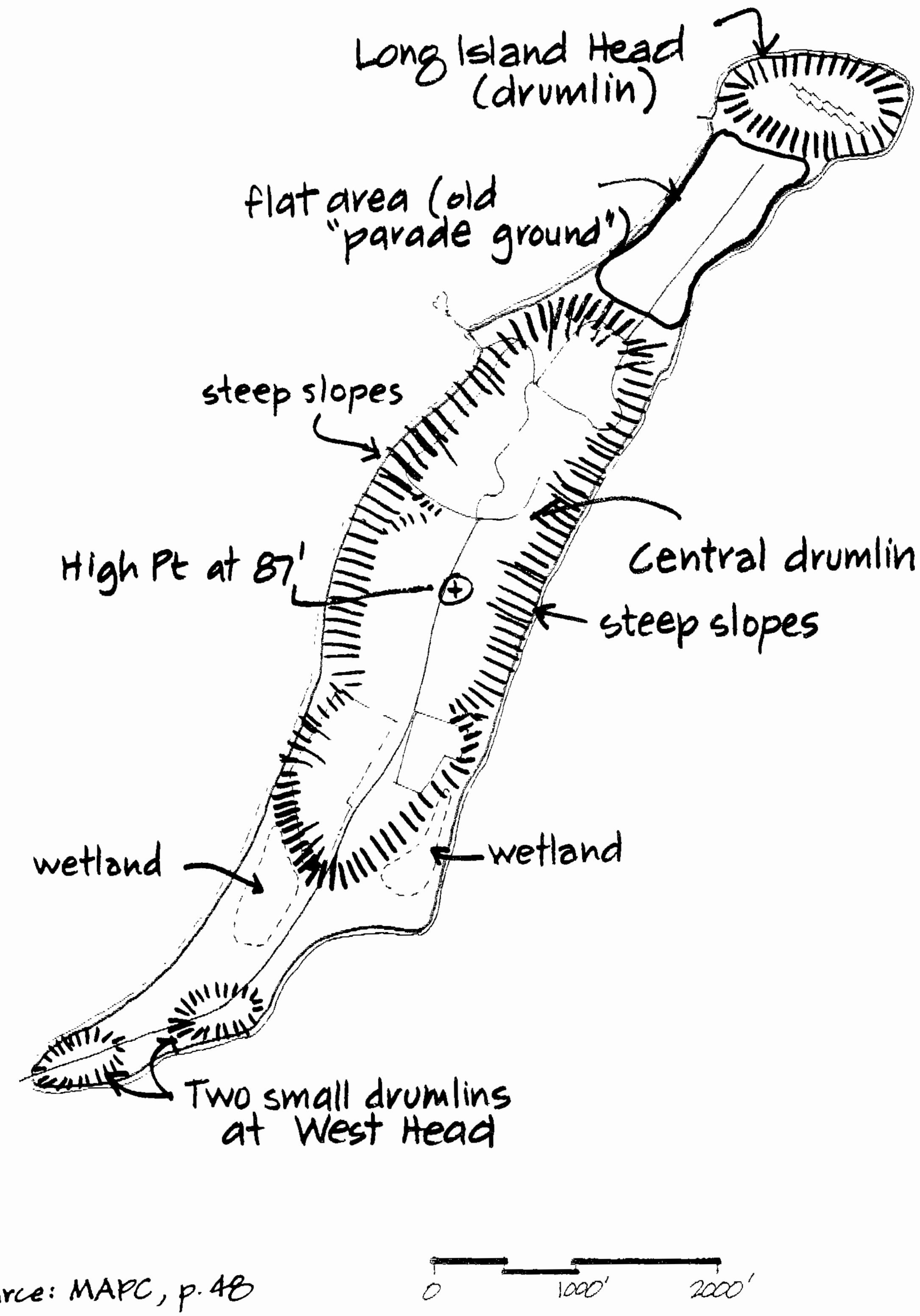
A.2 Soils and Geology

Drumlins are typically composed of unconsolidated heterogeneous mixtures of coarse and fine materials (till). The remainder of the

---

* MAPC, p. 54.

Long Island topography



source: MAPC, p. 48

ce maguire inc.

figure 2

island is composed of sands and gravels. Fine soils are found in the marsh areas of the West Head. South of Bass Point, there is a sandy beach of suitable for recreation.

A.3 Vegetation

The southern portion of the island supports dense picturesque stands of mature red pine (Pinus resinosa), as well as apple (Malus spp.), sumac (Rhus typhina), and poplar (Populus spp.) trees which cover the slopes of the two small drumlins. Two wetlands are also found near the West Head. A one-acre freshwater marsh is located along the western shore, between the abandoned Nike site and the Long Island Chronic Disease Hospital. Along the eastern shore there is a 12-acre marsh near Bass Point with a characteristic vegetation of Common Reed (Phragmites communis).* Figure 3 depicts the location of vegetation found on Long Island.

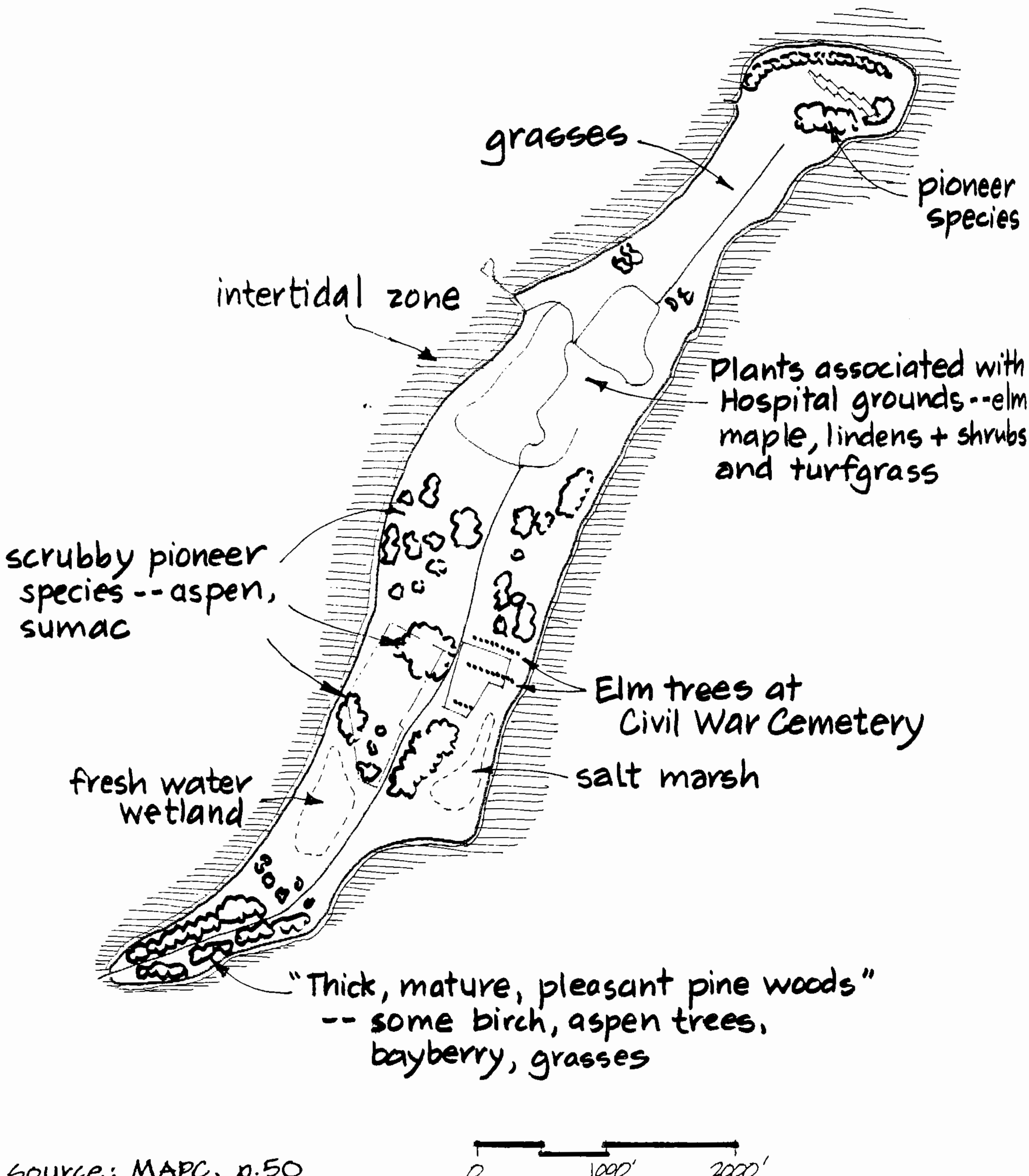
Between the West Head and the Hospital, there is an extensive stand of scrubby vegetation, consisting of a staghorn sumac (Rhus typhina) community, with scattered specimens of red pine (Pinus resinosa), quaking aspen (Populus tremuloides), and cherry (Prunus spp). At the Civil War Cemetery, rows of American elm (Ulmus americana) have been planted.

Within the hospital grounds elms, maples, catalpa, and birch have been planted. Scattered grasses and brush grow in the area between the hospital and Long Island Head. The head features a grass sumac vegetation community with occasional specimens of apple, poplar, white oak and red pine.

---

* MAPC, p. 50

Long Island vegetation



source: MAPC, p.50

A.4 Wildlife

According to the Metropolitan Area Planning Council's (MAPC) 1972 Comprehensive Plan, Long Island wildlife includes ring-necked pheasants, songbirds, rats, meadow mice, and cotton-tail rabbits.

A.5 Land Use and Cultural Features

On Long Island, there is only one active land use, the Long Island Chronic Disease Hospital. The hospital consists of some 20 buildings occupying about 60 acres or a little under one-third of the island. The Department of Health and Hospitals of the City of Boston runs two chronic disease hospitals, the Mattapan Hospital and the one on Long Island. Between the two hospitals, there are 445 licensed chronic disease beds and only 300 patients.* Of these 300, only 160 are certified to be legitimately in need of chronic disease care, and the rest are homeless.*

Other cultural features and artifacts on the island include an abandoned military installation (Fort Strong), a lighthouse, (Long Island Light), an abandoned Nike missile site, and a Civil War cemetery (that was moved to Long Island from Rainsford Island). The locations of these artifacts are found in Figure 4.

A.6 Noise

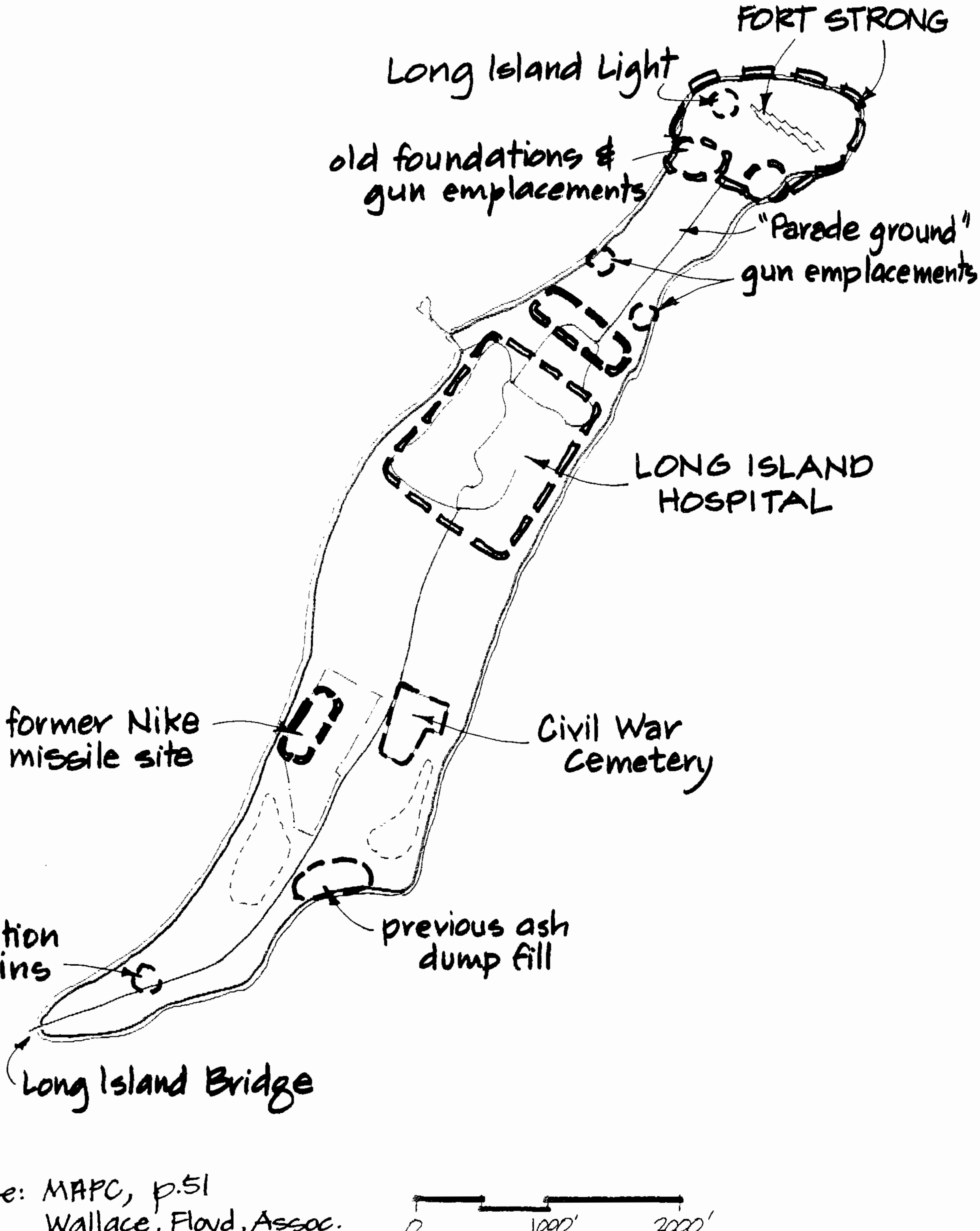
Existing land uses on Long Island are not significant generators of noise. At the hospital, the noise level is about 65-70 dB**. Long Island Head and the Parade Ground area adjacent to it, however, lie directly under an approach runway to Logan Airport. Aircraft use this runway year round, but because of seasonal variation in prevailing winds, the runway is used much more in winter when prevailing winds are from the northwest than in summer when prevailing winds are from the southwest. Because Long Island Head is only 3 miles from Logan

---

* Task Forces to Mayor Flynn, p.532.

** Metcalf & Eddy, Inc., SOS II, p. 2-91.

Long Island
land use and cultural features



source: MAPC, p.51
Wallace, Floyd, Assoc. p. 41

ce maguire inc

figure 4

Airport, aircraft fly over at a fairly low altitude resulting in noise levels as high as 84-100 dBA*. Such aircraft flyovers are expected to continue and would pose periodic high noise intrusion and disruption to proposed park visitors (see Section 12.6).

A.7 Viewshed

As previously mentioned, Long Island is located near the exact geographic center of Boston Harbor. The island is quite removed from residential and commercial areas on the mainland. Only at a distance of three miles is a residential area reached (Squantum and Point Shirley).

Only portions of shoreline communities potentially have a direct view of Long Island. See Figure 5. These portions include: Point Shirley, the south-facing neighborhoods of Cottage Hill, Court Park and Cottage Park in Winthrop; South Boston east of Telegraph Hill; the east-facing slopes of Squantum; the Wollaston Beach community of Quincy; the Hough's Neck area; and the west facing slopes of Telegraph Hill in Hull. The Long Island Hospital, situated on a bluff in the central part of the island, is visible from many locations; particularly prominent is the large water tower.

Other harbor islands are over 1 mile from Long Island. George's Island, the most heavily used harbor island, is fully 2 miles from Long Island.

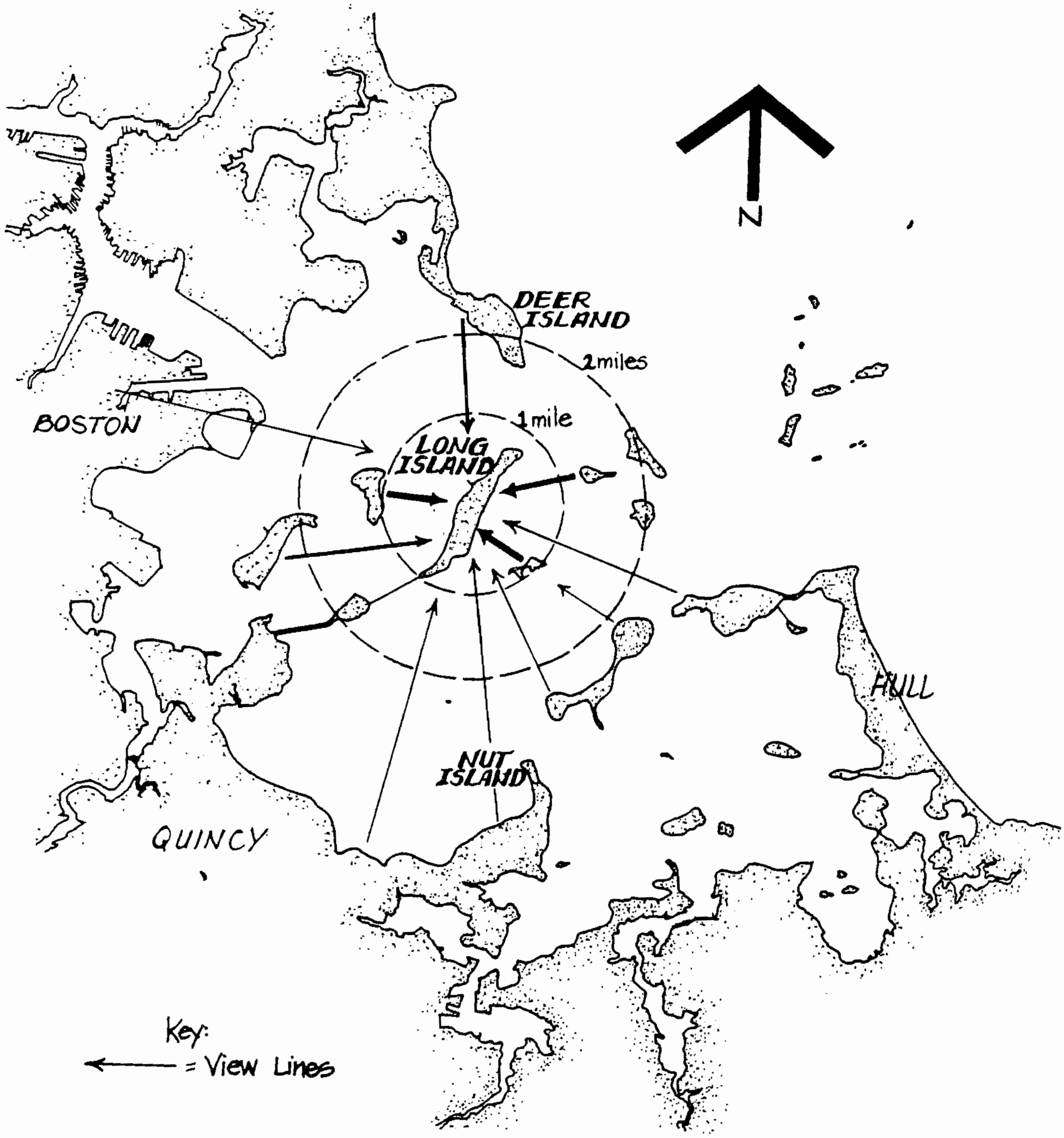
B. Deer Island

Deer Island became connected to the Town of Winthrop in 1936 by the progressive deposition of material in Shirley Gut. It is the second largest of the Boston Harbor Islands, having an area of 210 acres.

---

* Metcalf & Eddy, Inc., SOS II, p. 2-91

Views to Long Island



ce maguire inc. 1984

figure 5

B.1 Topography

Figure 6 shows the topographic features of Deer Island. The dominant feature of the island is a large drumlin located in the central portion of the island which reaches an elevation of approximately 105 feet. This drumlin is known as Signal Hill.* Its summit has been altered to permit construction of a wastewater treatment-related lagoon. The side slope of the central drumlin facing the treatment plant has been cut and made steeper. A much smaller drumlin on the north side of the island reaches 60 feet in elevation. The southern portion of the island (about 40 acres) is gently sloping. In this portion, there is a second hill on the island which, though it looks like a drumlin, is man-made. It was built to house three of the bunkers of Fort Dawes.* The shoreline of the upper half of the island consists of either a seawall or riprap. The remaining shoreline is either coarse sand or stones. A sandy beach is found on the eastern shore near Fort Dawes. There are fine views over the harbor from both the central drumlin and the flat southern tip of the island.**

B.2 Soils and Geology

The drumlins are composed of a compact, heterogeneous mixture of gravel, sand, silt, and clay (till). The remainder of the island has soils composed of sands and gravels. Only on the eastern shore is there currently a beach with fine sand.

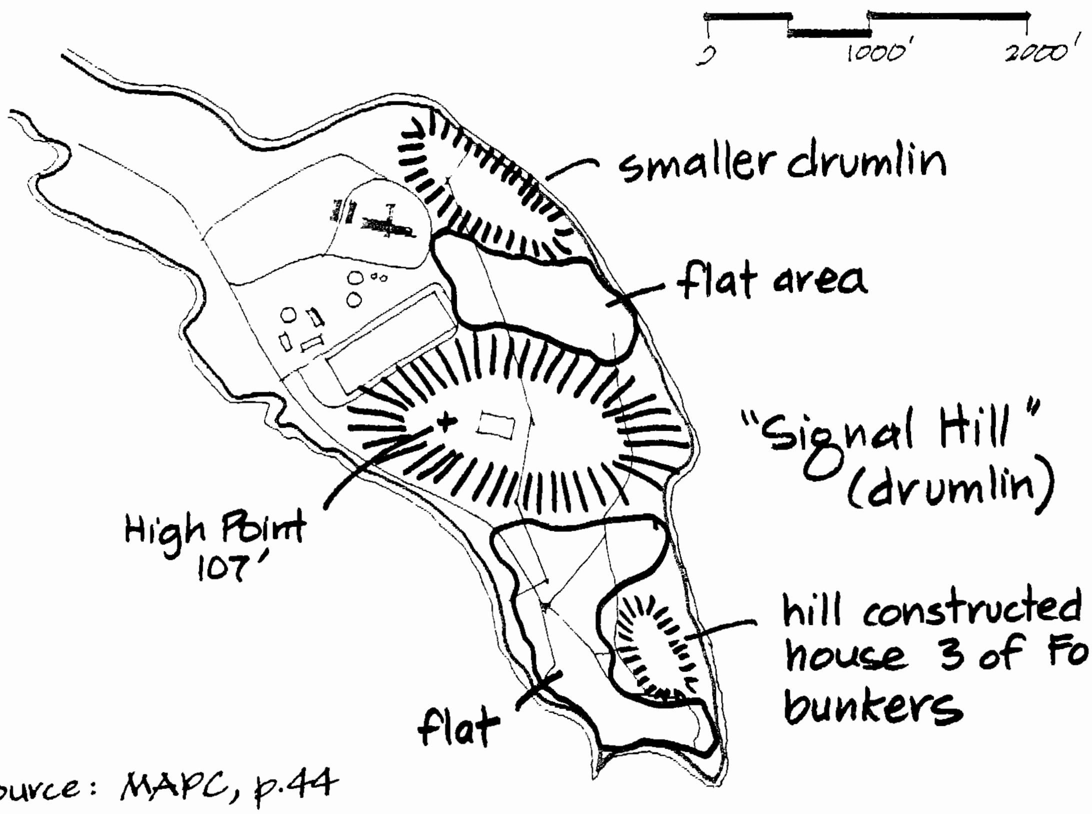
B.3 Vegetation

Most of the island, including the central drumlin, is covered in grasses, scrub growth, and brush. On the south-facing slope of the central drumlin is a small grove of cottonwoods. There are few other

---

* Randall, p. ICA 158:4
** MAPC, p. 47

Deer Island topography



ce maguire inc

figure 6

trees on the island.* Figure 7 shows the approximate location and sparseness of vegetation on Deer Island.

B.4 Wildlife

According to the 1972 Comprehensive Plan, wildlife found on Deer Island includes red-winged blackbirds, ring-necked pheasants, songbirds, meadow mice, raccoons, and rats.**

B.5 Land Use and Cultural Features

Existing land uses on the island are shown in Figure 8. The largest active use on the island is the Deer Island Wastewater Treatment Facility operated by the MDC. The Suffolk County House of Correction occupies a large area north of the treatment plant.

Other features include a 12-foot high concrete wall that splits the island into an eastern and western half. It was constructed to separate Fort Dawes from the remainder of the island. There are also a number of abandoned land uses including an abandoned pig farm adjacent to the House of Correction, Fort buildings, bunkers, gun emplacements, and some industrial buildings.

B.6 Noise

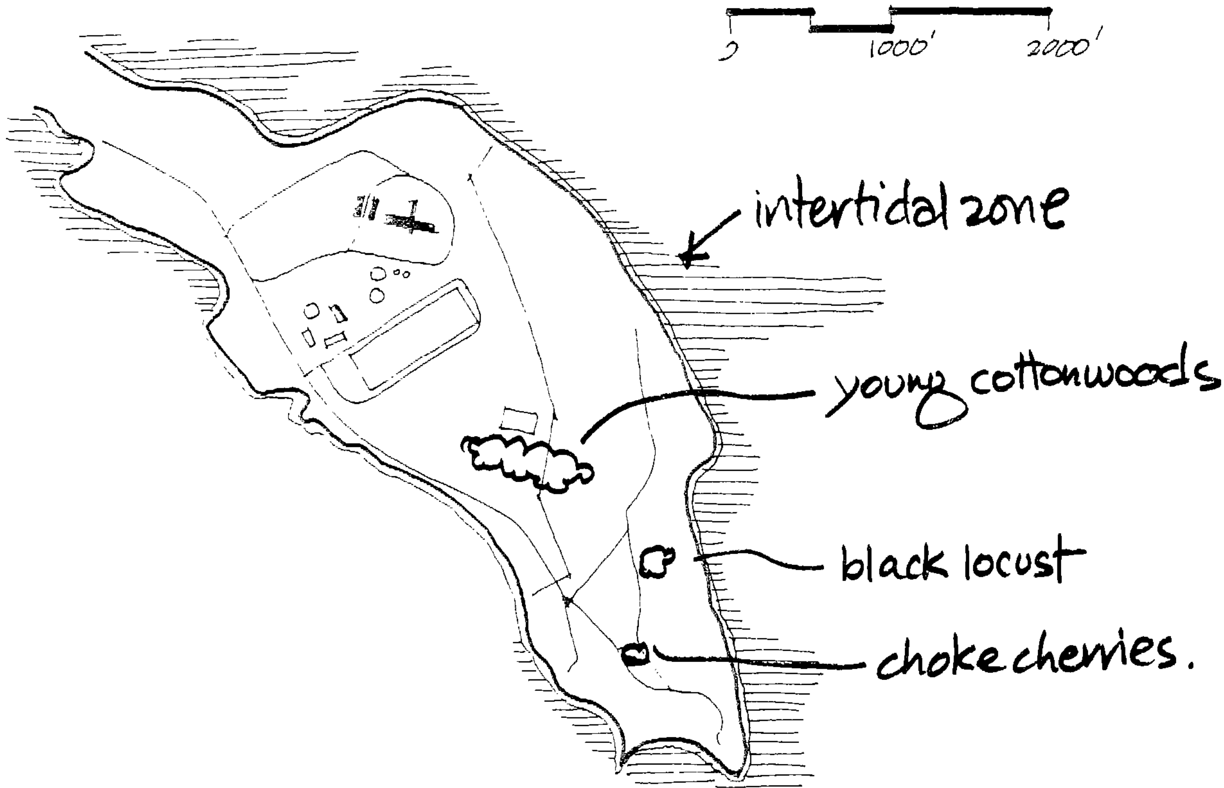
The predominant contributors to noise at Deer Island are overflights from nearby Logan Airport and neighborhood vehicular traffic. According to Metcalf and Eddy's Site Options Study (Volume II, pg. 2-43), the average day/night noise levels in the plant vicinity are between 73 and 74 dBA. This is comparable to a very noisy urban residential area (see Section 12.6 of Volume 2).

---

* MAPC, p. 45

** MAPC, p. 136.

Deer Island vegetation

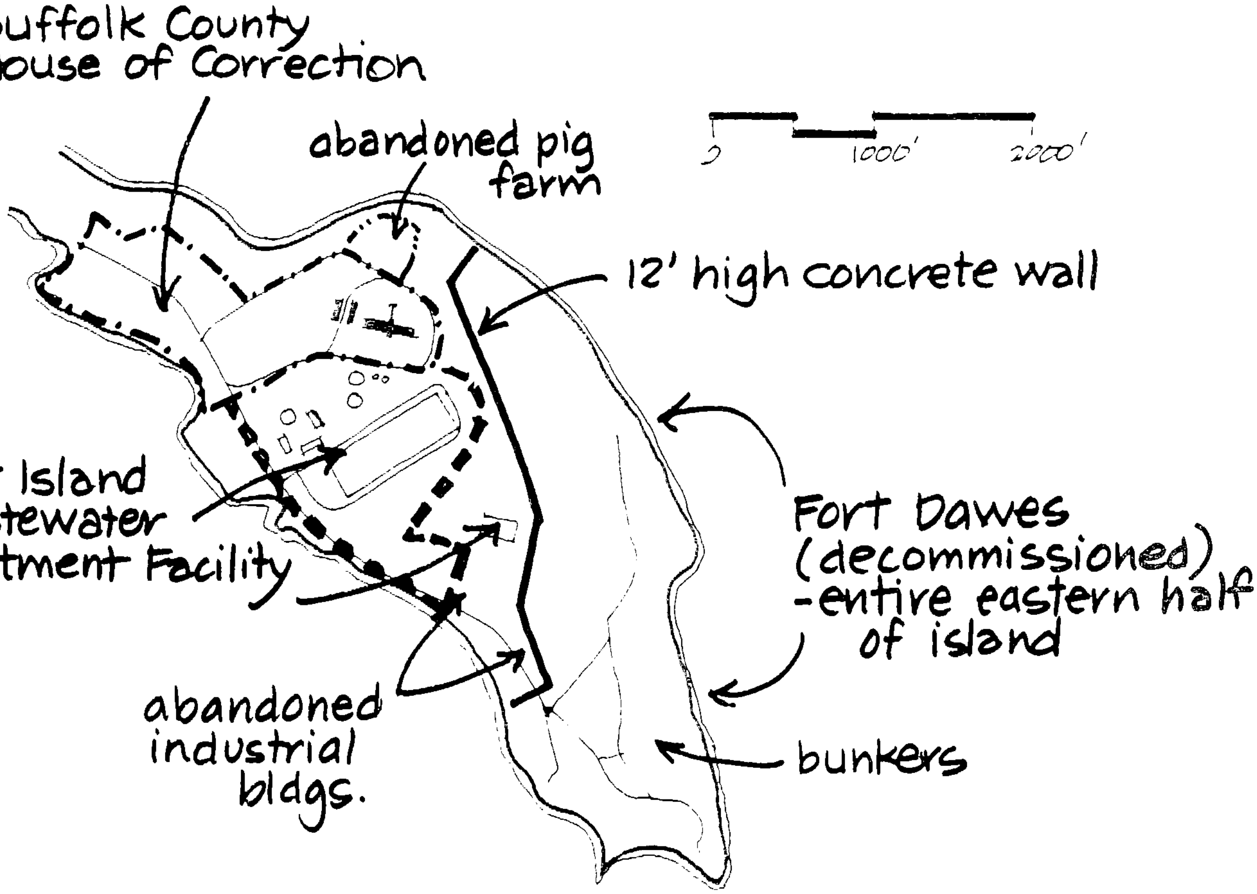


source: MAPC, p.45

ce maguire inc

figure 7

Deer Island
land use and cultural features



source: MAPC, p. 45 ; SOS II, fig II-7

B.7 Viewshed

The Deer Island wastewater treatment facility is located a scant 2,000 feet from Point Shirley and about a mile from Winthrop's Cottage Hill neighborhood. No other residential areas are located within a few miles of Deer Island. See Figure 9.

It is probable, based on the topography of these neighborhoods, that clear views of the treatment plant area can be obtained from these above-mentioned neighborhoods.

Signal Hill effectively blocks much of the view of the Deer Island Wastewater Treatment Facility from Long Island Head.

C. Nut Island

Nut Island was once a four-acre island just off shore from Quincy's Great Hill. Today, it is connected to the mainland (at Hough's Neck) by filled land and totals 17 acres in size.

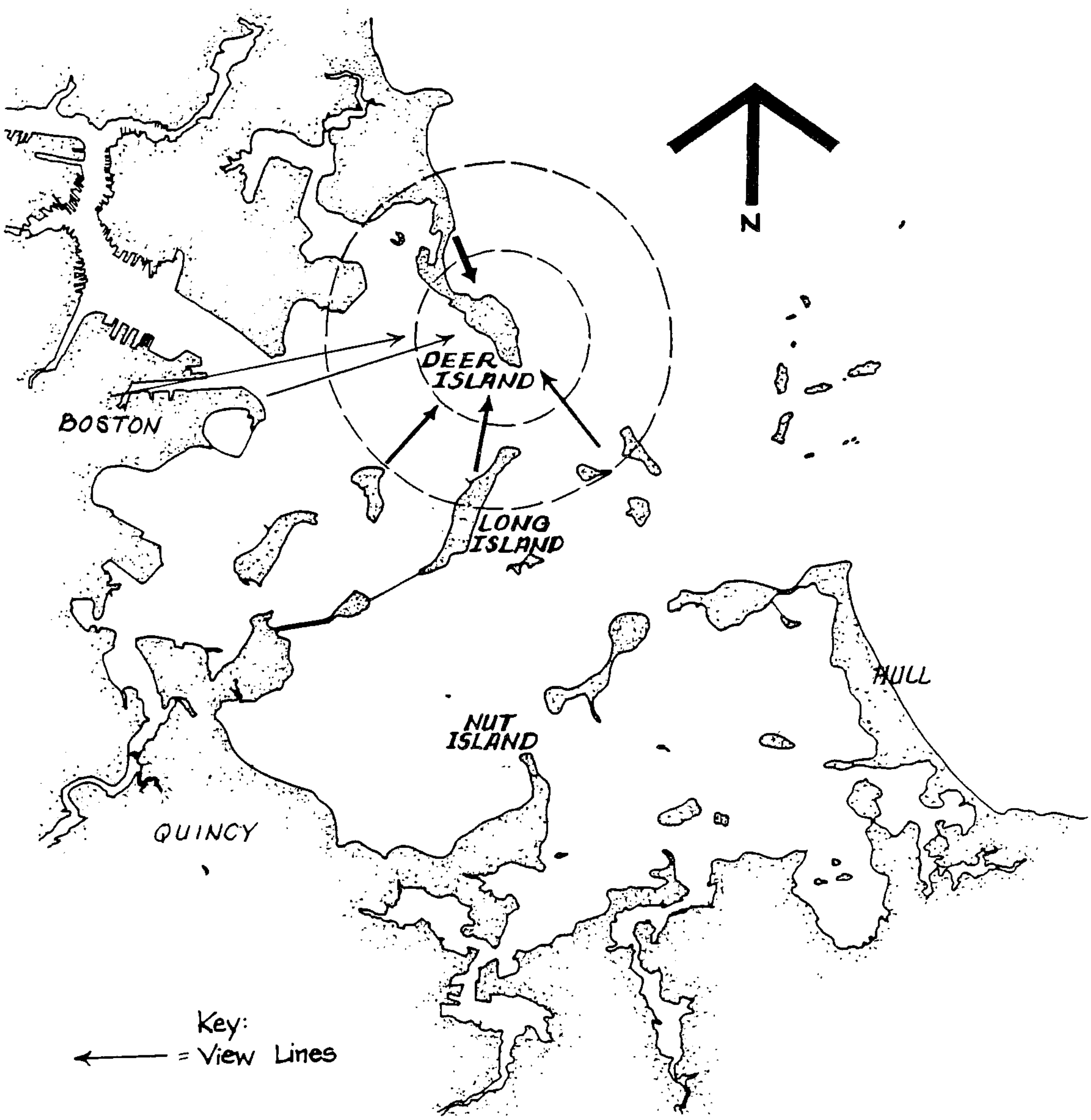
C.1 Topography

The entire island has been transformed by the construction and engineering requirements of the Nut Island Wastewater Treatment Facility. The island, at present, is a roughly rectangular, flat peninsula, as shown in Figure 10.

C.2 Soils and Geology

In constructing the wastewater treatment facility, the island's original soil cover has been supplanted by man-made fill material. Presumably, its composition is variable (i.e., some sand, gravel, boulders, and finer material).

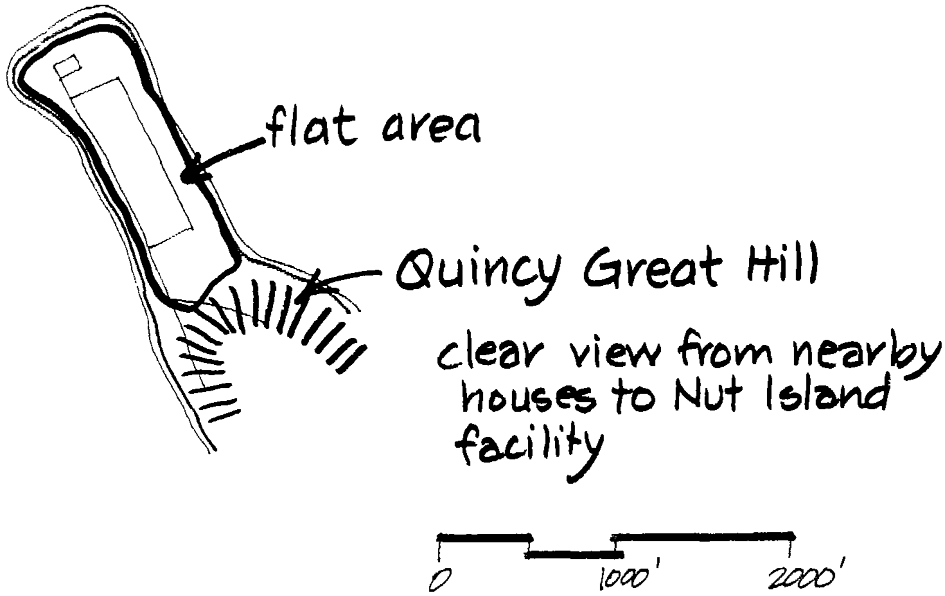
Views to Deer Island



C.E. Maguire inc 1984

figure 9

Nut Island topography



source: MAPC, p. 113

ce maguire inc

figure 10

C.3 Vegetation

The island's perimeter is planted in grass. The MAPC recorded the presence of a tree in the northwest corner of the island in 1972 (see Figure 11). Since 1972, there have been successional changes in the vegetative communities along the perimeter of the island tending to grasses and scrub.

C.4 Wildlife

The MAPC, in its 1972 Comprehensive Plan, does not record the presence of any wildlife on the island. In light of the sterile habitat and its lack of diversity, resident wildlife is likely to be negligible or nonexistent.

C.5 Noise

Traffic noise and other noise generators from the Hough's Neck neighborhood and the Nut Island treatment plant are not significant. The Site Options Study noted that the Nut Island Treatment Plant's isolated location insulates the site and its surroundings from intrusive levels of noise. The Study presumed noise levels in Hough's Neck were typical of urban residential areas - a day/night average noise level of 53 to 57 dBA with a typical average of 55dBA.* Noise monitoring done for the SDEIS by CE Maguire, Inc., confirmed this average noise level (see Section 12.6 of Volume 2).

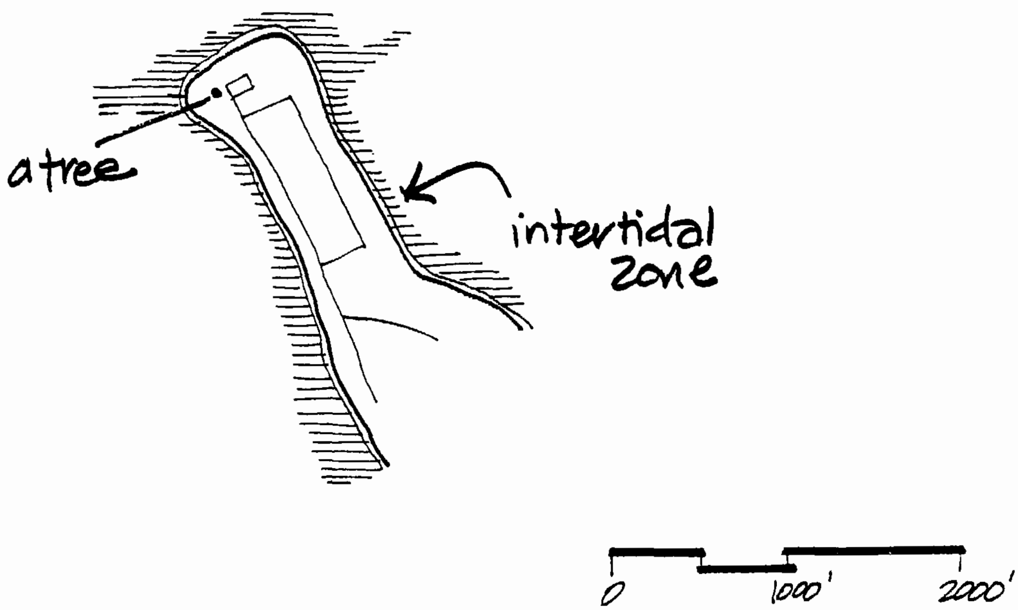
C.6 Land Use and Cultural Features

The Nut Island Treatment Plant takes up the bulk of the island's area (see Figure 12). No other land uses or cultural features are present. The island has no known archaeological, historical, or cultural artifacts.

---

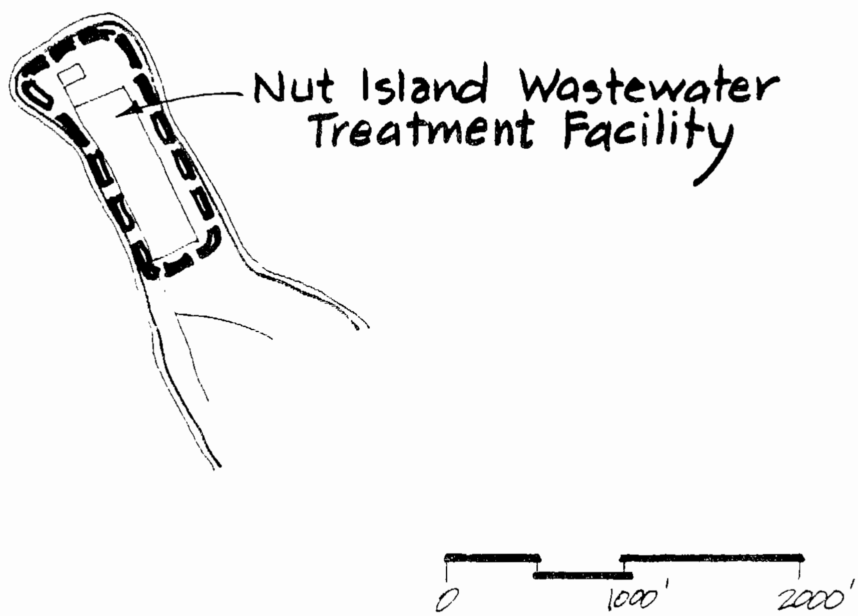
* Metcalf & Eddy, Site Options Study, p. 2-27, 2-73

Nut Island vegetation



source: MAPC, p. 114

Nut Island
land use and cultural features



source: MAPC, p. 114

ce maguire inc

figure 12

C.7 Viewshed

Nut Island and its treatment plant are located a short distance from Quincy's Hough's Neck community situated atop Quincy Great Hill. See Figure 13. The closest house to the treatment plant boundary is only 280 feet distant.

Clearly, houses on the north side of Quincy Great Hill have direct views of the treatment plant. Other residential areas that have views of Nut Island include the Quincy Bay shoreline of Hough's Neck (at distances of 1/2 to 1-1/4 miles), and the Adams Shore area of Quincy (at distances of up to 2 miles). Virtually all other residential areas are over 3 miles distant.

Finally, Nut Island is only 3/4 mile from the picturesque West Head of Peddocks's Island; as a result, the facilities located on Nut Island are clearly within that view from Peddock's.

D. Moon Island

Moon Island is about 45 acres in size. It is connected by road to both Squantum and Long Island.

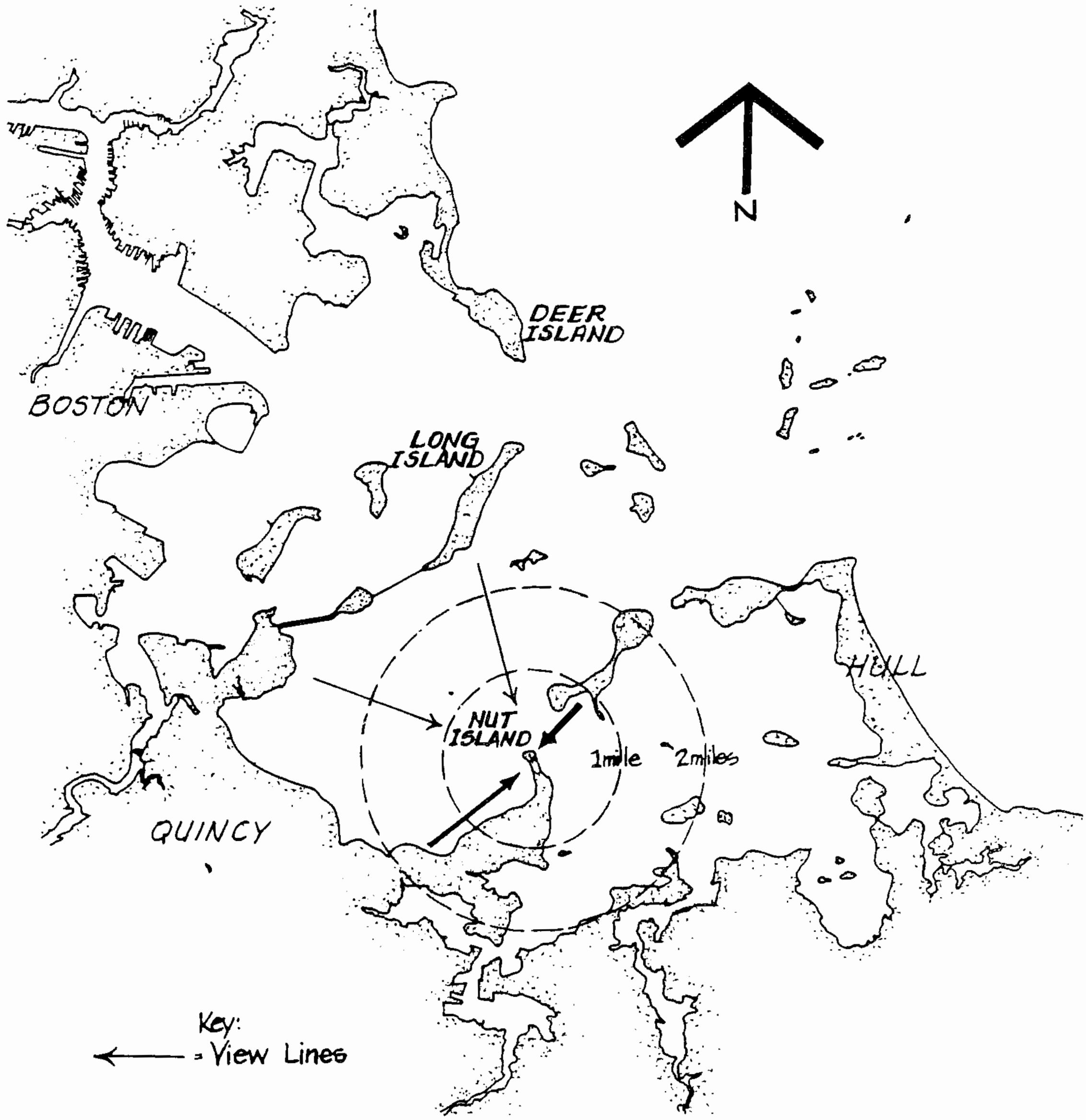
D.1 Topography and Natural Features

The dominant feature on Moon Island is a large drumlin that reaches an elevation of 100 feet. There are fine views of Boston's skyline, Quincy Bay, Dorchester Bay, other islands, and the Blue Hills from this vantage point.* (Figure 14)

---

* MAPC, p. 59

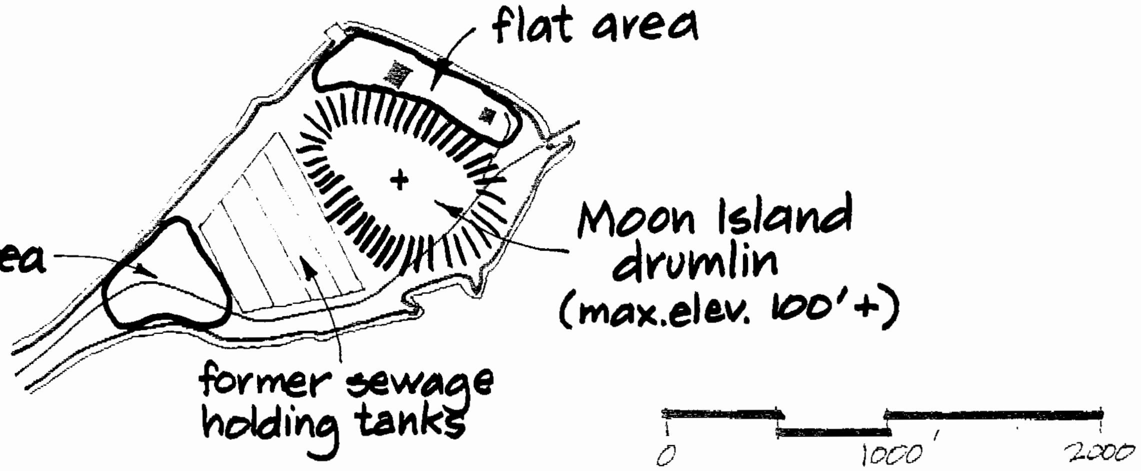
Views to Nut Island



c.e. maguire inc. 1984

figure 13

Moon Island topography



source: MAPC, p. 57

ce maguire inc.

figure 14

D.2 Soils and Geology

The drumlin is a heterogeneous mixture of sand, gravel, silt and clay (till). According to the 1972 Comprehensive Plan, the remainder of the island is man-made* and probably of variable composition.

D.3 Vegetation

The west-facing slope of the drumlin is in forest consisting of white birch, maple, black pine, elm, oaks, and beech trees. There is a grove of trees to the west of the sewage reservoir. Large elm trees were planted alongside the road through the island. The remainder of the island is covered in grasses, sumac, and other shrubs.** (See Figure 15).

D.4 Wildlife

The MAPC has recorded observing brown thrashers, songbirds, rats, meadow mice, gray squirrels, and skunks on the island.*** Moon Island is reported to have a large rat population. It is also reported that the fishing for flounder, mackerel and striped bass along the western shoreline is good, particularly from the granite seawall on the northern end near the sewage outfall.

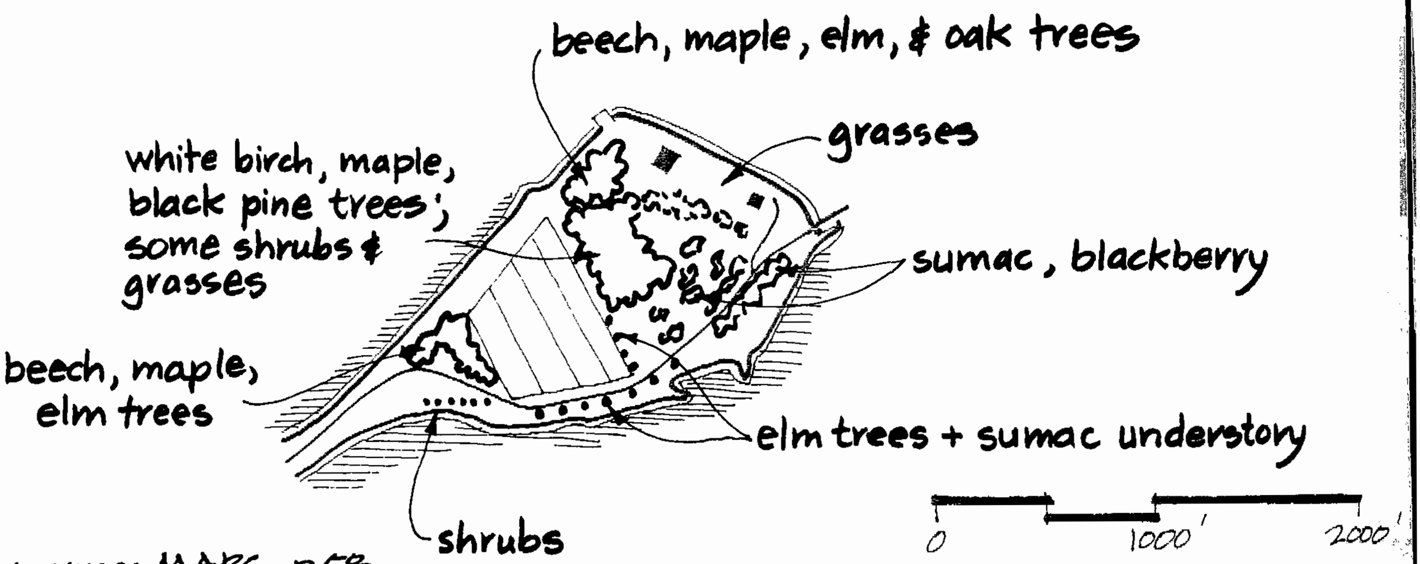
D.5 Land Use and Cultural Features

The dominant land use and man-made feature on Moon Island is the sewage reservoir. (See Figure 16.) The reservoir takes up at least one third of the western end of the island. The reservoir is composed of four tanks that average 900 feet in length, 150 feet in width, and 17 feet in height. They were intended to hold raw wastewater overflows prior to discharge to the harbor on outgoing tides. The reservoir is currently in operation when sewage flows normally routed to the Deer

---

* MAPC, p. 57
** MAPC, p. 58
*** MAPC, p. 136

Moon Island vegetation

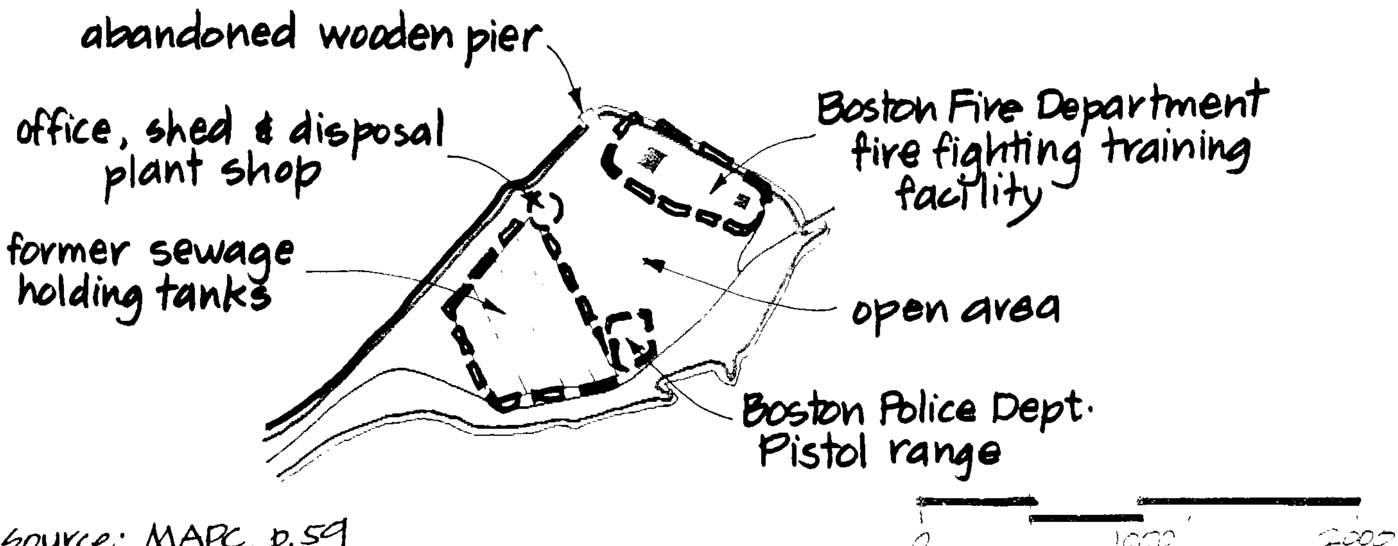


source: MAPC, p.58

ce maguire inc

figure 15

Moon Island
land use and cultural features



source: MAPC, p.59

ce maguire inc

figure 16

Island treatment facility exceed Deer Island's influent pumping capacity.

In addition, the Boston Fire Department has a fire fighting training facility on the northern end of the island. Adjacent to the reservoir, the Boston Police Department has a small pistol range.

D.6 Noise

There is no known noise data on Moon Island itself.

D.7 Moon Island Viewshed

Moon Island is relatively isolated from other harbor islands and shoreline residential communities. Thompson, Spectacle, and Long Island, as well as the Squantum community are all about 1 mile distant.

Houses located on the east (Quincy Bay facing) side of Squantum have views over to Moon Island.

12.3.1.3 Existing Recreational Facilities

Since the 1960's, a number of recreational facilities have been constructed on the Boston Harbor Islands. This section describes the facilities that are available, as well as the existing transportation system.

A. Transportation to the Harbor Islands State Park

The two principal ways for potential visitors to the Harbor Islands State Park to access the islands are by independently owned and operated ferry boat or by private boat. At the present time, there are three private excursion boat companies which operate on a for-profit basis. All provide transportation only to George's Island.

Some islands, such as Deer, Moon, Nut, Long, and Castle can be physically reached by car, but only with varying degrees of obstacles from the authorities. At the northern most point of Deer Island, there is a prison gate house that effectively prevents visitors from entering the island. At the Squantum end of the causeway connecting Moon Island to Squantum is a gate house that, too, prevents access by the public to both Moon and Long Islands. Nut Island is also inaccessible by reason of the gate house at the entrance of the Nut Island Treatment Plant.

All of the ferry boats leave from downtown Boston, either from Long or Rowes Wharf. Park visitors typically arrive in downtown Boston by automobile, or take the MBTA. The MBTA provides inexpensive and frequent service to the Boston waterfront from nearly all areas of Metropolitan Boston.

The Commonwealth of Massachusetts has, via a recent bond issue, authorized $7 million for the construction of a Visitor's Center to be built on Long Wharf in downtown Boston to serve as the gateway to the Boston Harbor Islands State Park. This will centralize the embarkation point for the majority of visitors to the Harbor Islands State Park, enabling more people to take advantage of this recreational resource. It will also make the gateway to the Harbor Islands State Park far more visible for potential park patrons. It could also make the visitors' harbor island experience more pleasant and understandable since the water taxi schedule to other islands could be posted at the Visitors Center.

To reach other harbor islands after landing at George's Island, it is necessary to take one of the smaller water taxis. At present, two private enterprises are under contract to Massachusetts DEM to provide transportation to other islands in the State Park. Water taxis provide service to Gallop's or Lovell's Island or to Grape, Peddocks, or Bumpkin Island. Water taxi service to islands owned by DEM is free of charge to park visitors.

By private boat, all the aforementioned Harbor Islands are accessible in addition to the remaining islands, except Deer, Moon, Nut, and Long Island where admittance is restricted). Table 1 and 2 list the piers and boat launching sites in and around Boston Harbor. Table 3 lists where boats are available.

B. Harbor Island Facilities

The following is a list of facilities and recreational activities that are available on the six Boston Harbor Islands that are readily accessible by private excursion boat and water taxi:

- George's Island - two picnic areas, food service (snack bar), tours through Fort Warren (National Historic Landmark), fresh water, walks and trails, large pier.

- Gallop's Island - trails and paved paths, picnic areas, viewing areas, wading beaches, wildlife (a seagull colony in residence).

- Lovell's Island - swimming beach with lifeguards, camping and picnic areas, historic Fort Standish, and trails, as well as dunes and a salt marsh.

- Bumpkin Island - paths and trails, pier, three picnic areas, campsites, interpretive program.

- Peddock's Island - camping and picnic areas, wooded trails, and historic Fort Andrews. (There is a charge to visit Peddock's Island.)

- Grape Island - camping and picnic areas, trails, berry picking in season, historic agricultural interpretive program.

TABLE 1

PIERS

Boston

Castle Island
Kelly's Landing, South Boston

Boston Harbor

Bumpkin Island
Gallop's Island
George's Island
Grape Island
Lovell's Island
Peddock's Island
Great Brewster Island

Hingham

Kehoe's Boat Livery

Hull

A Street Pier
Pemberton Pier
Steamboat Pier, Nantasket Pier
Gun Rock

Revere

Captain Fowler's Marina, Rte. 1A, Point of Pines

TABLE 2

BOAT LAUNCHING SITES

Boston

Children's Museum, Boston
Commonwealth Pier, Boston
Castle Island, Boston
City Point Beach, Boston
Kelly's Landing, Boston
Charles River, Msgr. William J. Daly Recreational Center, Nonantum Rd., Brighton-Newton
Rainbow Park, Dorchester
Rowes and Long Wharfs, Boston

Hingham

Iron Horse Statue Area
Hingham Marine Center

Hull

A Street Pier
Pemberton Pier
Gould's Boat Shop, Nantasket Pier
Nantasket Avenue
Hampton Circle

Quincy

Bay View Avenue, Houghs Neck
Quincy Bay Marina, Houghs Neck
Boston Harbor Marina, E. Squantum St.
Wollaston Beach
Mound St. Beach
Continental Marine, Washington Court
Bays Water Boat Rental, Bays WAter Rd.

Revere

Captain Fowler's Marina, Rte. 1A, Point of Pines
Route 1A, Pine River

Weymouth

North Weymouth Marine
Tern Harbor Marina, Back River
State Boat Ramp, River Street
Weymouth Back River (Take Neck St. off Rte. 3A)

Winthrop

Winthrop Public Landing, Shirley St. and Deer Island Road

TABLE 3

BOAT RENTAL LOCATIONS

Boston

Boston Boat Sales, 170 Granite Ave., Dorchester
Boston Harbor Sailing Club, 72a East India Row

Hingham

Hewitt's Cove Marina, 349 Lincoln St.
Kehoe's, 3 Otis St.
Multihull Associates, 349 Lincoln St.

Hull

A Street Pier, Rowboats
Pemberton Pier, Rowboats, 173 Main St.
Pemberton Bait Shop, 173 Main St.
Priscilla Sails, 180 Cadish Ave.
Annapolis Sailing School, James St. Pier

Quincy

Gamble's Landing Boat Rentals, 15 Baywater Rd.
Hurley's Boat Rental, 136 Bay View Ave., Houghs Neck
Quincy Bay Marina, Houghs Neck
Harvey-Elliot Boat Livery, Harvey's Lane
Harbor View Yacht Sales, 64 Washington Court

Revere

Capt. Fowler's Marina, Whitin Ave. Ext. (Rte. 1A at Gen. Edwards Bridge)
Simpson's Pier, 90 Broadsand Ave.

Winthrop

Belle Isle Terrace
Crystal Cove Marina, 514 Shirley St.
Winthrop Sailboat Rental, 541 Shirley St.

Table 4 summarizes the existing recreational facilities of the Boston Harbor Islands State Park. Table 5 lists the existing recreational facilities in shoreline parks and recreational areas adjacent to the harbor. Figures 17 and 18 depict the location of these facilities.

Existing Recreational Facilities: Boston Harbor Islands

	Ownership*	Ferry Service	Docking Facilities/Boat Piers	Camping Facilities	Toilets	Picnic Areas/Refreshments	Trails	New Structures	Existing Historic Structures/Forts	Beaches (developed or not)	Swimming	Lifeguard	Fishing Piers
Long Island	1								●	●			
Sheep Island	2												
Rainsford Island	1									●			
Slate Island	2					●	●		●				
Spectacle Island	1,2								●				
Deer Island	1,3,4												
Gallop's Island	2	●	●		●	●	●	●	●	●	●	●	●
George's Island	3	●	●		●	●	●	●	●		●	●	●
Calf Island	2								●				
Gt. Brewster Island	2		●	●			●		●	●			
Green Island	2												
Little Brewster Island	4								●				
Little Calf Island	2												
Thompson Island	5		●		●		●		●	●			
Middle Brewster Island	2								●				
Outer Brewster Island	2								●				
Bumpkin Island	2	●	●	●	●	●	●		●	●	●		●
Grape Island	2	●	●	●	●	●	●	●	●	●	●		●
Hewitts Cove	2		●					●					
Peddock's Island	3	●	●	●	●	●	●		●	●			
Raccoon Island	2												
Lovell Island	3	●	●		●		●		●	●	●	●	
Castle Island											●	●	●

Source: Wallace Floyd Assoc. - Draft Concept Plan. Mass. DEM - Newsletter.

*Key to Ownership: 1. Boston 2. DEM 3. MDC 4. U.S. Gov't 5. Trustees of Thompson Academy

Table 4

Existing Recreational Facilities: Boston Harbor Shoreline

	Athletic Facilities	Bandstands and Music Shells	Swimming	Salt Water Beach	Launching Areas/Boating	Camping	Fishing	Picnic/Refreshments	Historic Sites	Children's playgournd	Bike Trails	Walking Trails	Lookout Tower
Yirrell Beach			●	●			●						
Coughlin Park	●									●			
Pico Beach	●		●										
Donavan Beach			●				●						
Belle Isle Reservation Park													●
Orient Heights/ Constitution Beach	●		●	●			●						
Porzio Park	●						●	●		●			
Lo Presti Park	●						●	●		●			
Connomwealth Pier					●								
Sugar Bowl							●				●		
Kelleys Landing			●		●		●	●			●		
L Street Beach			●	●							●		
Columbus Park	●									●	●		
U. Mass Harbor Campus							●				●		
Rainbow Park					●		●	●					
Harborside Condominium Beach			●	●									
Nickerson Beach			●	●									
Orchard Beach			●	●			●						
Willows Beach			●	●									
Perry Beach	●		●	●			●						
Edgewater Beach			●	●									
Baker Beach			●	●						●			
Mount St. Beach			●							●			

Source: MDC Recreational Facilities & CZM Boston Harbor Access Guide

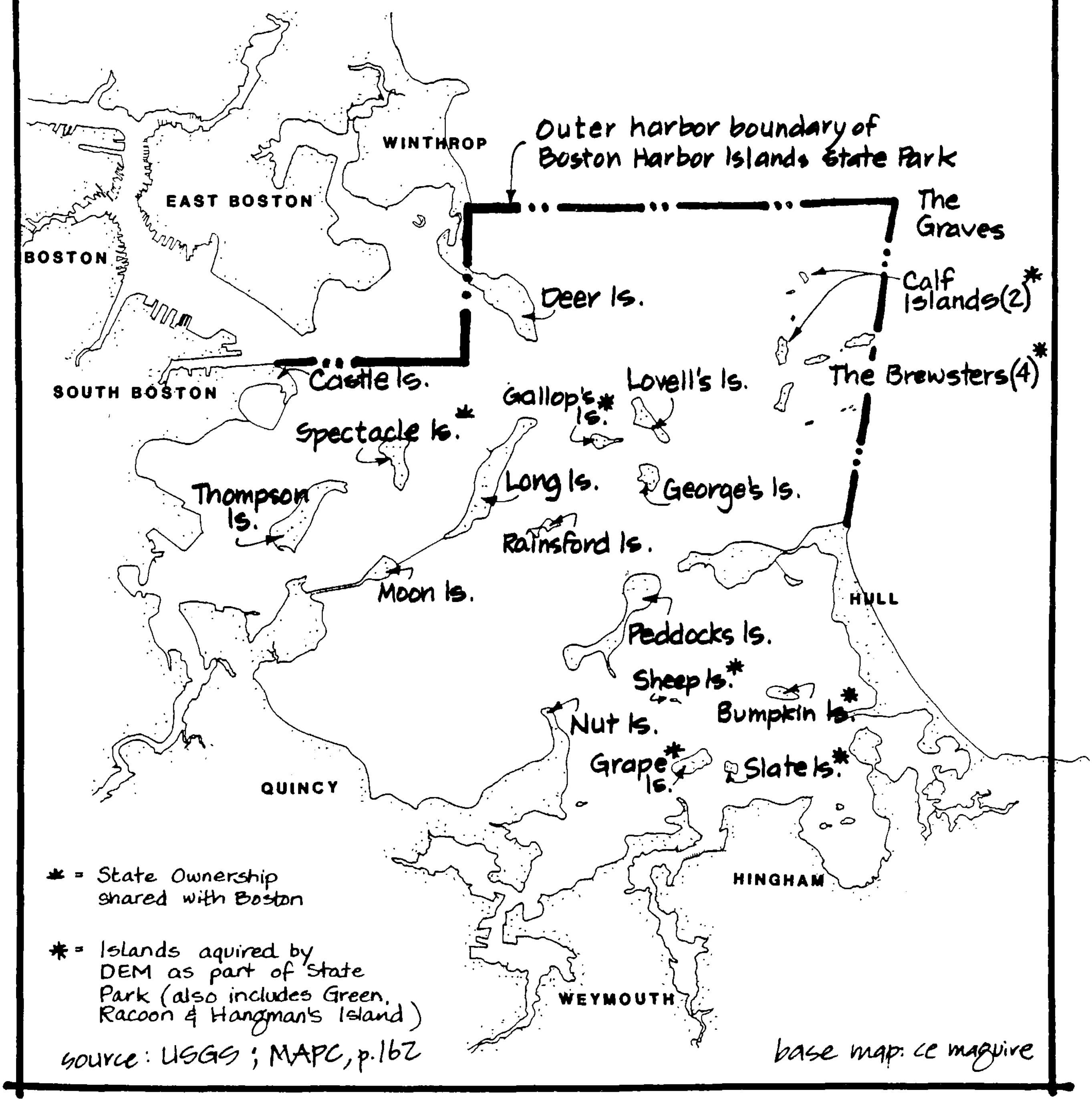
Table 5

Existing Recreational Facilities: Boston Harbor Shoreline

	Athletic Facilities	Bandstands and Music Shells	Swimming	Salt Water Beach	Launching Areas/Boating	Camping	Fishing	Picnic/Refreshments	Historic Sites	Children's playgournd	Bike Trails	Walking Trails	Lookout Tower
Constitution Beach	●			●				●		●			
Belle Isle Marsh								●			●	●	●
Marine Park	●	●						●		●	●		
Caddy Mem. Park Quincy Shore Dr.								●		●			●
Nantasket Beach Hull		●		●						●			
Revere Beach Revere		●		●			●						
Nahant Beach	●	●		●	●					●			
Carson Beach			●	●	●						●		
Wollaston Beach				●									
Malibu Beach			●	●						●			
Tenean Beach	●		●	●				●		●			
Savin Hill Beach			●	●			●						
Castle Is. Beach				●									
City Point Beach				●									
M St. Beach			●	●							●		
Pleasure Bay Beach			●	●							●		
Winthrop-Shore Beach				●									
Winthrop Public Landing					●		●						
Winthrop-Winthrop Beach			●	●			●						
Lovell's Island				●	●	●		●				●	
George's Island							●	●	●				●
Castle Is. Pier/ Fort Independence			●	●	●		●	●		●	●		
City Pt. Beach			●	●	●		●	●		●	●		

Source: MDC Recreational Facilities & CZM Boston Harbor Access Guide.

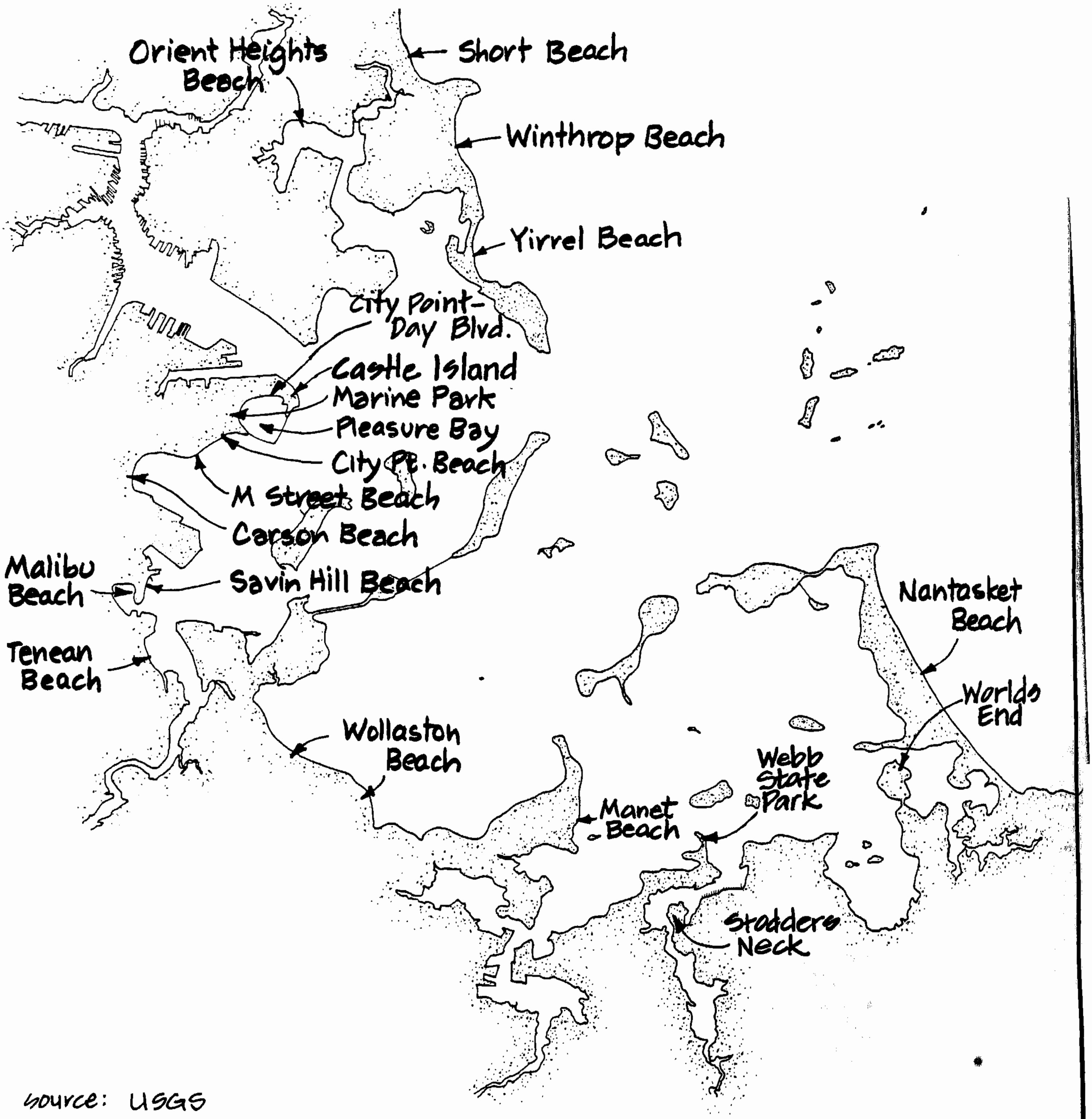
Location map: Boston Harbor Islands



ce maguire inc.

Figure 17

Location map: Shoreline recreational areas



ce maguire inc

Figure 18

12.3.1.4 Current Recreational Plans

A. General

Since the 1960's, several reports have been published on the harbor islands and recreation. In 1967, the Metropolitan Area Planning Council (MAPC) published the Open Space Recreation Program for Metropolitan Boston. Volume 2 of this report looked at the problem and potential of the harbor, and recommended protecting and developing the Boston Harbor and Islands for recreation.

Through the passing of Chapter 742 of the Acts of 1970, the Massachusetts Legislature empowered the Department of Natural Resources (now Department of Environmental Management) to take by eminent domain islands of the harbor, and to maintain and improve them pending the completion and approval of a comprehensive plan.

Since then, there have been formal plans produced in 1972 and 1984. Over this period of time, DEM's attitude has changed little about the value of the Boston Harbor Islands for recreation; however, there has been a change in the extent of new construction and in the priorities of which islands are to be developed first.

B. 1972 Comprehensive Plan

The 1972 Comprehensive Plan, which was published by the Metropolitan Area Planning Council (MAPC) under contract to the Massachusetts Department of Natural Resources (now DEM), outlined an intensive development scheme for the harbor islands. Included in the plans were new facilities such as restaurants, conference centers, athletic buildings, swimming pools, theaters and museums. Also included were plans to restore and rehabilitate the many military fortifications and to develop camping facilities and picnic grounds.

In the 1972 Plan, Long Island Head was to be developed as a major terminus on ferry routes serving the Harbor Islands State Park. In addition, the plans called for a large Visitor Center as well as a restaurant, conference and recreation center, dance hall, theater, educational facility, multi-purpose athletic building, playfields, a major outdoor recreation facility and group camping sites. These facilities relied on the assumption that the Long Island Hospital was to be relocated and that land area utilized for recreation.

The program for Deer Island included parkland, playgrounds, trails, a swimming beach, picnic areas, a boat dock and mooring area, and a fishing pier. The plan assumed the relocation of the prison and the utilization of that land area for expansion of the MDC sewage treatment plant, plus an additional 10 acres of filled land.

For Nut Island, the MAPC considered making the peninsula accessible to the public and constructing a fishing pier. The plan assumption was that the sewage treatment plant use would remain and become a recreation resource in the sense of allowing educational visits.

On Moon Island, the plans advocated reusing the wastewater reservoir as a fish hatchery (among several other alternatives), as well as the development of an open area on top of the drumlin, for informal recreational activities, such as picnicking. The existing fishing pier was also to have been improved.

Much of the recreational development proposed in the 1972 Comprehensive Plan carried a distinctive water orientation. Some development, such as the development of beach areas for swimming was linked to then proposed efforts to improve water quality in the harbor. A wide variety of both active and passive recreational facilities were included in the Comprehensive Plan to provide a breadth of recreational activities.

To transport park patrons to the islands, there was to be a publicly-regulated but privately-owned ferry system consisting of four interconnected routes, as follows:

- Route 1: Main Line Run:

  Boston Waterfront - Long Island - George's Island Peddock's Island - Nantasket

- Route 2: Inner Harbor-Dorchester Bay

  Boston Waterfront - Deer Island - Long Island - Thompson's Island - Spectacle Island - South Boston

- Route 3: Serving Small Islands

  George's Island - Lovell's Island - Gallop's Island
  George's Island - The Brewsters - Calf Island
  Peddock's Island - Grape Island - Bumpkin Island

Route 4: Neighborhood loop (for future addition).
Stops not specified

Three other neighborhood loops were described as having considerable merit within the transportation system as a whole.

The first was a loop around Hingham Bay. It would serve Grape, Bumpkin, and Peddock's Island from the Hewitts's Cove terminal. The second neighborhood loop would cruise through Dorchester Bay and land at Thompson's, Spectacle, and Long Islands. It would stop at mainland terminals located at Kelley's Landing (South Boston), Columbia Point, and Commercial Point (Dorchester). Finally, a third neighborhood loop would link East Boston with the Chelsea Yacht Club, the Little Mystic Channel, and the Charlestown Navy Yard.

C. 1984 Master Plan Update
Boston Harbor Islands State Park Master Plan

The 1984 update is largely a continuation of the 1972 Comprehensive Plan, but there are several notable differences. To a great extent, the differences reflect the realities of ever rising development costs and clearer definitions of the Harbor Island goals in relation to the unique experiences available. The plan focuses development priorities on the actual islands and on substantial improvements to the two primary embarkation points.

Development programs in the 1984 plan generally recommend a lesser extent of construction and fewer high cost facilities. At the same time, the carrying capacities have been reexamined to allow a higher density of use. The combination of these changes obviously allows for a much improved cost/benefit with the new plan.

The major themes that guide the development continue to include an emphasis of natural forces, harbor geography, and harbor history. Also, the theme of harbor transportation is now exploited positively by recognition of the amount of time that an island park visitor spends on the trip to the island and utilization of that for its interpretive value to emphasize the uniqueness of the Harbor Island experience. "Navigation aids, such as lighthouses and buoys, can be seen and explained from the numerous vantage points within the harbor. Watching the parade of freighters, tankers, tugs, fishing and lobster boats, commuter boats and pleasure boats offers enormous interpretive potential and focuses on the majority of the harbor which is water rather than islands."* Additionally, the normally negative sounds of Logan's air traffic can be made more positive by its inclusion as a dramatic sight and sound segment of the overall transportation theme.

Other than Long Island, none of the Harbor Islands from the 1972 plan that have land access are part of the 1984 update. This presumably is both a development cost recognition and a development priority status for Deer, Moon and Nut Islands. DEM staff note that the absence of these three islands is not an indication of their programmatic deletion from the Harbor Islands State Park System. They are to be reviewed by DEM and updated once substantial completion of the 1984 plan is achieved. Perhaps the wastewater treatment considerations affecting those islands would also be resolved by then.

---

* WFA, p. 14.

Total annual visitation to the islands is projected to increase from the present 170,000 to about 600,000 by the year 2000 and with the development and transportation improvements. The present private fleet of five 350-400 passenger capacity ferrys will need to be increase to a fleet of twelve. Seven service schedules will be necessary and are to provide separate schedules for Long, Georges, Peddocks and Spectacle Islands. Water taxi service is also to be expanded and is to include a pair of 250 passenger capacity ferrys that will travel circuits among the four major island centers. Smaller water taxis, with a volume of service comparable to that of today, will provide connections to the smaller islands.

D. The Affected Islands: Long, Deer, Nut, Moon

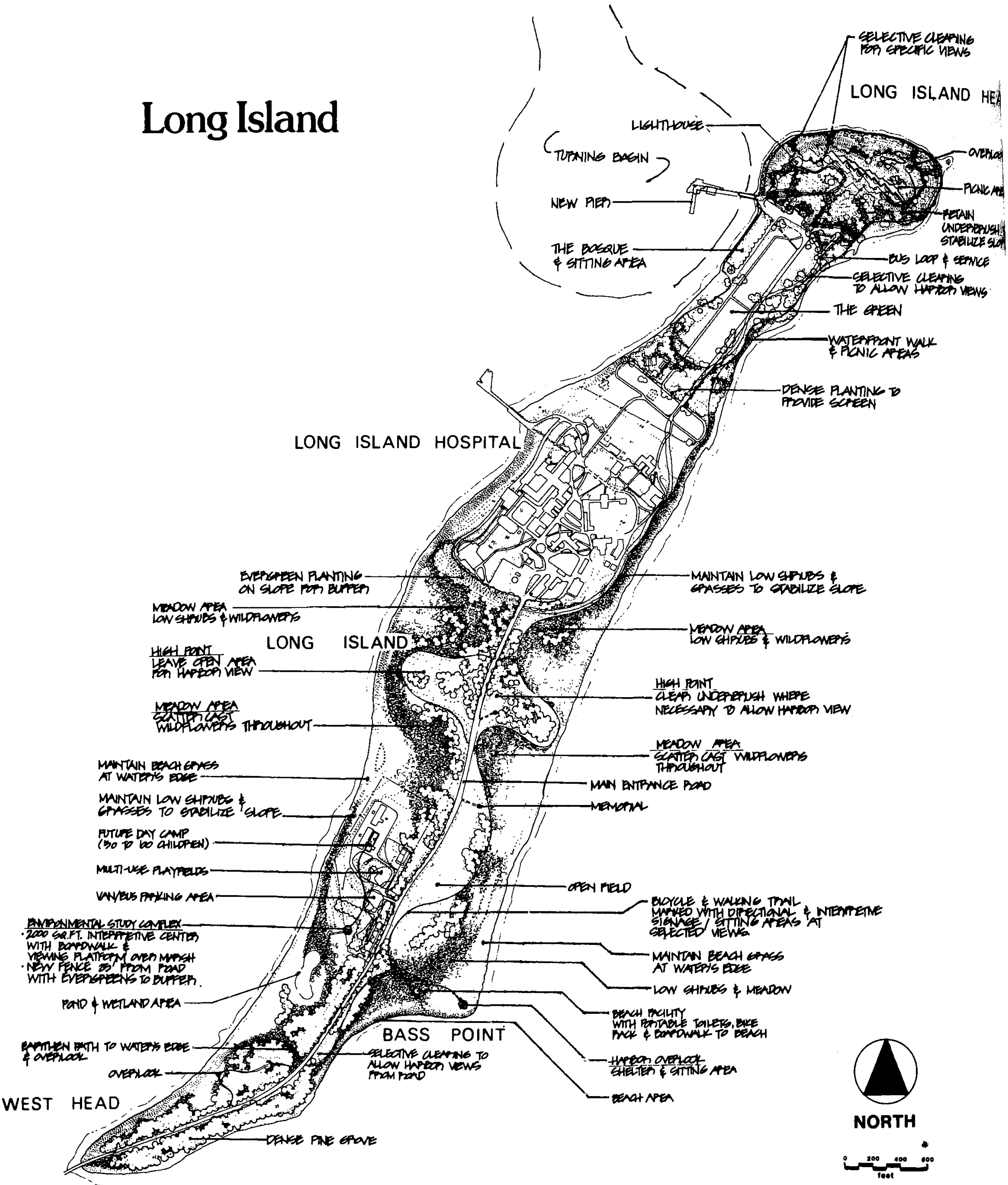
These four islands are being considered to varying extents and combinations for the siting of expanded primary and/or secondary wastewater treatment facilities. The following descriptions of proposed recreational development on the same islands are from two different sources. Long Island is an element of the soon to be published 1984 Boston Harbor Islands State Park Master Plan, which is an update of the 1972 Boston Harbor Islands Comprehensive Plan wherein Deer, Nut and Moon Islands are elements.

1. Proposed Long Island Plan

Development for Long Island, as depicted in Figure 19, proposes high itensity uses for the head and moderate uses for the southern half. All of Long Island is proposed for recreation development and use except for the Long Island Hospital compound which is assumed to remain.

The primary access to and from the island during the summer months would be the scheduled ferries. Internal access between the Head and the southern portion would be shuttle van. Some controlled access through the Squantum community for bicycles would be permitted.

Long Island



Source: Wallace Floyd Assoc. Inc., 1984

Extended season access for spring and fall could be provided by shuttle bus from the mainland.

Major new elements to be developed on Long Island Head are to include a pier and visitors center, a transportation exhibit in the historic lighthouse, the major gun emplacements from Fort Strong, a cultural museum (proposed by the City), major picnic and sitting areas, play fields and interpretive trails with viewing nodes. Development costs are estimated at $5.5 million for the Head.

For the southern portion of the island, the new major elements include an environmental study complex, a swimming beach, and an extensive system of hiking and bicycling trails with numerous overlooks. The development generally focuses on sensitively exploiting the natural features which include a large wet meadow, a dune environment, a large succession meadow and a large grove of mature pines. Should use levels indicate a need, the beach area could be expanded and a day camp established at the former Nike site. Development cost for the southern portion is estimated at $2.1 million.

The $7.6 million total development cost for Long Island is scheduled to largely take place during the first three-year phase 1985-1987 - of the twenty-year program for the Boston Harbor Islands State Park system.

Future use is projected at 2,500 visitations per average weekend day for the Head area and 1,500 at the southern end with most of the latter occurring on the beach. Of the 600,000 annual visitations projected for the Harbor Islands Parks, Long Island could accommodate about 240,000.

2. Proposed Deer Island Plan

The second largest island in the overall harbor island system, Deer Island as proposed in the 1972 plan assumed that relocation of the prison and the expansion of the treatment plant from 26 acres to up to 130 acres, including 10 acres of made land.

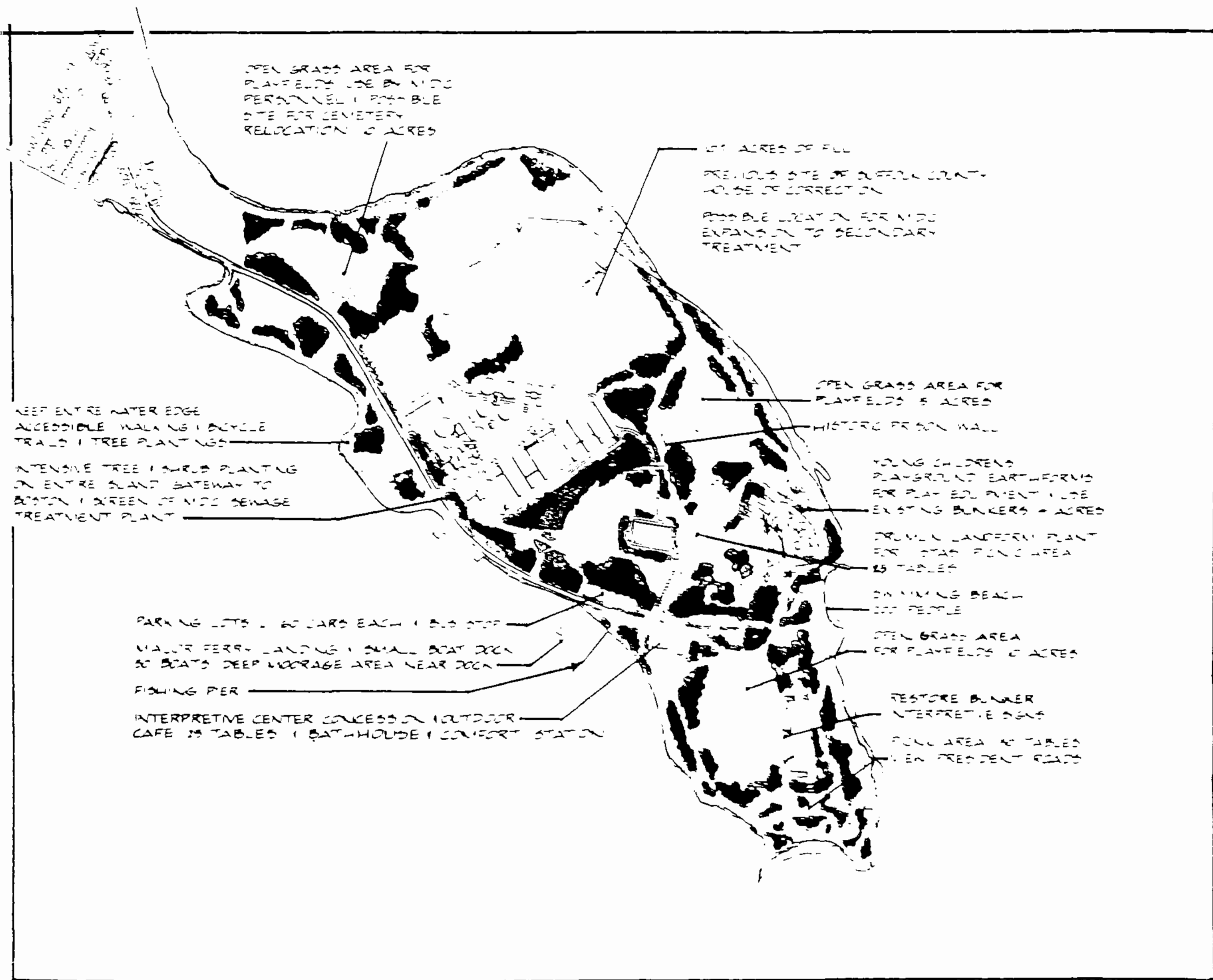
The level of use is generally moderate with an area of intense use which included a major ferry landing and interpretive center as illustrated on Figure 20. The southern end of the island is a large passive use informal park with open grassed areas, picnicing, viewing areas and interpretive restoration of the World War II bunkers. An extensive planting program would reforest the shore edge and the Signal Hill drumlin to enhance the island as the primary entrance to Boston Harbor from the President Roads shipping channels.

The swimming beach along the sandy east shore would utilize the bathhouse and comfort station in the interpretive center. A three-mile-long bike trail would follow the shore edge.

The 1,000 maximum daily visitations projected for Deer Island in the 1972 Plan would likely increase to 1,500 or more if the plan were subjected to a review and update comparable to the 1984 Plan. Considering that Deer Island access is not limited to seasonal ferrys but obtainable year-round over public streets, the annual visitations could easily exceed 100,000. The 1972 Plan noted a cost for development of about $2 million.

3. Proposed Nut Island Plan

The 1972 Plan for Nut Island assumed that the wastewater treatment plant would remain, and, therefore, recreational development was limited to a public fishing pier and a slightly enlarged visitors parking area. Unlike the Harbor Islands Parks System in general, Nut Island was seen as a local recreational resource and was not included in the water transportation planning. The 50 maximum daily visitations projected in 1972 is perhaps optimistic, but with the islands year-round access it would still be a few thousand annual visitations.



DEER ISLAND

BOSTON HARBOR ISLANDS COMPREHENSIVE PLAN

0 200' 400'

MASSACHUSETTS DEPARTMENT OF NATURAL RESOURCES

MAPC Metropolitan Area Planning Council

fig 20

A main emphasis of the 1972 Plan was plantings along the shore edge, and particularly as a screen for the residential area, to "soften the island's man-made appearance and reduce the contrast between the natural character of the Harbor and the important man-made facility."* The construction cost was estimated to be about $30,000 in 1972, and the plan is illustrated in Figure 21.

4. Proposed Moon Island Plan

The 1972 Plan for Moon Island assumed that the City of Boston fire fighting academy would be retained and the police pistol range was recommended to be relocated due to its obvious conflicts with public recreational use. The Plan, illustrated in Figure 22, focused on the two dominant features of Moon Island, which are the drumlin and the four cut granite 1880's sewage reservoir tanks.

The top of the drumlin was to be left open to allow capture of visitors from the many viewing areas connected with walking trails and a 25 table picnic area. Of the several alternatives for the reuse of the sewage tanks, the plan found a fish hatchery to be the most viable and attractive. Other facilities included a marine exhibit and an interpretive center with parking for 20 cars and a bus stop.

It is not clear whether the 1972 construction cost of $326,800 includes modification to the reservoir for fish hatchery use.

The projected annual visitation for Moon Island was estimated to be about 30,000 in the 1972 plan.

---

* MAPC, p. 114.

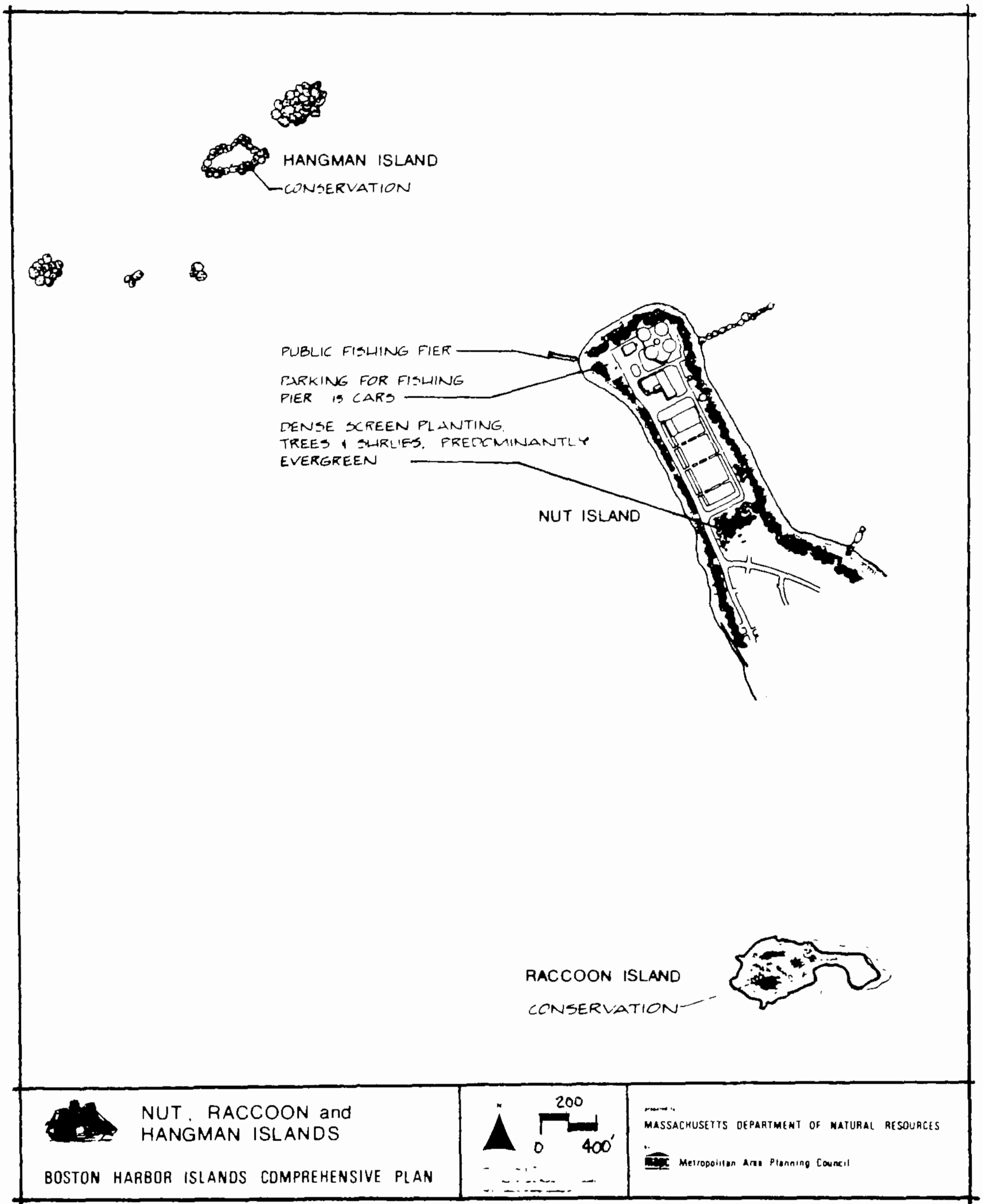
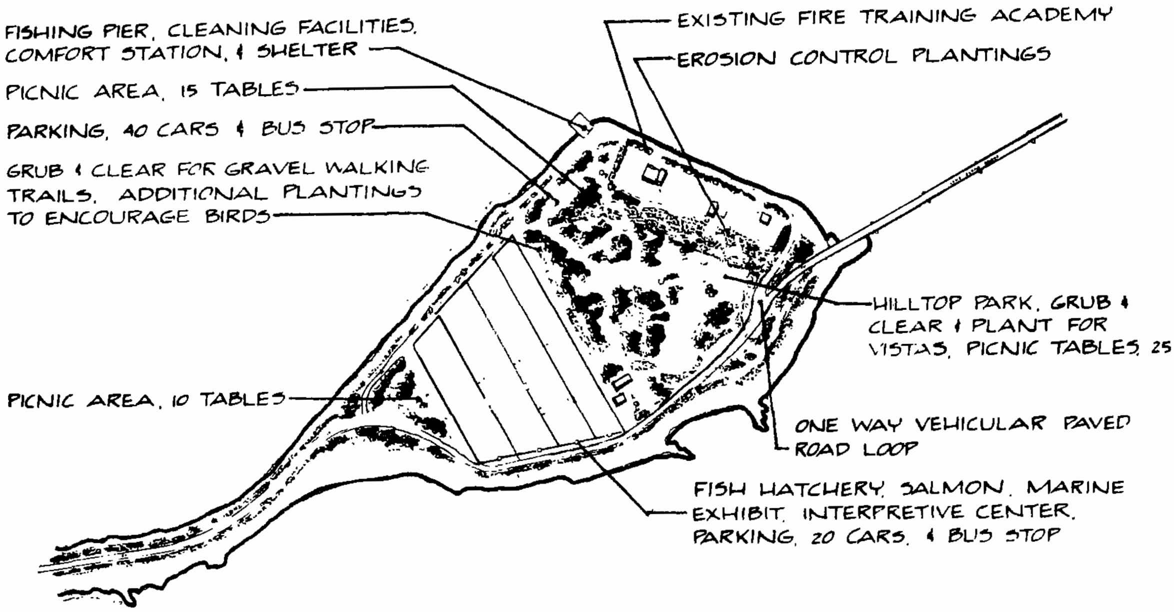

HANGMAN ISLAND
CONSERVATION
PUBLIC FISHING PIER
PARKING FOR FISHING PIER 15 CARS
DENSE SCREEN PLANTING. TREES & SHRUBS. PREDOMINANTLY EVERGREEN
NUT ISLAND
RACCOON ISLAND
CONSERVATION
NUT, RACCOON and HANGMAN ISLANDS
BOSTON HARBOR ISLANDS COMPREHENSIVE PLAN
200
0
400'
MASSACHUSETTS DEPARTMENT OF NATURAL RESOURCES
Metropolitan Area Planning Council

fig. 21



MOON ISLAND

BOSTON HARBOR ISLANDS COMPREHENSIVE PLAN

N

0 200' 400'

prepared for

MASSACHUSETTS DEPARTMENT OF NATURAL RESOURCES

by

mapc Metropolitan·Area Planning Council

fig. 22

12.3.2 Visual Quality

12.3.2.1 Overview

Visual quality is defined in this SDEIS as the fitness or grade of excellence of a view. The objective of assessing visual impact is to develop a basis to evaluate and recommend actions to manage the appearance of the land in order to provide compatible siting for wastewater treatment facilities relative to their surroundings.

"Beauty is in the eye of the beholder" is a common saying. If visual quality is purely subjective as this saying implies, then it would not be possible to quantify or qualify visual quality impacts. If, on the other hand, there can be agreement between people on what is "beautiful" or attractive, then the impacts of a proposed project on visual quality, albeit subjective, can be used with other more objectively based measures to make reasoned siting judgements.

There is a body of research, based on surveys, that has attempted to discern the preferences of people for particular landscapes or views. The methods used in these studies have varied: some have involved asking for judgements on photographs and then physically calculating, for example, the area taken up by water or forest in order to correlate between the subjective judgment and the area; others have asked people to compare photographs and rank them by "beauty" or preference in order to reach a consensus of visual preferences.

These studies have shown some degree of consistency in the way people value landscapes ranging from natural to urban areas. Based on these findings, it can be said that many people today, particularly those in urban settings, prefer a varied natural landscape to an urbanized one and find a "pastoral" landscape to be most pleasant and inviting. Varied urban settings, however, such as city skylines, particularly when integrated with varied features such as water, are also viewed positively.

Visual preferences, however, change with time, setting, context, and viewer background. It is possible, nonetheless, to apply certain generalities about how people will react to a particular landscape or the addition of development to a setting. A universally accepted quantified system of detailed visual evaluations is not, however, available and is not attempted in this analysis.

12.3.2.2 Hypotheses in Landscape Preference

Because studies have shown there to be common threads in the way the landscape is perceived, it is possible to perform a general visual quality assessment on the proposed sites in this project utilizing these elements.

To this end, the following hypotheses were considered and accepted as applicable in visual quality assessment for this project:

a. As the relative relief of a view becomes more varied, the scenic quality of that view is perceived to increase.

   Flat landscapes are judged to be monotonous and boring. It is this perception, that makes most people judge a view to an urban skyline or mountains as one of high scenic quality.

b. As the diversity of compatible natural or man-made land uses increases, the visual quality of that landscape increases.

   A single land use over a large uniform area is perceived to be monotonous. This can be applied to both urban areas with tract homes or rural areas with corn fields. Logan Airport has some of this negative attribute.

c. As "naturalness" of a landscape increases, so does its scenic quality.

Most people in North America prefer natural, pastoral landscapes over urbanized landscapes.

d. As views of water surfaces increase, the scenic quality increases. People greatly admire expansive views over oceans, lakes and ponds. There is a limit however. In the middle of an ocean, few people would find views pleasant.

e. As the number of "edge conditions" increases, the perceived scenic quality increases.

Views which encompass a variety of edges -- water, shore, forests, fields, hills, and man-made features -- are perceived as most attractive and having the greatest visual/scenic quality.

f. As the size of the view increases, the perceived scenic quality increases.

People value wide, expansive views of the surrounding landscape.

g. As the length of view increases, the scenic quality increases. People value views to distant horizons.

h. As the viewer's position becomes superior to the view, the higher the scenic quality becomes.

People enjoy views from high places, whether tops of buildings, hills, or mountains.

Based on these hypotheses, the following generalizations can be made with regard to the siting of wastewater treatment facilities in Boston Harbor.

1. On whichever island new or expanded wastewater treatment facilities are sited, the visual quality of that island will be degraded if such siting involves the removal of significant or varied natural features or the noticeable expansion of facilities. The greater the degree of removal of features or the expansion of facilities, the greater the visual degradation. Mitigations such as plantings, berms, and careful facility design to achieve more compatible siting are possible means to reduce negative impacts.

2. Siting of prominent facilities or structures on high ground (such as on the drumlins on Long Island) makes them more visible and therefore accentuates their negative values relative to their surroundings.

3. Because people enjoy the landscape when viewing it from a high place siting a facility on top of a drumlin that is or could be used as a vantage point, for example for park use, will degrade the overall visual experience that island visitors can have.

4. Because a single undistinguished land use over a large area can be monotonous, the visual quality of a large treatment plant will likely be more negative than a smaller treatment plant. Also, opportunities to mitigate a large-scale facility are more limited.

5. Taking away or otherwise intruding on a view over water reduces the range of visual experiences, particularly at recreational settings.

6. On whichever island existing wastewater facilities are reduced in size, the visual quality will improve. The degree of improvement is, however, broadly variable. Little improvement or enhancement of views would be perceived if the abandoned facility area is merely demolished, leveled and grassed. More improvement to visual quality could occur if the area were rehabilitated with land shaping and plantings, for example, to introduce a new

element of diversity or to establish site compatibility with the shoreline setting.

12.3.2.3 Impacts of Secondary Treatment Alternatives

A. Alternative 1: All Deer Island

Under this option, all secondary treatment facilities (115 acres) would be located on Deer Island and the existing Nut Island facility would be reduced to a two-acre headworks.

On Deer Island, the 115-acre treatment plant would occupy nearly all the remaining land south of the existing treatment facility. It would require levelling of the Signal Hill drumlin, the demolition of the remains of Fort Dawes, riprapping of major portions of the shoreline and construction of piers.

Winthrop residents and those viewing the site from the harbor already perceive Deer Island as industrial in character as a result of the existing 26-acre treatment plant and the 40-acre prison. Viewers would perceive that industrial character of the site under this alternative grown to a vast scale encompassing the entire island. Overall, the existing modest diversity of onsite land uses and the elimination of the single most positive natural feature of the island would result in a degraded visual quality and severe adverse impact primarily from harbor views and to a limited extent from Winthrop viewing areas.

Signal Hill, the prominent centrally located drumlin on the island would be leveled, eliminating the prime topographic and natural visual feature of the island. This regrading would remove a prominent natural feature from view by the closest residents in Point Shirley and Cottage Hill as well as from the harbor. The construction of riprap to stabilize the shoreline and construction of piers would alter the edge of the island to a more unnatural character altering views of the shoreline from water.

Vegetation on Deer Island is so sparse presently that its removal would only be a minor visual loss, with the exception of the drumlin noted previously. The demolition of the remaining Fort Dawes structures and the removal of gun implacements would not be an adverse impact visually, since these features are not perceived from most viewpoints.

The expansion of the Deer Island plant will cause the greatest adverse visual quality impact from the harbor. Currently, the Deer Island Treatment Plant and the House of Correction are partly or intermittently hidden from view from most of Winthrop residents and recreational uses by intervening land uses and topographic elevations. Views to the site over much of Boston Harbor are also limited by the interposition of Signal Hill and other harbor islands. The leveling of the drumlin and the subsequent expansion of the treatment facility across the island, will change the view from the harbor to Deer Island from one that is currently perceived as a mixture of industrial and open space, to one that is predominantly industrial in appearance. Also, as the island lies low to the water, including the southerly end which would be only slightly higher, views from the water would be readily obtainable from the smallest boats.

On Nut Island the reduction of treatment facilities from 12 acres to a 2 acre headworks will potentially free up the remaining part of the island for other uses, among them recreation. It must be noted that the visual quality of the island could improve only if demolition of the abandoned treatment plant facilities and rehabilitation of the site were performed. The visual impact of a 2-acre headworks would generally be slight and that size facility could be easily made visually compatible with the site. Views from Houghs Neck across Nut Island to the harbor are available from numerous locations. Approximately 12 to 20 homes along Quincy Great Hill would have direct views of the treatment plant site along with larger views of the harbor. Other locations in North Quincy and along Wollaston Beach would also have somewhat improved views of the site within the harbor setting under this option.

B. Alternative 2: Split Deer Island and Nut Island

This alternative would site expanded secondary treatment facilities on Deer Island (up to 115 acres) and expanded primary treatment facilities on Nut Island (approximately 18 acres).

With this alternative, the impacts on the visual quality of Deer Island by a large-scale facility expansion would be the same as that discussed for Alternative 1 above. Existing open space, natural features and mix of perceived land uses would be replaced by a single industrial appearing land use that would be more visible and cause a decline in the visual quality of the site.

For Quincy residents, the visual impacts of a Nut Island expansion encompassing the entire site will be an increase to the existing severely adverse condition. Expansion of the land area of Nut Island by filling of the Bay (1-3 acres) and construction of a primary treatment plant to approximately 18 acres will cause an additional decline in the visual quality of that portion between shoreline Quincy Bay and Hingham Bay. This area is readily viewed from portions of Houghs Neck, North Quincy and Wollaston Beach. It is also viewed from the West Head of Peddock's Island, an important island within the Boston Harbor Islands State Park, as well as from other parts within the southern harbor. Adequate site compatibility utilizing visual screening or plantings is not expected to mitigate this alternative's adverse quality due to the limited site size available and the major facility expansion required.

C. Alternative 3: All Long Island

Under this alternative, all primary and secondary treatment facilities would be sited on Long Island (96 acres) with a headworks/ pump station on Deer Island (5 acres) and a headworks (2 acres) on Nut Island.

This alternative would have severe adverse visual impacts on Long Island and the proposed Boston Harbor Island State Park recreational area from the siting of major treatment facilities there. There would be, however, an opportunity to reduce existing facilities on and improve the visual quality of both Deer Island and Nut Island.

On Long Island the entire central drumlin area, which is a high point of the site, would need to be utilized for a portion of the 96-acre treatment facility. Regrading of the site would alter present varied and rolling topography by flattening and lowering it. The existing hospital and grounds with its campus-like visual quality would be demolished and replaced by facilities of an industrial appearance. The former Nike missile site would also be demolished although its visual presence is negligable. The Civil War Cemetery historical area would remain, but its present area would be adversely affected either directly by treatment facility siting or roadway relocation, or indirectly by the alteration of the visual character of this area of the island.

Large expanses of undeveloped land would lose their existing natural qualities. The brackish and fresh water wetlands and barrier beach area adjacent to the proposed plant site would lose their natural settings and relationship to the existing undeveloped southern part of the island. The large central drumlin would be regraded flat or possibly terraced to support the new facilities. Riprap would be required along portions of the shoreline to stabilize presently steep slopes. Large expanses of scrubby grasses, thickets, and groves of mature trees would also have to be removed. These changes to the natural topography and vegetative cover of the island would eliminate much of that area's natural diversity and pastoral quality which is a positive overall visual quality. It would be replaced with major treatment facilities and recontoured land area distinctly negative in visual quality and not conducive to the existing compatibility between recreational park uses and natural features.

Due to its central location in the harbor, treatment facilities on Long Island would be clearly in view from the nearby islands, principally Spectacle, Thompson, Rainsford, Gallops, George's, Peddocks, and Deer. These locations figure prominently in the Boston Harbor Island State Park plan and their visual context would become adversely altered. Views of Long Island are also afforded from many parts of Winthrop, Boston, Quincy and Hill. Long Island Head, which is proposed by DEM as an intensive use recreation area able to support up to 150,000 annual visitations, would afford clear views of the treatment plant located just to the south.

On Deer Island, the reduction of the existing 26-acre facility to a 5-acre headworks/pump station will be somewhat beneficial, but it will not improve visual quality on Deer Island to a major extent. The Deer Island headworks and pump station, though smaller in size, will still be a significant structure comparable to the present pump station-power building and will continue to be perceived visually along with the 40-acre prison. Therefore, there will continue to be a significant adverse visual factor both from land and harbor views.

On the positive side the overall visual quality of Deer Island would be somewhat improved by the removal of such negatively perceived elements as tanks and steelwork. The potential installation of plantings to screen the facility and the prison would further improve the visual quality of the site. Additionally, if the southern part of the island could remain as open space, perhaps developed in the future for recreation, then there would be a positive visual quality benefit to veiwers.

The reduction of Nut Island facilities to a 2-acre headworks would potentially improve the visual quality of Nut Island from adjacent Quincy Great Hill and from North Quincy areas and recreational beaches. A full description of this benefit is found under Alternative 1.

D. Alternative 4: Split Deer Island and Long Island

Under this alternative, secondary facilities (82 acres) would be located on Long Island, primary facilties (52 acres) would be located on Deer Island, with a headworks (2 acres) on Nut Island.

This alternative would improve the visual quality of Nut Island by the reduction of facilities to a 2-acre headworks, although it would severely impact Long Island. Deer Island impacts would be moderate.

The visual impacts on Nut Island would be largely beneficial as described under Alternative 1 above.

On Deer Island, the treatment facilities would be doubled in size to approximately 52 acres. Expansion would be located to the northeast of Signal Hill drumlin and adjacent to the present facility and the 40-acre prison. This expansion would newly expose the treatment facility to harbor views from the east and to somewhat increased views from those residences along the edge of Cottage Hill which presently view treatment facilities. However, this expansion would likely be perceived as generally comparable with the visual quality of the existing facilities and the prison, thereby minimizing any appreciable perceived gain of adverse effects.

The major adverse visual quality impacts of this alternative on Long Island would be similar to these described in Alternative 3 above. The slightly reduced size of facilities (14 acres smaller) would not reduce the visual impact to any appreciable extent since views would still perceive the major alterations and recontouring of the site, and the alterations to the site and its present setting would remain. From Long Island Head (DEM's proposed intensive use recreation site) and the West Head, the treatment plant will continue to dominate views on the island; while from the water or other nearby islands signficant visibility of the treatment plant would remain.

12.3.2.4 Impacts of Primary Treatment Alternatives

A. Alternative 1: All Deer Island

The impacts of this alternative on visual quality are slightly to moderately beneficial on Nut Island and moderately adverse on Deer Island. Nut Island benefits, resulting from the reduction of facilities to a 2-acre headworks, are similar to that described for Nut Island under secondary treatment Alternative 1 above. On Deer Island the expansion of treatment facilities to 62 acres results in similar impacts as those for the 52-acre facility (as described in secondary Alternative 4) since the slightly increased size does not appreciably alter the drumlin or the site's character with the prison use remaining. The perception of this larger expanded treatment facility would be generally comparable to the visual quality of the existing treatment plant.

B. Alternative 2: Split Deer Island and Nut Island

This alternative continues the current situation by maintaining primary treatment facilities on both Nut and Deer Islands, although in each instance they will be expanded. The visual quality of both islands and views to the sites from adjacent neighborhoods and water areas would be an increase to the severely adverse condition at Nut Island and the moderately adverse condition at Deer Island.

The adverse impacts on Deer Island of a 52-acre facility are described under secondary treatment Alternative 4 above. Similarly, on Nut Island, adverse visual impacts are described under secondary treatment Alternative 2 above.

C. Alternative 3: Split Deer Island and Long Island

Under this alternative, visual quality would improve at Nut Island from the reduction of treatment facilities to a headworks (2 acre), it would be moderately degraded on Long island, and would be moderately degraded on Deer Island also.

For Nut Island, the impacts of a headworks are similar to other Nut Island headworks alternatives described above (see Secondary Alternative 1). On Deer Island, the adverse impacts of a 52-acre treatment plant are similar to that described under secondary Alternative 4 above.

On Long Island, the introduction of an 18-acre treatment facility would moderately degrade the visual quality of the island setting in the vicinity of the plant site, negatively affecting some on-site views in this southern portion of the island, as well as some views to the island from the harbor. Of all the Long Island alternatives, this one would negatively impact the visual quality of Long Island the least. It may be, moreover, that views from the harbor could be effectively screened except for the pier. This would leave the most significant of these impacts to onsite views on the vicinity of the site and from the hospital grounds.

The degree of design sensitivity applied to the facility and its siting, including screenings and plantings, will determine the extent and significance of adverse visual impact experienced by viewers. The DEM plan for this southern portion of the island is highly dependent on the visual continuity of the many natural features that the plan weaves into a sequence of moderate intensity recreational experiences. The treatment plant siting and operations will be disruptive to these experiences

Siting the treatment plant on the former Nike Base and adjacent grounds, which have low visual quality at present, would provide visual screening of the facility from the high intensity recreational uses proposed on Long Island Head. However, there would be a dimunition of the quality of some of the views from the hospital and from portions of the central roadway. Any additional visual quality effects would be dependent on the more detailed final design studies conducted for the project. Careful planning and site design may mitigate these effects somewhat with screening and plantings necessary to limit negative visual quality.

BIBLIOGRAPHY/SOURCES

Cambridge Systematics, Inc. Boston Harbor Islands State Park Master Plan Update, Draft Transportation Plan, 1983.

Environmental Assessment Council, Inc. Environmental Inventory - Boston, EIS, 1977(?).

Environmental Protection Agency, Draft Environmental Impact Statement on the Upgrading of the Boston Metropolitan Area Sewerage System, Vol. I, 1978.

Kales, Emily and David. All About the Boston Harbor Islands, Herman Publishing Co., Boston, 1976.

Mass. Department of Environmental Management. Boston Harbor Islands State Park. Newsletter, September 1983.

Metcalf & Eddy, Inc. Nut Island Wastewater Treatment Plant Facilities Planning Project, Phase I, Site Options Study Volume II, 1982.

Metropolitan Area Planning Council Boston Harbor Islands Comprehensive Plan, 1972.

Metropolitan District Commission, Recreational Facilities, July 1982.

Metropolitan District Commission, Transcript of Public Hearing, July 29, 1982.

Randall, Debra A., Archaeological Survey of the Proposed MDC Sludge Management Plant at Deer Island, Massachusetts, 1981.

Sweetser, M.F., King's Handbook of Boston Harbor. Moses King Publisher, Cambridge, MA, 1882.

Task Forces to Mayor Flynn, Boston in Transition, A Program and Policy Analysis, Office of the Mayor, January, 1984.

Wallace, Floyd, Assoc., Inc. Boston Harbor Islands State Park - Draft Concept Plan, 1983.

Wallace, Floyd, Assoc., Inc. Boston Harbor Islands State Park - Review of Park Development, 1983.

Wallace, Floyd, Assoc., Inc. Boston Harbor Islands State Park - 1984 Master Plan, 1984.

12.4 Engineering Cost Estimates

Section 12.4
TABLE OF CONTENTS

1.0 SUMMARY

1.1 Introduction

This report describes the basis of the preliminary cost estimates applied in the Supplemental Draft EIS (SDEIS) for the wastewater treatment facility alternatives being proposed for Boston Harbor. It identifies the method followed for initial development of facility costs for a wide range of treatment facility options considered by the MDC or proposed by others during the EIS process, and explains the methods and assumptions applied to revise these initial cost estimates once a smaller set of alternatives was reached. The impact analysis done in the SDEIS does not encompass all costs associated with harbor treatment facilities. For example, costs of sludge disposal are not a part of the capital costs developed for wastewater treatment plants; likewise, costs for associated barging of equipment, busing of construction workers, unforeseen site constraints, and mitigation measures are not part of the facility capital costs presented in this section, nor are costs for other projects (such as CSO or I/I improvements) included. These costs will be developed either as part of separate facility plans or during final facility design of harbor treatment plants.

1.2 SDEIS Alternatives Considered

The preparation of a Supplemental Draft EIS of proposed wastewater treatment facilities in Boston Harbor began with a review of the facility engineering requirements and the development of associated preliminary costs for all viable treatment alternatives. The determination of which alternatives were to be considered in the SDEIS required the review of all potential siting alternatives for Boston Harbor wastewater treatment facilities.

This review was based on:

- alternatives studied by the MDC and their consultants in the Nut Island Site Options Study (1982) report;

- other siting alternatives and treatment options which were previously studied; and

- new alternatives not previously considered which have been identified as part of this SDEIS analysis.

Preliminary analysis of these siting alternatives defined such criteria as the level of treatment, acreage required, site environment and the neighboring community, and the number of sites and facilities involved. Costs for construction and for operation, maintenance and replacement (O, M & R) were examined initially as a means of comparing the alternatives within either a primary level or secondary level of treatment.

To compare the relative viability of the options at this early stage of analysis, a general screening process was used to reduce the number of alternatives for further, more detailed study. Environmental and community impacts were found to be of greatest concern among options. Costs of the options were found not to be a principal determinant in the screening process. A separate report describes the screening process and its results (see Section 12.12).

Eight alternatives were selected from the screening process. These were then reanalyzed in greater detail to independently establish preliminary capital costs and O, M & R costs for both primary and secondary options. In certain instances, revisions were made to the preliminary costs based on the findings of this re-analysis. Table 12.4-1, which follows, summarizes these estimated costs as they now stand. Further final design details may further refine these costs at that last phase of the facility design process. The set of final

TABLE 12.4-1

BOSTON HARBOR SDEIS: SUMMARY OF OPTIONS AND THEIR COSTS

Option No.	Sites, Level of Treatment, and (Acreage Required): Nut Island	Deer Island	Long Island	Costs in $Millions [1]: Capital	O&M	Present Worth [2] ($Millions)
SECONDARY ALTERNATIVES						
1a.2	■ (2)	● ▬ (115)		595.04	43.59	1019.06
1b.2*	● (18)	● ▬ (115)		650.40	45.18	1089.93
2b.1	■ (2)	■ (5)	● ▬ (96)	705.98	44.63	1140.13
2b.3	■ (2)	● (52)	● ▬ (82)	738.33	53.12	1255.07
PRIMARY ALTERNATIVES						
4a.2 D	■ (2)	● (62)		751.99	21.10	957.28
4b.2 D*	● (18)	● (52)		810.22	22.01	1024.31
5a.2 D	■ (2)	● (52)	● (18)	816.23	23.52	1044.97
5b.2 D**	■ (2)	■ (5)	● (52)	871.55	21.51	1080.74

KEY: ■ = headworks only ● = primary treatment ▬ = secondary treatment

D = deep ocean outfall * = MDC's preferred options

** = This option dropped during final screening.

[1] Revised costs reflect refinements to earlier facility plans as discussed in section 12.4 of Volume II. These costs do not include sludge disposal, barging, busing, or special noise mitigation measures (see Sections 4.5 and 5.2).

[2] Assumes 10% interest over 20 years.

Source: CE Maguire, Inc., November, 1984.

capital and O, M & R costs shown here and in Volume 1 of the SDEIS are the basis for the cost analysis presented.

2.0 DEVELOPMENT OF ENGINEERING AND SITING ALTERNATIVES

2.1 Evaluation of MDC Alternatives from the Nut Island Site Options Study (1982)

The MDC Nut Island Site Options Study (1982) report was the principal source of facility design criteria and cost data applicable to the possible sites being considered. It presented capital and O&M cost tables for 12 options analyzed in detail for the MDC by their consultants, Metcalf & Eddy, Inc. The SDEIS review process required the examination of each alternative to verify the level of treatment proposed, acreage required, site environment, including the neighboring community, and the number and type of facilities involved. Evaluation of facilities siting also included the determination of individual unit processes requirements, the treatment facilities for north and south system flows, and the overall usage and characteristics of the sites.

For example, the MDC Nut Island Site Options Study (1982) "Option 5" provides secondary treatment. Under this option, a primary-secondary treatment facility for the north system flows would be located on Deer Island, a primary treatment facility for south system flows would be located on Nut Island, and a companion secondary treatment facility for south system flows would be located on Long Island. Therefore, three distinct sites with varying levels of treatment would be involved under this option. The use of Deer Island could impact neighboring Port Shirley in Winthrop, the use of Nut Island could impact neighboring Houghs Neck in Quincy, and the use of Long Island could impact neighboring Squantum also in Quincy. Such combinations of wastewater treatment engineering and siting considerations were evaluated during the initial review of alternatives.

In general, the alternatives presented in the MDC Nut Island Site Options Study (1982) involved both primary and secondary treatment. They involved the use of Deer and Nut Islands to varying degrees in all cases, and the use of Long Island for three options, all of which are secondary treatment options. The choice of alternatives studied by the MDC and their consultants was based on the circumstances and decision process in effect at that time. Subsequent developments, notably the opportunity to apply to EPA for a waiver from secondary treatment, resulted in a need to reconsider these MDC facility plan options, and in certain instances, develop new ones as described in Section 2.3 below.

2.2 Alternatives Considered from Other Studies

Other studies conducted prior to the MDC Nut Island Site Options Study (1982) also examined options for wastewater treatment facilities siting in Boston Harbor. These included:

- MDC, Wastewater Engineering and Management Plan for Boston Harbor - Eastern Massachusetts Metropolitan Area, EMMA Study, Metcalf & Eddy, Inc., March, 1976.

- EPA, Draft Environmental Impact Statement on the Upgrading of the Boston Metropolitan Area Sewerage System, Greeley and Hansen and Environmental Assessment Council, Inc., August, 1978.

The MDC EMMA Study (1976) was the original facility plan for siting of treatment facilities and it recommended a plan which provided wastewater treatment at four sites. Secondary and advanced treatment facilities would be located at Deer Island, Nut Island, the Middle Charles River, and Upper Neponset River. The study also considered siting along the Aberjona River. These proposed sites were then evaluated by EPA prior to approval of federal funds.

The EPA Draft EIS (1978) written following the MDC EMMA Study (1976) plan, initially considered eleven sites in the vicinity of Boston Harbor for the location of wastewater treatment facilities. These sites were: Deer Island, Spectacle Island, Long Island, Moon Island, Squantum, Peddocks Island, Nut Island, Broad Meadows, Kings Cove, Lower Neck, and Broad Cove. Of these sites, only Deer Island, Long Island, Squantum Point, Nut Island and Broad Meadows were found to be suitable for further consideration.

As is apparent, conditions had changed sufficiently from the date of these studies, and particularly the EPA Draft EIS (1978), to warrant a new facility planning effort by the MDC, as evidenced by the MDC Nut Island Site Options Study (1982), and a supplemental environmental review by EPA in this SDEIS.

Chief among the options developed in these prior plans which were carried in the SDEIS were the proposal from the EMMA Study to site "satellite" advanced treatment facilities on the Charles and Neponset Rivers, and the recommendation from the EPA Draft EIS (1978) for consolidated secondary treatment facilities on Deer Island.

2.3 New Alternatives Not Previously Studied

After reviewing the range of alternatives presented in the MDC Nut Island Site Options Study (1982), the MDC EMMA Study (1976), and the EPA Draft EIS (1978), public and agency comment was invited during the EPA scoping period for the SDEIS. It became apparent from the comments received that several additional options should also be considered. Some of these options involved variations of treatment process locations for both primary and secondary treatment. Sites considered were primarily those at Deer, Nut, and Long Islands. These included:

- Primary treatment at Deer and Nut Island with a combined secondary facility on Long Island,

- Converting Nut Island to a headworks and providing primary treatment at Long Island,

- Converting both Deer and Nut Islands to either headworks or pumping facilities and providing either primary or secondary treatment facilities on Long Island.

Other new alternatives considered looked at utilization of other sites in Boston Harbor including Thompson Island, Lovell Island, or the Brewster Islands.

Besides the presentation of new options relating to siting of facilities, the comments received during scoping suggested optional treatment processes as possible additional alternatives to be examined. For example, an intermediate level of treatment greater than primary, but less than secondary, could be achieved through chemically assisted primary treatment (or advanced primary). Though initially considered, these intermediate treatment levels were dropped because no proposal to utilize such treatment had been made.

After reviewing all of the existing and new siting and treatment alternatives, twenty-two options (including some similar options having only slight variations in their facility layout) were analyzed for preliminary screening. This screening reduced the number of viable alternatives to eight. A separate report describing the screening process and the results was distributed in June, 1984 (see Section 12.12). These eight were then reanalyzed to establish independent and revised costs as appropriate.

3.0 FACILITIES DESIGN CRITERIA

The MDC Nut Island Site Options Study (1982) presented in detail the individual facility components required for each treatment alternative. These components are designed to provide optimum removal of coarse solids, suspended and floating solids, grease, and organic matter. Other components also provide for disinfection and odor control. Land acquisition and other associated site development costs were also developed in the prior study.

After reviewing established design guidelines, the generalized design criteria presented in the MDC Nut Island Site Options Study (1982) were found to be accurate for the treatment alternatives presented. These design criteria applied to such treatment components as screens, grit chambers, primary tanks, aeration tanks and equipment, secondary tanks, sludge pumps and thickeners, and digesters.

Design criteria used to determine the individual component dimensions were developed from those used in the MDC Nut Island Site Options Study (1982) for each option presented. In order to facilitate the comparison of the treatment alternatives in the SDEIS, the component dimensions established for a given volume were carried over to the new options, when applicable. Otherwise, new component dimensions were derived based on the established design criteria and assumptions presented in the MDC study. The dimensions of these major treatment facility components utilized in the SDEIS are presented in Table 12.4-2. A general comparison of treatment components is presented in Figure 12.4-1.

4.0 DEVELOPMENT OF INITIAL PRELIMINARY COSTS OF ALTERNATIVES

4.1 Capital and O&M Costs Update

The MDC Nut Island Site Options Study (1982) included a table of capital costs for each option. The cost table presented detailed costs for each option component, as well as other construction-related costs such as removal of unsuitable materials and land acquisition. Since this study was completed in June 1982, the costs presented in that report were based on an Engineering News Record (ENR) Construction Cost Index of 3600, reflecting then current prices.

TABLE 12.4-2

TREATMENT FACILITY DIMENSIONS BY OPTION[1] Table 12.4-2

	Treatment System Description						
	Preliminary Treatment	Upgraded Primary Treatment			Secondary Treatment		Disinfection
Option Site, island	Aerated grit chamber No. - width x length x depth	Primary sedimentation No. - width x length x depth	Gravity thickening No. - diameter	Anaerobic sludge digestion No. - diameter x depth	Activated sludge aeration No. - width[3] x length x depth	Secondary sedimentation No. - width x length x depth	Contact Tank width x length x depth
1a. Deer (existing)	2 - 20 x 34 x 15	8 - 100 x 240 x 11.3	4 - 55	4 - 108 x 30	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	20 - 96 x 200 x 11.3	6 - 80	8 - 105 x 30	22 - 120 x 185 x 20	50 - 80 x 260 x 12	340 x 680 x 15
Nut (new)	4 - 25 x 80 x 15	-	-	-	-	-	-
1b. Deer (existing)	2 - 20 x 34 x 15	8 - 100 x 240 x 11.3	4 - 55	4 - 108 x 30	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	12 - 96 x 200 x 11.3	5[4] - 80	4 - 105 x 30	22 - 120 x 185 x 20	50 - 80 x 260 x 12	340 x 680 x 15
Nut (existing)	-	-	-	4 - 110 x 30	-	-	-
Nut (new)	4 - 25 x 80 x 15	12 - 64 x 185 x 10	2 - 80	-	-	-	-
1c. Deer (existing)	2 - 20 x 34 x 15	8 - 100 x 240 x 11.3	4 - 55	4 - 108 x 30	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	12 - 96 x 200 x 11.3	4 - 80	4 - 105 x 30	16 - 120 x 185 x 20	38 - 80 x 260 x 12	294 x 588 x 15
Nut (existing)	-	-	-	4 - 110 x 30	-	-	-
Nut (new)	4 - 25 x 80 x 15	12 - 64 x 185 x 10	2 - 80	-	6 - 120 x 185 x 20	12 - 85 x 260 x 12	170 x 340 x 15
2a.1 Deer (existing)	2 - 20 x 34 x 15	8 - 100 x 240 x 11.3	4 - 55	4 - 108 x 30	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	12 - 96 x 200 x 11.3	4 - 80	4 - 105 x 30	16 - 120 x 185 x 20	38 - 80 x 260 x 12	294 x 588 x 15
Nut (new)	4 - 25 x 80 x 15	-	-	-	-	-	-
Long (new)	-	8 - 96 x 200 x 10	2 - 80	4 - 105 x 30	6 - 120 x 185 x 20	12 - 85 x 260 x 12	170 x 340 x 15
2a.2 Deer (existing)	2 - 20 x 34 x 15	8 - 100 x 240 x 11.3	4 - 55	4 - 108 x 30	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	12 - 96 x 200 x 11.3	4 - 80	4 - 105 x 30	16 - 120 x 185 x 20	38 - 80 x 260 x 12	294 x 588 x 15
Nut (existing)	-	-	-	4 - 110 x 30	-	-	-
Nut (new)	4 - 25 x 80 x 15	12 - 64 x 185 x 10	2 - 80	-	-		-
Long (new)	-	-	2[4] - 55	-	6 - 120 x 185 x 20	12 - 85 x 260 x 12	170 x 340 x 15
2b.1 Deer (existing)	2 - 20 x 34 x 15	-	-	-	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	-	-	-	-	-	-
Nut (new)	4 - 25 x 80 x 15	-	-	-	-	-	-
Long (new)	-	30 - 96 x 200 x 11.3	8 - 80	12 - 105 x 30	22 - 120 x 185 x 20	50 - 80 x 260 x 12	340 x 680 x 15
2b.2 Deer (existing)	2 - 20 x 34 x 15	8 - 100 x 240 x 11.3	4 - 55	4 - 108 x 30	-	-	-
Deer (new)	2[2] - 20 x 64 x 15	12 - 96 x 200 x 11.3	4 - 80	4 - 105 x 30	-	-	-
Nut (existing)	-	-	-	4 - 110 x 30	-	-	-
Nut (new)	4 - 25 x 80 x 15	12 - 64 x 185 x 10	2 - 80	-	-	-	-
Long (new)	-	-	2[4] - 80	-	22[2] - 120 x 185 x 20	50 - 80 x 260 x 12	340 x 680 x 15
3a. Deer (existing)	2 - 20 x 34 x 15	-	-	-	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	-	-	-	-	-	-
Nut (new)	4 - 25 x 80 x 15	-	-	-	-	-	-
Lovel (new)	-	30 - 96 x 200 x 11.3	8 - 80	12 - 105 x 30	22 - 120 x 185 x 20	50 - 80 x 260 x 12	340 x 680 x 15
3b. Deer (existing)	2 - 20 x 34 x 15	-	-	-	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	-	-	-	-	-	-
Nut (new)	4 - 25 x 80 x 15	-	-	-	-	-	-
Brewsters (new)	-	30 - 96 x 200 x 11.3	8 - 80	12 - 105 x 30	22 - 120 x 185 x 20	50 - 80 x 260 x 12	340 x 680 x 15
4a. Deer (existing)	2 - 20 x 34 x 15	8 - 100 x 240 x 11.3	4 - 55	4 - 108 x 30	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	20 - 96 x 200 x 11.3	6 - 80	8 - 105 x 30	-	-	340 x 680 x 15[6]
Nut (new)	4 - 25 x 80 x 15	-	-	-	-	-	-
4b. Deer (existing)	2 - 20 x 34 x 15	8 - 100 x 240 x 11.3	4 - 55	4 - 108 x 30	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	12 - 96 x 200 x 11.3	4 - 80	4 - 105 x 30	-	-	294 x 588 x 15[6]
Nut (existing)	-	-	-	4 - 110 x 30	-	-	-
Nut (new)	4 - 25 x 80 x 15	12 - 64 x 185 x 10	2 - 80	-	-	-	170 x 340 x 15[6]
5a. Deer (existing)	2 - 20 x 34 x 15	8 - 100 x 240 x 11.3	4 - 55	4 - 108 x 30	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	20 - 96 x 200 x 11.3	6 - 80	8 - 105 x 30	-	-	294 x 588 x 15[5] [6]
Nut (new)	4 - 25 x 80 x 15	-	-	-	-	-	170 x 340 x 15[5] [6]
Long (new)	-	12 - 64 x 185 x 10	2 - 80	4 - 110 x 30	-	-	-
5b. Deer (existing)	2 - 20 x 34 x 15	-	-	-	-	-	-
Deer (new)	2[2] - 20 x 28 x 15	-	-	-	-	-	-
Nut (new)	4 - 25 x 80 x 15	-	-	-	-	-	-
Long (new)	-	30 - 96 x 200 x 11.3	8 - 80	12 - 105 x 30	-	-	340 x 680 x 15[5] [6]

1. Dimensions given in feet.
2. New construction involves expansion of aerated grit chambers at the Winthrop Terminal Facility.
3. Width includes multiple passes in aeration tanks.
4. Includes the capability to rethicken digested sludge which has been diluted and pumped from another primary treatment plant site.
5. Local outfalls only.
6. One tank 240 x 480 x 15 feet, would be constructed at Deer Island if Deep Ocean Outfall is utilized for this Option.

Source: CE Maguire, Inc. based on information contained in MDC, Site Options Study (June 1982).

WASTEWATER TREATMENT COMPONENTS BY TREATMENT LEVEL

			COMPONENT	FLOWS		
				NORTH SYSTEM	SOUTH SYSTEM	COMBINED
		Head-works	Aerated Grit Chambers	4[1]	4	8[1]
			Primary Sedimentation Tanks	20[2]	12	28[2]
Secondary	Primary		Gravity Sludge Thickeners	8[3]	2	10[3]
			Anaerobic Digestors	8[3]	4[4]	12[5]
			Aeration Tanks	16	6	22
			Secondary Sedimentation Tanks	38	12	50

(1) 2 of these are existing at Deer Island
(2) 8 of these are existing at Deer Island
(3) 4 of these are existing at Deer Island (4) 4 of these are existing at Nut Island
(5) 4 of these are existing at Deer Island and 4 at Nut Island

Source: Based on MDC, Nut Island Site Options Study (1982) Volume 1, Table 5-5.

Figure 12.4-1

In order to facilitate the presentation of relative costs for all of the options under consideration in the SDEIS, the MDC Nut Island Site Options Study (1982) cost table was first updated to an ENR Construction Cost Index of 4200, reflecting 1984 prices. Table 12.4-3 presents these costs for all options considered. The project costs presented in the SDEIS reflect current 1984 dollars and will change accordingly to reflect future inflation beyond 1984 at the time when project construction begins.

Operation and maintenance (O&M) cost tables were similarly presented in the MDC Nut Island Site Options Study (1982) to reflect prices then in effect. Therefore, these costs were also updated to 1984 prices.

4.2 Costs of New Alternatives

In developing costs for new options, individual component characteristics for each option were compared with those presented in the MDC Nut Island Site Options Study (1982). When an identical process capacity was involved, the cost from the MDC study (updated) was carried over and assigned to that component for the new option. For cases where identical process capacities did not exist, costs were developed utilizing the MDC study data applied as a ratio of volume to costs. In such cases, the resultant figures were examined to assure consistency. It was determined that for this stage of preliminary conceptual design and associated cost analysis such an approach was reasonable.

For example, under SDEIS Option 2b.1 at Long Island, the influent pump station would be identical to that required for "Option 11" of the MDC Nut Island Site Options Study (1982). Therefore, the costs were assumed to be the same. However, under Option 2b.1 at Long Island, 30 primary tanks would be required. The greatest number of tanks to be constructed at any location for any MDC study alternative was twenty; therefore, the estimated preliminary cost for primary tanks at Long Island was calculated based on a proportionate cost.

Table 12.4-3

UPDATED SITE OPTIONS STUDY COSTS (ENR 4200)

	Option 1a.2		Option 1b.2		Option 1c		Option 2a.1*		
	Deer	Nut	Deer	Nut	Deer	Nut	Deer	Nut	Long
Influent Pump Station	29,677	-	29,677	2,993	16,881	2,993	16,881	2,993	10,432
Screens & Grit Chambers	315	9,129	315	9,129	315	9,129	315	9,129	-
Primary Sedimentation Tanks	30,051	-	18,031	17,918	18,031	17,918	18,031	-	17,918
Gravity Thickeners	3,506	-	2,921	1,169	2,337	1,169	2,337	-	1,169
Anaerobic Digesters	22,059	-	12,920	-	12,920	-	12,920	-	12,920
Gas Storage	3,105	-	3,150	-	3,150	-	3,150	-	3,150
Secondary Aeration Tanks	80,317	-	80,317	-	59,012	21,307	59,012	-	21,307
Blower Building	44,743	-	44,743	-	31,319	13,422	31,319	-	13,422
Secondary Sedimentation Tanks	248,614	-	248,614	-	183,974	64,639	183,974	-	64,639
Electrical Generator Building	2,066	-	-	1,540	-	1,540	-	-	2,066
Engine Generators	6,080	-	1,216	4,864	1,216	4,864	1,216	-	4,864
Administration & Maintenance Building	7,560	-	6,615	4,442	6,615	5,355	6,615	-	6,615
Scum Incinerator	7,245	-	3,623	3,885	3,623	3,885	3,623	-	3,623
Odor Control Facilities	17,073	741	-	17,814	-	17,814	-	741	17,073
Chlorination Equipment	3,443	1,402	3,443	1,402	2,835	1,591	2,835	1,402	2,066
Chlorine Contact Tanks	13,857	-	13,857	-	10,409	3,469	10,409	-	3,469
Utility Company Power to Site	-	1,772	-	1,969	-	2,048	-	1,772	-
Pier Facilities	11,528	-	11,528	8,892	11,528	8,892	11,528	-	8,234
Interisland Wastewater Tunnel	-	82,819	-	82,819	-	-	-	46,459	-
Effluent Pump Station	29,413	-	29,413	-	22,411	8,710	22,411	-	8,710
Outfalls	47,723	-	47,723	-	41,265	49,397	41,265	-	53,019
Miscellaneous Civil	756	-	709	-	599	552	599	-	552
Channels and Dikes	3,141	275	3,141	6,297	3,141	15,666	3,141	275	1,245
Removal Unsuitable Materials	27,353	-	26,514	-	20,731	-	20,731	-	973
Earth Fill	-	-	-	2,442	-	13,262	-	-	2,008
Foundation Preparation	-	-	-	15,730	-	49,167	-	-	5,689
Demolition	-	2,835	-	1,575	-	1,575	-	2,835	-
Subtotal by Site	639,670	98,973	588,470	184,880	452,312	318,364	452,312	65,606	265,163
Capital Cost	738,643		773,350		770,676			783,081	
Land Acquisition	2,077		2,077		1,820		1,820		1,050
Sludge Processing	11,924		111,924		111,924		111,924		
Total Capital Cost	852,644		887,351		884,420			897,875	

Table 12.4-3 cont.

	Option 2a.2*			Option 2b.1*			Option 2b.2*		
	Deer	Nut	Long	Deer	Nut	Long	Deer	Nut	Long
Influent Pump Station	16,881	2,993	10,432	16,881	-	10,432	16,881	2,993	37,589
Screens & Grit Chambers	315	9,129	-	315	9,129	-	315	9,129	-
Primary Sedimentation Tanks	18,031	17,918	-	-	-	45,077	18,031	17,918	-
Gravity Thickeners	2,337	1,169	810	-	-	4,675	2,337	1,169	2,429
Anaerobic Digesters	12,920	-	-	-	-	33,089	12,920	-	-
Gas Storage	3,150	-	-	-	-	3,150	3,150	-	-
Secondary Aeration Tanks	59,012	-	21,307	-	-	80,317	-	-	80,317
Blower Building	31,319	-	13,423	-	-	44,743	-	-	44,743
Secondary Sedimentation Tanks	183,974	-	64,639	-	-	248,614	-	-	248,614
Electrical Generator Building	-	1,540	-	-	-	2,066	-	1,540	-
Engine Generators	1,216	4,864	-	-	-	6,080	1,216	4,864	-
Administration & Maintenance Building	6,615	4,442	4,725	-	-	8,978	5,670	4,442	8,978
Scum Incinerator	3,623	3,885	-	-	-	7,245	3,623	3,886	-
Odor Control Facilities	-	17,814	-	223	741	17,073	-	17,814	-
Chlorination Equipment	2,835	1,402	2,066	189	1,402	3,443	189	1,402	3,443
Chlorine Contact Tanks	10,409	-	3,469	-	-	13,857	-	-	13,857
Utility Company Power to Site	-	1,969	-	-	1,772	-	-	1,969	-
Pier Facilities	11,528	8,892	8,234	-	-	8,234	11,528	8,892	8,234
Interisland Wastewater Tunnel	-	45,892	-	68,156	46,459	-	68,156	44,990	-
Effluent Pump Station	22,411	-	8,710	-	-	29,413	-	-	29,413
Outfalls	41,265	-	53,019	-	-	91,855	-	-	91,855
Miscellaneous Civil	599	158	394	-	-	630	410	158	630
Channels and Dikes	3,141	6,297	687	642	275	11,118	1,260	6,297	11,118
Removal Unsuitable Materials	20,731	-	973	-	-	2,270	1,462	-	-
Earth Fill	-	2,442	2,008	-	-	4,679	-	2,442	-
Foundation Preparation	-	15,730	5,689	-	-	11,359	-	15,730	11,359
Demolition	-	1,575	-	6,606	2,835	-	-	1,575	-
Subtotal by Site	452,312	148,111	200,585	93,012	62,613	688,397	147,148	147,210	592,579
Capital Cost		801,008			844,022			886,937	
Land Acquisition	1,820		735			2,450	607		2,380
Sludge Processing	111,924					111,924	111,924		
Total Capital Cost		915,487			958,396			1,001,848	

Table 12.4-3 cont.

	Option 3a*			Option 3b*			Option 4a.1		Option 4a.2	
	Deer	Nut	Lovell	Deer	Nut	Brewsters	Deer	Nut	Deer	Nut
Influent Pump Station	16,881	-	37,589	16,881	-	37,589	29,677	-	29,677	-
Screens & Grit Chambers	315	9,129	-	315	9,129	-	315	9,129	315	9,129
Primary Sedimentation Tanks	-	-	45,077	-	-	45,077	30,051	-	30,051	-
Gravity Thickeners	-	-	4,675	-	-	4,675	3,506	-	3,506	-
Anaerobic Digesters	-	-	33,089	-	-	33,089	22,059	-	22,059	-
Gas Storage	-	-	3,150	-	-	3,150	3,150	-	3,150	-
Secondary Aeration Tanks	-	-	80,317	-	-	80,317	-	-	-	-
Blower Building	-	-	44,743	-	-	44,743	-	-	-	-
Secondary Sedimentation Tanks	-	-	248,614	-	-	248,614	-	-	-	-
Electrical Generator Building	-	-	2,066	-	-	2,066	2,066	-	2,066	-
Engine Generators	-	-	6,080	-	-	6,080	6,080	-	6,080	-
Administration & Maintenance Building	-	-	8,978	-	-	8,978	6,615	-	6,615	-
Scum Incinerator	-	-	7,245	-	-	7,245	7,245	-	7,245	-
Odor Control Facilities	223	741	17,073	223	741	17,073	17,073	741	17,073	741
Chlorination Equipment	189	1,402	3,443	189	1,402	3,443	3,443	1,402	3,443	1,402
Chlorine Contact Tanks	-	-	13,857	-	-	13,857	13,857	-	6,940	-
Utility Company Power to Site	-	1,772	*	-	1,772	*	2,363	1,772	2,363	1,772
Pier Facilities	-	-	11,528	-	-	11,528	11,528	-	11,528	-
Interisland Wastewater Tunnel	45,375	67,200	-	102,850	86,400	-	-	82,819	-	82,819
Effluent Pump Station	-	-	29,413	-	-	29,413	29,413	-	41,252	-
Outfalls	-	-	91,855	-	-	91,855	47,723	-	411,847	-
Miscellaneous Civil	-	-	*	-	-	*	457	-	457	-
Channels and Dikes	642	275	11,118	642	275	11,118	1,517	275	1,517	275
Removal Unsuitable Materials	-	-	*	-	-	*	2,190	-	2,190	-
Earth Fill	-	-	547,500	-	-	992,500	-	-	-	-
Foundation Preparation	-	-	*	-	-	*	-	-	-	-
Demolition	6,606	2,835	-	6,606	2,835	-	-	2,835	-	2,835
Subtotal by Site	70,231	83,354	1,247,410	127,706	102,554	1,692,410	240,328	98,973	609,374	98,973
Capital Cost		1,400,995			1,922,670	-	339,301		708,347	
Land Acquisition			*			*	840		840	
Sludge Processing			111,924			111,924	50,388		50,388	
Total Capital Cost		1,512,919			2,034,594	-	390,529		759,575	

Table 12.4-3 cont.

	Option 4b.1		Option 4b.2		Option 5a.1*			Option 5a.2*		
	Deer	Nut	Deer	Nut	Deer	Nut	Long	Deer	Nut	Long
Influent Pump Station	16,881	2,993	16,881	2,993	29,677	-	10,432	29,677	-	10,432
Screens & Grit Chambers	315	9,129	315	9,129	315	9,129	-	315	9,129	-
Primary Sedimentation Tanks	18,031	17,918	18,031	17,918	18,031	-	17,918	18,031	-	17,918
Gravity Thickeners	2,337	1,169	2,337	1,169	2,337	-	1,169	2,337	-	1,169
Anaerobic Digesters	12,920	-	12,920	-	12,920	-	12,920	12,920	-	12,920
Gas Storage	3,150	-	3,150	-	3,150	-	3,150	3,150	-	3,150
Secondary Aeration Tanks	-	-	-	-	-	-	-	-	-	-
Blower Building	-	-	-	-	-	-	-	-	-	-
Secondary Sedimentation Tanks	-	-	-	-	-	-	-	-	-	-
Electrical Generator Building	-	1,540	-	1,540	-	-	2,066	-	-	2,066
Engine Generators	1,216	4,864	1,216	4,864	1,216	-	4,864	1,216	-	4,864
Administration & Maintenance Building	5,670	4,442	5,670	4,442	5,670	-	6,615	5,670	-	6,615
Scum Incinerator	3,623	3,886	3,623	3,886	3,623	-	3,623	3,623	-	3,623
Odor Control Facilities	-	17,814	-	17,814	-	741	17,073	-	741	17,073
Chlorination Equipment	2,835	1,591	2,835	1,591	2,835	1,402	2,066	2,835	1,402	1,402
Chlorine Contact Tanks	10,409	3,469	6,940	-	10,409	-	3,469	6,940	-	-
Utility Company Power to Site	2,363	2,204	2,363	1,772	2,363	1,772	-	2,363	1,772	-
Pier Facilities	11,528	8,892	11,528	8,892	11,528	-	8,234	11,528	-	8,234
Interisland Wastewater Tunnel	-	-	-	77,433	-	46,459	-	-	46,459	36,049
Effluent Pump Station	22,411	8,710	41,462	-	22,411	-	8,710	41,462	-	-
Outfalls	41,265	49,397	411,847	-	41,265	-	53,019	411,847	-	-
Miscellaneous Civil	410	158	394	158	410	-	158	394	-	158
Channels and Dikes	1,260	6,297	1,260	6,297	1,260	275	1,245	1,260	275	1,245
Removal Unsuitable Materials	1,359	-	1,359	-	1,359	-	487	1,359	-	487
Earth Fill	-	3,256	-	2,442	-	-	1,004	-	-	1,004
Foundation Preparation	-	15,730	-	15,730	-	-	2,849	-	-	2,849
Demolition	-	1,575	-	1,575	-	2,835	-	-	2,835	-
Subtotal by Site	157,983	165,034	544,131	179,645	170,779	62,613	161,071	556,927	62,613	131,258
Capital Cost	323,017		723,776			294,463			750,798	
Land Acquisition	607		607		607		525	607		525
Sludge Processing	50,388		50,388		50,388		50,388			
Total Capital Cost	374,012		774,771			445,983			802,318	

Table 12.4-3 cont.

	5b.1*			5b.2*			Option 2b.3*		
	Deer	Nut	Long	Deer	Nut	Long	Deer	Nut	Long
Influent Pump Station	16,881	-	10,432	16,881	-	10,432	16,881	-	37,589
Screens & Grit Chambers	315	9,129	-	315	9,129	-	315	9,129	-
Primary Sedimentation Tanks	-	-	45,077	-	-	45,077	18,031	-	17,918
Gravity Thickeners	-	-	4,675	-	-	4,675	2,337	-	1,169
Anaerobic Digesters	-	-	33,089	-	-	33,089	12,031	-	12,920
Gas Storage	-	-	3,150	-	-	3,150	3,150	-	3,150
Secondary Aeration Tanks	-	-	-	-	-	-	-	-	80,317
Blower Building	-	-	-	-	-	-	-	-	44,743
Secondary Sedimentation Tanks	-	-	-	-	-	-	-	-	248,614
Electrical Generator Building	-	-	2,066	-	-	2,066	-	-	2,066
Engine Generators	-	-	4,864	-	-	4,864	1,216	-	4,864
Administration & Maintenance Building	-	-	6,615	-	-	6,615	5,670	-	8,978
Scum Incinerator	-	-	3,623	-	-	3,623	3,623	-	3,623
Odor Control Facilities	223	741	17,073	223	741	17,073	-	741	17,073
Chlorination Equipment	189	1,402	3,443	189	1,402	3,443	189	1,402	3,443
Chlorine Contact Tanks	-	-	13,857	-	-	6,940	-	-	13,857
Utility Company Power to Site	-	1,772	-	-	1,772	-	-	1,772	-
Pier Facilities	-	-	8,234	-	-	8,234	11,528	-	8,234
Interisland Wastewater Tunnel	68,156	46,459	-	68,156	46,459	-	68,156	46,459	-
Effluent Pump Station	-	-	29,413	-	-	41,252	-	-	29,413
Outfalls	-	-	91,855	-	-	411,857	-	-	91,855
Miscellaneous Civil	-	-	368	-	-	368	410	-	630
Channels and Dikes	642	275	11,118	642	275	11,118	1,260	275	11,118
Removal Unsuitable Materials	-	-	1,135	-	-	1,135	1,462	-	973
Earth Fill	-	-	2,339	-	-	2,339	-	-	2,008
Foundation Preparation	-	-	6,638	-	-	6,638	-	-	11,359
Demolition	6,606	2,835	-	6,606	2,835	-	-	2,835	-
Subtotal by Site	93,012	62,613	299,064	93,012	62,613	623,988	147,148	62,613	655,914
Capital Cost		454,689			779,613			865,675	
Land Acquisition			1,225			1,225	1,820		2,180
Sludge Processing			50,388			50,388	111,924		
Total Capital Cost		506,302			831,226			981,799	

* <u>Footnotes to Table 12.4-3</u>: See Attachment 1 at end of this section.

Some cost items from the MDC Nut Island Site Options Study (1982) did not have associated sizes or quantities specified, such as removal of unsuitables. Therefore, the cost for removal of unsuitables and other similar site requirements was estimated based on comparative facility sizing and/or land area. In all cases, at this stage of the analysis, no unique site problems which affect estimation of preliminary construction costs were established for any of the new alternatives developed (with the exception of the man-made island option which was dropped from further consideration due to higher costs and construction problems).

It was recognized, further, that certain cost items established could be more dependent on site-specific conditions. For example, removal of the drumlin at Deer Island would increase the cost of site preparation in relation to the resultant acreage. At Nut Island, construction on piles would increase the cost of foundation preparation there. Therefore, cost comparisons for individual components were made with those for the same site whenever possible to reflect such known conditions or circumstances. Where base costs were utilized to establish costs at other sites, adjustment was made to provide consistent estimating or reflect known variations in sites. Again, such adjustment was made within the broad limits of accuracy for preliminary costs developed in the MDC Nut Island Site Options Study (1982).

In the case of Long Island, some uncertainty exists with regard to site subsurface conditions and construction/foundation requirements. Because approval of access to the site was delayed it has not been possible to investigate these conditions fully in order to verify their existence. Since the MDC Nut Island Site Options Study (1982) located secondary treatment facilities on Long Island in the same general location as the options now being considered, it is assumed that such facilities are, in general, feasible at this site with no special problems that could significantly affect site costs. Detailed conditions at Long Island, during final design, will be verified should that site be selected.

4.3 Assumptions Made on Engineering Cost Analysis

Reflecting the preliminary nature of the cost estimates being made, as noted above, many basic assumptions were made in order to estimate the costs of these alternatives. The foremost assumption is that costs for new options can be reasonably developed, at this stage of the analysis, based on a comparative ratio of design criteria involving flow, acreage, or quantity (of tanks) to a given cost as developed in the prior MDC study. Other assumptions which were made, involving elements of site or operations, are described in Attachment 1 to this report.

4.4 Operations and Maintenance Costs

Operation and maintenance (O&M) costs for the new options were developed similarly to the capital costs. That is, each cost item under a new or different option was compared to those for the MDC Nut Island Site Options Study (1982) alternatives, and costs were developed based on applicable ratios. Revised operation and maintenance costs are presented in Table 12.4-4. The following description highlights the key elements of O&M costs.

4.4.1 Chlorine

Costs established in the Site Options Study (1982) for chlorine were found to be inconsistent with the description of the chlorine volume estimates at the given price per ton. These were therefore adjusted to reflect the corrected and updated estimates. Preliminary O&M costs were established based on the further assumption that post-chlorination will take place 6 months per year for deep ocean outfalls.

Annual Operation & Maintenance Costs[1] **Table** 12.4-4
(thousands of dollars per year)

Option Item/Site	1a. Deer	Nut	1b. Deer	Nut	2b.1 Deer	Nut	Long	Deer	2b.3 Deer	Nut	Long
Power	24,700	279	24,382	363	650	279	24,050	9,377	9,377	279	17,229
Chlorine[2][5]	2,454	480	2,454	480	1,120	480	1,334	1,120	1,120	480	982
Labor[3]	6,977	607	6,522	2,518	208	607	5,772	3,579	3,579	607	6,067
Materials and Supplies	1,353	212	1,320	512	319	212	1,035	807	807	212	1,145
Subtotal by Site	35,484	1,578	34,678	3,873	2,297	1,578	32,191	14,833	14,883	1,578	25,423
Subtotal by Option	37,062		38,551		36,066				41,884		
Solids Handling	6,633		6,633		6,633				6,633		
TOTAL	43,695		45,184		42,699				48,517		

(1) Based on Site Options Study, Table 7-13; Updated to ENR 4200.
(2) Based on a unit cost of chlorine at $350/ton.
(3) Based on Site Options Study, Table 7-13 and Table 7-15, revised to reflect updated facility components.
(4) Does not include the anticipated additional cost of transporting workers.
(5) These chlorine costs reflect seasonal post-chlorination for deep ocean options.

Annual Operation & Maintenance Costs[1] Table 12.4-4
(thousands of dollars per year)

Option Item/Site	4a.2 Deer	4a.2 Nut	4b.2 Deer	4b.2 Nut	5a.2 Deer	5a.2 Nut	5a.2 Long	5b.2 Deer	5b.2 Nut	5b.2 Long
Power	9,423	279	8,633	363	8,633	279	84	650	279	8,750
Chlorine(2)(5)	2,717	480	2,237	959	2,237	480	480	1,120	480	1,598
Labor(3)	4,125	607	3,579	2,518	3,579	607	1,638	208	607	3,328
Materials and Supplies	995	203	933	512	933	212	300	319	212	677
Subtotal by Site	17,260	1,569	15,382	4,352	15,382	1,578	2,502	2,297	1,578	14,353
Subtotal by Option	18,829		19,734		19,462			18,228		
Solids Handling	2,275		2,275		2,275			2,275		
TOTAL	21,104		22,009		21,737			20,503		

(1) Based on Site Options Study, Table 7-13; Updated to ENR 4200.
(2) Based on a unit cost of chlorine at $350/ton.
(3) Based on Site Options Study, Table 7-13 and Table 7-15, revised to reflect updated facility components.
(4) Does not include the anticipated additional cost of transporting workers.
(5) These chlorine costs reflect seasonal post-chlorination for deep ocean options.

4.4.2 Staffing

Operation costs for each option are directly related to the number of personnel required, which in turn is dependent upon the size of the facility and number of locations involved. Staffing requirements were estimated for the new alternatives based on the staffing requirements and costs presented Table 7-15 of MDC Nut Island Site Options Study (1982).

4.4.3 Power

Costs presented for power are based on those presented in the MDC Nut Island Site Options Study (1982) updated to ENR 4200. Power costs for new options were calculated by proportioning flows for similar facilities.

4.4.4 Materials and Supplies

Cost estimates for this item were also based on those presented in the MDC Nut Island Site Options Study (1982) updated to ENR 4200. Estimates for new options were calculated by proportioning flows for similar facilities.

5.0 REVISED COSTS FOR SCREENED ALTERNATIVES

5.1 Updated Costs from Nut Island Site Options Study (1982)

In reviewing the preliminary component list and associated cost estimates (as shown in Table 12.4-3) for the various options being considered in the SDEIS, it was not feasible to study each of the more than twenty alternatives in detail. Therefore, as described in previous sections of this report, initial review focused only on updating of these costs from the previous MDC study or developing comparable facility costs where necessary with minimal recosting of components. The costs developed in the MDC Nut Island Site Options Study (1982) were, therefore, accepted as reasonable at this stage of preliminary analysis. These were found, moreover, to be comparable within treatment levels and thus not a major screening criteria.

5.2 Use of EXEC/OP Computer Model for Verification

Once the alternatives were screened down to eight options--four primary and four secondary--more detailed analysis and verification of the cost estimates could proceed. One method of cost verification used was a computer model entitled "EXEC/OP". This model was applied to develop independent, hypothetical construction costs for the key unit processes involved in both primary and secondary treatment facilities. The model was developed by the EPA Municipal Environmental Research Laboratory in Cincinnati and utilized as its basis the experience of more than sixty separate treatment facilities across the country (see Bibliography). EXEC/OP was used to compare such treatment component costs as settling tanks, digesters, thickeners, and screening/degritting facilities. It was also considered for site-specific issues like foundation work, excavation, and energy costs. Odor control, sludge disposal, and land acquisition was not an output of the model.

The first step in using EXEC/OP is the preparation of a multi-option flow diagram of the system being analyzed. Such a typical multi-option flow diagram is shown in Figure 12.4-2.

From this, the EXEC/OP model then develops costs based on data from selected recently built treatment plants in the U.S. Costs are developed using input such as current construction cost index (ENR 4200 used), wholesale price index, interest rate (a rate of 8-1/8% was used), and cost escalator for engineering and contingencies (a rate of 35% was used). Other input parameters include flow quantity plus wastewater quality indicators such as BOD_5, suspended solids, nitrogen, phosphorus, and alkalinity. While these latter inputs can vary, the parameters applied were not expected to significantly affect the basic focus of comparing such hypothetical costs with the estimates made in the MDC study.

EXEC/OP can be utilized in two ways. When the specific unit processes at a location are known, the model can supply a detailed performance report of the facility in terms of facility output in volume or costs or energy produced. If, however, it is questionable as to the benefits of utilizing a particular unit process, or if two processes are to be compared, EXEC/OP will select the combination of unit processes that best meets a stipulated set of prioritized criteria of cost, energy, land utilization, a subjective index of system desirability, and/or effluent quality. Sample outputs of both of these situations are shown in Attachments 2 and 3. These are provided as examples of the model's output only. Not every value derived from EXEC/OP is applicable to the costing process.

Because the basis of the EXEC/OP model was treatment facilities between 1 and 100 MGD of flow and since not all components identified by the MDC study are covered by EXEC/OP, it was decided to apply the model solely as a method of initial cost comparison with the MDC facility costs. None of the other performance parameters of EXEC/OP were considered, although, as the examples of the model's output show, these are readily produced and provide useful indications of a facility's performance.

While some bias in results may be introduced from the case studies used in the model due to their smaller size (composed to the MDC system), the application of a cost comparison based on unit processes should, it was felt, still provide reasonably comparable costs for the process components being compared. It should be pointed out, moreover, that cost graphs developed for the wastewater treatment facilities which were the basis of the model, showed that facility process costs become linear for plants over 20 MGD. Therefore, the assumption of the model's applicability to larger facilities was considered valid.

TYPICAL MULTI-OPTION FLOW DIAGRAM

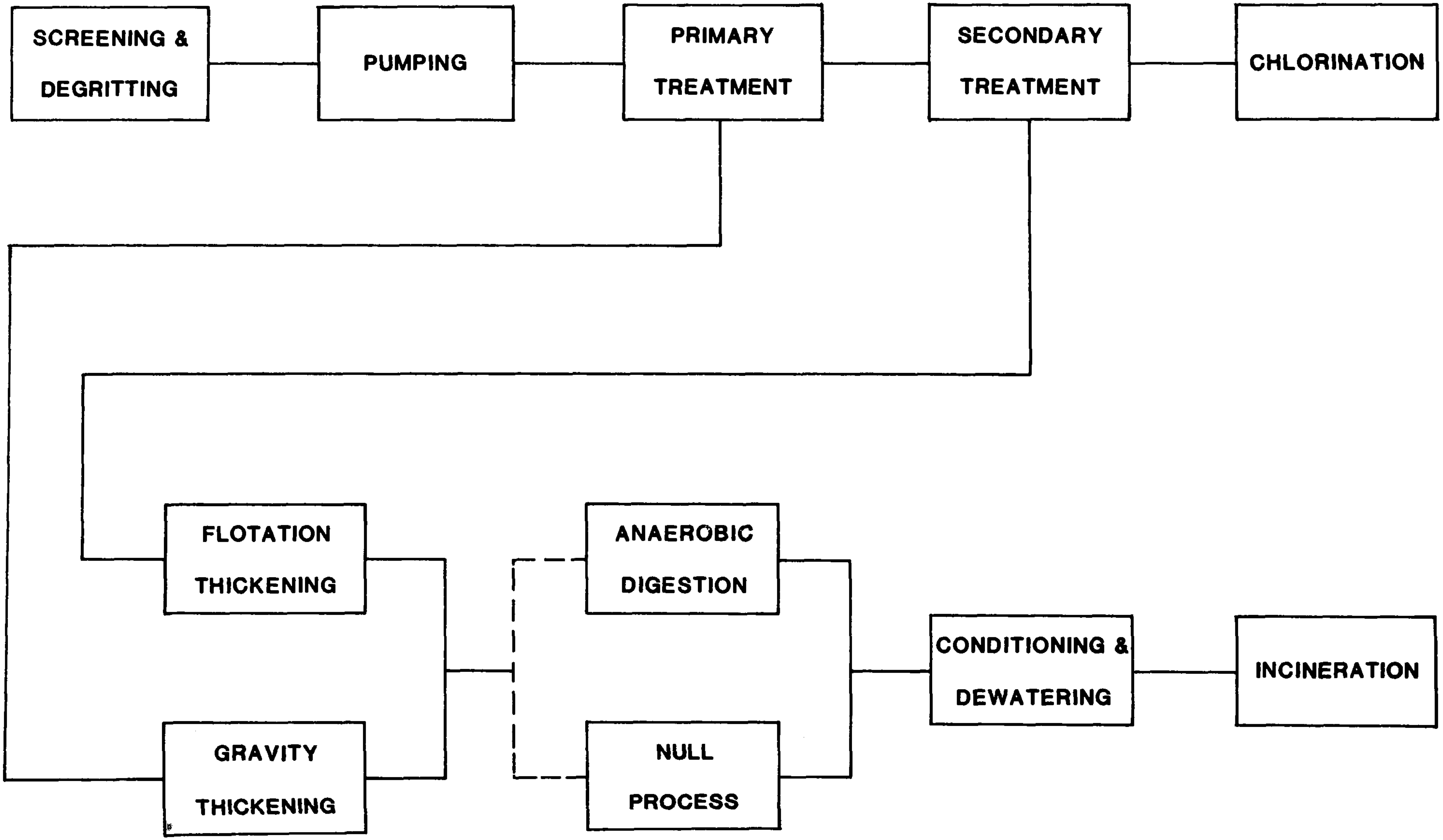


Figure 12.4-2

Utilizing the model, cost comparisons were generated for the facility process components as noted above. In most cases, the costs provided from EXEC/OP were within a reasonable range (about 25%) of the original cost estimates from the MDC study. Where the updated MDC costs were within this range, the figures derived from the MDC Nut Island Site Options Study (1982) were utilized. In a few cases, however, the variation between the two cost sources was greater than this limit indicating the need for additional review and clarification from the MDC and their consultants, as well as further verification of costs from other sources.

5.3 Survey of Existing Facilities and Other Sources

As a follow-up to the EXEC/OP model, several telephone surveys were made of other secondary and primary facilities to establish their actual construction costs for the most significant discrepancies found to exist. One item that was signalled by the comparison with EXEC/OP to be a significant discrepancy involved the costs of secondary sedimentation tanks. The information compiled from the survey of treatment plants (most of which varied in size, yet were smaller than the proposed 500 MGD plant of the MDC) indicated a range of consistent and comparable costs well below the initial MDC estimates. A summary of these costs are as follows:

Facility Location	Primary (P) or Secondary (S) Flow in MGD	Secondary Settling Tank Unit Cost 1984
Providence, R.I.	210P, 77 S	$ 40/Sq. Ft.
Meriden, Conn.	10 S	$ 51/Sq. Ft.
Philadelphia, Pa.	210 S	$ 89/Sq. Ft.
1978 EPA DEIS (Greeley & Hansen)	500 S	$112/Sq. Ft.
1982 MDC Site Options Study (Metcalf & Eddy)	500 S	$230/Sq. Ft.

Recognizing the variability of these facilities, their characteristics, and their construction costs, it is possible, nonetheless, to consider the range of costs shown above versus the significantly higher magnitude of costs represented by the costs estimated for the MDC. The range of costs for other plants did include projects with unique construction and siting problems which resulted in higher costs than usual at the cited facilities. A higher cost approaching the cost developed in MDC Nut Island Site Options Study (1982) may, in fact, be generated when such factors as barging, construction schedule delays, other special contingencies, or mitigation measures are applied to the costs of the project overall. However, it was deemed not appropriate to include such outside costs in the preliminary estimate of costs for sedimentation tanks. Any such additional cost factors should be factored in separately to show their specific influence on costs at all levels of treatment.

Based on a review of the information available, it was estimated that a total cost of $241.5 million for secondary treatment be used. This estimated total cost is derived from the data developed in the 1978 EPA Draft EIS based on secondary sedimentation tanks valued at $116.5 million (updated costs equal to $112/sq. ft.) and aeration tanks and blower building valued at $125 million. The costs utilized for settling tanks are derived from an established method of engineering estimating which independently sizes the tanks, their volume of concrete and steel, and cost per cubic yard. The costs for aeration tanks and blower building remain consistent with the estimates from the MDC Nut Island Site Options Study (1982).

In addition to this source, other component costs considered to be a significant variation were reexamined. Such costs were revised utilizing similar engineering approaches as noted above for the sedimentation tanks as well as established cost tables (see Bibliography). The specific components thus revised are discussed in the following section.

5.4 Revised Cost Estimates

Based on the reanalysis and revision of costs conducted at this time for the remaining eight options, as described above, a set of "revised" preliminary costs was developed. Table 12.4-5 presents these costs consolidated for all sources utilized. Attachment 1 at the end of this section lists the assumptions used in developing these revised cost estimates. Table 12.4-1 (noted previously) uses these revised construction costs, adds annual O&M costs, and calculates present worth for these eight options. As apparent from a comparison of the initially updated MDC costs and the revised costs, MDC derived costs were used for the most part in the SDEIS with only a few instances of revised costs developed from other sources.

Upon comparison of EXEC/OP cost estimates with those updated from the MDC Nut Island Site Options Study (1982), several component categories were found to vary. Chief among these were the following: prechlorination, screening and degritting, influent pumping, secondary sedimentation tanks, digestion, flotation thickening, and effluent pumping. Upon consideration of the reasons for these variations, it was determined that the EXEC/OP figure or some other available cost basis (see Bibliography) was a more reasonable estimate. For example, the following factors influenced the revision of costs in some of the more significant component categories:

> Influent and Effluent Pumping, Prechlorination - The costs from the MDC study included "credit" for reuse of existing treatment facilities. In order to maintain consistency among siting options at the initial stages of analysis, such site-specific influences (as well as others) were not included as part of the option capital costs. It was assumed for comparative purposes that all sites would be evaluated on an equalized facility cost basis.
>
> Upon further revision to the remaining options, this assumption was dropped in order to reflect the actual site conditions existing at each location so that the assessment of impacts by option could be made, for this smallet set of

TABLE 12.4-5

	Revised Capital Costs (Mill $)[1]			
	Option 1a.2		Option 1b.2	
	Deer	Nut	Deer	Nut
Prechlorination*	3.43	1.47	3.43	1.47
Screen & Degrit*	1.86	9.94	1.86	9.94
Influent Pumping	29.68	--	29.68	2.99
Primary Settling	30.05	--	18.03	17.92
Gravity Thickeners[2]	3.51	--	2.92	1.17
Anaerobic Digesters[2]	22.06	--	12.92	--
Gas Storage[2]	3.15	--	3.15	--
Secondary Settling*	116.38	--	116.38	--
Aeration	80.32	--	80.32	--
Blower Building	44.74	--	44.74	--
Chlorination	17.11	--	17.11	--
Piers*	11.81	--	11.81	12.49
Tunnels	--	82.82	--	82.82
Outfalls	47.72	--	47.72	--
Channels & Dikes	3.14	.28	3.14	6.30
Power to Site	--	1.77	--	1.97
Demolition	--	2.84	--	1.58
Remove Unsuitables	27.35	--	26.51	--
Generators & Bldg.	8.15	--	1.22	6.40
Admin. Bldg.	7.56	--	6.62	4.44
Effluent Pumping*	10.00	--	10.00	--
Misc. Civil	.76	--	.71	--
Earth Fill	--	--	--	2.44
Foundations	--	--	--	15.73
Land	2.08	--	2.08	--
Odor Control	17.07	.74	17.07	17.81
Scum Incinerator	7.25	--	3.62	3.89
Subtotal by Site	495.18	99.86	461.04	189.36
Option Total	595.04		650.40	

Table 12.4-5 (cont.)

	Option 2b.1			Option 2b.3		
	Deer	Nut	Long	Deer	Nut	Long
Prechlorination*	3.43	1.47	--	3.43	1.47	--
Screen & Degrit*	1.86	9.94	--	1.86	9.94	--
Influent Pumping	16.88	--	10.43	16.88	--	37.59
Primary Settling	--	--	45.08	18.03	--	17.92
Gravity Thickeners[2]	--	--	4.68	2.34	--	1.17
Anaerobic Digesters[2]	--	--	33.09	12.92	--	12.92
Gas Storage[2]	--	--	3.15	3.15	--	3.15
Secondary Settling*	--	--	116.38	--	--	116.38
Aeration	--	--	80.32	--	--	80.32
Blower Building	--	--	44.74	--	--	44.74
Chlorination	--	--	17.11	--	--	17.11
Piers*	--	--	13.93	11.81	--	13.93
Tunnels	68.16	46.46	--	68.16	46.46	--
Outfalls	--	--	91.86	--	--	91.86
Channels & Dikes	.64	.28	11.12	1.26	.28	11.12
Power to Site	--	1.77	--	--	1.77	--
Demolition	6.61	2.84	--	--	2.84	--
Remove Unsuitables	--	--	2.23	1.46	--	.97
Generators & Bldg.	--	--	8.15	--	--	6.93
Admin. Bldg.	--	--	8.98	--	--	8.98
Effluent Pumping*	--	--	10.00	--	--	10.00
Misc. Civil	--	--	.63	.41	--	.63
Earth Fill	--	--	4.68	--	--	2.01
Foundations	--	--	11.36	--	--	11.36
Land	--	--	2.45	--	--	2.38
Odor Control	.22	.74	17.07	17.07	.74	17.07
Scum Incinerator	--	--	7.25	3.62	--	3.89
Subtotal by Site	97.8	63.50	544.68	162.40	63.50	512.43
Option Total		705.98			738.33	

Table 12.4-5 (cont.)

	Option 4a.2		Option 4b.2	
	Deer	Nut	Deer	Nut
Prechlorination*	3.43	1.47	3.43	1.47
Screen & Degrit*	1.86	9.94	1.86	9.94
Influent Pumping	29.68	--	29.68	2.99
Primary Settling	30.05	--	18.03	17.92
Gravity Thickeners[2]	3.51	--	2.34	1.17
Anaerobic Digesters[2]	22.06	--	12.92	--
Gas Storage[2]	3.15	--	3.15	--
Secondary Settling*	--	--	--	--
Aeration	--	--	--	--
Blower Building	--	--	--	--
Chlorination	10.19	--	9.59	--
Piers*	11.81	--	11.81	12.49
Tunnels	--	82.82	--	77.43
Outfalls	479.50	--	479.50	--
Channels & Dikes	1.52	.28	1.26	6.30
Power to Site	2.36	1.77	2.36	1.77
Demolition	--	2.84	--	1.58
Remove Unsuitables	2.19	--	1.36	--
Generators & Bldg.	8.15	--	1.22	6.40
Admin. Bldg.	6.62	--	5.67	4.44
Effluent Pumping*	10.50	--	10.50	--
Misc. Civil	--	.39	.16	--
Earth Fill	--	--	--	2.44
Foundations	--	--	--	15.73
Land	.84	--	.61	--
Odor Control	17.07	.74	17.07	17.81
Scum Incinerator	7.25	--	3.62	3.89
Subtotal by Site	651.74	100.25	626.45	183.77
Option Total	751.99		810.22	

Table 12.4-5 (cont.)

	Option 5a.2			Option 5b.2		
	Deer	Nut	Long	Deer	Nut	Long
Prechlorination*	3.43	1.47	--	3.43	1.47	--
Screen & Degrit*	1.86	9.94	--	1.86	9.94	--
Influent Pumping	29.68	--	10.43	16.88	--	10.43
Primary Settling	18.03	--	17.92	--	--	45.08
Gravity Thickeners[2]	2.34	--	1.17	--	--	4.68
Anaerobic Digesters[2]	12.92	--	12.92	--	--	33.09
Gas Storage[2]	3.15	--	3.15	--	--	3.15
Secondary Settling*	--	--	--	--	--	--
Aeration	--	--	--	--	--	--
Blower Building	--	--	--	--	--	--
Chlorination	9.59	--	--	--	--	10.19
Piers*	11.81	--	13.93	--	--	13.93
Tunnels	--	46.46	36.05	68.16	46.46	--
Outfalls	479.50	--	--	--	--	518.50*
Channels & Dikes	1.26	.28	1.25	.64	.28	11.12
Power to Site	2.36	1.77	--	--	1.77	--
Demolition	--	2.84	--	6.61	2.84	--
Remove Unsuitables	1.36	--	.49	--	--	1.14
Generators & Bldg.	1.22	--	6.93	--	--	6.93
Admin. Bldg.	5.67	--	6.62	--	--	6.62
Effluent Pumping*	10.50	--	--	--	--	10.50
Misc. Civil	.39	--	.16	--	--	.37
Earth Fill	--	--	1.00	--	--	2.34
Foundations	--	--	2.85	--	--	6.64
Land	.61	--	.53	--	--	1.23
Odor Control	17.07	.74	17.07	.22	74	17.07
Scum Incinerator	3.62	--	3.89	--	--	7.25
Subtotal by Site	616.37	63.50	136.36	97.8	63.50	710.25
Option Total		816.23			871.55	

*Based on longer distance from LI site.

Notes

*These costs were revised based on initial review of EXEC/OP estimates followed by verification or substitution using other sources including recent construction costs. (see Bibliography). In most cases, revisions to costs applied consistently across all options within a treatment level so that no significant alterations to the siting criteria resulted.

[1]Costs originally estimated in the MDC Nut Island Site Options Study (1982) for sludge disposal facilities (and shwon in Table 12.4-3) are no longer being carried due to the lack of a sludge management decision at this time. Sludge planning is ongoing. of sludge options being conducted by the Commonwealth. These costs will be estimated separately under a sludge management facility plan and environmental impact assessment.

[2]Digestion equipment and associated components may not be required under a composting method of sludge disposal, but may be used in other sludge disposal methods being considered by the State. Costing of digestion and related other components in this analysis is based on the conclusions in MDC Site Options Study (1982).

Source: CE MAGUIRE, INC. (October 12, 1984).

possible alternatives, including all reasonable characteristics and conditions that would apply to a siting location.

- Secondary Settling - A major difference in the estimate of the cost of secondary settling tanks is a result of differing cost factors as described in the previous section. As a result of further analysis, a revised cost was arrived at.

- Piers--These costs were increased at Nut Island to reflect the view that added dredging would be needed due to the shallower depths encountered there.

- Screening and Degritting--The original estimates were found to be somewhat lower than other sources indicated were appropriate. This difference was relatively small overall; however, to maintain consistency, the costs were adjusted.

- Odor Control--The MDC Site Options Study (1982) did not include odor control equipment at either Deer Island or Long Island treatment facilities. Such available design measures as covered headworks and enclosed digester operations with ventilation blowers to capture escaping gases were not uniformaly applied at all sites. It was concluded, for purposes of the SDEIS analysis, that odor control must be a feature of all options at every location, and these costs were factored into the estimates.

In addition, several component categories costed originally in the MDC Site Options Study (1982) and carried in the initial SDEIS cost update (Table 12.4-3), were found to be inconsistent because they no longer would be required under some of the sludge disposal choices based on the Commonwealth's newly proposed sludge disposal plan. This resulted in further interim revisions to costs from the preliminary SDEIS figures initially developed.

For example, if composting were selected as the method of sludge disposal, sludge thickening, digestion, and gas storage facilities may not be required (although it may occur if proven to be cost effective). While if incineration were used digestion would only occur under primary treatment options. Therefore, final cost estimates for the options including sludge handling and disposal will vary according to the sludge disposal method to be selected. At this stage for the SDEIS analysis, preliminary costs for each of the wastewater treatment alternatives does not include sludge handling and disposal methods. Costs for sludge processing and disposal will be developed separately by the MDC in upcoming facility planning.

At this stage of the analysis, as the figures (in current dollars) summarized in Table 12.4-1 show, the primary treatment options are estimated to cost between $752 million and $872 million; the secondary treatment options are estimated to cost between $595 million and $738 million. Present worth values, combining annual O, M & R costs with the amortized construction debt payback are estimated to be between $1,019 million and $1,255 million for secondary options, and between $957 million and $1,081 million for primary options.

This range of costs should not be compared between treatment levels since, as has been stated from the outset of this project, the decision on whether secondary or primary treatment would be required rests solely with the review by EPA of the MDC's 301(h) waiver application. However, some clarification of these estimated costs is needed.

The significant reduction in secondary treatment costs for all options from those shown in Table 12.4-3 was a result primarily of: reduction of estimated costs for secondary sedimentation tanks as noted in the previous section. By comparison, primary treatment costs were not reduced since the question of sedimentation tank costs did not affect the primary options. Additionally, the costs of a long outfall--estimated to be $480 million -- which affected only the primary options was further increased late in the SDEIS analysis as a result of the MDC extending the outfall location from 7 to 9 miles.

It must be remembered that the capital costs for any of the options will increase from those presented in Table 12.4-5 by the added costs of sludge disposal facilities involving either composting, incineration, ocean disposal, landfilling, or some combination of these. Likewise, there will be added contingency costs, in some cases amounting to significant amounts, from the need to barge equipment and materials, provide shuttle bus service for workers, provide noise mitigation measures, or otherwise mitigate potential adverse impacts during facility construction and operations.

For the purposes of the SDEIS analysis, the costs presented in Table 12.4-5 are intended to reflect updated and revised facility capital costs developed consistently across all sites and consistent with the assumptions noted in Attachment 1. Such a baseline analysis was a necessary preparation for the SDEIS in order to verify the costs presented in MDC Site Options Study (1982), establish a consistent and reasonable cost basis for all options being studied in detail, and provide a framework for the impact assessment.

5.5 Revised O & M Costs

The operations and maintenance costs shown in Table 12.4-6, following, reflect a combination of factors. Costs shown for the seven options selected following the screening process are final estimates based on further analysis made of the operational conditions under each remaining alternative. In particular, staffing levels and power costs were refined to reflect more accurately the likely conditions at each site under each of the alternatives. The costs shown for the last primary option (5b.2) which is not under active consideration at this time are those developed as part of the initial screening review.

TABLE 12.4-6

O,M&R COSTS (Thousands of Dollars)

Option	1a.2		1b.2		2b.1			2b.3		
	Deer	Nut	Deer	Nut	Deer	Nut	Long	Deer	Nut	Long
LABOR										
#Staff	227	20	215	83	34	20	219	118	20	209
$1000/yr.	$6,872	$607	$6,522	$2,518	$1,031	$607	$6,629	$3,579	$607	$6,340
CHLORINE										
Tons/yr.	7,010	1,370	7,010	1,370	3,196	1,370	3,811	3,196	1,370	2,806
$1000/yr.	$2,454	$480	$2,454	$480	$1,120	$480	$1,334	$1,120	$480	$982
POWER										
1000 Kw. Hr/Mo	23,760	90	23,620	170	5,450	90	18,560	9,120	90	20,650
$1000/yr	$24,700	$279	$24,382	$363	$5,664	$279	$19,288	$9,478	$279	$21,460
MAT'LS & SUPP.										
$1000/yr	$1,353	$212	$1,320	$512	$319	$212	$1,035	$807	$212	$1,145
Subtotal by Site $1000/yr.	$35,379	$1,578	$34,678	$3,873	$8,134	$1,578	$28,286	$14,984	$1,578	$29,927
Option Sub-Total	$36,957		$38,551		$37,998			$46,489		
Solids Handling	6,633		6,633		6,633			6,633		
Total	$43,590		$45,184		$44,631			$53,122		

O,M&R COSTS (Continued)

Option	4a.2		4b.2		5a.2			5b.2		
	Deer	Nut	Deer	Nut	Deer	Nut	Long	Deer	Nut	Long
LABOR										
# Staff	136	20	118	83	118	20	63	34	20	102
$1000/yr	$4,125	$607	$3,579	$2,518	$3,579	$607	$1,911	$1,031	$607	$3,093
CHLORINE										
Tons/yr	7,762	1,370	6,392	2,740	6,392	1,370	1,370	3,196	1,370	4,566
$1000/64	$2,717	$480	$2,237	$959	$2,237	$480	$480	$1,120	$480	$1,598
POWER										
1000 Kw-hr/mo	9,380	90	8,480	170	8,480	90	740	5,450	90	4,180
$1000/yr	$9,423	$279	$8,633	$363	$8,633	$279	$1,598	$5,559	$279	$4,264
MAT'LS & SUPP.										
$1000/yr	$995	$203	$933	$512	$933	$203	$300	$319	$203	$677
Subtotal by Site										
$1000/yr	$17,260	$1,569	$15,382	$4352	$15,382	$1,569	$4,289	$8,029	$1,569	$9,632
Option Sub-Total	$18,829		$19,734		$21,240			$19,230		
Solids Handling	2,275		2,275		2,275			2,275		
Total	$21,104		$22,009		$23,515			$21,505		

Source: CE Maguire, Inc. (Revised October 12, 1984)

5.6 Costs to be Developed During Final Facility Design

The types of capital and O,M&R costs involving wastewater treatment facilities siting to be developed further involve several key parameters. Foremost among these is the estimate of costs for the sludge management and disposal options being considered by the Commonwealth. Final costs of sludge disposal will be made as part of an upcoming MDC facility plan and EPA supplemental environmental review. The SDEIS has considered the effects of each sludge option as it may influence siting of treatment plants and has found sludge siting issues not to be a determinant in siting of treatment plants.

Other costs have been considered, but are not incorporated to the capital costs of alternatives in the SDEIS. These include such things as barging operations to reduce the need for trucking through local communities and busing of construction workers to minimize auto traffic. Possible mitigation measures may include roadway repaving or new traffic signals, added roadway safety measures, possible financial compensation for direct impacts to local communities, improvements to land areas around the treatment plants afforded by buffer areas and screening, possible varied construction schedules and added noise mitigation, or other special measures which may also be applied to the project and would add to the overall costs.

Another unresolved issue that will be studied as part of the facility final design and may alter cost estimates is the method of disinfection applied to wastewater. Current practice of the MDC involves the addition of chlorine to wastewater both prior to treatment, to control odors, and following treatment, to further disinfect prior to discharge. This current practice requires the regular delivery by truck of chlorine gas to both existing treatment plants. Concerns about potential safety problems during truck delivery through local neighborhoods and onsite storage of chlorine gas have been raised by local residents, and have led to consideration of other possible alternative methods for disinfection.

One such method examined is the onsite production of sodium hypochlorite. Using preliminary information developed by the MDC's facility planners (Havens & Emerson, Draft Deer Island Facility Plan, 1984) it was found that this alternative offended several advantages over chlorine gas, notably in terms of elimination of the trucking and storage safety issues. Such a system would essentially be an onsite generation process to manufacture sodium hypochlorite (NaOCl) at the site of treatment facilities. In the case of consolidated treatment facilities, this system would be located at one location; however, it would be developed for split systems. The chief comparative differences of this process are its potentially higher capital costs (depending upon the specific process components and number of facilities), and its associated greater O&M costs (particularly for power), compared to chlorine use. However, the magnitude of difference must be more carefully analyzed for the particular process components, dosage requirements, and operational elements under each alternative method. These details will be examined during the final design stage of treatment facility design and will alter the final facility costs (capital and O,M&R) for the project.

Attachment 1

ASSUMPTIONS MADE IN COSTING THE ALTERNATIVES

1. MDC Nut Island Site Options Study (1982) prepared by Metcalf & Eddy, Inc., hereafter referred to as the Site Options Study, is the basis for the preliminary engineering and cost analysis carried out by CE Maguire, Inc. in the initial review of available information leading to the first-tier screening of alternatives. All inherent assumptions and engineering factors used in the MDC's facility planning for the sites considered by their consultants are maintained in the assessment of new sites and/or facilities with the exceptions noted below.

2. Capital costs developed by the MDC's facility planner, as presented in Section 7 of the Site Options Study (and appearing in Table 7-12) which utilized an ENR of 3600, have been updated to an ENR of 4200.

3. For alternatives being considered which were also considered previously (by MDC or EPA), the approach used was to review the basic engineering and cost parameters presented in order to verify available criteria and assumptions utilized previously. Once accepted, these factors were updated as necessary and then utilized to develop the list of both previous and new alternatives.

4. Construction costs utilized are based on wastewater flow volumes and capacities developed for the MDC in the Site Options Study; any changes to the assumptions on volumes and capacities for treatment facilities will affect those costs accordingly either up or down.

5. Costing of facilities associated with new options assumes that construction of similar treatment facilities at different locations will be of a comparable nature; no abnormal variations in surface/subsoil/geologic conditions or other factors are factored in unless these are stated in the Site Options Study or became

known in the impact analysis for the SDEIS. Any such variations, if identified, are factored into the cost analysis.

6. Costs for power to the site of treatment facilities is developed based on the criteria used in the Site Options Study.

7. Costs utilized for channels, and dikes in all alternatives where applicable are based on conservative costs developed and presented in the Site Options Study for these construction elements.

8. Inter-island tunnel costs for transport of effluent were developed from Site Options Study based on a unit cost of appproximately $3,200/ft for 10-foot diameter and $6,050/ft for 16-foot diameter tunnels. These costs will be updated in the SDEIS cost analysis.

9. Construction costs of new facilities on Long Island assume no additional costs for foundation preparation beyond those utilized in Site Options Study.

10. Costs do not reflect any additional land acquisition costs, should these prove necessary, beyond those assumed the Deer Island and Long Island in the Site Options Study.

11. Costs do not include major movement of materials by barge (based on assumptions in Site Options Study) as now is being required; they also do not include movement of personnel by shuttle bus.

12. Assumptions on manpower and staffing contained in the Site Options Study have been maintained in the update of alternatives; staffing levels for headworks/pump station at Deer Island were further revised to reflect current MDC staffing levels.

13. Assumptions in the Site Options Study regarding staff vehicle trips and construction worker vehicle trips are maintained in the analysis carried out for the screening. Similarly, construction truck trips per day are carried forward based on the presentations

in the MDC study, and are the basis for developing a barge alternative which now eliminates most of the prior trucking assumptions.

14. Costs for chlorine contact tanks are carried forward from the Site Options Study based on the apparent facility criteria utilized.

15. Costs for chlorine (annual) are likewise carried forward based on the assumptions presented in the MDC study; however, there is an apparent inconsistency in the unit cost factor used by the facility planner which has been adjusted to be consistent with the volumes presented.

16. Digestion costs were accepted as reasonable for purposes of this analysis, however, these would not be expected to result under a composting sludge disposal method, or for processing of secondary sludge.

17. Revised costs shown for process components (denoted by a * in the table) refect a variety of outside sources including equipment manufacturers, existing facility costs, and modelling analysis as noted in the body of this report. For the most part, costs developed for the MDC by Metcalf & Eddy, Inc. were found to be reasonable and based on sound engineering judgement.

ATTACHMENT 2

```
**************
*            *
*   EXEC/OP  *
*            *
* VERSION 1.2 *
*            *
**************
```

EXECUTIVE PROGRAM
(OPTIMIZATION VERSION)
FOR
PRELIMINARY SYNTHESIS OF WASTE TREATMENT SYSTEMS

U.S. ENVIRONMENTAL PROTECTION AGENCY
MUNICIPAL ENVIRONMENTAL RESEARCH LABORATORY
SYSTEMS AND ECONOMIC ANALYSIS SECTION
CINCINNATI, OHIO 45268

```
**********************************************************************************
*                                                                                *
* OPTION 1B & 4B.2  - NUT ISLAND PRIMARY                                         *
*                                                                                *
**********************************************************************************
```

PROCESS ALTERNATIVES

OPTION NO.	PROCESS NO.	STAGE NO.	SIDESTREAM DESTINATION	REMARKS
1	12	1	5	PRECHLORINATION
2	1	2	5	PRELIMINARY TREATMENT
3	15	3	5	RAW WASTEWATER PUMPING
4	2	4	5	PRIMARY SEDIMENTATION
5	8	5	4	GRAVITY THICKENING
6	6	6	4	DIGESTION OF PRIMARY SLUDGE

EFFLUENT DISCHARGE STANDARDS

5-DAY BOD, MG/L	200.00
SUSPENDED SOLIDS, MG/L	200.00
AMMONIA - N, MG/L	10000.00
NITRATE - N, MG/L	10000.00
PHOSPHORUS, MG/L	10000.00

SELECTION CRITERIA

	CRITERION	WEIGHT	LIMIT
1	INITIAL CONSTR. COST, M$	00	10000.00
2.	ANNUAL O & M COST, $/MG	00	100000.00
3.	TOTAL ANNUAL COST, $/MG	1 00	100000.00
4.	ENERGY CONSUMED, KWH/MG	00	10000.00
5.	ENERGY PRODUCED, KWH/MG	00	00
6.	NET ENERGY CONSUMED, KWH/MG	00	10000.00
7	LAND REQUIRED, ACRES	00	10000.00
8.	UNDESIREABILITY INDEX	00	10000.00

ECONOMIC DATA

CONSTRUCTION COST INDEX	2.1770
WHOLESALE PRICE INDEX	3.0630
DIRECT HOURLY WAGE, $/HR	45.0000
FRACTION CHARGED TO INDIRECT WAGES	.6667
COST ESCALATOR FOR MISC. FEES	1.3500
COST OF ELECTRICITY, $/KWH	.0720
BTU TO KWH CONVERSION EFF	.0900
DISCOUNT RATE	.0812
CAPITAL RECOVERY FACTOR	1028

STAGE NO.	PROCESS OPTION	SLUDGE TONS/DAY	CONSTR COST M$	ANN O&M COST $/MG	TOTAL ANN COST $/MG	ENER USE KWH/MG	ENER PROD KWH/MG	NET ENER KWH/MG	LAND REQD ACRES	UNDESIRE-ABILITY
1 Prechlor	1	.00	1 4699	38.26	41.02	34.71	00	34.71	00	.00
2 Scr + Degr	2	.00	3.2734	37.38	43.52	1.74	00	1.74	00	.00
3 Pump	3	.00	23.7575	12.14	56.75	42.85	00	42.85	00	.00
4 Primary	4	91 12	7.8493	21 10	35.83	7.64	.00	7.64	00	.00
5 Grav	5	91.12	.6822	1.84	3.12	.26	00	.26	00	.00
6 Dig	6	88.38	11.9435	29.87	52.29	111.71	459.01	-347.30	00	00
SYSTEM VALUES		91 12	48.98	140.58	232.54	198.91	459.01	-260.09	.00	00

PRIMARY AND SECONDARY SLUDGES MIXED AT STAGE 15

PROCESS PERFORMANCE CHARACTERISTICS

VOLUME FLOW, MGD
CONCENTRATION, MG/L
CONSULT PROGRAM REFERENCE MANUAL FOR MEANING OF PROCESS INPUT AND OUTPUT DESIGN DATA.

STAGE 1 PROCESS OPTION 1

INPUT DESIGN DATA:

1	2	3	4	5	6	7	8
12.000	.500	320.000	.000	.000	.000	.000	.000
9	10	11	12	13	14	15	16
.000	.000	.000	.000	.000	.000	2.070	1.000

OUTPUT DESIGN DATA:

1	2	3	4	5	6	7	8	9	10
6963.013	2736.405	.000	.000	.000	.000	.000	.000	.000	.000
11	12	13	14	15	16	17	18	19	20
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

INFLUENT / EFFLUENT / SIDESTREAM CHARACTERISTICS:

	Q	SOC	SNBC	SON	SOP	SFM	SBOD	VSS	TSS
INFLUENT:	150.000	105.000	30.000	15.000	3.000	55.000	150.000	205.000	220.000
EFFLUENT:	150.000	105.000	30.000	15.000	3.000	55.000	150.000	205.000	220.000
SIDESTRM:	.000	.000	.000	.000	.000	.000	.000	.000	.000
	DOC	DNBC	DN	DP	DFM	ALK	DBOD	NH3	NO3
INFLUENT:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	.000
EFFLUENT:	43.000	11 000	25.000	5.000	300.000	100.000	55.000	25.000	.000
SIDESTRM:	.000	.000	.000	.000	.000	.000	.000	.000	.000

STAGE 2 PROCESS OPTION 2

INPUT DESIGN DATA:

1	2	3	4	5	6	7	8
1.000	.000	.000	.000	.000	.000	.000	.000
9	10	11	12	13	14	15	16
.000	.000	.000	.000	.000	.000	.000	2.070

OUTPUT DESIGN DATA:

1	2	3	4	5	6	7	8	9	10
.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
11	12	13	14	15	16	17	18	19	20
.000	.000	.000	.000	.000	.000	000	.000	.000	.000

INFLUENT / EFFLUENT / SIDESTREAM CHARACTERISTICS:

	Q	SOC	SNBC	SON	SOP	SFM	SBOD	VSS	TSS
INFLUENT:	150.000	105.000	30.000	15.000	3.000	55.000	150.000	205.000	220.000
EFFLUENT:	150.000	105.000	30.000	15.000	3.000	55.000	150.000	205.000	220.000
SIDESTRM:	.000	.000	.000	.000	.000	000	.000	.000	.000
	DOC	DNBC	DN	DP	DFM	ALK	DBOD	NH3	NO3
INFLUENT:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	.000
EFFLUENT:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	000
SIDESTRM:	.000	.000	.000	.000	.000	.000	.000	.000	000

STAGE 3 PROCESS OPTION 3

INPUT DESIGN DATA:

1	2	3	4	5	6	7	8
10.200	.000	.000	.000	.000	000	.000	.000
9	10	11	12	13	14	15	16
.000	.000	.000	.000	000	.000	.000	2.600

OUTPUT DESIGN DATA:

1	2	3	4	5	6	7	8	9	10
178.823	.000	.000	.000	.000	.000	.000	.000	.000	.000
11	12	13	14	15	16	17	18	19	20
.000	.000	.000	.000	.000	.000	000	.000	.000	.000

INFLUENT / EFFLUENT / SIDESTREAM CHARACTERISTICS:

	Q	SOC	SNBC	SON	SOP	SFM	SBOD	VSS	TSS
INFLUENT:	150.000	105.000	30.000	15.000	3.000	55.000	150.000	205.000	220.000
EFFLUENT:	150.811	106.512	30.432	15.216	3.043	55.792	152.160	207.952	223.168
SIDESTRM:	.000	.000	.000	.000	.000	.000	.000	.000	.000
	DOC	DNBC	DN	DP	DFM	ALK	DBOD	NH3	NO3
INFLUENT:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	.000
EFFLUENT:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	.000
SIDESTRM:	.000	.000	.000	.000	000	.000	.000	.000	.000

STAGE 4 PROCESS OPTION 4

NOTE: INFLUENT (EFFLUENT FROM PREVIOUS STAGE) INCLUDES RETURN SIDESTREAMS FROM SLUDGE TREATMENT

INPUT DESIGN DATA:

1	2	3	4	5	6	7	8
.650	2.000	168.000	.000	.000	.000	.000	.000
9	10	11	12	13	14	15	16
000	000	000	.000	.000	000	2.400	1.000

OUTPUT DESIGN DATA:

1	2	3	4	5	6	7	8	9	10
645.876	233.498	1823.036	.000	.000	.000	.000	.000	.000	.000
11	12	13	14	15	16	17	18	19	20
.000	.000	000	000	.000	.000	000	000	.000	000

INFLUENT / EFFLUENT SIDESTREAM CHARACTERISTICS:

	Q	SOC	SNBC	SON	SOP	SFM	SBOD	VSS	TSS
INFLUENT:	150.811	106.512	30.432	15.216	3.043	55.792	152.160	207.952	223.168
EFFLUENT:	149.717	37.551	10.729	5.365	1.073	19.670	53.645	73.315	78.679
SIDESTRM:	1.094	9545.455	2727.273	1363.637	272.727	5000.001	13636.367	18636.367	20000.004
	DOC	DNBC	DN	DP	DFM	ALK	DBOD	NH3	NO3
INFLUENT:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	000
EFFLUENT:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	.000
SIDESTRM:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	.000

STAGE 5 PROCESS OPTION 5

INPUT DESIGN DATA:

1	2	3	4	5	6	7	8
970	800.000	7.500	.000	.000	25.000	.000	.000
9	10	11	12	13	14	15	16
7.500	25.000	000	.000	.000	.000	000	1.900

OUTPUT DESIGN DATA:

1	2	3	4	5	6	7	8	9	10
13849.529	.000	7.500	25.000	.000	.000	.000	.000	.000	.000
11	12	13	14	15	16	17	18	19	20
.000	.000	.000	.000	.000	.000	.000	.000	.000	000

INFLUENT / EFFLUENT / SIDESTREAM CHARACTERISTICS:

	Q	SOC	SNBC	SON	SOP	SFM	SBOD	VSS	TSS
INFLUENT:	1.094	9545.455	2727.273	1363.637	272.727	5000.001	13636.367	18636.367	20000.004
EFFLUENT:	.283	35795.445	10227.273	5113.637	1022.727	18750.000	51136.367	69886.359	75000.000
SIDESTRM:	.811	386.282	110.366	55.183	11.037	202.338	551.832	754.170	809.353
	DOC	DNBC	DN	DP	DFM	ALK	DBOD	NH3	NO3
INFLUENT:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	.000
EFFLUENT:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	.000
SIDESTRM:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	.000

STAGE 6 PROCESS OPTION 6

INPUT DESIGN DATA:

1	2	3	4	5	6	7	8
15.000	32.000	1.000	.000	1.000	.300	.500	7.500
9	10	11	12	13	14	15	16
.500	15.000	.000	.000	.000	.000	.000	1.500

OUTPUT DESIGN DATA:

1	2	3	4	5	6	7	8	9	10
.500	15.000	851.075	809964.250	425373.250	.000	.000	.000	.000	.000
11	12	13	14	15	16	17	18	19	20
.000	.000	.000	.000	.000	.000	000	.000	.000	.000

INFLUENT / EFFLUENT / SIDESTREAM CHARACTERISTICS:

	Q	SOC	SNBC	SON	SOP	SFM	SBOD	VSS	TSS
INFLUENT:	.283	35795.445	10227.273	5113.637	1022.727	18750.000	51136.367	69886.359	75000.000
EFFLUENT:	.283	17897.723	10227.273	3451.705	511.364	18750.000	15340.904	34943.180	53693.180
SIDESTRM:	.000	.000	.000	.000	.000	.000	.000	.000	.000
	DOC	DNBC	DN	DP	DFM	ALK	DBOD	NH3	NO3
INFLUENT:	43.000	11.000	25.000	5.000	300.000	100.000	55.000	25.000	000
EFFLUENT:	2567.816	11.000	1686.932	516.364	300.000	6033.097	4394.527	1686.932	.000
SIDESTRM:	.000	.000	.000	.000	.000	000	.000	.000	000

ATTACHMENT 3

```
**************
*            *
*   EXEC/OP  *
*            *
* VERSION 1.2 *
*            *
**************
```

EXECUTIVE PROGRAM
(OPTIMIZATION VERSION)
FOR
PRELIMINARY SYNTHESIS OF WASTE TREATMENT SYSTEMS

U.S. ENVIRONMENTAL PROTECTION AGENCY
MUNICIPAL ENVIRONMENTAL RESEARCH LABORATORY
SYSTEMS AND ECONOMIC ANALYSIS SECTION
CINCINNATI, OHIO 45268

```
*********************************************************************************
*                                                                               *
* OPTION 1A - DEER ISLAND SECONDARY WITH DIGESTION OPTION W/ECF                 *
*                                                                               *
*********************************************************************************
```

PROCESS ALTERNATIVES

OPTION NO.	PROCESS NO.	STAGE NO.	SIDESTREAM DESTINATION	REMARKS
1	2	1	5	PRIMARY SEDIMENTATION
2	3	2	4	ACTIVATED SLUDGE - FINAL SETTLING
3	12	3	0	CHLORINATION
4	13	4	2	FLOTATION THICKENING
5	8	5	2	GRAVITY THICKENING
6	6	6	2	DIGESTION OF PRIMARY AND SECONDARY SLUDGES
9	0	6	2	NULL PROCESS
7	7	7	2	CONDITIONING AND DEWATERING
8	14	8	2	INCINERATION

EFFLUENT DISCHARGE STANDARDS

5-DAY BOD, MG/L	30.00
SUSPENDED SOLIDS, MG/L	30.00
AMMONIA - N, MG/L	10000.00
NITRATE - N, MG/L	10000.00
PHOSPHORUS, MG/L	10000.00

SELECTION CRITERIA

	CRITERION	WEIGHT	LIMIT
1.	INITIAL CONSTR. COST, M$	.00	10000.00
2.	ANNUAL O & M COST, $/MG	.00	100000.00
3.	TOTAL ANNUAL COST, $/MG	1.00	100000.00
4.	ENERGY CONSUMED, KWH/MG	.00	10000.00
5.	ENERGY PRODUCED, KWH/MG	.00	.00
6.	NET ENERGY CONSUMED, KWH/MG	.00	10000.00
7.	LAND REQUIRED, ACRES	.00	10000.00
8.	UNDESIREABILITY INDEX	.00	10000.00

ECONOMIC DATA

CONSTRUCTION COST INDEX	2.1770
WHOLESALE PRICE INDEX	3.0630
DIRECT HOURLY WAGE, $/HR	45.0000
FRACTION CHARGED TO INDIRECT WAGES	.6667
COST ESCALATOR FOR MISC. FEES	1.3500
COST OF ELECTRICITY, $/KWH	.0720
BTU TO KWH CONVERSION EFF.	.0900
DISCOUNT RATE	.0812
CAPITAL RECOVERY FACTOR	1028

2 BEST DESIGNS

DESIGN 1

EXACT SYSTEM VALUE 374.297

STAGE NO.	PROCESS OPTION	SLUDGE TONS/DAY	CONSTR COST M$	ANN O&M COST $/MG	TOTAL ANN COST $/MG	ENER USE KWH/MG	ENER PROD KWH/MG	NET ENER KWH/MG	LAND REQD ACRES	UNDESIRE-ABILITY
1 Prim	1	297.80	22.5798	11.14	23.86	8.87	.00	8.87	.00	.00
2 Sec	2	164.95	69.5697	26.62	65.81	135.89	.00	135.89	.00	.00
3 Chlor	3	.00	17.3294	15.62	25.38	14.81	.00	14.81	.00	.00
4 Flot	4	164.95	19.1220	34.28	45.05	62.38	.00	62.38	.00	.00
5 Grav	5	297.80	2.0189	1.16	2.30	.20	.00	.20	.00	.00
6 Dig	6	440.62	51.9390	31.49	60.74	163.93	607.84	-443.91	.00	.00
7 Dew	7	283.40	10.0349	96.36	102.01	24.25	.00	24.25	.00	.00
8 Inc	8	339.08	18.8882	38.51	49.15	58.17	184.71	-126.54	.00	.00
SYSTEM VALUES		462.75	211.48	255.17	374.30	468.50	792.55	-324.05	.00	.00

PRIMARY AND SECONDARY SLUDGES MIXED AT STAGE 6

DESIGN 2

Use these Costs

EXACT SYSTEM VALUE 387.110

STAGE NO.	PROCESS OPTION	SLUDGE TONS/DAY	CONSTR COST M$	ANN O&M COST $/MG	TOTAL ANN COST $/MG	ENER USE KWH/MG	ENER PROD KWH/MG	NET ENER KWH/MG	LAND REQD ACRES	UNDESIRE-ABILITY
1 Prim	1	297.80	22.5798	11.14	23.86	8.87	.00	8.87	.00	.00
2 Sec	2	154.53	68.0367	26.06	64.39	130.15	.00	130.15	.00	.00
3 Chlor	3	.00	17.3259	15.62	25.38	14.80	.00	14.80	.00	.00
4 Flot	4	154.53	17.9701	31.76	41.89	59.16	.00	59.16	.00	.00
5 Grav	5	297.80	2.0189	1.16	2.30	.20	.00	.20	.00	.00
7 Dew	7	431.03	6.5737	119.63	123.33	15.47	.00	15.47	.00	.00
8 Inc	8	478.72	23.2223	92.89	105.98	46.40	397.99	-351.59	.00	.00
SYSTEM VALUES		452.32	157.73	298.26	387.11	275.05	397.99	-122.94	.00	.00

PRIMARY AND SECONDARY SLUDGES MIXED AT STAGE 6

BEST DESIGN IS NUMBER 1

SEARCH EFFORT WAS 369.7369% OF TOTAL ENUMERATION

12.5 Financial Impacts by Alternative

12.5 FINANCIAL IMPACTS

TABLE OF CONTENTS

12.5 FINANCIAL IMPACTS

12.5.1 Introduction

This section analyzes in two parts the costs of the eight wastewater treatment options remaining after initial screening and an analysis of the financial impacts on the users of sewer service who would pay the costs of new harbor wastewater treatment facilities. The first part summarizes the approach followed in updating and revising preliminary facility cost estimates for each of the options considered (as detailed in Section 12.4), plus the regulatory and administrative context of treatment facility construction and operations. The second part estimates the annual costs to users of new treatment facilities and the financial impacts on households in the MSD. This analysis is based upon assumptions made for the SDEIS regarding the funding levels and capital borrowing for such a project over the next several years which were applied to be consistent with other studies by the Commonwealth of wastewater treatment facility siting as one part of a larger State capital budget program as described later in this section.

12.5.2 Treatment Facility Costs

This section highlights the method followed in developing preliminary cost estimates of the eight wastewater treatment facility options studied in detail following initial screening of the twenty-two alternatives considered in the SDEIS. Each of the four primary and four secondary treatment options was analyzed to determine whether the design basis developed originally and cost factors applied were reasonable under present circumstances. Updating of costs was done based on an ENR Construction Cost Index of 4200. This measure is commonly used to provide a consistent cost index for projects of this type taking into account inflation and is comparable to a constant 1984 dollars valuation. Revisions to prior cost estimates were also made reflecting changes in the assumptions regarding sludge disposal, cost of secondary treatment components, or other associated engineering issues. A detailed discussion of the method followed and analysis of facility costs developed is presented in Section 12.4 of this volume.

12.5.2.1 Updated Facility Costs

In reviewing the preliminary costs for the numerous options being initially considered in the SDEIS, it was not feasible to study each of the more than twenty alternatives in detail. Therefore, to provide a cost basis for the screening process (see Chapter 4.0), initial financial review focused primarily on updating of the costs devloped in the MDC facility plan entitled, Nut Island Site Options Study (1982). The facility design criteria and preliminary costs developed in the Nut Island Site Options Study (1982) were accepted as reasonable at the preliminary stage of analysis. Where comparable facility costs for new alternatives not examined by the MDC were necessary, these were developed based on consistent engineering design criteria, but with minimal redesign of facility components. The costs derived from the this MDC facility plan are detailed in tables found Section 12.4.

12.5.2.2 Revised Cost Estimates

Based on further detailed analysis of the eight options remaining after screening, revised alternative costs in current dollars, as shown in Table 12.5-1, were developed for each option. This table shows that secondary treatment options are estimated to cost between $595 million and $738 million, and primary treatment options are estimated to cost between $752 million and $872 million. Operation, Maintenance and Replacement (OM&R) costs are projected to be between $44 and $53 million for secondary treatment options, and between $21 million and $24 million for primary treatment options. The Present Worth calculations of options, which combine O,M&R costs with the option capital costs (including costs of borrowing) over the twenty-year operational period of the proposed facility, are estimated to be between $1,019 million and $1,255 million for all secondary options, and between $957 million and $1,081 million for primary options. The borrowing interest and period rate used to derive these figures are 10% over 20 years.

TABLE 12.5-1

BOSTON HARBOR SDEIS: SUMMARY OF OPTIONS AND THEIR COSTS

Option No.	Sites, Level of Treatment, and (Acreage Required) — Nut Island	Deer Island	Long Island	Costs in $Millions[1] — Capital	O&M	Present Worth[2] ($Millions)
SECONDARY ALTERNATIVES						
1a.2	■ (2)	● ▬ (115)		595.04	43.59	1019.06
1b.2*	● (18)	● ▬ (115)		650.40	45.18	1089.93
2b.1	■ (2)	■ (5)	● ▬ (96)	705.98	44.63	1140.13
2b.3	■ (2)	● (52)	● ▬ (82)	738.33	53.12	1255.07
PRIMARY ALTERNATIVES						
4a.2 D	■ (2)	● (62)		751.99	21.10	957.28
4b.2 D*	● (18)	● (52)		810.22	22.01	1024.31
5a.2 D	■ (2)	● (52)	● (18)	816.23	23.52	1044.97
5b.2 D**	■ (2)	■ (5)	● (52)	871.55	21.51	1080.74

KEY: ■ = headworks only ● = primary treatment ▬ = secondary treatment

D = deep ocean outfall * = MDC's preferred options

** = This option dropped during final screening.

Source: CE Maguire, Inc., November, 1984.

[1] Revised costs reflect refinements to earlier facility plans as discussed in section 12.4 of Volume II. These costs do not include sludge disposal, barging, busing, or special noise mitigation measures (see Sections 4.5 and 5.2).

[2] Assumes 10% interest over 20 years.

Costs for alternatives should not be compared between primary and secondary treatment levels since, as has been stated from the outset of this SDEIS, these treatment process differences are not being compared in the decision on whether secondary or primary treatment would be required. This decision will be based solely on the independent scientific water quality review of the MDC's 301(h) secondary waiver application being conducted by EPA.

The chief factor which influenced revised estimates of facility costs was the receipt of updated information involving treatment components, including prechlorination, secondary sedimentation tanks, digestion, and effluent pumping. For example, the costs from the MDC facility plan were revised to reflect updated costs of secondary sedimentation tanks based on final costs at other treatment plants. It was also assumed initially, for comparative purposes and to maintain consistency among siting options, that all sites be evaluated regardless of the potential cost advantage of existing facilities' expansion. Upon further analysis and refinement of the remaining eight alternatives, based on the actual site conditions and facility characteristics including so called fast-track improvements now underway at both Deer Island and Nut Island facilities, these costs were reduced to reflect lower pump station costs that would in fact be required at those sites. (See Section 12.4).

In addition, costs originally developed in the Nut Island Site Options Study (1982) for sludge disposal by incineration were subsequently eliminated from this analyis because they no longer reflect the State's proposed priorities for sludge disposal alternatives now being analyzed. The state is now considering sludge management alternatives among composting, landfilling, and ocean disposal in addition to incineration options.

For example, if either ocean dumping or landfilling were selected as the method of sludge disposal, sludge thickening, digestion, and gas storage facilities may not be required. The other sludge disposal methods considered, composting or incineration, would similarly require alternate facility components having variable costs. Therefore, final cost estimates for sludge disposal options will vary according to the disposal method and facility site selected. These issues are described in Section 5.2 of Volume 1. The costs of sludge disposal facilities and associated components will be developed in the upcoming MDC facility planning and EPA environmental review process.

Final costs for all options, including sludge, will necessarily increase from those presented in this section by the addition of costs for a selected sludge disposal alternative involving either composting, incineration, ocean disposal, landfilling, or some combination of these. Likewise, there will be added capital costs to those presented here from the requirement to barge equipment and materials, and bus workers to the sites both of which actions are being required by EPA and the Commonwealth to the maximum extent feasible. It may also be necessary to provide mitigation measures beyond these actions to minimize adverse effects of the project. These may include such things as staggering the construction work force, repairing roadways and improving traffic controls, requiring special noise mitigations, or otherwise mitigating potential adverse impacts on nearby residences and the community during facility construction and operations. Added costs for such measures would apply in a similar fashion to all the siting options being considered, and would not alter the impact analyses conclusions on siting being made.

12.5.3 Overview of the Regulatory Framework

The costs presented in this section have been developed based upon two underlying requirements which must be met in order to be eligible for EPA construction grant funds. The first is that a potential grantee must demonstrate that it has the financial and management capability to manage, operate and maintain the treatment works. The second is that all facility operation, maintenance and replacement costs (O,M&R) must be paid for by the users of the treatment facilities based upon their proportionate use. Such funding methods as statewide or local taxes (unless an ad valorem user charge system has been approved) or other subsidies may not be applied to pay for the O,M&R portion of facility costs.

While these are prerequisites to receiving EPA funding, they also are essential aspects of the utility management concept of which EPA is a strong advocate. This concept implies that the treatment facilities are self-sustaining with all costs, including debt retirement costs remaining after Federal and State grants, paid for by those receiving the utility's services. Therefore, costs presented reflect this concept, as well as the EPA funding requirement. Thus, all project costs (after grants) have been assumed to be paid only by the system users.

The existing MDC management structure has been independently reviewed in a State-funded analysis prepared by the Bank of Boston. One conclusion of this review was that the MDC does not currently meet EPA's financial capability requirements. In addition, current compliance of the MDC with EPA 's user charge regulations is questionable.

Recently proposed and passed legislation to establish an independent authority would remedy these deficiencies by implementing the utility management concept through a water and sewer authority. EPA would require a new sewer authority to fully comply with the user charge regulations and demonstrate adequate financial capability as a prerequisite to any grant applications for the proposed treatment facilities. The O,M&R costs of such new facilities would still be required to be paid for solely by the users of the system. This will require a change from the present State financing method. Section 12.5.3.4 describes the management structure and administration of the previous MDC system with a brief highlight of the recently passed legislation for a new independent sewer authority. The details of this new legislation will be provided, as necessary, in the final EIS.

12.5.3.1 Financial Impacts on Users

The financial costs to users of building major sewage treatment facilities in Boston Harbor are presented here in terms of the estimated annual dollar charges to an average household within the MSD service area. These costs represent the local share of capital expenditures and borrowing needed to finance the construction of treatment facilities, and the operation, maintenance, and replacement (O, M, & R) costs necessary to run these facilities once they are built for their 20-year design life.

The estimate of annual household user costs (in 1984 dollars) for the project (assuming application of a middle range of 50 percent local cost share, as noted below) would increase between \$91 and \$111 for secondary treatment facilities, and between \$74 and \$82 for primary treatment facilities (see Table 12.5-2 following). Project user charges would become applicable over several years time so that the projected increases to users would be gradual. The first year of full plant operations, in 1995 assuming a 1988 start and seven year construction period, would be the first year when the full costs for these facilities (capital debt service plus O,M&R) would be applied.

In addition to the capital costs of treatment facilities, there will be additional costs to users for associated sludge disposal facilities and construction or operations requirements such as barging, busing, and possible mitigation measures (as noted in Section 4.3). As noted previously, these costs are not incorporated at this time. Sludge management capital costs will be added to treatment plant capital costs when a sludge disposal method is determined. Project barging and busing costs and applicable mitigations are estimated to represent between five and ten percent of total project capital costs depending upon the extent and final costs of such measures. These combined additional costs are estimated at \$45 million on average. Added costs of treatment facilities from actions being applied to minimize the harmful effects of the project, such as barging during

TABLE 12.5-2

ESTIMATED ANNUAL HOUSEHOLD USER CHARGES (1984 $) BY OPTIONS[1]

Assumed Level of MDC Share of Costs	SECONDARY OPTIONS: Secondary Treatment Facilities				PRIMARY OPTIONS: Primary Treatment Facilities			
	1a.2	1b.2	2b.1	2b.3	4a.2	4b.2	5a.2	5b.2
10%	60.27	62.90	62.95	73.61	35.12	36.96	38.86	37.15
50%[2]	90.76	96.22	99.12	111.45	73.66	78.48	80.69	81.81
70%	106.00	112.88	117.21	130.36	92.92	99.24	101.61	104.14

[1]Costs beginning in first-year of plant operations (assumed to be 1995) based on 30-year borrowing period at 10% annual interest rate; estimates shown are for additional costs to household users of new wastewater treatment facilities only, not including current MDC and local sewer charges, proposed sludge disposal facilities, or construction requirements such as barging, busing, noise mitigation or other mitigation measures.

[2]The 50% local share values were assumed for purposes of impact analysis.

Source: CE Maguire, Inc., (October 12, 1984).

construction, while significant, would not have a major affect on the annual household estimates presented here.

Major capital expenditures separate from the harbor wastewater treatment plants being analyzed in the SDEIS are also being planned by the Commonwealth of Massachusetts and by local MSD member communities to clean up Boston Harbor. These projects, include the collection and treatment of combined sewer overflows (CSO), repairs to sewers to reduce infiltration and inflow (I/I), and other collector system rehabilitation. This will also add to the overall costs of coordinated federal, state and local efforts to improve water quality in Boston Harbor. Moreover, such costs will be borne in large part by the users of the system. Preliminary estimates of the costs of total harbor cleanup projects are approximately $1.7 billion (including the costs of the wastewater treatment facilities examined in the SDEIS report).

This financial impact analysis, therefore, includes only the costs of the wastewater treatment facilities being planned by the MDC. Implementation of these facilities are a major step in the cleanup of Boston Harbor, recognizing, however, that they represent only a portion of the total costs necessary to improve water quality in Boston Harbor. Based on the comprehensive nature of the total harbor cleanup program, this SDEIS financial impact analysis provides estimates of annual household sewer charges which will be <u>lower</u> than the charges which will, ultimately, result from a total harbor cleanup program which may be implemented over a period of many years. At a minimum, new treatment facilities, for either upgraded primary or expanded secondary treatment, are required by law. The expenditures of capital funds and collection of increased user charges to construct, operate, and maintain new treatment facilities will be necessary regardless of whether or not the MDC or a new independent sewer authority is empowered to manage these facilities.

12.5.3.2 Estimate of Household Sewer Service Charges

As described in Section 12.5.3.4 (below), existing sewer service charges are comprised of the MDC charges to the forty-three member communities of the Metropolitan Sewerage District (MSD) plus the local charges by municipalities to individual residential, commercial and industrial users of the system. Since there is no uniformity in how these separate community charges are derived in each of the forty-three municipalities, the Boston Water and Sewer Commission (BWSC) charges for the City of Boston are presented here as representative of current average household sewer service costs throughout the MSD.

Boston is the largest user in the MSD contributing about 40 percent of the system's flow. According to the 1984 Bank of Boston Study, Protecting Water Resources: A Financial Analysis, a Boston average household of four paid a total annual bill of $80.00 (1983 average). Of this total, $46.00 was for the local city share of sewer service costs, while $34.00 was the share of MDC charges for sewer service passed on by Boston to the homeowner. Of this $34.00, a portion is attributable to the existing treatment plants, while the rest covers other MDC operations costs.

These user cost estimates must be further qualified due to their exclusion of the industrial user share of service costs. These were not factored into the analysis due to the unavailability of data. Boston currently is on a flat rate basis for sewer charges so that all users pay the same rate, with charges varying only according to their volume of flow. It is expected that the BWSC will be implementing an added "sewer strength" cost factor to account for industrial flows. Therefore, these estimates of residential user costs would be reduced by the significant contributions to flows being made by industrial users.

The financial impact of constructing new wastewater treatment facilities was analyzed using three separate funding assumptions. All three assumptions reflect varying financial grant levels applied to project capital costs. The first assumes that the level of federal and state aid will stand at 55% and 35%, respectively, of the total cost of construction. The associated MDC share of capital costs would be 10%. The second assumption still reflects a federal funding eligibility of 55%, however, because of the amount of these Federal grant funds available each year to Massachusetts the entire project could not be funded at the 55% level if the projected five to eight year construction schedule is adhered to. Therefore, this assumption reflects a 50% MDC share of total project capital costs with the remainder being funded by Federal and State grants. The third assumption considers the effects on local users of a 70% MDC share. This limited grant level would result from future reductions or elimination of federal aid with some State aid still provided.

While it is impossible to predict which of these (or other) assumptions will apply at the time of the project's implementation, the range of funding levels presented here is considered to be a reasonable representation of possible user costs under various funding conditions. These asumptions are, moreover, consistent with the user cost projections made for the State by the Bank of Boston in their overall assessment of the future MDC capital program.

Table 12.5-3 shows the amount of each year's amortization costs for a hypothetical $800 million project. The cumulative annual cost of borrowing (or debt service) is shown for installments of $200 million each, beginning in 1988 when construction is assumed to start. The MDC share of the annual debt service cost in shown under the three separate funding level assumptions, increasing cumulatively until the full borrowing level is reached. This calculation method was used to estimate user charges beginning in 1995 for each of the eight option's costs. The actual project costs of each alternative (from Table 12.5-1) were applied to the calculations with the addition of the household share of O,M&R costs to derive the values shown in Table 12.5-2.

TABLE 12.5-3

CALCULATION METHOD FOR DERIVING
PROJECTED AVERAGE ANNUAL HOUSEHOLD SEWER COSTS
FOR CONSTRUCTION OF NEW WASTEWATER TREATMENT FACILITIES
(ASSUMES A HYPOTHETICAL $800 MILLION FACILITY)[1]

Capitalization Year[2]	Cumulative Amortization Total (By Year)[3]	MDC Share of Capital and Debt Service Costs[4] (in Constant $) Average Household Charges 70% Share, or	Average Household Charges 50% Share, or	Average Household Charges 10% Share
1988	$21,200,000	$17.92	$12.80	$ 2.56
1990	42,400,000	35.84	25.60	5.12
1992	63,600,000	53.77	38.40	7.69
1994	84,800,000	71.69	51.20	10.25

Source: CE Maguire, Inc. (8/1/84)

[1]This table illustrates the calculation method employed to derive annual household user costs for each of eight options; it does so using a hypothetical $800 million facility capital cost (1984 $). In actuality, the individual project capital costs for each alternative (from Table 12.5-1) were used to derive the projected household user costs which appear in Table 12.5-2.

[2]This schedule assumes a 1988 start of construction with borrowing to start in the same year and continue in four equal installments. The actual borrowing schedule of the project will, in all likelihood, vary according to the specific project requirements at the time.

[3]The total capital budget shown in this table is $800 million divided into four installments of $200 million each. The amortization period is 30 years at a 10% annual interest rate. Debt service costs are shown cumulative with preceding years held constant. The actual capital costs for each option (from Table 12.5-1) are used in calculating the household user charges shown in Table 12.5-2.

[4]An estimated 828,000 households/users in the MSD metropolitan area are the basis for these costs; no industrial user charges are reflected in these figures. Household user charges shown include annual O,M&R costs for each facility (divided by the total number of households in the MSD) which were added to the amortization share of costs.

To develop an estimate of the total projected household sewer service charge, the existing MDC and local O,M&R user charges must also be considered. As noted above, these costs were estimated at $80 currently (1983) for an average family of four in Boston. However, for purposes of this analysis, these costs are not factored into the calculations appearing in Table 12.5-2, since no accurate measure of such costs in the future and across each of the 43 member communities is available. Moreover, future O,M&R charges would be calculated based on the replacement of existing treatment plants with new treatment plants. Therefore, the estimated total household charges attributable to the project (as defined above) is based in this analysis solely on the capital debt service and O,M&R costs of new wastewater treatment facilities.

Again, it should be remembered that these estimated costs do not reflect the costs of associated sludge disposal facilities or of associated construction requirements, such as barging, busing, or noise mitigation.

12.5.3.3 Conclusions Regarding Financial Impact on Households

The preceding tables show that the total estimated average annual household sewer service charge will increase from an estimated average $80 currently (1983), to an additional amount (in 1984 dollars) between $90 and $111 for secondary treatment, or between $74 and $82 for primary treatment facilities, in 1995 (50% local share assumed). This is the year in which it is assumed the full annual payment, of both debt service and O,M&R, is reached for this project.

User sewer charges will steadily increase beginning at the start of construction (1988 assumed) reflecting the anticipated phased borrowing of construction funds. Annual household user charges for this project will peak in the year when new MDC wastewater treatment facilities become operational (1995 assumed) reflecting the addition of project O,M&R costs to the established schedule of debt service costs. Additionally, capital spending for sludge disposal, CSO abatement, I/I removal, or related sewage system improvements that are being considered separately, as part of an overall harbor cleanup program, would further increase the sewer service charges to users during this period beyond the cost estimates shown here.

For the majority of households within the MSD, reported by the Census (1980) to have annual incomes above $15,000 (median), a gradual increase in sewer charges ranging between approximately $74 to $111 annually (using a 50% local share assumption for either primary or secondary treatment alternatives) does not appear to be a difficult financial cost for most households to absorb. It represents less than one percent of the MSD median household income. Additionally, for homeowners, this added cost could be spread over two or more installment payments annually depending upon the billing cycle of individual municipal sewer departments. For those who rent, if increased sewer charges are passed on by landlords, these costs could be budgeted over twelve payments in the monthly rent.

If the MDC funding share were to be 50%, as assumed, household user charges for this project would gradually add approximately $100 (average) for secondary facilities, or $80 (average) for primary facilities to homeowners' annual bills by 1995. Even a greater (70%) local share of costs would not greatly increase project user costs in real dollar terms, while lower user charges from a smaller (10%) local share would pose little difficulties of payment to users. Projected increases in sewer user charges would still be relatively low when considered over the course of the next several years and given the relatively low costs charged in the past.

Past charges for sewer service in the MSD have been far below those in other areas where such charges more closely reflect actual system costs. For example, comparing the estimated $80 annual average household rate, Boston sewer charges ranked 29th out of 35 major U.S. cities surveyed by the Bank of Boston. Current sewer rates in other cities include: Philadelphia - $136, Buffalo - $140, Baltimore - $148, Washington, D.C. - $158, and Cincinnati - $100. The projected increases in user charges from the project will bring MSD charges to levels comparable with many other cities. Compared to other utility costs such as electricity and gas, estimated to be about $600 and $1,000 annually per household, respectively, increased sewer user charges of the project are considered to be affordable.

As noted previously, it is important to remember that these capital costs being considered in the SDEIS represent only a portion of a larger capital program planned for Boston Harbor and the MDC system which will require additional local financing. The addition of the remaining designated projects of the Commonwealth, plus other projects of the individual cities and towns in the MSD, are expected to increase user charges beyond the estimates presented here.

Financial impacts on households under a total Harbor clean-up program beyond this project alone would depend on the timing of additional projects, their O&M costs, and the availability of other offsetting funds at either the federal or state levels.

Financial impacts must additionally be considered relative to financially sensitive populations within the MSD service area. Those with fixed incomes, such as many elderly residents and families with low income, share a sensitivity and financial limits to increases in their living costs. The expected gradual increases in sewer service charges for this project alone, over a period of several years, will help to lessen any financial burden on citizens whose ability to pay is limited. There may still be cases, however, of financial burden resulting from this project's implementation.

12.5.3.4 MDC Management Structure and Administration

1. Introduction

This Section begins with a description of the management and administrative structure of the current Sewerage Division of the Metropolitan District Commission (MDC). It is included here to show

how the MDC has operated to provide sewer service to the 43 cities and towns within the Metropolitan Sewer District (MSD). This section goes on to briefly identify the new sewer authority legislation recently passed as a replacement to the MDC Sewerage and Water Divisions. This description is based on a preliminary review of the legislation, and may not reflect subsequent amendments or modifications to be made prior to full implementation in the coming months. The legislation creates an independent sewer authority to serve as a new state entity with the power to sell bonds and collect revenues to construct, operate and maintain the proposed (and existing) wastewater treatment facilities of the MDC.

2. Existing MDC Structure

The Metropolitan District Commission (MDC) provides sewer service to 43 cities and towns which make up the Metropolitan Sewerage District (MSD). The MSD is divided into a northern and southern service area corresponding to the existing network of local and interceptor sewers. Northern and southern system sewers convey raw sewage to the Deer Island and Nut Island treatment plants, respectively. Individual municipal assessments for MDC sewer services are based on assessment ratios established for each member community to cover the costs of operation and maintenance of treatment facilities plus debt service. Actual billing of the municipalities and collection of their payments is handled by the State Treasurer.

As presently constituted, the MDC Sewerage Division maintains and operates two treatment plants, ten pumping stations, four pre-treatment headworks, three detention and chlorination stations for combined stormwater and sewage overflows, and 226 square miles of trunk sewers. More than 5,300 miles of local sewers, owned and operated by the individual municipalities, connect to the MSD trunk lines at 1,805 connections. Average daily sewage load throughout the system is approximately 380 million gallons.

Like all agencies of the Commonwealth, the MDC receives annual appropriations from the Legislature to fund operations, and must receive State authorization for all capital outlays as well. Unlike most other State agencies, however, the MDC reimburses the State for maintenance and operating expenses and debt service through an assessment process set by statute (M.G.L. Chapter 814, Acts of 1975).

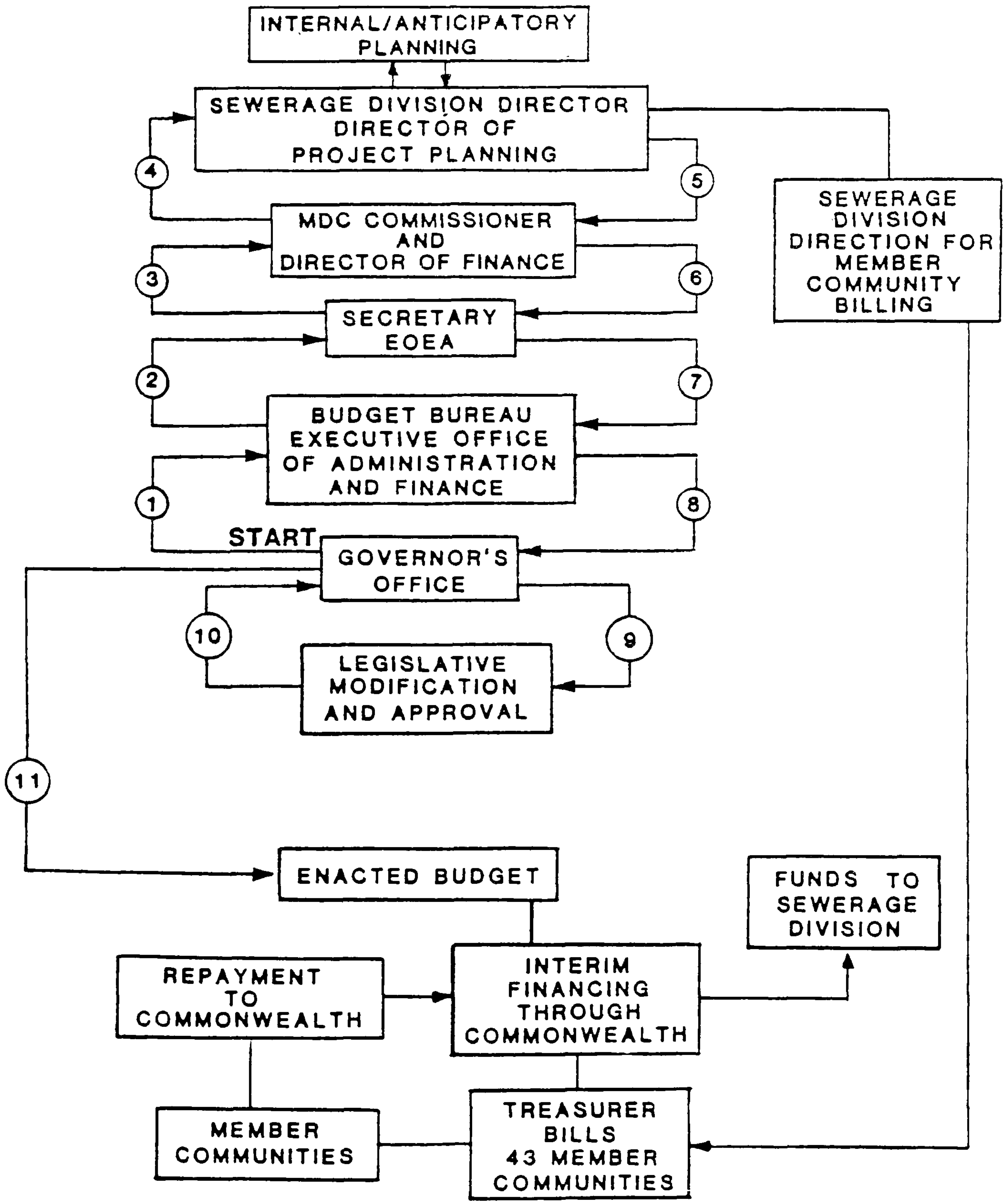
Each year the various divisions within the MDC prepare budget requests following general guidelines established by the Executive Offices for Administration and Finance (A & F) and the Executive Office of Environmental Affairs (EOEA) under which MDC is administered. Operation and Maintenance (O & M) and capital outlay budgets are prepared separately. The former is generally based on historical costs adjusted by inflation factors determined by A & F. It may also include requests for new expenditures deemed necessary by the Agency to maintain appropriate levels of service. Capital outlay budgets are required for the acquisition, construction, reconstruction or repair of land or facilities if their costs will exceed $10,000.

Both the O & M and capital outlay budgets are reviewed and approved by the Commission and then submitted to EOEA. Following informal consultations between the MDC, EOEA and A & F, adjustments are made to reflect both EOEA and the Governor's budget priorities. The entire EOEA budget is then submitted to the A & F Bureau of the Budget for final review and adjustment. It is subsequently incorporated into the total budget for the executive, legislative and judicial branches of government presented by the Governor to the Legislature each January.

The Legislature considers O & M and capital outlay budgets independently. Hearings are held on each by the Senate and House of Representatives. After passage by both Houses, the budgets are submitted to the Governor. Once signed, they become the basic fiscal management tool for each executive office and operating agency. Figure 12.5-1 graphically illustrates the budgeting and funding process of the Sewerage Division. Political factors come into play at each stage of

Figure 12.5-1

Sewerage Division Budgeting/Funding



[illegible]on, Deer Island Facilities Plan, Vol.1 (Sept., 1983) the legislative and executive process. These affect the level of budget requested, sometimes significantly reducing funding levels. Inadequate funding has been identified as a primary cause of the recent maintenance and operation problems experienced by the MDC.

a. Assessments

Annual State appropriations for O & M expenses and debt service for the MDC are reimbursed through the assessment process. This process varies by division. Included in the assessments levied by each division are their proportionate share of costs for both EOEA and the administrative and staff units within the MDC. The basis for allocation is set by State law.

Chapter 92 of the General Laws, as amended by Chapter 814, Acts of 1975, requires that each of the 43 cities and towns in the MSD pay annually to meet total costs of operation and maintenance plus debt service for the MDC Sewerage District. The total amount assessed is, however, subject to the limitations of the recently enacted state and local tax limits of "Proposition 2½" (M.G.L. Chapter 580, Acts of 1980 as amended by Chapter 782, Act of 1981).

Allocation of O & M expenses is based on contributing residential population and derived population equivalents of industrial users. (The law defines industrial wastes as those user wastes discharged into the system which would be subject to cost-recovery provisions of federal law with respect to any federal grant that might be made for construction of works that treat such wastes. While the cost-recovery provisions have been abolished, the definition still stands.) Costs for debt service are assessed based on the latest State census. Population equivalents are used for industrial wastes. Table 12.5-4 presents the 1984 population and population equivalent totals for the 43 MSD members.

While this system was designed to be user-based, with each customer paying according to the amount of sewage contributed, it may not,

Table 12.5-4

THE METROPOLITAN SEWERAGE DISTRICT

Community	Total 1980 Population	1984 MDC Sewer Charges (Actual $)	Current MDC Assessment Methodology - 1983 Assessments (a): Contributing Population	Assigned Nonindustrial Sanitary Sewage	Industrial Sanitary Sewage Based Upon Water Volumes	Total Sanitary Sewage Volume Responsibility
				mg	mg	mg
Arlington	48,219	571,496	47,438	1,473.42	16.40	1,489.82
Ashland	9,165	72,229	2,933	91.10	36.66	127.76
Bedford	13,067	167,971	6,886	213.88	343.53	557.41
Belmont	26,100	313,961	25,317	786.34	48.57	834.91
Boston	562,994	8,707,237	560,179	17,399.12	6,011.14	23,410.26
Braintree	36,337	440,281	35,610	1,106.04	115.80	1,221.84
Brookline	55,062	656,285	54,787	1,701.68	65.22	1,766.90
Burlington	23,486	271,479	19,376	601.82	217.34	819.16
Cambridge	95,322	1,404,590	94,845	2,945.88	1,756.22	4,702.10
Canton	18,182	196,123	11,891	369.33	176.03	545.36
Chelsea	25,431	316,481	25,304	785.94	80.49	866.43
Dedham	25,298	273,204	21,225	659.25	36.49	695.74
Everett	37,195	501,725	37,009	1,149.50	390.42	1,539.92
Framingham	65,113	734,221	52,807	1,640.18	272.25	1,912.43
Hingham	20,339	68,676	5,268	163.62	0.00	163.62
Holbrook	11,140	50,996	991	30.78	0.00	30.78
Lexington	29,479	343,042	25,352	787.43	147.42	934.85
Malden	53,386	652,435	53,119	1,649.37	66.64	1,716.51
Medford	58,076	704,796	57,786	1,794.83	95.84	1,890.67
Melrose	30,055	361,272	29,905	928.85	42.30	971.15
Milton	25,860	300,422	24,127	749.38	47.29	796.67
Natick	29,461	309,299	21,507	668.01	114.16	782.17
Needham	27,901	319,070	23,883	741.80	98.60	840.40
Newton	83,622	1,029,442	81,531	2,532.35	300.83	2,833.18
Norwood	29,711	393,339	29,562	918.19	328.46	1,246.65
Quincy	84,743	1,043,343	84,319	2,618.94	161.53	2,780.47
Randolph	28,218	276,555	20,825	646.82	15.90	662.72
Reading	22,678	233,230	18,210	565.60	0.00	565.60
Revere	42,423	488,955	40,514	1,258.36	0.00	1,258.36
Somerville	77,372	954,399	76,985	2,391.15	243.57	2,634.72
Stoneham	21,424	255,844	21,124	656.11	17.26	673.37
Stoughton	26,710	199,115	12,046	374.15	9.03	383.18
Wakefield	24,895	297,351	24,571	763.17	27.42	790.59
Walpole	18,859	198,144	5,695	176.89	396.23	573.12
Waltham	58,200	883,177	57,909	1,798.65	1,055.97	2,854.62
Watertown	34,384	421,042	34,212	1,062.62	85.90	1,148.52
Wellesley	27,209	294,750	23,427	727.64	11.21	738.85
Westwood	13,212	97,351	5,747	178.50	30.00	208.50
Weymouth	55,601	528,800	38,309	1,189.87	39.28	1,229.15
Wilmington	17,471	118,559	210	6.52	312.86	319.38
Winchester	20,701	231,129	18,507	574.83	30.53	605.36
Winthrop	19,294	232,615	19,198	596.29	31.37	627.66
Woburn	36,626	505,510	27,579	856.60	898.18	1,754.78
Total	2,070,021	17,712,704	1,878,025	58,331.32	14,174.34	72,505.66

(a) Volumes shown do not include any infiltration, inflow, or stormwater quantities.

Source: Black & Veatch,"Report on Annual Cost Assessment Methodology...", (June, 1981).

in the opinion of the EPA, meet the federal guidelines governing the collection of operational, maintenance and replacement (O, M & R) costs through a user charge, which must be determined based on both contributed sewage flow and, in the case of non-residential users, the concentration of contaminants discharged ("strength").

User charge guidelines, rules and regulations promulgated in accordance with the Federal Clean Water Act (Public Law 92-500, as amended by Public Law 95-217 and Public Law 97-117) require that user charge systems be developed to recover operation and maintenance costs (including costs for replacement of necessary equipment) from the users of the sewerage system in proportion to contributed sewage flow and strength. The present user charge system of the MDC was implemented in Fiscal Year 1982. However, it has not yet been approved by State and federal authorities, nor has the application of sewer strength surcharges been fully implemented. For example, the City of Boston which makes up about 40 percent of the MDC flow, has not yet implemented sewer strength costing. All users in the City are charged only on the basis of flow.

Specific details on the MDC's assessment methods and management structure are contained in the reports listed below. These studies have been prepared by consultants to the State during the course of work on the SDEIS and are incorporated in this DEIS by reference.

1) Black & Veatch, "Report on Annual Cost Assessment Methodology to MSD Member Communities Including User Charge Systems," June, 1981.

2) ibid, (1984).

3) Bank of Boston, Protecting Water Resources: A Financial Analysis, February 8, 1984.

4) Havens & Emerson/Parsons Brinkerhoff, MDC, Deer Island Facilities Plan, Volume I, Fast-Track Improvements, Appendix B: Administration and Management, January, 1984.

b. Funding of MDC Sewerage Assessments at the Community Level

MDC assessments are levied annually on member communities via the "Cherry Sheet," which provides each community a summary of local aid coming from the Commonwealth as well as payment due for a variety of services provided, including sewerage. The Cherry Sheet is used by city and town officials in planning local revenue requirements and setting local tax rates.

Each of the 43 municipalities that make up the Metropolitan Sewerage District uses its own system for billing individual sewer users. Some charge for both the costs of local sewerage service and the community's share of the MDC annual costs. Some municipalities do not bill for sewer service at all, preferring instead to cover these costs through local property taxes. Others bill based on water consumption. No metering of sewage flows is done in the MSD, therefore, it is unknown if billing coincides with actual costs of services. This variation in assessments is a factor in the current deliberations on funding for the new sewer authority.

According to a survey conducted by the Bank of Boston (1984), thirteen communities still finance both local costs as well as the MDC assessment through general property taxes. The remaining thirty MSD members have some type of user charge, i.e., individual bills are sent to all customers, both residential and non-residential, who use the local sewer system. Bills are usually based on water consumed, and rates vary widely by community, ranging from 30¢ per 100 cubic feet to 75¢ per 100 cubic feet. In addition, some communities simply charge a flat rate. There is also considerable variation in these changes. The lowest annual charge is $8.00 per connection; the highest, $50.00.

In some cases, sewer user charges cover both local costs and the MDC assessment. In other cases, only local costs are covered, and the MDC assessment is paid out of property tax receipts. In still others, fees support operating expenses and the MDC assessment, but debt service comes out of general revenues. In most communities, however, revenues received from sewerage user charges do not fully finance all the costs, both direct and indirect, associated with the provision of sewerage services. These must be covered, therefore, from other local revenues. It is this variability which may not conform to existing Federal guidelines for grant eligibility. Table 12.5-5 presents the sewer rates for each of the MSD communities.

3. Legislation Establishing an Independent Sewer (and Water) Authority

Legislation has recently been passed by the Massachusetts Legislature and signed by the Governor to establish a new, independent sewer and water authority to replace the existing MDC Water and Sewerage Divisions. This legislation is, in part, a response to the past problems encountered by the MDC in the provision of sewer services to its member communities (as discussed elsewhere in the SDEIS). The legislation is one approach to more effective delivery of sewer service to the member communities of the MSD. As such, it is an important element of the overall Boston Harbor cleanup program. It is anticipated that this legislation will provide the reforms and management reorganization necessary to meet Federal guidelines for financial and administrative management of a sewer authority.

In 1984, the Bank of Boston prepared a study entitled Protecting Water Resources: A Financial Analysis for the Massachusetts Executive Office of Environmental Affairs, as noted previously. The study examined the financial implications of creation of an independent new state authority combining the former MDC Sewerage and Water Divisions. The advantage of such an independent authority would be that it could be given power to sell revenue bonds to finance capital projects, and power to collect revenues directly from the user communities to cover

Table 12.5-5

SUMMARY OF MDC SEWERAGE SYSTEM MEMBER COMMUNITIES
LOCAL COST RECOVERY INFORMATION
SEWAGE SYSTEMS

Community	Method Used to Recover Sewage System Costs: Taxed Based: Local	Taxed Based: MDC	User Charge: Local	User Charge: MDC	Customer Sewage Billing Information: Metered	Customer Classes	Billing Frequency	Computerized Billing	EPA Grants	EPA User Charge System	Sewage Rates
					%						
Arlington			X	X	100	Res,Comm,Ind	Semi-Annual	Yes	Yes	Approved	$0.40 per Ccf
Ashland			X	X	100	No	Semi-Annual	Yes	No	No	1st 1600 cf - $15.00 minimum Over 1600 cf - $0.65 per Ccf
Bedford			X	X	100	No	Semi-Annual	Yes	Applied	Submitted	1st 2,500 cf - $0.005 per cf Over 2,500 cf - $0.0125 per cf Service charge - $5.00 per billing period
Belmont			X	X	100	No	Quarterly	Yes	Yes	Approved	$0.38 per Ccf
Boston			X	X	100	Yes	Quarterly	Yes	Yes	Approved	$5.46 per 1000 cf
Braintree			X	X	100	Yes	Quarterly	Yes	Yes	Approved	$0.85 per Ccf
Brookline			X	X	100	Yes	Quarterly	Yes	No	Approved	$0.40 per Ccf
Burlington			X	X	100	Res,Comm,Ind	Res:Semi-Annual Other:Quarterly	Yes	Yes	No	60% of water bill
Cambridge			X	X	100	Yes	Tri-Annually	Yes	No	No	$0.62 per Ccf
Canton	X	X							Yes	Submitted	Ad Valorem
Chelsea	X	X							Yes	Submitted	Ad Valorem
Dedham	X	X							No	Submitted	Ad Valorem
Everett	X	X							No	No	Ad Valorem
Framingham			X	X	100	No	Tri-Annually	No	No	Approved	75% of water bill
Hingham		X	X		100	Res,Comm,Ind	Annually	Yes	No	No	$50.00 per dwelling unit $50.00 per single family $100.00 per two family $150.00 per three family Ind,Schools & Comm - $5.00 per 1,000 cf $50.00 minimum
Holbrook			X	X	Part Res, All Ind & Comm	Res,Comm,Ind	Quarterly	Yes	No	Approved	Res: $9.00 per quarter Com & Ind: NA

Source: Black & Veatch, (June, 1981).

SUMMARY OF MDC SEWERAGE SYSTEM MEMBER COMMUNITIES
LOCAL COST RECOVERY INFORMATION
SEWAGE SYSTEMS

Community	Method Used to Recover Sewage System Costs: Taxed Based		User Charge		Customer Sewage Billing Information				EPA Grants	EPA User Charge System	Sewage Rates
	Local	MDC	Local	MDC	Metered	Customer Classes	Billing Frequency	Computerized Billing			
					%						
Lexington	X	X							Yes	No	Ad Valorem
Malden			X	X	100	No	Semi-Annual	Yes	Yes	Approved	$0.40 per Ccf $10.00 minimum
Medford	X	X							No	No	Ad Valorem Minimum tax - $16.50 for 6 months
Melrose	X	X							No	Submitted	Ad Valorem
Milton			X	X	100	Res & Ind	Semi-Annual	Yes	No	Approved	1st 1600 cf - $12.50 minimum Over 1600 cf - $0.70 per Ccf
Natick		X	X		100	No	Quarterly	Yes	Yes	No	$0.30 per Ccf $0.75 minimum per month
Needham	X	X							Applied	No	Ad Valorem
Newton	X	X	X	X	100	No	Semi-Annual	Yes	No	Submitted	75% of water bill plus taxes
Norwood	X	X							Yes	No	Ad Valorem (will put UC in effect in 1984)
Quincy	X	X	X	X	99.6	Major, Tax Ex., & all other		No	Yes	Approved	Major & Tax Ex. - $1.49 per Ccf All Other - Ad Valorem
Randolph		X	X		99	Yes	Semi-Annual	No	Yes.	Approved	$30 per single family $60 per 2 family $90 per 3 family Comm & above 3 family - $0.0015 per cf
Reading	X	X	X	X	99.9	Yes	Quarterly	Yes	Yes	Submitted	$0.80 per Ccf with 10% discount if paid within 30 days - $1.50 minimum Debt service from taxes
Revere	X	X							No	No	Ad Valorem
Somerville		X	X	X	3,000 Unmetered	Sp. Discharge Customers	Quarterly	Yes	Yes	Approved	$0.60 per Ccf

SUMMARY OF MDC SEWERAGE SYSTEM MEMBER COMMUNITIES
LOCAL COST RECOVERY INFORMATION
SEWAGE SYSTEMS

Community	Method Used to Recover Sewage System Costs: Taxed Based		User Charge		Customer Sewage Billing Information				EPA Grants	EPA User Charge System	Sewage Rates
	Local	MDC	Local	MDC	Metered %	Customer Classes	Billing Frequency	Computerized Billing			
Stoneham			X	X	100	Yes	Semi-Annual	Yes	Yes	Approved	$0.78 per Ccf
Stoughton			X	X	100	Yes	Res:Semi-annual Com/Ind:Quarterly	Yes	Applied	Approved	$0.80 per Ccf $25.00 minimum per 6 months
Wakefield	X	X							No	No	Ad Valorem
Walpole	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Waltham			X	X	99	Res & Ind	Quarterly Large:Monthly	Yes	No	Approved	$0.55 per Ccf
Watertown			X	X	100	Yes	Semi-Annual	Yes		Approved	$0.42 per Ccf applied to 85% of water meter reading
Wellesley			X	X	100	Yes	Bi-Monthly	Yes	Yes	Approved	63% of water bill $1.89 minimum per 2 months
Westwood	X	X							Yes	Approved	Ad Valorem (UC approved for January 1, 1985)
Weymouth		X	X		100	Yes	Annually	Yes	Yes	Approved	Annual $ / Residential / Other $30.00 / 1 family / First 13,999 cf $55.00 / 2 family / Up to 21,999 cf $75.00 / 3 family / Up to 28,999 cf $90.00 / 4 family / Up to 34,999 cf $15.00 / each add. unit / Every add. 5,000 cf
Wilmington			X	X	100	Yes	Quarterly	Yes	Yes	Approved	$0.75 per Ccf $9.00 minimum
Winchester	X	X							Yes	No	Ad Valorem
Winthrop	X	X							Yes	No	Ad Valorem (UC to be adopted by mid-1984)
Woburn			X	X	100	Yes	Annually	Yes	Yes	Submitted	Domestic:1st 10,000 cf - $0.30 per 1000 cf Over 10,000 cf - $0.20 per 1000 cf $8.00 minimum per year Industrial:1st 500,000 cf - $0.60 per 1000 cf Next 500,000 cf - $0.40 per 1000 cf Over 1,000,000 cf - $0.15 per 1000 cf $25.00 minimum per year

NR - no response

its costs. Additionally, the new authority would establish consistency among members in the collection of user charges and conformance with applicable federal guidelines. The most significant changes arising from a new sewer authority are that:

1. Metropolitan sewer operations would be financed totally through user charges that are uniform; and,

2. Capital funding for the sewer system would be raised from sale of revenue bonds.

It should be noted that the current legislation signed by the Governor may be amended over the course of implementing the new authority. Any pertinent changes and effects on the project of a new sewer and water authority will be examined in the final EIS.

THE METROPOLITAN SEWERAGE DISTRICT

Community	Total 1980 Population	1984 MDC Sewer Charges (Actual $)	Current MDC Assessment Methodology - 1983 Assessments (a)			
			Contributing Population	Assigned Nonindustrial Sanitary Sewage	Industrial Sanitary Sewage Based Upon Water Volumes	Total Sanitary Sewage Volume Responsibility
				mg	mg	mg
Arlington	48,219	571,496	47,438	1,473.42	16.40	1,489.82
Ashland	9,165	72,229	2,933	91.10	36.66	127.76
Bedford	13,067	167,971	6,886	213.88	343.53	557.41
Belmont	26,100	313,961	25,317	786.34	48.57	834.91
Boston	562,994	8,707,237	560,179	17,399.12	6,011.14	23,410.26
Braintree	36,337	440,281	35,610	1,106.04	115.80	1,221.84
Brookline	55,062	656,285	54,787	1,701.68	65.22	1,766.90
Burlington	23,486	271,479	19,376	601.82	217.34	819.16
Cambridge	95,322	1,404,590	94,845	2,945.88	1,756.22	4,702.10
Canton	18,182	196,123	11,891	369.33	176.03	545.36
Chelsea	25,431	316,481	25,304	785.94	80.49	866.43
Dedham	25,298	273,204	21,225	659.25	36.49	695.74
Everett	37,195	501,725	37,009	1,149.50	390.42	1,539.92
Framingham	65,113	734,221	52,807	1,640.18	272.25	1,912.43
Hingham	20,339	68,676	5,268	163.62	0.00	163.62
Holbrook	11,140	50,996	991	30.78	0.00	30.78
Lexington	29,479	343,042	25,352	787.43	147.42	934.85
Malden	53,386	652,435	53,119	1,649.87	66.64	1,716.51
Medford	58,076	704,796	57,786	1,794.83	95.84	1,890.67
Melrose	30,055	361,272	29,905	928.85	42.30	971.15
Milton	25,860	300,422	24,127	749.38	47.29	796.67
Natick	29,461	309,299	21,507	668.01	114.16	782.17
Needham	27,901	319,070	23.863	741.80	98.60	840.40
Newton	83,622	1,029,442	81,531	2,532.35	300.83	2,833.18
Norwood	29,711	393,339	29,562	918.19	328.46	1,246.65
Quincy	84,743	1,043,343	84,319	2,618.94	161.53	2,780.47
Randolph	28,218	276,555	20,825	646.82	15.90	662.72
Reading	22,678	233,230	18,210	565.60	0.00	565.60
Revere	42,423	488,955	40,514	1,258.36	0.00	1,258.36
Somerville	77,372	954,399	76,985	2,391.15	243.57	2,634.72
Stoneham	21,424	255,844	21,124	656.11	17.26	673.37
Stoughton	26,710	199,115	12,046	374.15	9.03	383.18
Wakefield	24,895	297,351	24,571	763.17	27.42	790.59
Walpole	18,859	198,144	5,695	176.89	396.23	573.12
Waltham	58,200	883,177	57,909	1,798.65	1,055.97	2,854.62
Watertown	34,384	421,042	34,212	1,062.62	85.90	1,148.52
Wellesley	27,209	294,750	23,427	727.64	11.21	738.85
Westwood	13,212	97,351	5,747	178.50	30.00	208.50
Weymouth	55,601	528,800	38,309	1,189.87	39.28	1,229.15
Wilmington	17,471	118,559	210	6.52	312.86	319.38
Winchester	20,701	231,129	18,507	574.83	30.53	605.36
Winthrop	19,294	232,615	19,198	596.29	31.37	627.66
Woburn	36,626	505,510	27,579	856.60	898.18	1,754.78
Total	2,070,021	17,712,704	1,878,025	58,331.32	14,174.34	72,505.66

(a) Volumes shown do not include any infiltration, inflow, or stormwater quantities.

TABLE 11

SUMMARY OF MDC SEWERAGE SYSTEM MEMBER COMMUNITIES
LOCAL BILLING INFORMATION AND RATES
WATER SYSTEMS

Community	Customer Water Billing Information					Water Rates
	Metered	Unmetered	Customer Classes	Billing Frequency	Computerized Billing	
	%	%				
Arlington	100	0	Res,Comm,Ind	Semi-Annual	Yes	\$0.90 per Ccf
Ashland	100	0	No	Semi-Annual	Yes	1st 1600 cf - \$15.00 minimum Over 1600 cf - \$0.65 per Ccf
Bedford	100	0	No	Semi-Annual	Yes	1st 2000 cf - \$0.005 per cf Over 2000 cf - \$0.01 per cf Service charge - \$5.00 per billing period
Belmont	100	0	No	Quarterly	Yes	1st 800 cf - \$6.50 per quarter minimum Over 800 cf - \$0.65 per Ccf
Boston	99.9	0.1	Yes	Quarterly	Yes	\$7.48 per 1000 cf
Braintree	100	0	Yes	Quarterly	Yes	\$1.00 per Ccf
Brookline	100	0	Yes	Quarterly	Yes	\$0.95 per Ccf
Burlington	100	0	Res,Comm,Ind	Res:Semi-Annual Other:Quarterly	Yes	Res: 1st 20,000 gal - \$12.00 minimum s/a Next 15,000 gal - \$0.70 per 1000 gal Next 165,000 gal - \$0.80 per 1000 gal Over 200,000 gal - \$0.90 per 1000 gal Comm & Ind: 1st 10,000 gal - \$6.25 minimum qtr Next 7,500 gal - \$0.70 per 1000 gal Next 82,500 gal - \$0.80 per 1000 gal Over 100,000 gal - \$0.90 per 1000 gal
Cambridge	100	0	Yes	Tri-Annually	Yes	\$0.66 per Ccf
Canton	100	0	Res & Ind	Res:Semi-Annual Ind:Monthly	Yes	\$0.85 per Ccf
Chelsea	100	0	No	Quarterly	No	1st 1000 cf - \$8.50 minimum Over 1000 cf - \$0.85 per Ccf
Dedham	Served by Dedham Water Co.			Res:Quarterly Other:Monthly		1st 4,500 cf per qtr - \$1.848 per Ccf Next 13,500 cf per qtr - \$0.845 per Ccf Over 18,000 cf per qtr - \$0.483 per Ccf 5/8" minimum - \$24.42 per qtr; allowance - 900 cf per qtr 3/4" minimum - \$41.13 per qtr; allowance - 1500 cf per qtr Etc. for other meter sizes up to 6 inch - \$802.56 per qtr
Everett	100	0	No	Quarterly Some Ind:Monthly	Yes	\$0.40 per Ccf minimum \$8.00 per year for 2,000 cf
Framingham	100	0	No	Tri-Annually	No	\$0.40 per Ccf
Hingham	100 Hingham Water Co.	0	Res,Comm,Ind	Quarterly	Yes	5/8" minimum - \$15.31;allowance - 7 Ccf 1st 5 Ccf - \$1.750 per Ccf Next 10 Ccf - \$1.577 per Ccf Next 20 Ccf - \$1.437 per Ccf Next 50 Ccf - \$1.126 per Ccf Next 50 Ccf - \$0.839 per Ccf Over 135 Ccf - \$0.555 per Ccf Minimum,allowance,and blocks vary by meter size up to 8" minimum - \$731.62;allowance - 1146 Ccf All usage - \$0.555 per Ccf

TABLE 11 (continued)

SUMMARY OF MDC SEWERAGE SYSTEM MEMBER COMMUNITIES
LOCAL BILLING INFORMATION AND RATES
WATER SYSTEMS

Community	Customer Water Billing Information: Metered	Unmetered	Customer Classes	Billing Frequency	Computerized Billing	Water Rates
	%	%				
Holbrook	Res: 33 Ind & Com: 100	Res: 67	Res,Comm,Ind	Quarterly	Yes	Res: $22.00 per quarter Ind & Comm: $1.00 per Ccf
Lexington	100	0	Yes	Semi-Annual	Yes	1st 2,000 cf - $11.00 minimum Over 2,000 cf $0.55 per Ccf
Malden	100	0	No	Semi-Annual	Yes	$0.60 per Ccf $15.00 minimum
Medford	100	0	Yes	Semi-Annual	No	$8.00 per 1000 cf $22.00 minimum
Melrose	100	0	Yes	Semi-Annual	Yes	1st 5,000 cf - $0.65 per Ccf Next 5,000 cf - $0.75 per Ccf Next 5,000 cf - $0.85 per Ccf Over 15,000 cf - $0.90 per Ccf $16.25 minimum per 6 months Based on annual usage/billed semi-annual
Milton	100	0	Res & Ind	Semi-Annual	Yes	1st 1600 cf $13.50 minimum Over 1600 cf - $0.75 per Ccf
Natick	99	1	No	Quarterly	Yes	$0.70 per Ccf $1.75 minimum per month
Needham	100	0	Yes	Semi-Annual	Yes	1st 2,000 cf - $14.50 minimum Over 2000 cf - $0.72 per Ccf
Newton	100	0	No	Semi-Annual	Yes	1st 4,000 cf $0.55 per Ccf Next 4,000 cf - $0.65 per Ccf Over 8,000 cf - $0.75 per Ccf 5/8"-3/4" $9.00 minimum 1" $13.50 minimum Etc. thru 8" meters $99.00
Norwood	100	0	Yes	Quarterly Large: Monthly	Yes	Quarterly: $7.50 minimum per quarter 1st 6,000 cf $0.64 per Ccf Next 240,000 cf $0.55 per Ccf Over 246,000 cf - $0.44 per Ccf Large customers: $7.50 minimum per month 1st 2,000 cf - $0.64 per Ccf Next 80,000 cf $0.55 per Ccf Over 82,000 cf - $0.44 per Ccf
Quincy	99.6	0.4	No	Semi-Annual Over 2"-monthly	No	$0.90 per Ccf $18.00 minimum
Randolph	99	1	Yes	Semi-Annual	No	$0.42 per Ccf $20.00 per year minimum
Reading	99.9	0.1	Yes	Quarterly	Yes	$1.50 per Ccf with 10% discount if paid within 30 days $7.50 minimum
Revere	100	0	Res & Ind	Res:Semi-annual Ind:monthly	Yes	$0.65 per Ccf $21.00 per 6 months minimum
Somerville		3,000 Unmetered	No	Quarterly	Yes	$0.88 per Ccf
Stoneham	100	0	Yes	Semi-Annual	Yes	1st 2,100 cf $15.00 minimum Over 2100 cf $0.85 per Ccf

TABLE 11 (continued)

SUMMARY OF MDC SEWERAGE SYSTEM MEMBER COMMUNITIES
LOCAL BILLING INFORMATION AND RATES
WATER SYSTEMS

Community	Customer Water Billing Information: Metered	Unmetered	Customer Classes	Billing Frequency	Computerized Billing	Water Rates
	%	%				
Stoughton	100	0	Res,Comm,Ind	Res:Semi-annual Com/Ind-Quarterly	Yes	1st 1,000 cf - $20.00 minimum Next 1,000 cf - $0.80 per Ccf Next 3,200 cf - $0.90 per Ccf Next 6,600 cf - $1.00 per Ccf Next 6,600 cf - $1.10 per Ccf Next 6,600 cf - $1.20 per Ccf Next 25,000 cf - $1.30 per Ccf Next 50,000 cf - $1.40 per Ccf Over 100,000 cf - $1.65 per Ccf
Wakefield	100	0	Yes	Semi-Annual	Yes	1st 1,500 cf - $25.00 minimum Over 1,500 cf - $1.25 per Ccf
Walpole	NR	NR	NR	NR	NR	NR
Waltham	99	1	Res & Ind	Quarterly Large: Monthly	Yes	1st 100,000 cf - $0.80 per Ccf Next 1,900,000 cf - $0.72 per Ccf Over 2,000,000 cf - $0.70 per Ccf 5/8" - $8.00 per qtr min + $12.00 per year rental 3/4" - $15.00 per qtr min + $18.00 per year rental Etc. for other meter sizes up to 10" - $1500 + $900
Watertown	100	0	Yes	Semi-Annual	Yes	$0.64 per Ccf $16.00 minimum
Wellesley	100	0	Yes	Bi-Monthly	Yes	$3.00 customer charge $1.10 per Ccf Summer months: 1st 2500 cf - $1.10 per Ccf Over 2,500 cf - $1.60 per Ccf
Westwood	Served by Dedham Water Co.			Res:Quarterly Other:Monthly		1st 4,500 cf per qtr - $1.848 per Ccf Next 13,500 cf per qtr - $0.845 per Ccf Over 18,000 cf per qtr - $0.483 per Ccf 5/8" minimum - $24.42 per qtr; allowance - 900 cf per qtr 3/4" minimum - $41.13 per qtr; allowance - 1500 cf per qtr Etc. for other meter sizes up to 6 inch - $802.56 per qtr
Weymouth	100	0	Yes	Tri-Annually Large: Monthly	Yes	1st 150,000 cf - $1.15 per Ccf Next 350,000 cf - $1.05 per Ccf Next 1,000,000 cf - $0.95 per Ccf Over 1,500,000 cf - $0.85 per Ccf 5/8" - $3.00 per month minimum includes 200 cf 3/4" - $4.50 per month minimum includes 200 cf Etc. for other meter sizes up to 10 inch - $240
Wilmington	100	0	Yes	Quarterly	Yes	1st 9,000 cf - $1.04 per Ccf Next 81,000 cf - $0.70 per Ccf Over 90,000 cf - $0.64 per Ccf 5/8" - $12.48 minimum includes 1,200 cf 1" - $37.44 minimum includes 3600 cf Etc. for other meter sizes up to 8 inch - $597.60
Winchester	100	0	Yes	Semi-annual Large:Quarterly	Yes	$0.65 per Ccf $3.00 minimum per quarter $6.00 minimum semi-annually
Winthrop	100	0	No	Quarterly	No	1st 6667 cf per yr - $60.00 minimum Over 6667 cf - $0.90 per Ccf
Woburn	80	20	Yes	Semi-annual	Yes	Res: $13.00 flat rate Other: $0.50 per Ccf

NR - no response

TABLE III

SUMMARY OF MDC SEWERAGE SYSTEM MEMBER COMMUNITIES
LOCAL COST RECOVERY INFORMATION
SEWAGE SYSTEMS

	Method Used to Recover Sewage System Costs				Customer Sewage Billing Information						
	Taxed Based		User Charge								
Community	Local	MDC	Local	MDC	Metered	Customer Classes	Billing Frequency	Computerized Billing	EPA Grants	EPA User Charge System	Sewage Rates
					%						
Arlington			X	X	100	Res,Comm,Ind	Semi-Annual	Yes	Yes	Approved	$0.40 per Ccf
Ashland			X	X	100	No	Semi-Annual	Yes	No	No	1st 1600 cf - $15.00 minimum Over 1600 cf - $0.65 per Ccf
Bedford			X	X	100	No	Semi-Annual	Yes	Applied	Submitted	1st 2,500 cf - $0.005 per cf Over 2,500 cf - $0.0125 per cf Service charge - $5.00 per billing period
Belmont			X	X	100	No	Quarterly	Yes	Yes	Approved	$0.38 per Ccf
Boston			X	X	100	Yes	Quarterly	Yes	Yes	Approved	$5.46 per 1000 cf
Braintree			X	X	100	Yes	Quarterly	Yes	Yes	Approved	$0.85 per Ccf
Brookline			X	X	100	Yes	Quarterly	Yes	No	Approved	$0.40 per Ccf
Burlington			X	X	100	Res,Comm,Ind	Res:Semi-Annual Other:Quarterly	Yes	Yes	No	60% of water bill
Cambridge			X	X	100	Yes	Tri-Annually	Yes	No	No	$0.62 per Ccf
Canton	X	X							Yes	Submitted	Ad Valorem
Chelsea	X	X							Yes	Submitted	Ad Valorem
Dedham	X	X							No	Submitted	Ad Valorem
Everett	X	X							No	No	Ad Valorem
Framingham			X	X	100	No	Tri-Annually	No	No	Approved	75% of water bill
Hingham		X	X		100	Res,Comm,Ind	Annually	Yes	No	No	$50.00 per dwelling unit $50.00 per single family $100.00 per two family $150.00 per three family Ind,Schools & Comm - $5.00 per 1,000 cf $50.00 minimum
Holbrook			X	X	Part Res, All Ind & Comm	Res,Comm,Ind	Quarterly	Yes	No	Approved	Res: $9.00 per quarter Com & Ind: NR

TABLE II (continued)

SUMMARY OF MDC SEWERAGE SYSTEM MEMBER COMMUNITIES
LOCAL COST RECOVERY INFORMATION
SEWAGE SYSTEMS

	Method Used to Recover Sewage System Costs				Customer Sewage Billing Information						
	Taxed Based		User Charge								
Community	Local	MDC	Local	MDC	Metered	Customer Classes	Billing Frequency	Computerized Billing	EPA Grants	EPA User Charge System	Sewage Rates
					%						
Lexington	X	X							Yes	No	Ad Valorem
Malden			X	X	100	No	Semi-Annual	Yes	Yes	Approved	$0.40 per Ccf $10.00 minimum
Medford	X	X							No	No	Ad Valorem Minimum tax - $16.50 for 6 months
Melrose	X	X							No	Submitted	Ad Valorem
Milton			X	X	100	Res & Ind	Semi-Annual	Yes	No	Approved	1st 1600 cf - $12.50 minimum Over 1600 cf - $0.70 per Ccf
Natick		X	X		100	No	Quarterly	Yes	Yes	No	$0.30 per Ccf $0.75 minimum per month
Needham	X	X							Applied	No	Ad Valorem
Newton	X	X	X	X	100	No	Semi-Annual	Yes	No	Submitted	75% of water bill plus taxes
Norwood	X	X							Yes	No	Ad Valorem (will put UC in effect in 1984)
Quincy	X	X	X	X	99.6	Major, Tax Ex., & all other		No	Yes	Approved	Major & Tax Ex. - $1.49 per Ccf All Other - Ad Valorem
Randolph		X	X		99	Yes	Semi-Annual	No	Yes	Approved	$30 per single family $60 per 2 family $90 per 3 family Comm & above 3 family - $0.0015 per cf
Reading	X	X	X	X	99.9	Yes	Quarterly	Yes	Yes	Submitted	$0.80 per Ccf with 10% discount if paid within 30 days - $1.50 minimum Debt service from taxes
Revere	X	X							No	No	Ad Valorem
Somerville		X	X	X	3,000 Unmetered	Sp. Discharge Customers	Quarterly	Yes	Yes	Approved	$0.60 per Ccf

TABLE 121 (continued)

SUMMARY OF MDC SEWERAGE SYSTEM MEMBER COMMUNITIES
LOCAL COST RECOVERY INFORMATION
SEWAGE SYSTEMS

	Method Used to Recover Sewage System Costs				Customer Sewage Billing Information						
	Taxed Based		User Charge								
Community	Local	MDC	Local	MDC	Metered	Customer Classes	Billing Frequency	Computerized Billing	EPA Grants	EPA User Charge System	Sewage Rates
					%						
Stoneham			X	X	100	Yes	Semi-Annual	Yes	Yes	Approved	$0.78 per Ccf
Stoughton			X	X	100	Yes	Res:Semi-annual Com/Ind:Quarterly	Yes	Applied	Approved	$0.80 per Ccf $25.00 minimum per 6 months
Wakefield	X	X							No	No	Ad Valorem
Walpole	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Waltham			X	X	99	Res & Ind	Quarterly Large:Monthly	Yes	No	Approved	$0.55 per Ccf
Watertown			X	X	100	Yes	Semi-Annual	Yes		Approved	$0.42 per Ccf applied to 85% of water meter reading
Wellesley			X	X	100	Yes	Bi-Monthly	Yes	Yes	Approved	63% of water bill $1.89 minimum per 2 months
Westwood	X	X							Yes	Approved	Ad Valorem (UC approved for January 1, 1985)
Weymouth		X	X		100	Yes	Annually	Yes	Yes	Approved	Annual $ / Residential / Other $30.00 / 1 family / First 13,999 cf $55.00 / 2 family / Up to 21,999 cf $75.00 / 3 family / Up to 28,999 cf $90.00 / 4 family / Up to 34,999 cf $15.00 / each add. unit / Every add. 5,000 cf
Wilmington			X	X	100	Yes	Quarterly	Yes	Yes	Approved	$0.75 per Ccf $9.00 minimum
Winchester	X	X							Yes	No	Ad Valorem
Winthrop	X	X							Yes	No	Ad Valorem (UC to be adopted by mid-1984)
Woburn			X	X	100	Yes	Annually	Yes	Yes	Submitted	Domestic:1st 10,000 cf - $0.30 per 1000 cf Over 10,000 cf - $0.20 per 1000 cf $8.00 minimum per year Industrial:1st 500,000 cf - $0.60 per 1000 cf Next 500,000 cf - $0.40 per 1000 cf Over 1,000,000 cf - $0.15 per 1000 cf $25.00 minimum per year

NR - no response

12.6 Noise Analysis

12.6 NOISE ANALYSIS

12.6.1 Ambient Noise Levels

Three sources of information have been used to characterize existing levels of noise on-site and in the neighborhood of each proposed site for wastewater treatment facilities. For the Deer Island site and nearby Winthrop community, field monitoring of noise levels was done recently by Havens & Emerson for the MDC (memorandum dated June 14, 1984, addressed to the Deer Island Citizens Advisory Committee). Results are shown in Table 12.6-1 and in Figure 12.6-1, reproduced from the memo.

Additional data for Deer Island and vicinity, as well as Long Island, were reported in the MDC, Site Options Study (1982) by Metcalf and Eddy, Inc. For the sites at Long Island and Nut Island, field measurements were taken by CE Maguire, Inc. in Squantum, Houghs Neck, and Adams Shore in Quincy. These tests were taken on 7/12/84 using a Genrad model 1551-C sound level meter calibrated before and after testing with a Genrad model 1567 sound level calibrator. Tests were made on the A weighted spectrum. Field sheets and computation sheets are shown in Attachment I. Testing locations are shown in Figures 12.6-2a and 2b and results are summarized in Table 12.6-2.

At each testing site in the Maguire analysis, 50 to 100 samples were taken, one every 10 seconds. After 50 samples, a test at the 95th percentile was undertaken to determine if the sample set was statistically valid. If not, 50 more samples were taken and the set was tested again. Statistically valid sets were obtained at all sites within 100 samples. From these sets, L_{10}, L_{50} L_{90} and Leq sound energy levels were calculated.

L_{10} corresponds to the sound energy level exceeded 10 percent of the time, L_{50} to the level exceeded 50 percent of the time, L_{90} to the level exceeded 90 percent of the time and Leq is the equalized or "average" overall sound energy level.

TABLE 12.6-1

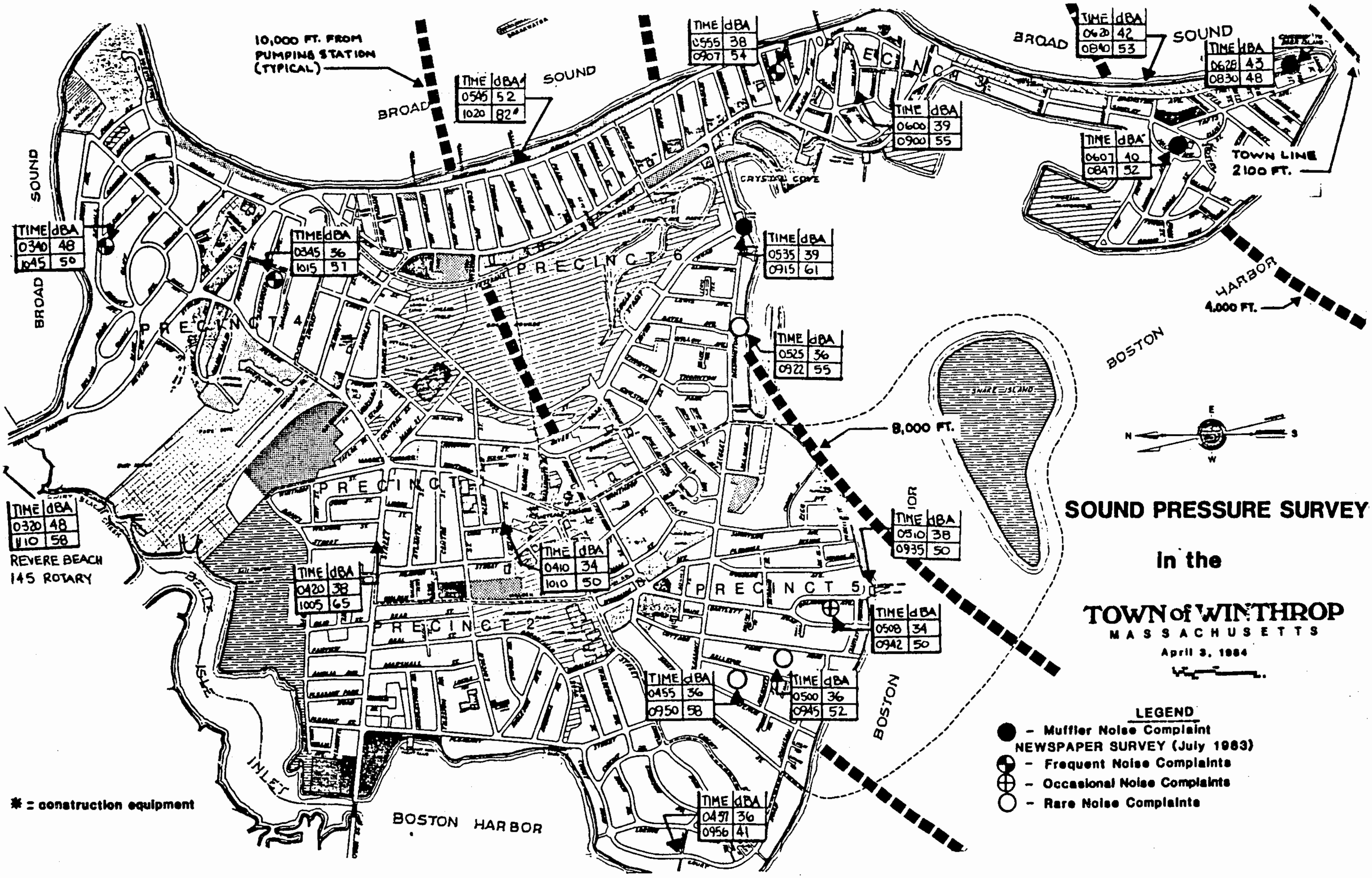
NOISE LEVELS IN THE VICINITY OF DEER ISLAND, 1984[1]

LOCATION	EARLY AM	MID AM	Leq[2]
Revere Beach Rotary	48	58	
Sawmill @ Floyd	48	50	
Sagamore	36	57	
Cora St.	34	50	
Main @ Banks	38	65	65-70
Court	36	41	
Bellevue	36	58	65-80
Park	36	52	
Winthrop Shore Drive	52	82**	
Orlando Ave.	34	50	
Orlando @ Shore	38	50	
Washington @ Bates	36	55	
River @ Washington	39	61	
Tewksbury St.	38	54	
Cottage Ave.	39	55	65-75
Macy Ave.	40	52	
Brewster Ave.	42	53	
Causeway to Deer Isl.	43	48	
Deer Island	--	--	65-70

**Construction equipment at this location

[1] Reported by MDC, June 14, 1984. Locations are reported in order by distance from Deer Island, farthest to closest. Statistical sampling techniques were not used in this MDC study. Levels reported are from instantaneous field readings.

[2] From MDC, Site Options Study, Vol. II (Metcalf & Eddy, Inc., pg. 2-48, 1982). These selective readings are based on computer modelling results



Source: MDC, Havens & Emerson, June 14, 1984.

LOCATIONS OF WINTHROP NOISE MEASUREMENTS

fig. 12.6-1

TABLE 12.6-2

AMBIENT NOISE LEVELS IN THE VICINITY OF

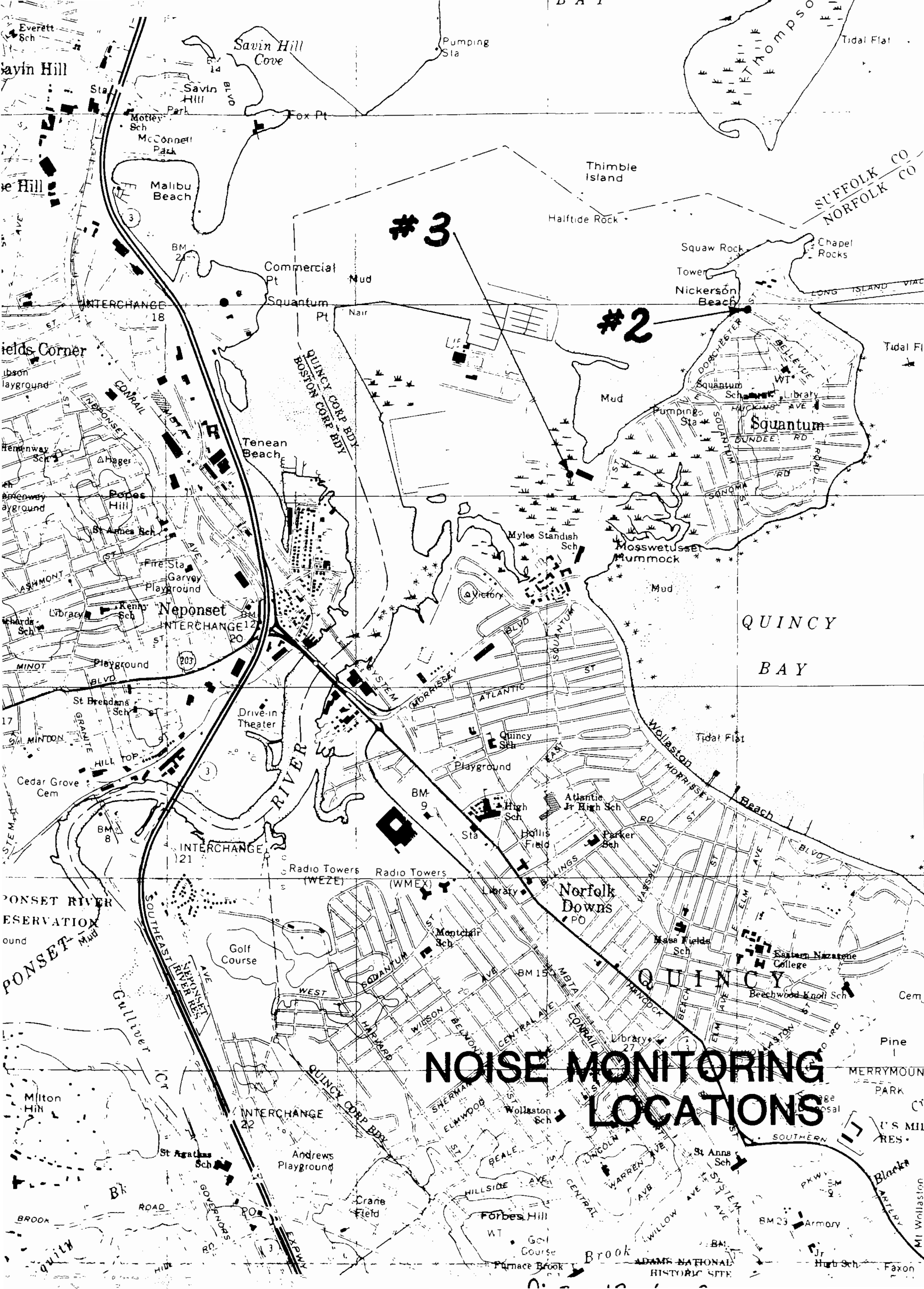
LONG ISLAND AND NUT ISLAND, 1984[1]

SITE	L10	L50	L90	Leq	Leq[2]
1. Long Island	--	--	--	--	65-70
2. Squantum-Dorchester/Shoreham Sts	64	56	49	59	<65
3. Squantum-Jordan Access Rd.	67	58	50	61	
4. Houghs Neck - Nut Island Gate	56	55	54	55	
5. Houghs Neck - Sea St.	59	54	52	56	
6. Adams Shore, Quincy - Sea St.	68	64	58	65	

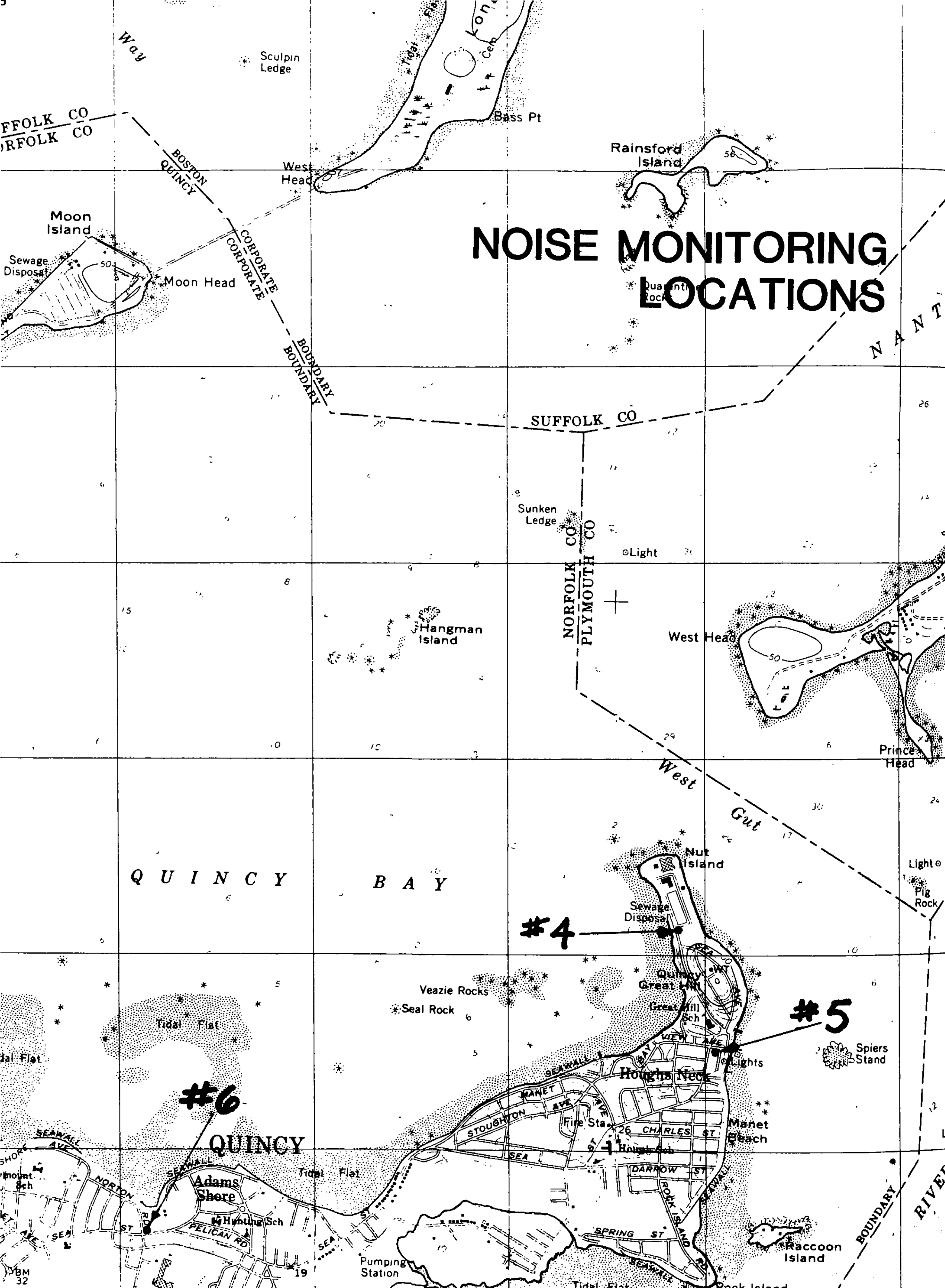
---

[1]A-weighted sound pressure levels, recorded by CE Maguire, Inc. during mid-morning and afternoon of 7/12/84 (see Attachment I field sheets).

[2]From MDC, Site Options Study, Vol. II (Metcalf & Eddy, Inc., pg. 2-92, 1982). These selective readings are based on computer modelling results



NOISE MONITORING LOCATIONS
#3
#2
Savin Hill Cove
Savin Hill
Pumping Sta
Fox Pt
Thompson
Tidal Flat
Malibu Beach
Thimble Island
Halftide Rock
SUFFOLK CO
NORFOLK CO
Squaw Rock
Chapel Rocks
Tower
Nickerson Beach
Commercial Pt
Squantum Pt
Mud
INTERCHANGE 18
Fields Corner
QUINCY CORP BDY
BOSTON CORP BDY
Squantum Sch
Library
Pumping Sta
Squantum
Tenean Beach
Popes Hill
Myles Standish Sch
Mosswetusset Hummock
Neponset
INTERCHANGE 20
QUINCY
BAY
Tidal Flat
Wollaston Beach
Drive-in Theater
RIVER
Cedar Grove Cem
Quincy Sch
Playground
High Sch
Atlantic Jr High Sch
Hollis Field
Parker Sch
INTERCHANGE 21
Radio Towers (WEZE)
Radio Towers (WMEX)
Library
Norfolk Downs
NEPONSET RIVER RESERVATION
Golf Course
Montclair Sch
Mass Fields Sch
Eastern Nazarene College
QUINCY
Beechwood Knoll Sch
Pine
MERRYMOUNT PARK
Milton Hill
INTERCHANGE 22
St Agathas Sch
Andrews Playground
Wollaston Sch
St Anns Sch
Crane Field
Forbes Hill
Golf Course
Brook
ADAMS NATIONAL HISTORIC SITE
Furnace Brook
Armory
Faxon



ce maguire inc. 1984

Noise levels measured in both these separate studies are generally comparable to the ranges reported by Metcalf & Eddy in the MDC Site Options Study (1982). Statistical comparison among results is not possible due to inconsistency of sampling locations times of tests and lack of statistical validity in the various noise measurements done for the MDC.

These sources of noise information for the three sites under consideration indicate that ambient noise levels in Quincy were generally at the upper ranges of daytime standards for community noise (see following section). Levels in Winthrop (remembering the limitations of these data) are also at the upper ranges of community noise. These noise measurements reflect the urbanized nature of the communities surrounding the proposed treatment plant sites.

In addition to these measured readings, noise monitoring was conducted by Massport as part of their ongoing noise measurement and abatement program. Figure 12.6-3 shows the location of Massport microphones used to measure noise energy levels of aircraft operations. Figure 12.6-4 shows noise contours taken from Massport's Generic Environmental Impact Report on operation of Logan Airport published in October, 1984. Noise generated by airport operations is a significant part of the background noise in Winthrop, and also contributes to noise in Quincy, though to a lesser degree, based on the flight paths followed. While none of the proposed alternatives will result in any alteration of airport noise, airport noise levels are included here to indicate existing noise impacts on the local adjoining communities, and to place the proposed treatment plant siting actions in the Harbor setting.

12.6.3 Relevant Standards and Criteria

The applicable noise control standards which would govern the proposed treatment plant sites and their surroundings are the City of Boston Noise Control Regulations, EPA recommended noise exposure limits, and Massachusetts statewide noise regulations. Tables 12.6-3 and 12.6-4 show maximum allowable noise levels under the first two standards.

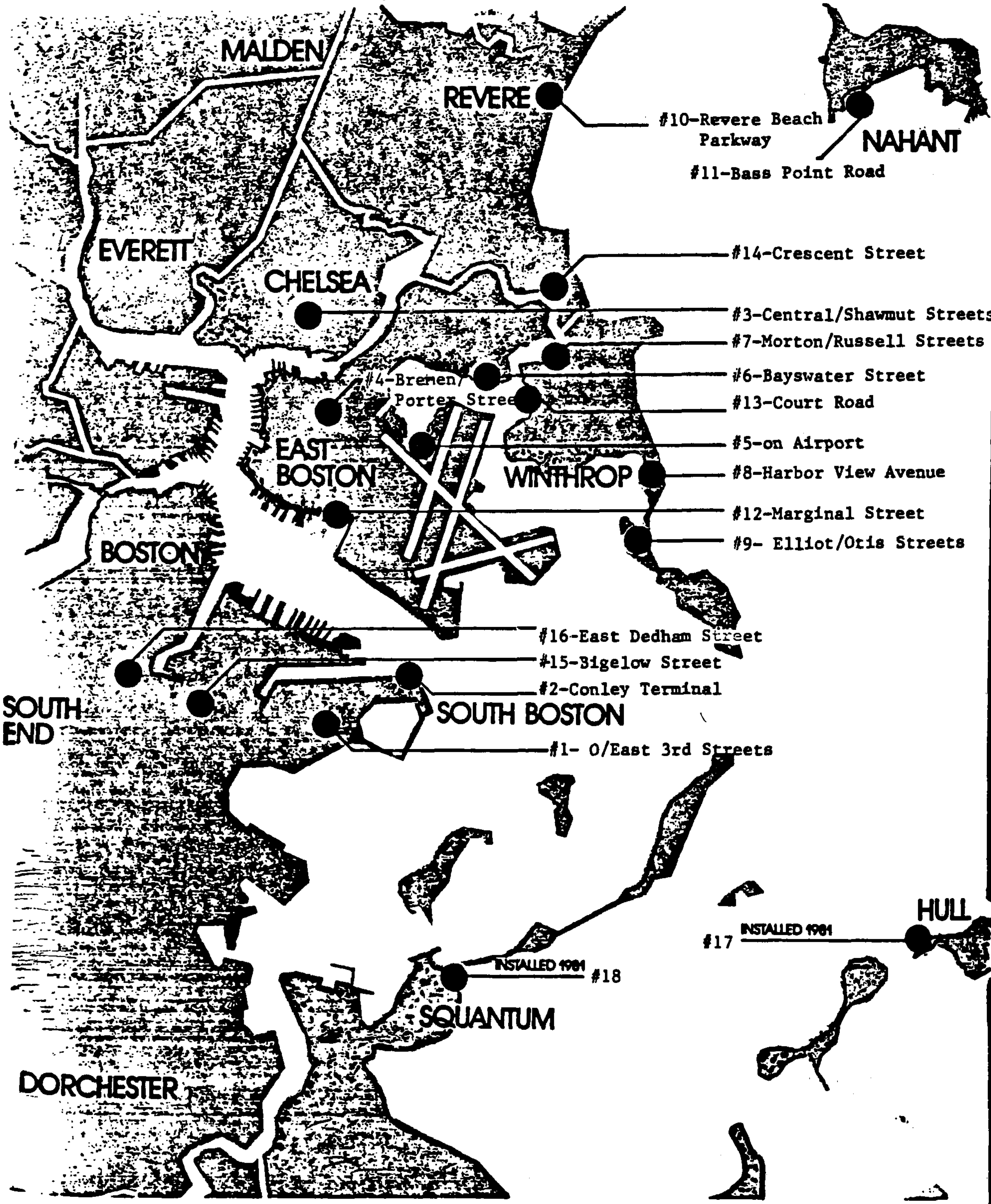
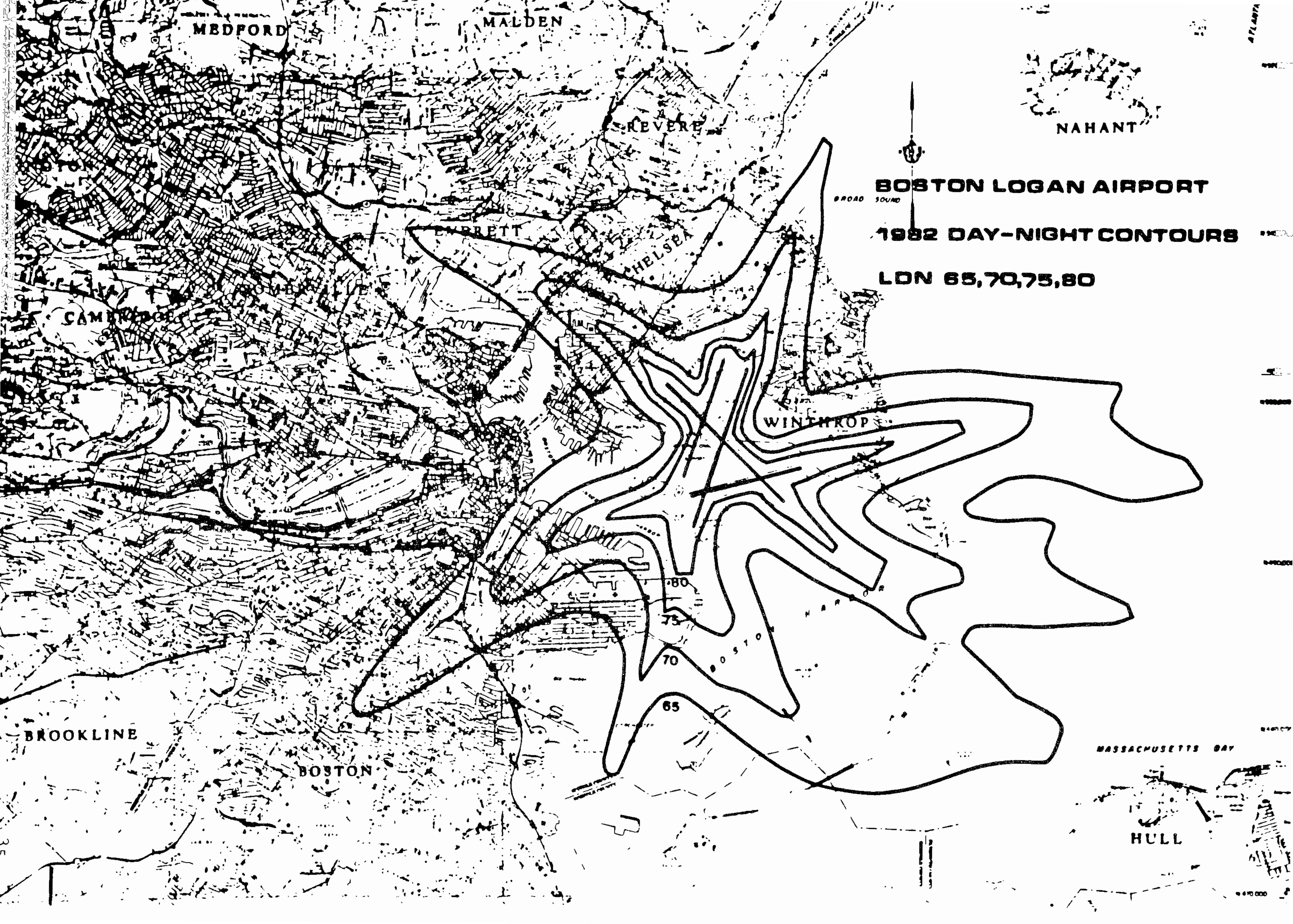


fig.12.6-3

MASSPORT MICROPHONE LOCATIONS

Source: Massport, Generic Environmental Impact Statement (Oct. 1984)


MEDFORD
MALDEN
REVERE
NAHANT
BOSTON LOGAN AIRPORT
1982 DAY-NIGHT CONTOURS
LDN 65,70,75,80
EVERETT
CHELSEA
SOMERVILLE
CAMBRIDGE
WINTHROP
80
75
70
65
BROOKLINE
BOSTON
MASSACHUSETTS BAY
HULL

Noise requirements established by the Massachusetts DEQE under Regulation 10 of their Air Pollution Regulations provide that approval for installation or modification of a noise source will be granted if it does not:

1. Increase the broadband noise level in excess of 10 dB(A) above ambient (corresponding to L_{90}); or,

2. Produce a puretone condition, where a puretone is any given octave band center frequency that exceeds the two adjacent center frequencies by three (3) or more decibels.

These standards apply primarily to operations noise. For construction generated noise, there are no specific standards that apply at the state level; however, the State would require application of all reasonable noise mitigation measures (as noted in Section 12.6.5 below).

Most pertinent of these controls is the Boston Noise Control Regulation. This applies to Deer Island and Long Island. Under the Boston noise limits, maximum noise levels would apply during construction and operations. These standards do not, however, apply on Nut Island or in Quincy. They also do not apply in Winthrop, although their application on Deer Island would serve to protect that site's neighbors. State regulations apply at all locations. Both Quincy and Winthrop would be covered by noise regulations of the Commonwealth. The guidelines set by the City of Boston noise regulation and by the State's regulations were used as the basis for assessing potential noise impacts at all sites.

TABLE 12.6-3

BOSTON NOISE CONTROL REGULATIONS

	Maximum Allowable Noise Levels
Residential	
7:00 A.M. - 6:00 P.M.*	60 dBA
All other times	50 dBA
Residential/Institutional	
7:00 A.M. - 6:00 P.M.	65 dBA
All other times	55 dBA
Business	
Any time	65 dBA
Industrial	
Any time	70 dBA

*Except Sundays and holidays when special permit to operate is needed.

Construction Noise Regulations*

Lot Use of Affected Property	L_{10} Level	Maximum Noise Level at Affected Property Line
Residential or Institutional	75 dBA	86 dBA
Business or Recreational	80 dBA	--
Industrial	85 dBA	--

Note: L_{10} defines the noise level that is exceeded 10 percent of the time.

*Construction noise standards apply to the 7 A.M. to 6 P.M. period; work during other times and on Sundays requires a permit.

SOURCE: Regulations for the Control of Noise, City of Boston, Boston Department of the Environment, (Jeff Boehm 725-4416), personal communication 11/5/84.

Table 12.6-4

YEARLY AVERAGE* EQUIVALENT SOUND LEVELS IDENTIFIED AS REQUISITE TO PROTECT THE PUBLIC HEALTH AND WELFARE WITH AN ADEQUATE MARGIN OF SAFETY

	Measure	Indoor Activity Interference	Indoor Hearing Loss Consideration	To Protect Against Both Effects (b)	Outdoor Activity Interference	Outdoor Hearing Loss Consideration	To Protect Against Both Effects (b)
Residential with Outside Space and Farm Residences	L_{dn}	45		45	55		55
	$L_{eq(24)}$		70			70	
Residential with No Outside Space	L_{dn}	45		45			
	$L_{eq(24)}$		70				
Commercial	$L_{eq(24)}$	(a)	70	70(c)	(a)	70	70(c)
Inside Transportation	$L_{eq(24)}$	(a)	70	(a)			
Industrial	$L_{eq(24)}$(d)	(a)	70	70(c)	(a)	70	70(c)
Hospitals	L_{dn}	45		45	55		55
	$L_{eq(24)}$		70			70	
Educational	$L_{eq(24)}$	45		45	55		55
	$L_{eq(24)}$(d)		70			70	
Recreational Areas	$L_{eq(24)}$	(a)	70	70(c)	(a)	70	70(c)
Farm Land and General Unpopulated Land	$L_{eq(24)}$				(a)	70	70(c)

Code:

a. Since different types of activities appear to be associated with different levels, identification of a maximum level for activity interference may be difficult except in those circumstances where speech communication is a critical activity. (See Figure D-2 for noise levels as a function of distance which allow satisfactory communication.)
b. Based on lowest level.
c. Based only on hearing loss.
d. An $L_{eq(8)}$ of 75 dB may be identified in these situations so long as the exposure over the remaining 16 hours per day is low enough to result in a negligible contribution to the 24-hour average, i.e., no greater than an L_{eq} of 60 dB.

Note: Explanation of identified level for hearing loss: The exposure period which results in hearing loss at the identified level is a period of 40 years.

*Refers to energy rather than arithmetic averages.

Source: Identification of Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (EPA 550/9-74-004)

12.6.4 Potential Impacts of Siting Alternatives

There are three aspects of noise associated with proposed treatment plant alternatives: noise from plant operations, construction noise and traffic noise. In assessing the impacts of associated project noise on nearby abuttors, several factors were considered. For operations noise, the standards of the Massachusetts Noise Regulations and City of Boston Noise Regulations were applied (see previous section). In the case of the State regulation, an increase of less than 10 decibels above existing background noise levels was allowable. The Boston regulation provided maximum allowable noise limits of between 55 and 65 dBA. For construction noise, the Boston regulations were applied with a maximum limit of 75 (L_{10}) and 86 dBA used. For traffic noise, consideration was given to the noise level, its frequency and duration as the basis for evaluating impacts. The impacts of each alternative are discussed below.

a. Noise from Plant Operations

Noise from the operation of proposed treatment facilities is not likely to represent a widespread or significant impact at either Deer Island, Nut Island or Long Island. The MDC, Site Options Study (M&E, 1982) determined that noise from the Deer Island wastewater treatment facility would result in an increase of less than one decibel in background noise at the nearest residence in Point Shirley (about one half mile away). At the prison (within 700 feet), noise level increases were within two decibels of background levels. The range of instant on-site readings recorded on Deer Island were a low of 38 dBA at the old pumphouse to a high of 88 dBA at the existing pump station.

Recent MDC studies indicated that the noise of muffler throb from the existing diesel engines at Deer Island resulted in a 2 dBA oscillation over a background reading of 41 dBA at the nearest Point Shirley residence (about 2,200 feet). Proposed new improved treatment facilities utilizing electric motors to replace the current diesel engines will result in a noise reduction of about this magnitude from present conditions.

EPA criteria (EPA - 430/9-76-003, January 1976) state that changes in noise level of 0 to 3 dBA are expected to cause little or no impact. State noise regulations allow an increase in ambient noise levels by up to 10 dBA.

The City of Boston regulations allow noise levels of 55 to 65 dBA from operations, which, based on the noise levels recorded at the site, indicate that operations noise from the existing facilities is a slight impact at Winthrop residences and is within allowable limits set by the regulations. Operations of proposed new treatment facilities with improved equipment would result in better operations with reduced noise impacts expected at nearby residences. Noise impacts during operations of new facilities on the adjacent prison population would also be expected to result in noise levels below those recorded at existing facilities and well within maximum allowable Boston or State noise standards.

On Long Island, the distance between the site and the nearest residences is about 12,000 feet (or six times the distance between Point Shirley and Deer Island). No significant noise impact on residences from proposed treatment facility operations is anticipated. The hospital at Long Island would be within 1,500 feet of a proposed 18-acre primary (150 MGD) treatment plant site and within 200 feet of a larger 52-acre consolidated primary (500 MGD) plant site (although the location of potential noise generating equipment would vary). Noise levels from operations of either size treatment plant nearby to the hospital would result in noise level increases over background levels of less than one decibel to no more than three decibels. Noise increases of this magnitude would have only a slight effect on hospital residents or staff and are within the limits set by the Boston Noise Regulations. Noise levels would likewise be slight relative to possible on-site recreation activities.

At Nut Island, there are a small number of residences on Quincy Great Hill in Houghs Neck within 1,000 feet of the potential operational noise sources at proposed treatment facilities. Peak operational noise levels generated on-site at a primary treatment plant were assumed to be 78 dBA (based on peak measurements of 75 to 80 dBA taken at Nut Island and at other treatment plants). Operations noise at Nut Island under primary treatment alternatives may lead to noise levels at the nearest homes (about 1,000 feet from potential noise generating facilities) of approximately 52 dBA. This is an insignificant increase above existing conditions and does not exceed levels specified by State noise control guidelines (greater than 10 dBA above background). This is not expected to constitute appreciable local annoyance. Noise control measures, including containment of major noise generating equipment within enclosed buildings, will keep noise of operations within acceptable levels at nearby residences (see Section 4.3.3).

Noise levels at the nearest residences to Nut Island under a headworks option would be less than 50 decibels (based on an increased distance of 1,500 feet) and below existing background levels. This level of noise would result in no appreciable effect offsite (given a background in the range of 55 dBA).

A "puretone condition" is a factor addressed in the State's noise standards which relates to constant monotones, and can be a problem due to constant motor whine or engine muffler throb. Proposed new treatment facilities at all sites would result in no significant puretone conditions. Existing problems with engine and muffler noise will be eliminated by electric motors.

b. Construction Noise

Table 12.5-7 (from the 1978 Draft EIS) shows typical sound pressure levels generated by construction equipment without added noise mitigation, such as special mufflers. The mid-range of these values is 88 dBA, the highest is for pile driving at 101 dBA. Other construction activities may also approach peak noise levels.

Since it is not possible to predict what combination of equipment noises will be operating at a given time over a site during construction,

Table 12.6-7

TYPICAL CONSTRUCTION SITE EQUIPMENT SOUND LEVELS (in dBA)

Construction Equipment	Typical Sound Level at 50 Feet
1. Dump truck	88
2. Portable air compressors	81
3. Concrete mixer (Truck)	85
4. Paving Breaker	88
5. Scraper	88
6. Dozer	87
7. Paver	89
8. Generator	76
9. Pile driver	101
10. Rock drill	98
11. Pump	76
12. Pneumatic tools	85
13. Backhoe	85

SOURCE: EPA 1975

we have expressed this value as a range between 88 dBA, which is assumed to be typical noise of construction equipment without mitigation (the mode of the values presented), and 101 dBA, which represents a peak value, based on a pile driver without special noise mitigation applied.

Additionally, separate noise calculations were made for construction equipment assuming the application of noise mitigation measures (see Section 12.6.5 below). Based on predicted construction practice as indicated by the Commonwealth, a reduction in equipment noise of 10 decibels to 78 dBA (typical) and 90 dBA (peak) was used to reflect mitigated noise levels, assuming the application of noise mufflers and quieter construction equipment which may be available on a construction project of this scale.

For the prediction of noise levels offsite, the following formula was used. This formula will account for the attenuation of noise with distance without corrections for temperature, humidity, barometric pressure or topography. The sound pressure level (dBA_1) at any given distance d_1 from a generating source can be calculated on the basis of known noise levels (dBA_2) at a known distance d_2 by the formula:

$$dBA_2 = dBA_1 - 20 \log(d_2/d_1)$$

This formula has been used to estimate probable noise levels at the nearest residences or population groups to each of the wastewater treatment facility sites under various distances as shown in Table 12.6-8. "Typical" values shown in this table represent noise levels due only to construction assuming construction noise equal to 88 dBA without mitigation or 78 dBA with mitigation. "Worst case" values represent noise levels likely to result from pile driving or comparable peak construction noise activities at 101 dBA without mitigation and 90 dBA with mitigation. The impact assessment was made using mitigated construction noise levels since the MDC has reportedly carried out mitigation practices in other construction projects and EPA and the Commonwealth have indicated that they will require the application of

TABLE 12.6-8

PREDICTED CONSTRUCTION NOISE LEVELS NEAR CONSTRUCTION SITES

SITE	Receptor	Approx. Distance (feet)	With no Noise Mitigation "Typical" Noise Level (dBA)[1]	With no Noise Mitigation "Worst Case" Noise Level (dBA)[2]	Max. Allowable Noise Levels (dBA)[3]	With Noise Mitigation "Typical" Noise Level (dBA)[4]	With Noise Mitigation "Worst Case" Noise Level (dBA)[5]
Deer Island	Prison	200	75	89	75 (L_{10})-86	66	78
	Nearest Residence	2,000	56	69		46	58
	Center of Point Shirley	3,000	52	65		42	54
Long Island	Hospital[6]	200	75	89	75 (L_{10})-86	66	78
		1,500	57	71		48	60
	Nearest Residence In Squantum	12,000	40	53		30	42
Nut Island	Nearest Residence[7]	50	88	NA	75 (L_{10})-86	78	NA
		100	82	95		72	84
		1,000	62	75		52	64
	Center of Houghs Neck	3,000	52	65		42	54

[1] Assumes construction noise equivalent to 88 dBA the mode of equipment noise levels shown in Table 7.

[2] Assumes noise generated by pile driving at 101 dBA; this noise value assumes normal equipment operations without any special alteration or muffler applications which would lower noise levels.

[3] Boston Noise Regulations, maximum allowable construction noise level at receptor boundary; this standard is used as a guideline for Nut Island, and in Quincy where only the State regulations would apply.

[4] Assumes construction noise equivalent to 78 dBA with use of standard noise mitigation practices as determined by the Commonwealth and MDC.

[5] Assumes construction noise equivalent to 90 dBA with use of special noise mitigation practices as determined by the Commonwealth and MDC.

[6] A 1,500 foot distance assumes a primary plant (150 MGD) located at the Nike base; alternately, a treatment plant sited adjacent to the hospital at a distance of 200 feet would generate higher noise levels as shown in table above.

[7] At 50 feet, which can only occur under a primary option which does not utilize filling of Quincy Bay and does not relocate residents (not a likely outcome), noise levels would be highest as shown in the table above; such a value may also result under options where the open space at the entrance to the site is used as a staging area, but such activity would result in noise levels of limited duration under the "typical" category with a "worst case" not applicable (NA). The successively greater distances shown above reflect varying potential noise levels under various alternatives and construction options.

Source: CE Maguire, Inc. (Nov., 1984).

maximum noise mitigation measures, to the extent feasible, in this project.

Under typical operations with noise mitigation, noise levels generated by construction activities at Deer Island, Long Island, and Nut Island would be slight to moderate and well within maximum Boston and State limits for construction activity. At the nearest residences in Point Shirley, at the prison on Deer Island, at the hospital on Long Island (either an 18- or 52-acre primary treatment plant), and at nearby residences on Houghs Neck, the noise levels generated during construction would be between 46 to 78 dBA, all well below the acceptable limits at the respective sites.

For the limited duration of operation of peak noise generating equipment with noise mitigation, noise levels in Point Shirley, at the Deer Island prison, and at the Long Island hospital (as noted above) are slight to moderate increases and still within allowable noise limits at between 58 and 78 dBA at the respective locations.

The sensitivity of the hospital population on Long Island may require further mitigation of noise levels beyond the construction practices which will be required at other sites. These may be needed, even though projected noise levels there (at 60 to 78 dBA) would be within maximum allowable limits as set by Boston. This is particularly true for a larger facility closer to the hospital. Special mitigation measures, in addition to those discussed below, may be necessary at this site.

Peak construction noise with mitigation, at nearby residences to Nut Island, would have the greatest potential impact, even though it would not exceed maximum noise control guidelines. Under certain circumstances, noise levels at this site may approach allowable limits and could have a potentially disruptive effect on neighbors. In the case of a primary facility on Nut Island (with filling) noise levels may, under peak conditions, become moderately adverse (at 84 dBA) at abutting locations, approaching maximum allowable levels. Without filling, it is assumed that relocation of nearby residents will be accomplished so that peak noise levels will not exceed the standards set and would not pose greater noise impacts on the closest remaining homes. In the case of a headworks facility at Nut Island, peak noise levels would be slightly adverse, well below the maximum allowable limits.

In the case of construction noise without mitigation applied, a situation not expected to occur, typical construction noise levels would be higher than those noted above (see Table 12.6-8); however, they would, in most cases, still be within the limits of the allowable standards. The only exception to this would be noise to nearby residences at Nut Island under primary treatment alternatives (as noted above). It is expected, therefore, under such a circumstance, that relocation of nearby residents will be carried out in order to avoid potentially severe adverse impacts, among them noise, and reestablish adequate buffer areas.

Even though typical noise levels are within maximum guideline limits (as set by the City of Boston), construction noise is likely to represent a significant annoyance and occasional disruption to nearby residents and other groups around all three sites based on their proximity to the construction sites. This impact, which is unavoidable, is common to any construction project and would require mitigation measures to lessen adverse effects.

Mitigation actions to lower construction noise to more acceptable levels would, therefore, be employed at all sites where potentially sensitive receptor groups reside. This would include the hospital population at Long Island, the prison population at Deer Island, and nearby residences at both Nut Island and Deer Island. The types of mitigations that could be employed are discussed in Section 12.6.5 following.

c. Traffic Noise

Because of the decision to barge equipment and construction materials to the sites, and to bus and/or ferry workers to and from the sites to the maximum extent feasible, the minimal traffic resulting from construction activities is not expected to be a significant increase over existing traffic levels (see Section 12.2). It, therefore, is not expected that truck or bus traffic will result in appreciable sustained increases in overall traffic noise levels on the way to and from the respective sites.

The additional small numbers of trucks and buses to and from the sites may result in occasional increased noise immediately adjacent to the streets along which the trucks and buses will travel, particularly in the case of residential streets. From Table 12.6-7, it can be seen that heavy trucks typically generate maximum noise levels of 85 to 88 dBA at a distance of 50 feet. Buses would be less noisy and more readily absorbed by existing traffic noise levels. It is clear that, during passage of heavy trucks, instantaneous noise levels at nearby abuttors may be as high as those noted above. However, the duration of this noise is very brief and given the small numbers of trucks (projected at 8 or less per day on average) and buses (between 2 and 14 daily on average) only moderate noise disruption and annoyance is expected to result. In the case of the peak traffic levels when the number of buses may double, the potential disruption will increase, but would still be within moderate impact levels given the existing traffic flows.

Indications are that as the proportion of trucks in the traffic mix increases, annoyance increases at an even greater rate (Langdon 1976). Some complaints relative to traffic activities and traffic noise should, therefore, be expected at all locations. Moreover, general neighborhood dissatisfaction with a project has been shown to increase hostility to noise interference (Taylor and Hall, 1978). If fear and/or anger is associated with the source of the noise, annoyance is also increased (Griffiths, et al 1980). Given the high level of concern and dissatisfaction apparent in the potentially affected neighborhoods adjacent to all sites, negative perceptions to the project should be expected resulting in likely complaints about construction traffic.

12.6.5 Mitigations

The most obvious means to mitigate noise impacts is to minimize the source of the noise. This is especially appropriate during construction when noise levels are likely to be highest, both on-site and at nearby receptors.

To reduce onsite construction noise, particularly involving peak noise generating equipment such as pile drivers, noise mitigation measures should be provided at a minimum on Nut Island and Deer Island with further investigations on Long Island to establish the extent of construction work necessary involving the need for special foundation work, such as pile driving.

Noise mufflers, selection of less noisy equipment, alternate construction methods which minimize noise levels (such as augering or use of forms in place), and other noise reduction practices are commonly available and have been used by area contractors and the MDC in other projects to limit noise. Such methods, if required, could be implemented to set a noise limit that is within applicable standards at the nearest receptor boundary. Such mitigations may increase the costs of construction above the levels estimated in the SDEIS; yet, with these mitigation practices applied, population groups around the three sites would not be exposed to noise levels in excess of allowable limits set by existing standards.

Additionally, scheduling of work during daylight hours (7 A.M. to 6 P.M.) will be applied; at Deer Island and Long Island, work beyond these hours or on Sundays and holidays requires a special permit from the City of Boston.

Scheduling of traffic to minimize on-site concentrations of heavy trucks is also expected to be an effective means of reducing noise. Annoyance has been shown to increase as more leisure time activities are affected (Jonah et. al 1981). The waterfront location of these sites may cause conflicts between construction activities and people's leisure pursuits. Careful scheduling of noise generating activities should, therefore, be used to minimize interference with leisure activities and reduce potential noise annoyance at nearby recreational areas.

Citizens are also less annoyed if they perceive that their complaints are taken seriously, adequate efforts to reduce noise are being made, and there is some control exerted over the noise (Langdon 1976). This suggests that a mechanism for receiving, recording and processing complaints should be instituted and that measures taken to reduce noise should be publicized from the outset (see mitigation discussion in Section 6.3.3).

During operations, slight noise impacts (or less) are expected (as noted above). However, at sites where noise may be a special concern, such as Nut Island or Long Island, additional noise buffers and further design measures to limit noise may be appropriate.

SOURCES

EPA, 1976, USEPA Direct Environmental Factors at Municipal Wastewater Treatment Works (EPA - 430/9-76-003, January, 1976).

EPA, 1978, USEPA Draft Environmental Impact Statement on the Upgrading of the Boston Metropolitan Area Sewerage System, August 4, 1978.

Griffiths et al, 1980, I.D. Griffiths, F.J. Langdon, and M.A. Swan, "Subjective Effects of Traffic Noise Exposure: Reliability and Seasonal Effects," Sound and Vibration, Vol. 71(2), 1980, p. 351-386.

Havens & Emerson, 1984, Draft Deer Island Facilities Plan (unpublished) 1984.

Jonah et al, 1981, Brian A. Jonah, J.S. Bradley, and N.E. Dawson, "Predicting Individual Subjective Response to Traffic Noise," Journal of Applied Psychology, Vol. 66(4), 1981, p. 490-501.

Langdon, 1976, F.J. Langdon, "Noise Nuisance Caused by Road Traffic Noise in Residential Areas: Part III," Journal of Sound and Vibration, Vol. 49(2), 1976, p. 241-256.

Massport 1984, Generic Environmental Impact Report, Operation of Logan Internation Airport, Massachusetts Port Authority, Boston, M.A., October 1984.

Metcalf & Eddy 1982, Nut Island Wastewater Treatment Plant Facilities Planning Study Phase I, Site Options Study Pgs. 2-47, 2-48.

Taylor & Hall, 1978, S.M. Taylor and F.L. Hall, "Regulatory Implications of Individual Reactions to Road Traffic Noise," Transportation Research Record 686, 1978, p. 27-33.

Weetman, 1984, David G. Weetman, memo to Citizens Advisory Group/ Interested Members of the Public, June 14, 1984.

ATTACHMENT I

Field Sheets and Computation Sheets

GENERAL

Operator DRW/DG
Date 7/12/84
Time 12:05
Day S M T W T F S
Wind Speed 12 Direction ____
Temp. 80 Rel. Hum. 20
Other Weather
sunny, clear

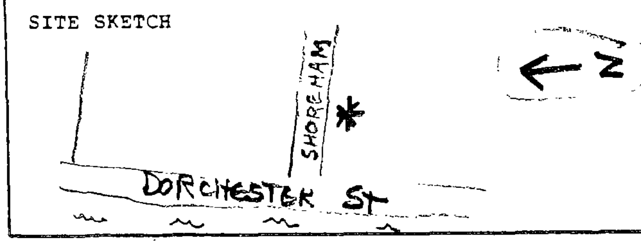
EQUIPMENT

Sound Level Meter 1551-C
Manufacturer ____
Serial # ____
Calibrator ____
Serial # ____
SLM Setting ___ Fast, ___ Slow
Other ____

SITE

Site No. 1
Location SQUANTUM
Site Description
residential

SITE SKETCH

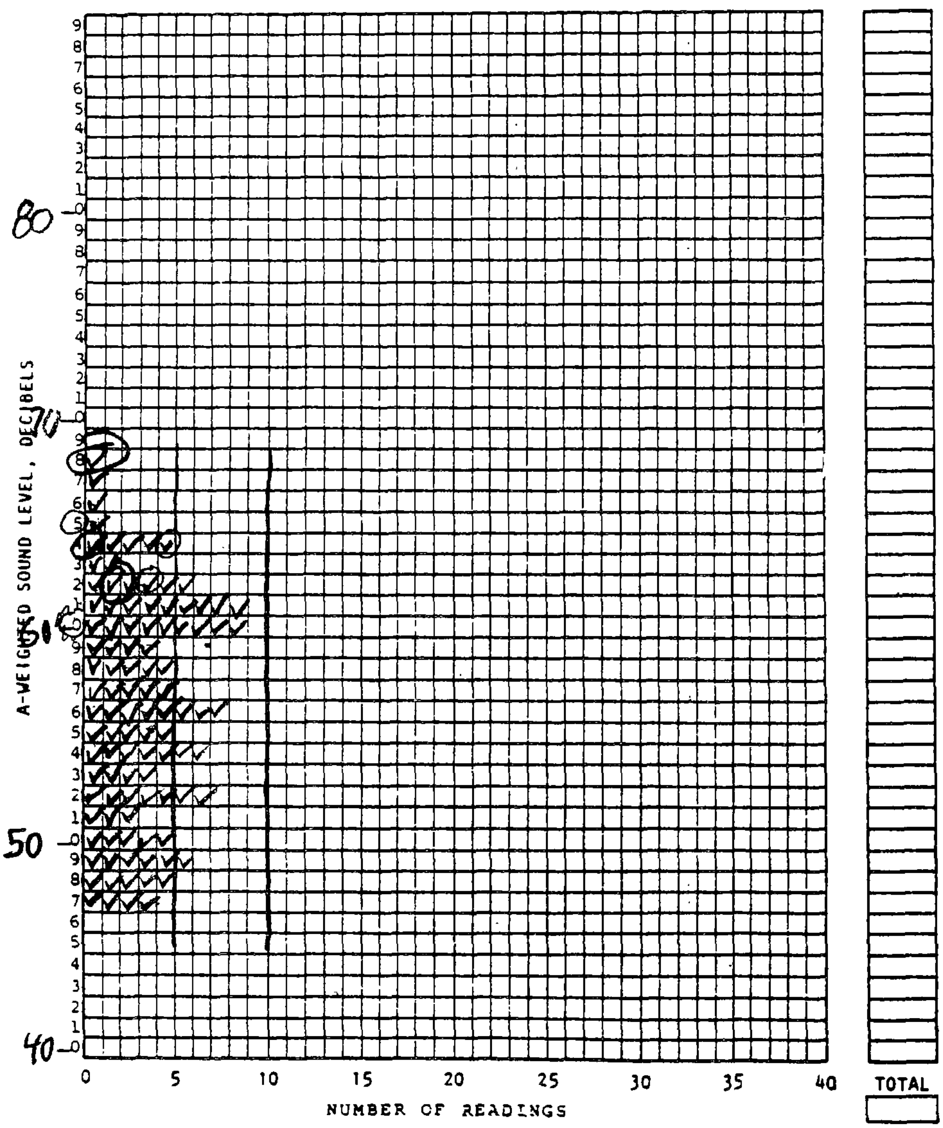


MISCELLANEOUS

Traffic Count: Autos ____

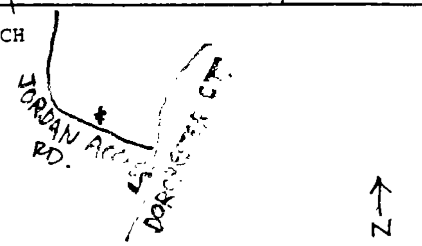
Trucks ____ Other ____ Total ____

Comments leaves Rustling
L10=64db L50=56



GENERAL	EQUIPMENT	SITE
Operator DRW	Sound Level Meter	Site No. 2
Date 7/12/84	Manufacturer	Location SQUANTUM
Time 12:	Serial #	
Day S M T W (Th) F S	Calibrator	Site Description
Wind Speed 10 Direction W	Serial #	COMMERCIAL AREA
Temp. 80 Rel. Hum.	SLM Setting ___ Fast, ___ Slow	
Other Weather clear, sunny	Other	

SITE SKETCH



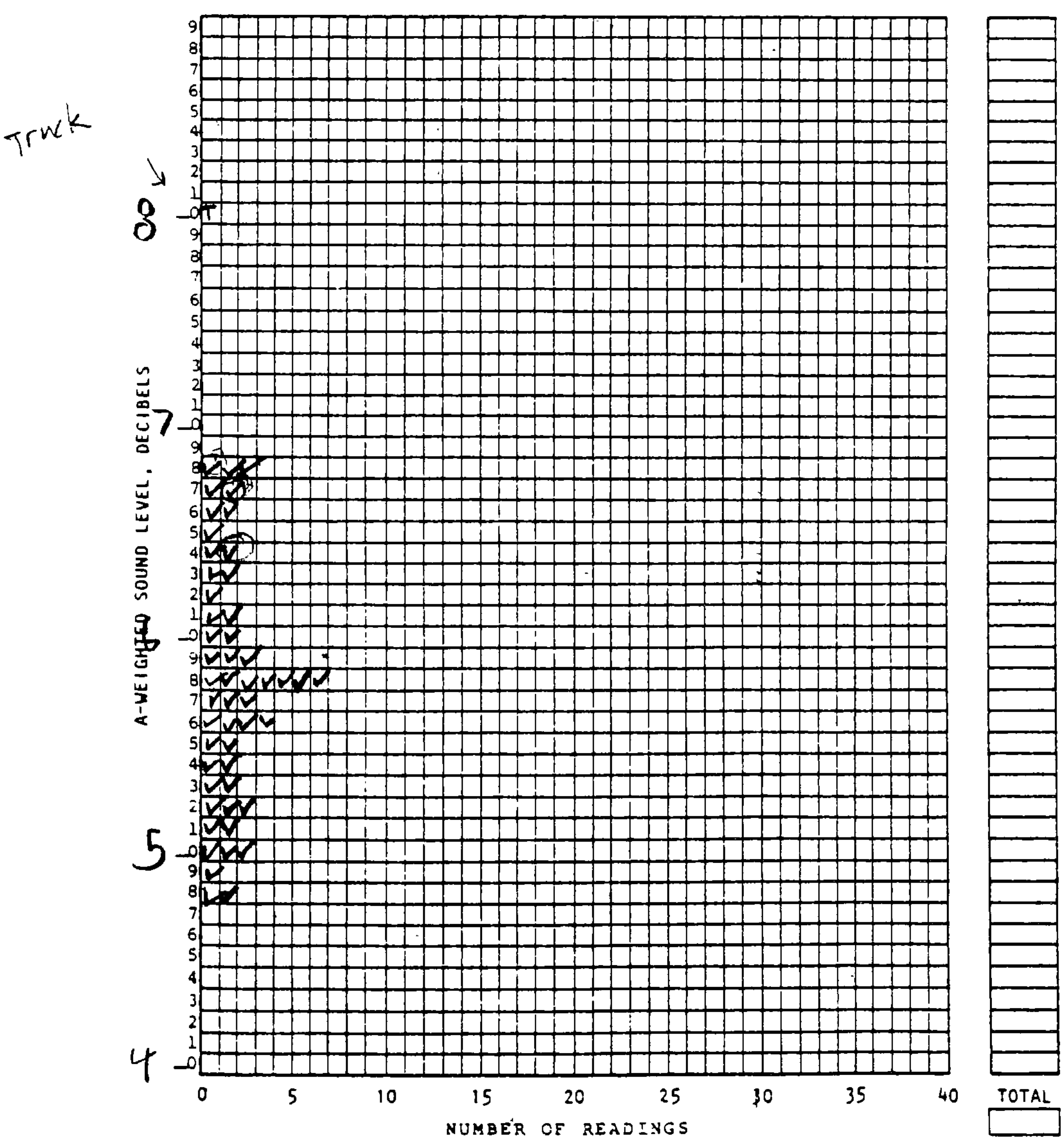
MISCELLANEOUS

Traffic Count: Autos

Trucks ______ Other ______ Total ______

Comments

L10 = 67 L50 = 58



HOUGHS NECK 3

FIGURE 2. SAMPLE L_{eq} COMPUTATION WORKSHEET

A SOUND LEVEL dB	B COUNT		C RELATIVE SOUND ENERGY		D RELATIVE TOTAL SOUND ENERGY
100		x	100,000	=	
99		x	79,400	=	
98		x	63,100	=	
97		x	50,100	=	
96		x	39,800	=	
95		x	31,600	=	
94		x	25,100	=	
93		x	20,000	=	
92		x	15,900	=	
91		x	12,600	=	
90		x	10,000	=	
89		x	7,940	=	
88		x	6,310	=	
87		x	5,010	=	
86		x	3,980	=	
85		x	3,160	=	
84		x	2,510	=	
83		x	2,000	=	
82		x	1,590	=	
81		x	1,260	=	
80		x	1,000	=	
79		x	794	=	
78		x	631	=	
77		x	501	=	
76		x	398	=	
75		x	316	=	
74		x	251	=	
73		x	200	=	
72		x	159	=	
71		x	126	=	
70		x	100	=	
69		x	79.4	=	
68		x	63.1	=	
67		x	50.1	=	
66		x	39.8	=	
65		x	31.6	=	
64		x	25.1	=	
63		x	20.0	=	
62		x	15.9	=	
61		x	12.6	=	
60		x	10.0	=	
59		x	7.94	=	
58	1	x	6.31	=	6.31
57	1	x	5.01	=	5.01
56	14	x	3.98	=	55.72
→ 55	16	x	3.16	=	50.56
54	17	x	2.51	=	42.67
53	2	x	2.00	=	4.00
52		x	1.59	=	
51		x	1.26	=	
50		x	1.00	=	
49		x	.794	=	
48		x	.631	=	
47		x	.501	=	
46		x	.398	=	
45		x	.316	=	
44		x	.251	=	
43		x	.200	=	
42		x	.159	=	
41		x	.126	=	
40		x	.100	=	
39		x	.079	=	
38		x	.063	=	
37		x	.050	=	
36		x	.040	=	
35		x	.032	=	

1. Sum B 51
2. Sum D 164.27
3. Sum D/Sum B 3.22
4. L_{eq} 55

GENERAL

Operator DG
Date 7/12/84
Time 1:30 PM
Day S M T W Th F S
Wind Speed 5 Direction
Temp. 90 Rel. Hum.
Other Weather
clear, sunny

EQUIPMENT

Sound Level Meter
Manufacturer
Serial #
Calibrator
Serial #
SLM Setting ___ Fast, ___ Slow
Other

SITE

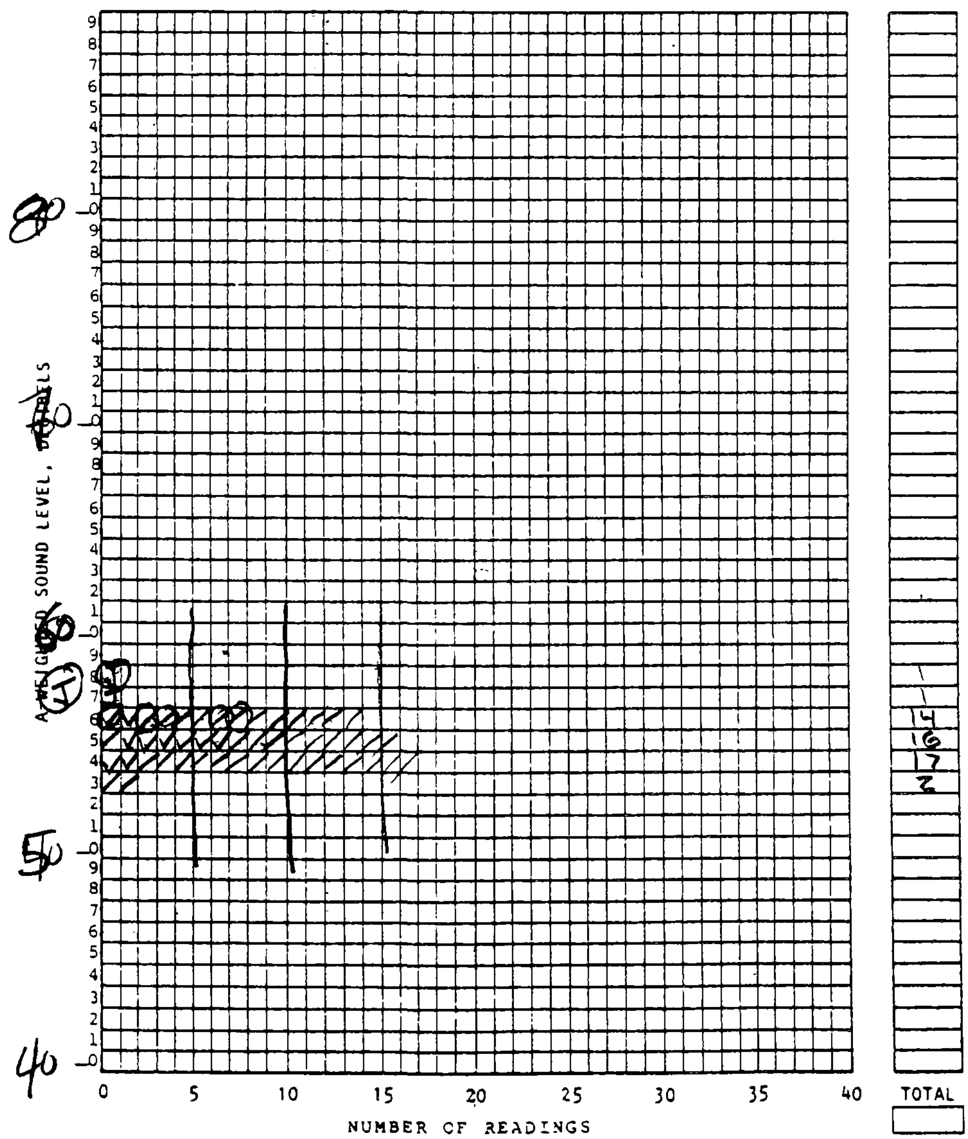
Site No. 3
Location HOUGHS NECK

Site Description
EDGE OF RESIDENTIAL AREA AT NI PLANT

SITE SKETCH

MISCELLANEOUS

Traffic Count: Autos
Trucks Other Total
Comments
L10 = 56 L50 = 55



SQUANTUM 2

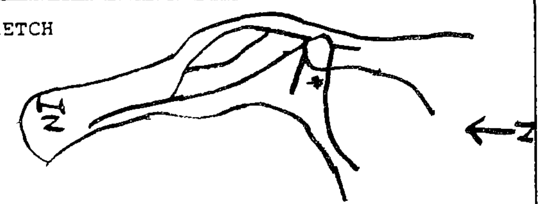
FIGURE 2. SAMPLE L_{eq} COMPUTATION WORKSHEET

A SOUND LEVEL dB	B COUNT		C RELATIVE SOUND ENERGY		D RELATIVE TOTAL SOUND ENERGY
100		x	100,000	=	
99		x	79,400	=	
98		x	63,100	=	
97		x	50,100	=	
96		x	39,800	=	
95		x	31,600	=	
94		x	25,100	=	
93		x	20,000	=	
92		x	15,900	=	
91		x	12,600	=	
90		x	10,000	=	
89		x	7,940	=	
88		x	6,310	=	
87		x	5,010	=	
86		x	3,980	=	
85		x	3,160	=	
84		x	2,510	=	
83		x	2,000	=	
82		x	1,590	=	
81		x	1,260	=	
80		x	1,000	=	
79		x	794	=	
78		x	631	=	
77		x	501	=	
76		x	398	=	
75		x	316	=	
74		x	251	=	
73		x	200	=	
72		x	159	=	
71		x	126	=	
70		x	100	=	
69		x	79.4	=	
68	3	x	63.1	=	189.3
67	2	x	50.1	=	100.2
66	2	x	39.8	=	79.6
65	1	x	31.6	=	31.6
64	2	x	25.1	=	50.2
63	2	x	20.0	=	40
62	1	x	15.9	=	15.9
→ 61	2	x	12.6	=	25.2
60	2	x	10.0	=	20.0
59	3	x	7.94	=	23.82
58	7	x	6.31	=	44.17
57	3	x	5.01	=	15.03
56	4	x	3.98	=	15.92
55	2	x	3.16	=	6.32
54	2	x	2.51	=	5.02
53	2	x	2.00	=	4.00
52	3	x	1.59	=	4.77
51	2	x	1.26	=	2.52
50	3	x	1.00	=	3.00
49	1	x	.794	=	.794
48	2	x	.631	=	1.262
47		x	.501	=	
46		x	.398	=	
45		x	.316	=	
44		x	.251	=	
43		x	.200	=	
42		x	.159	=	
41		x	.126	=	
40		x	.100	=	
39		x	.079	=	
38		x	.063	=	
37		x	.050	=	
36		x	.040	=	
35		x	.032	=	

1. Sum B 51
2. Sum D 678.626
3. Sum D/Sum B 13.31
4. L_{eq} 61

GENERAL	EQUIPMENT	SITE
Operator DRW	Sound Level Meter	Site No. 4
Date 7/12/84	Manufacturer	Location HOUGHS NECK
Time 11:50 PM	Serial #	
Day S M T W (Th) F S	Calibrator	Site Description
Wind Speed 2 Direction	Serial #	Commercial area
Temp. 85 Rel. Hum.	SLM Setting ___ Fast, ___ Slow	
Other Weather	Other	

SITE SKETCH



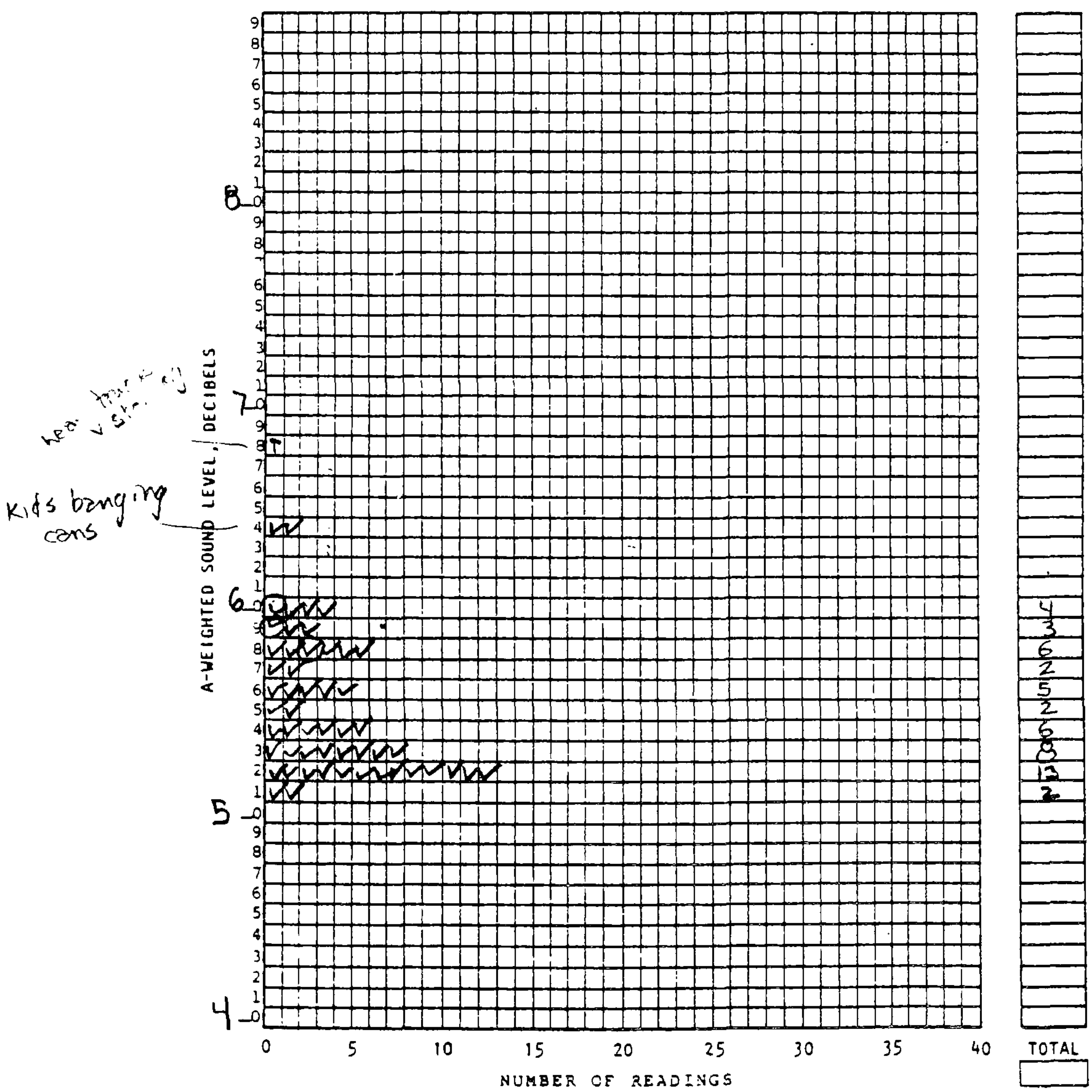
MISCELLANEOUS

Traffic Count: Autos ______

Trucks ______ Other ______ Total ______

Comments

L10 = 59 L50 = 54



HOUGAS NECK 4

FIGURE 2. SAMPLE L_{eq} COMPUTATION WORKSHEET

A SOUND LEVEL dB	B COUNT		C RELATIVE SOUND ENERGY		D RELATIVE TOTAL SOUND ENERGY
100		x	100,000	=	
99		x	79,400	=	
98		x	63,100	=	
97		x	50,100	=	
96		x	39,800	=	
95		x	31,600	=	
94		x	25,100	=	
93		x	20,000	=	
92		x	15,900	=	
91		x	12,600	=	
90		x	10,000	=	
89		x	7,940	=	
88		x	6,310	=	
87		x	5,010	=	
86		x	3,980	=	
85		x	3,160	=	
84		x	2,510	=	
83		x	2,000	=	
82		x	1,590	=	
81		x	1,260	=	
80		x	1,000	=	
79		x	794	=	
78		x	631	=	
77		x	501	=	
76		x	398	=	
75		x	316	=	
74		x	251	=	
73		x	200	=	
72		x	159	=	
71		x	126	=	
70		x	100	=	
69		x	79.4	=	
68		x	63.1	=	
67		x	50.1	=	
66		x	39.8	=	
65		x	31.6	=	
64		x	25.1	=	
63		x	20.0	=	
62		x	15.9	=	
61		x	12.6	=	
60	4	x	10.0	=	40
59	3	x	7.94	=	23.82
58	6	x	6.31	=	37.86
57	2	x	5.01	=	10.02
→ 56	5	x	3.98	=	19.9
55	2	x	3.16	=	6.32
54	6	x	2.51	=	15.06
53	8	x	2.00	=	16.00
52	13	x	1.59	=	20.67
51	2	x	1.26	=	2.52
50		x	1.00	=	
49		x	.794	=	
48		x	.631	=	
47		x	.501	=	
46		x	.398	=	
45		x	.316	=	
44		x	.251	=	
43		x	.200	=	
42		x	.159	=	
41		x	.126	=	
40		x	.100	=	
39		x	.079	=	
38		x	.063	=	
37		x	.050	=	
36		x	.040	=	
35		x	.032	=	

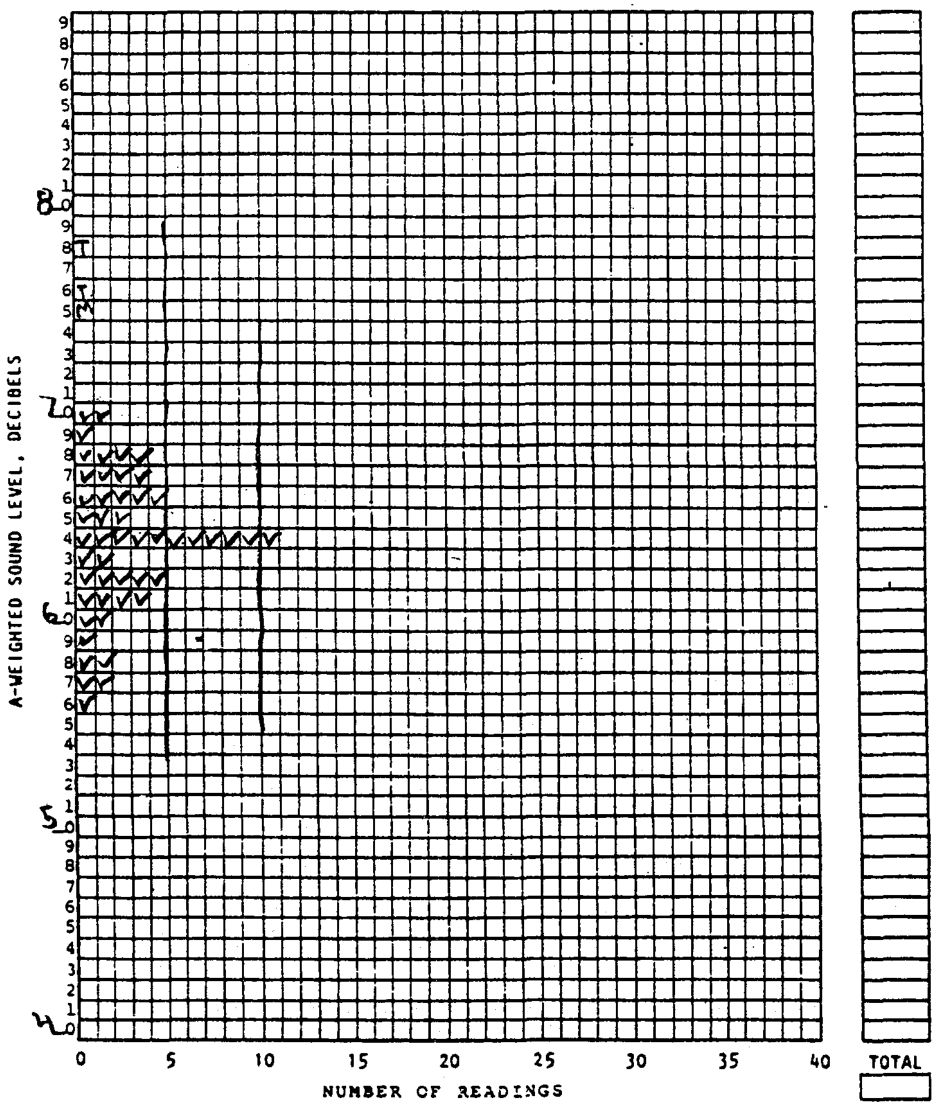
1. Sum B 51
2. Sum D 192.17
3. Sum D/Sum B 3.77
4. L_{eq} 56

GENERAL	EQUIPMENT	SITE
Operator DRW /DG Date 7/12/84 Time 2130 Day S M T W (Th) F S Wind Speed ____ Direction ____ Temp. ____ Rel. Hum. ____ Other Weather	Sound Level Meter ____ Manufacturer ____ Serial # ____ Calibrator ____ Serial # ____ SLM Setting ____ Fast, ____ Slow Other ____	Site No. 5 Location POST ISLAND, Quincy Site Description SEA ST @ RIVERSIDE ADAMS SHORE BRANCH LIBRARY

SITE SKETCH	MISCELLANEOUS
	Traffic Count: Autos ____ Trucks ____ Other ____ Total ____ Comments L10 = 68 L50 = 64

trucks

muffless car



ADAMS SHORE
QUINCY (6)

FIGURE 2. SAMPLE L_{eq} COMPUTATION WORKSHEET

A SOUND LEVEL dB	B COUNT		C RELATIVE SOUND ENERGY		D RELATIVE TOTAL SOUND ENERGY
100		x	100,000	=	
99		x	79,400	=	
98		x	63,100	=	
97		x	50,100	=	
96		x	39,800	=	
95		x	31,600	=	
94		x	25,100	=	
93		x	20,000	=	
92		x	15,900	=	
91		x	12,600	=	
90		x	10,000	=	
89		x	7,940	=	
88		x	6,310	=	
87		x	5,010	=	
86		x	3,980	=	
85		x	3,160	=	
84		x	2,510	=	
83		x	2,000	=	
82		x	1,590	=	
81		x	1,260	=	
80		x	1,000	=	
79		x	794	=	
78		x	631	=	
77		x	501	=	
76		x	398	=	
75		x	316	=	
74		x	251	=	
73		x	200	=	
72		x	159	=	
71		x	126	=	
70	2	x	100	=	200
69	1	x	79.4	=	79.4
68	4	x	63.1	=	252.4
67	4	x	50.1	=	200.4
66	5	x	39.8	=	199
→ 65	3	x	31.6	=	94.8
64	11	x	25.1	=	276.1
63	2	x	20.0	=	40
62	5	x	15.9	=	79.5
61	4	x	12.6	=	50.4
60	2	x	10.0	=	20
59	1	x	7.94	=	7.94
58	2	x	6.31	=	12.62
57	2	x	5.01	=	10.02
56	1	x	3.98	=	3.98
55		x	3.16	=	
54		x	2.51	=	
53		x	2.00	=	
52		x	1.59	=	
51		x	1.26	=	
50		x	1.00	=	
49		x	.794	=	
48		x	.631	=	
47		x	.501	=	
46		x	.398	=	
45		x	.316	=	
44		x	.251	=	
43		x	.200	=	
42		x	.159	=	
41		x	.126	=	
40		x	.100	=	
39		x	.079	=	
38		x	.063	=	
37		x	.050	=	
36		x	.040	=	
35		x	.032	=	

1. Sum B 49
2. Sum D 1526.56
3. Sum D/Sum B 31.15
4. L_{eq} 65

12.7 Odor Analysis

12.7 ODORS

Odors caused by normal operations of new treatment facilities would be slight at any of the sites. Odor control measures will be required at all sites, including enclosed facilities and special ventilation systems for treatment components where odors may be produced. Infrequent odor problems will occur in spite of these measures as a result of inadequate maintenance, equipment breakdowns, or process upsets. At these times odors will likely reach offsite. The extent of their impact will depend on the intensity of odors produced, site conditions, weather conditions, and the promptness with which actions are taken to eliminate the source of odor.

The types of odors which may be perceived offsite are a result of odor causing substances in the wastewater Hydrogen sulfide gas (sometimes likened to the smell of rotten eggs) is the most common cause of odors in wastewater collection and treatment systems. It can be produced by slime growth or sludge deposits associated with wastewater treatment facilities, or wherever anaerobic conditions occur during the treatment process. Other less common odors can include ammonia smells from biological activity in wastewater, gases released during the sludge digestion process, or chlorine vapors from the onsite disinfection practices. With prompt remedial action and close operational supervision, odor releases will be infrequent and of limited duration.

The current wastewater treatment facilities at Deer Island and Nut Island include little or no odor control equipment. Odor problems being experienced at the two sites differ. At Deer Island, the odors resulting in the most complaints are diesel fumes from generators and occasional chlorine vapors from chlorination system leaks. On Nut Island, odors are produced by wastewater which has become anaerobic (septic) during the long travel time from outlying parts of the southern MSD system to the site. In both cases, proposed new treatment facilities would improve existing conditions and would eliminate these problems.

Diesel engines would not be used for the new facilities; therefore, no further problems with odors from diesel fumes would occur. New chlorination facilities would eliminate existing problems of chlorine vapor leaks and new headworks would be enclosed and ventilated, thereby improving conditions at the proposed treatment facilities which could lead to odor problems.

When odors do occur, the severity of their impact will depend on:

- the intensity and nature of the odors produced;
- site conditions, including
  - temperature
  - wind direction
  - wind velocity
  - weather system stability
  - topography
  - proximity of receptors to the odor source; and
- actions taken on the site to minimize odor impacts.

To evaluate the potential odor impacts of the alternatives, it is therefore necessary to consider these factors as they relate to each of the sites.

At any site, the potential for odor problems will vary directly with the size of the facilities and the number of treatment components located at each site. A headworks by itself may be a source of occasional odors, resulting in moderate impacts at nearby receptors, largely the result of incoming wastewater which has become anaerobic ("sour") during the long passage to the site. Periodic cleaning of headworks can also release odors. If chlorine is applied at a headworks, the potential for chlorine vapor leaks also exists.

Primary treatment facilities also contain sources of occasional, moderate odors. Settling basins may produce odors if inadequately maintained. Sludge handling and treatment processes may also produce odors and chlorine leaks may occur at chlorination points.

Secondary treatment processes by themselves are not normally a source of offensive odors. However, all secondary siting options would include some primary treatment also. Secondary facilities also produce more sludge than primary systems. Sludge may cause infrequent odor problems (especially if not properly handled and treated) leading to moderate odors during times of process upsets or during some maintenance procedures.

Conditions which are most likely to affect impacts of odors offsite are wind direction and weather. The occurrence of wind patterns likely to affect the population concentrations at each site are shown in Figure 12.7-1. From this figure, it can be seen that prevailing wind directions at Deer Island and Nut Island are away from the nearby populations. The percentage of occurrence of winds which could carry odors to nearby homes or institutions are relatively low on a year-round basis. On Long Island, the prevailing winds are towards the concentrations of people and would, therefore, carry potential odors towards them.

The ability of workers on the site to reduce the impacts of odors will depend upon the timeliness of worker response to odor incidents, availability of methods for odor abatement, and the effectiveness of the application of these methods. Responses to odor problems will vary at each site according to the size of facilities in operation there. In general, a smaller facility, such as a headworks or small primary plant, could more readily respond to odor problems than a larger facility. However, at all sites it is expected that odor problems will be dealt with as quickly and fully as possible according to the particular events that trigger odor releases. The following discussion considers the odor impacts at each site which would occur during times of operational problems or other instances of odor releases.

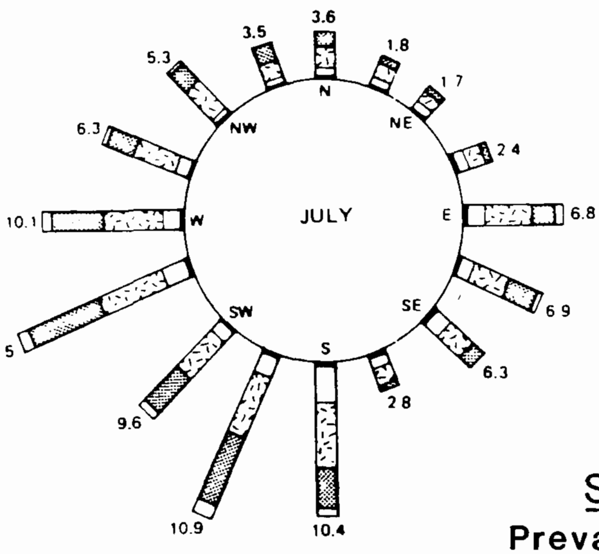
12.7.1 Deer Island

Infrequent odors from problems at proposed treatment facilities at Deer Island will generally result in moderate impacts at the Deer Island Prison, and moderate impact at residences in Point Shirley. Impacts on

FIG.12.7-1

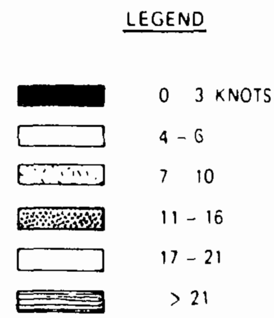
TYPICAL WIND PATTERNS IN BOSTON HARBOR SUMMER AND WINTER

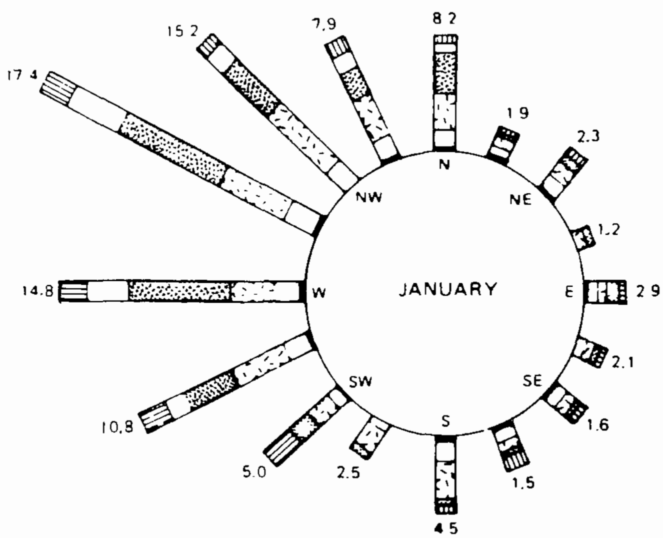
Percentages of Seasonal Winds Shown for Each Direction



Summer

Prevailing Winds from the Southwest





Winter

Prevailing Winds from the Northwest

SOURCE: Metcalf and Eddy, Inc. (1982), from "Climatology of the U.S., No. 82-19", U.S. Department of Commerce, National Climate Center.

the prison which is within 700 feet of possible odor sources at the treatment plant are most likely at times when summer weather inversions or relatively infrequent southeasterly winds coincide odor releases. Under these circumstances, odors may also spread to residences in Point Shirley; however, the greater distance of these residences to the site (2,200 to 4,000 feet) would attenuate these effects somewhat.

12.7.2 Long Island

Infrequent odors from treatment facilities at Long Island will result in moderate impacts at the Long Island Hospital (under primary treatment options) and on recreational visitors (assuming recreational development proceeds). Prevailing winds will tend to move odors directly from the wastewater treatment facilities to the hospital (1,200 feet with an 18-acre primary plant sited at the Nike base) and towards Long Island Head and the area of proposed intensive park use (2,000 to 3,000 feet away). When odors do occur, moderate impacts to on-site populations are likely under either primary or secondary treatment alternatives.

12.7.3 Nut Island

Infrequent odors from treatment facilities at Nut Island are expected to result in moderate impacts on the closest Houghs Neck residences. Prevailing winds will, under most conditions, conduct odors produced at the site away from nearby residences. However, because of the proximity of some residences on Quincy Great Hill to the site, odors produced at times of little wind, summer inversions, or less common northerly wind, are likely to result in moderate impacts on these residences.

12.8 Area Geology

12.8 GEOLOGY

12.8.1 Background

This section describes the geology of Deer Island and Long Island in terms of their construction suitability and possible constraints that may exist. Nut Island, by virtue of its extensive man-made condition, is not examined in this section.

The entire New England region has been blanketed by glaciers for at least one active stage of glaciation. The last of these, the Wisconsin Stage of the Pleistocene Epoch, occurred over 13,000 years ago. At that time the glacial ice covering the study area was greater than 1,000 feet thick and probably moved in a southwesterly direction. It is likely that the glacial landforms found on Long Island and Deer Island were a direct result of this most recent glacial period.

Four predominant soil types have been identified on Long Island and Deer Island and provide their geologic framework. The oldest deposit, glacial till, is the material that constitutes the drumlin landforms. A drumlin is generally a smooth oval hill of glacial origin and composed of boulder clay, sand and/or gravel. This material is probably an unstratified dense deposit of glacial drift in a silty matrix based on the references cited on the end of this section and a visual observation of other excavated drumlins in the area. A second Pleistocene soil deposit identified by Kay (1977) is the stratified drift consisting of sand, gravel and clay, including some till, in areas covered with swamp. This material would also be expected to be medium dense, although less dense and more pervious than the till. This was identified on Deer Island.

A third type of soil identified as the recent or Holocene age is the beach deposits of sand with occasional gravel. These sediments may reveal some stratification due to major storms or other changes in the average environmental conditions. They are deposited directly by the ocean and are generally topographically flat and low lying. They may also occur as shallow deposits around the very stable drumlins, possibly within a few feet above or below sea level. These deposits may be displaced by storms and gradually reformed later under the more commonly occurring quiet conditions presently existing.

The fourth soil type identified by LaForge (1932) is a local area in the southern part of Long Island, which is especially low-lying and composed of marine silt, muck and possibly peat. This isolated section is likely in the salt marsh.

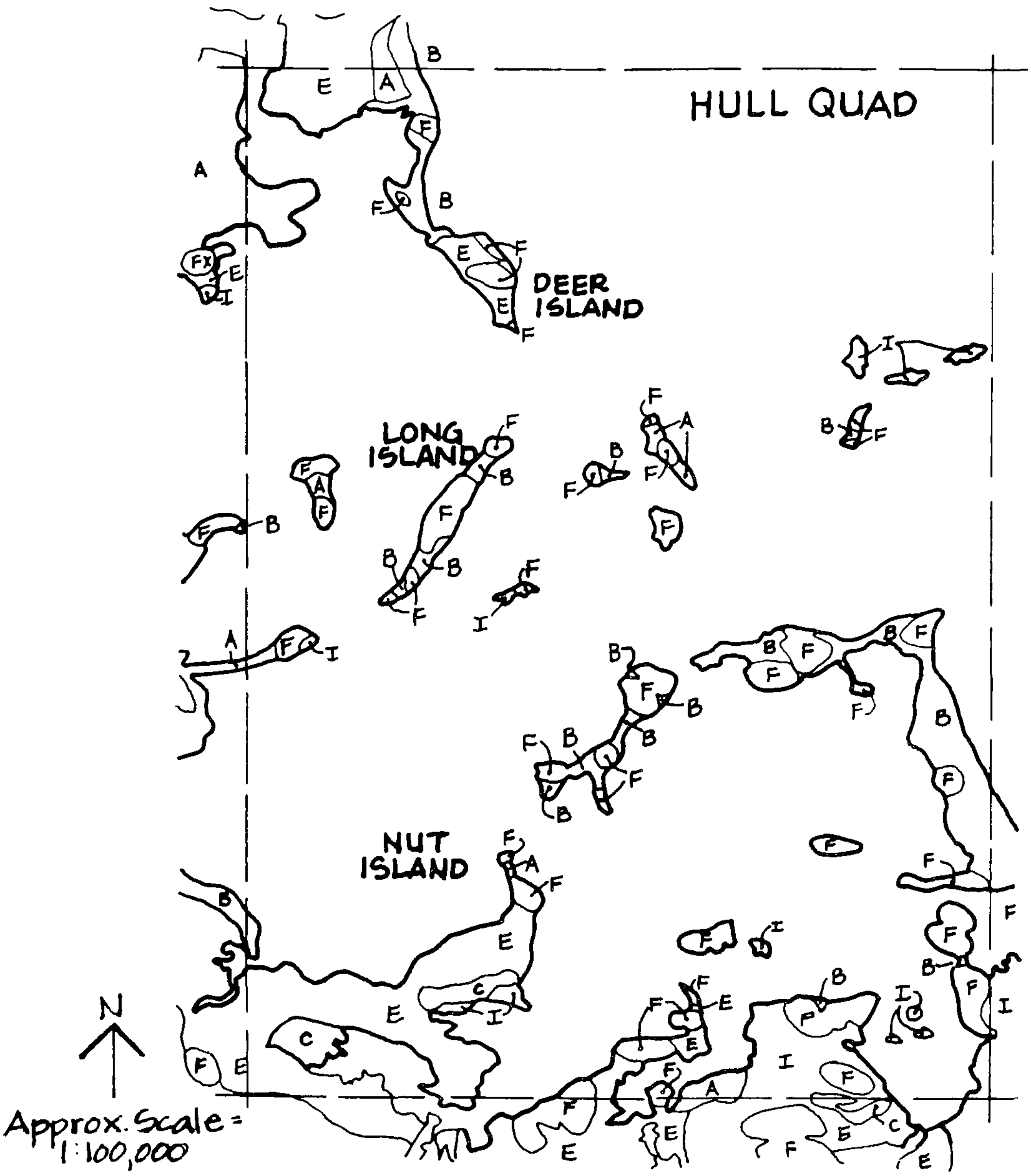
12.8.2 Long Island

LaForge (1932) identified three drumlins on Long Island. Small drumlins are located at both ends and a larger one makes up the central hill portion of the island. Figure12.8-1 from Kay (1977) presents the surficial geology of the area which identifies a fourth drumlin south of the main central drumlin.

Based on known general characteristics of these land form types, the most desirable areas on the island for major construction are those at higher elevations which generally are underlain by the glacial drumlins.

12.8.3 Deer Island

The major formation on this island is a drumlin. LaForge (1932) indicates the central area of highest elevation, including the area of the prison complex, is part of a drumlin formation. He indicates the remainder of the island as beach sand. His plan indicates that at that time the island was not connected to Point Shirley by beach sands. Kay (1977) does show the connection to Point Shirley, but identifies three individual drumlins joined by the stratified drift. These Pleistocene deposits make up



- **A** = MADE LAND; fill over salt marsh & shallow off shore
- **B** = BEACH DEPOSITS
- **C** = SALT MARSH
- **D** = ESKER; sand & gravel
- **E** = STRATIFIED DRIFT; sand, gravel & clay, minor till, in places over-lain by swamp
- **F** = DRUMLIN; mostly till; FX; former drumlins leveled to provide land fill.
- **G** = END MORAINS; mostly displaced stratified drift but also till.
- **H** = GROUND MORAINE; mostly till some bedrock outcrops
- **I** = ROCY TERRAIN; many bedrock outcrops; thin spotty drift.

source Clifford A. Kaye
U.S. Geological Survey

Boston Area Surficial

fig 12.8-1

nearly the entire island with the exception of the northwest corner of beach sand in an area north of the prison.

As a result of preliminary investigation, it appears that major construction on Deer Island is most desirable on areas underlain by the drumlin formations generally in the area of the present facilities. The depth to bedrock and the degree to which leveling of the large drumlin is required would dictate the costs of construction.

REFERENCES

1. Aerial Data Reduction Associates, Inc. "Togographic Survey of Long Island, Boston Harbor, MA", April, 1981.

2. Kay, Clifford A., "Boston Area Surficial", US Geological Survey, November 1977.

3. LaForge, Laurence, "Geology of the Boston Area, Massachusetts," U.S. Geological Survey, 1932.

12.9 Sludge Disposal Overview

12.9 SLUDGE DISPOSAL OVERVIEW

12.9.1 Summary

As noted in Section 2.5 of Volume 1 of the SDEIS, the siting of sludge disposal facilities for the MDC treatment system is a separate planning and environmental review process involving an analysis, now underway, of alternative sludge management processes, their respective costs, and environmental impacts. A full environmental assessment of the sludge alternatives will be made prior to a siting decision on the location of sludge disposal facilities, either at sites in the harbor or inland.

When the impacts of siting of wastewater treatment facilities are viewed from the perspective of possible additional requirements for siting of sludge facilities, it is clear that: The treatment plant siting decision is not driven by sludge siting requirements, as none of the sludge disposal actions would alter the respective treatment plant siting alternative's relative impacts, and none of the treatment plant options would foreclose a sludge management solution.

Therefore, this section examines, in a preliminary fashion, the various sludge disposal alternatives now under study by the State and EPA as these relate to siting of wastewater treatment facilities. The operational characteristics of these disposal methods are considered generically, and descriptions are provided.

12.9.2 Introduction

Analysis of alternatives for sludge disposal was undertaken for the SDEIS only to the extent necessary to evaluate whether the possible sludge treatment and disposal methods affect the siting of wastewater treatment facilities. As such, disposal alternatives were considered generically.

The disposal methods considered for this analysis were:

1) Composting
2) Incineration
3) Ocean Disposal
4) Landfilling

The issues for siting of sludge facilities associated with each of these disposal methods are varied according to the regulatory and operational factors governing each method. In general, sludge disposal would require additional land area, equipment and staffing, and costs (capital and O&M), and would introduce added potential environmental impacts including noise, public health, odor, truck traffic, and air quality. However, these added effects would not alter the relative impacts of the treatment plant siting alternatives discussed in Section 4.0 of Volume 1.

For example, land intensive methods of sludge management, such as composting, may be constrained at the Nut Island site because the island is too small to readily accommodate such facilities with residences abutting the site; composting facilities could be accommodated onsite at either Deer Island or Long Island with associated traffic volumes. Alternatively, composting can be relocated off-site, either to another harbor location or to an inland area with associated transportation volumes and costs utilizing either barging or trucking. All the sites being considered for treatment plants could accommodate sludge transfer facilities (truck or barge) if an alternate off-site location for sludge is recommended. In either case, whether sludge management activities are assumed to occur on-site or off-site, the siting of sludge disposal facilities would not be expected to alter the comparative siting advantages or disadvantages of the wastewater treatment facility alternatives.

The following sections discuss regulatory background of sludge management and identify currently proposed sludge management alternatives.

12.7.3 Regulatory Background

12.7.3.1 Overview

Both EPA and The Commonwealth Executive Office of Environmental Affairs (EOEA) consider composting of sludge to be a beneficial treatment method. A pilot plant to compost about 5 dry tons of sludge daily (about 7% of the total existing MDC sludge to be disposed of) is being funded by EPA and the Commonwealth (DWPC and the MDC), and has begun operations in the fall of 1984. EPA had issued a Record of Decision on proposed sludge disposal by incineration in a previous sludge EIS. Alternatively, EOEA is currently analyzing ocean disposal of sludge as an adjunct and backup method to composting. In assessing the impacts of the various sludge management alternatives on the wastewater treatment siting decision, primary consideration is given to composting alternatives, with the remaining disposal options also considered.

12.7.3.2 Federal and State Policy

Since the passage of the Clean Water Act (Public Law 92-500) in 1972, Federal Regulations favored the placement of sludges on the land or disposal by incineration (Federal Register, Vol. 49, No. 114 pp. 24358-9). EPA's policy on sludge disposal was explained in the prior EIS for the Metropolitan District Commission's Proposed Primary Sludge Management Plan (1979). The Record of Decision for this EIS, issued in 1980, emphatically ruled out ocean disposal of sludge and recommended incineration at Deer Island. This record of decision also required the MDC, as a condition of the EPA grant, to:

> "Investigate the feasibility of composting the primary sludge and to dispose of as much sludge by composting as is practicable."

12.7.3.3 State Policy

The Commonwealth, through EOEA, has developed a sludge management strategy which recommends composting as the primary sludge disposal option. This policy is based on an agreed upon schedule developed jointly with EPA, in response to court actions, to begin planning for sludge management and develop solutions to the present unlawful discharge of sludge to the harbor.

The State policy declares incineration to be the least preferred of all sludge disposal options. It identifies ocean disposal options as likely to have "the least direct impacts on public health" and clearly favors ocean disposal as a backup to composting. Landfilling as a disposal method is not addressed, although the State does have provisions to allow such a disposal method.

12.7.5.2 Environmental Impacts

a. General

Site-specific environmental impacts of possible sludge management methods, as noted above, which may affect a sludge facility siting decision, involve operational characteristics primarily. The construction effects of sludge facilities are relatively minor compared with the greater construction activities and costs associated with a treatment plant. The operational characteristics of sludge management facilities include:

- air quality
- noise
- traffic
- site acreage and land use compatibility
- cultural resources
- visual quality and recreational resources
- health effects
- costs

These are discussed generically below in order to identify the potential issues which may affect a sludge site selection.

b. Air Quality

Odors produced by composting, or noxious gases produced by incineration, could affect adjacent land uses. In Boston Harbor, prevailing summer winds which are from the southwest would tend to carry potential odors or gases produced out to sea and away from population concentrations. However, during less frequent periods of onshore winds, odors or gases may be carried towards residential areas and population concentrations.

c. Noise

Residents or others situated close to composting or transfer facilities may hear the noise of operations (typically machinery noises or backup beepers on equipment). Increased noise levels would, therefore, be a potential impact, depending upon receptor distance tc a facility site. It is expected that all applicable noise regulations would be complied with.

d. Traffic

Traffic is a potentially significant adverse impact insofar as trucking deliveries or pickups are required. In the case of composting facilities, this may involve two to four deliveries per week of wood chips to a site and another fourteen to twenty trucks daily to pick up a finished compost product for distribution. Such truck volumes can be a significant adverse impact on local residential areas closest to a site if the access and local roadway conditions are not adequate to accommodate such traffic. Barging would minimize these impacts, and is, therefore, recommended for all sludge management methods to the maximum extent feasible.

e. Site Acreage and Land Use Compatibility

Both the size/acreage needed for sludge facilities and their compatibility with other on-site uses is a potential siting issue. The need for additional acreage to accommodate sludge facilities on a site where treatment facilities are located may pose a greater likelihood of significant disruption to other on-site use, environmentally sensitive areas (if any exist), and adjacent residential areas.

f. Cultural Resources

Recent archaeological and historical investigations in Boston Harbor have revealed prehistoric and historic resources of major significance on some of the islands. Sites on several islands may be eligible, individually or collectively, for listing in the Federal Register of Historic Places. Siting of sludge facilities may impact on these resources. Sludge management in Boston Harbor will have to consider, therefore, potential encroachment on and disruption to any historic and prehistoric areas.

g. Visual Quality and Recreation Resources

Visual quality at a site may be impacted by the addition of sludge facilities. In particular, under an incineration option the addition of an incinerator smokestack (possibly up to 150 feet high) would present a major change in a site's appearance and would become a landmark. The need to light such a tall structure in order to provide safety to planes may necessitate use of 24-hour safety lights which would be highly visible from distant locations. Since Boston Harbor is on the direct flight path to Logan Airport, such an incinerator smokestack must be closely coordinated with the FAA at this location.

Compost facilities may not pose as great an adverse visual impact depending on their site layout. However, such facilities may impact a site if their appearance appreciably alters a site's visual quality or intrudes on other nearby activities or uses. Barge or truck transfer facilities for ocean disposal or landfilling of sludge would introduce added industrial appearing elements to a site, but these would be of relatively minor visual significance.

h. Health Effects

The public health effects of all sludge disposal methods are regulated and monitored by State and Federal authorities. None of the sludge alternatives would be permitted unless all potential health concerns were examined and shown to be acceptable. In the absence of final plans for sludge disposal, no such medical or scientific analysis has been conducted.

i. Costs

The range of costs for the various sludge options will depend upon the alternative(s) selected and associated equipment and process requirements. The costliest sludge option is incineration, which also is the most technically sophisticated. Composting and landfilling are next costly, although their cost elements and their long-term viability differ. Ocean disposal appears to be the least costly. Any cost estimates to be made during the facility planning stage will reflect design plans and site considerations at locations to be identified at a later stage of the analysis.

12.10 Archaeological and Historical Resources Report and NHPA Compliance Summary

12.10.1 NATIONAL HISTORIC PRESERVATION ACT (NHPA) REVIEW PROCESS (Section 106)

12.10.1 Background

"The National Historic Preservation Act (NHPA) of 1966 and its supporting regulations are intended to help ensure that no significant archaeological or historical properties are irretrievably lost as a result of federally-funded construction projects."* Section 106 requires federal agencies take into account what effect a federally funded, licensed or assisted project will have on any historic or archaeological properties either listed or eligible for listing in the National Register. As a result, before the Environmental Protection Agency (EPA) can issue a construction grant, the Section 106 review process must be completed.

There are essentially three phases (see Figure 12.10-1) to the Section 106 review process, as follows:

1. Determination of eligibility of the property for inclusion on the National Register (now underway).

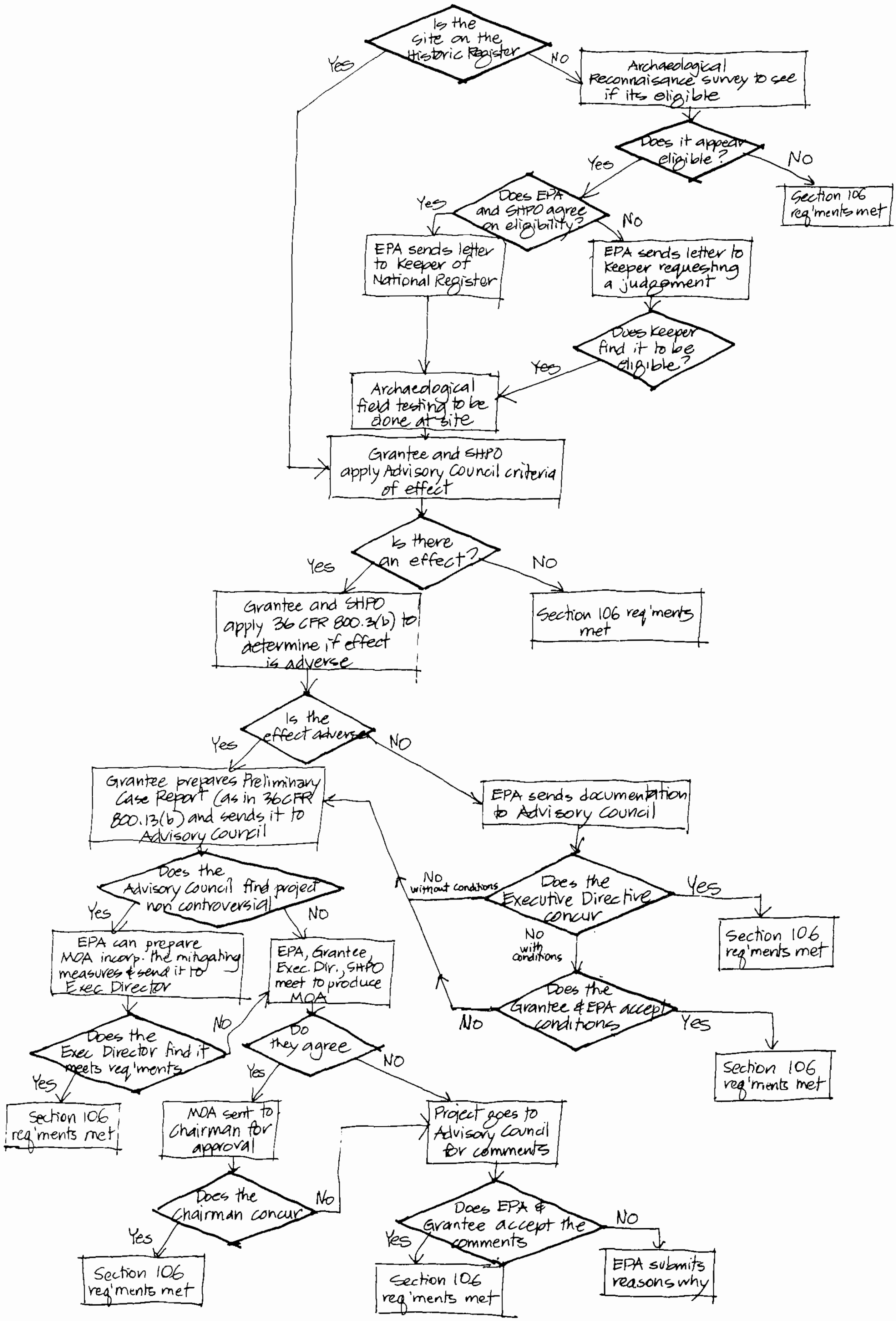
2. Determination of the effect of the proposed project on the property.

3. Preparation of mitigating measures for inclusion in the grant conditions.

12.10.2 NHPA Phases of Study

a) Phase I: Eligibility

In Phase I, the determination is made whether the property in question should be included on the National Register. This requires an archaeological reconnaissance survey to identify any sensitive areas within the project area. If it appears eligible for inclusion according fig 12.10-1 NHPA 205(g) REVIEW PROCESS



to the National Register criteria (36 CFR 60.4), then EPA sends a formal request under 36 CFR 63 to the Keeper of the National Register for inclusion. If the Keeper agrees, then the next phase, the determination of effect, is set to begin.

b) Phase II: Effect

In Phase II, EPA in consultation with the State Historical Preservatin Officer (SHPO), applies the Advisory Council Criteria of Effect (36 CFR 800.3[a]). If there is an effect according to this criteria, EPA and the SHPO apply a different set of criteria to determine whether the effects are adverse (36 CFR 800.3[b]). If the effects are not adverse, then EPA sends to the Advisory Council its documentation. If, however, under 36 CFR 800.3(b) the effects are adverse, then certain mitigating measures will be incorporated into the project.

c) Phase III: Mitigating Measures

After EPA sends its documentation of no adverse impacts to the Advisory Council, the Executive Director may either concur or not concur with EPA's findings. If the Executive Director agrees, then Section 106 requirements are satisfied. However, if the Executive Director disagrees with the finding of no adverse impact, then the Executive Director may suggest migitation measures which, if agreed upon by EPA, are included in the grant conditions.

If EPA does not agree with the conditions, then the project's impact is considered adverse. EPA must then prepare a Preliminary Case Report (the contents of which are described in 36 CFR 800.13[b]), and a description of mitigation measures.

There are two routes a project can now take: the quick route and the slow route. In the former, if the adverse impacts are customarily mitigated in a standard manner, and all the parties can agree with the proposed mitigation measures, then the requirements of Section 106 can be quickly satisfied. In this case, an on-site visit and public information meeting are usually waived.

In the slower route, projects must go through the consultation process. All the parties meet in an attempt to produce a Memorandum of Agreement. A site visit and public information meeting are usually required. If an agreement is struck, the parties ratify it, fulfilling the 106 requirements. If no agreement is made, the Advisory Council issues comments which EPA may accept. If EPA does not, then EPA must explain in a written report why the project should proceed.

12.10.3 SDEIS Archaeological and Historical Analysis

In applying these review elements to the EIS process, several steps have been initiated and others will be continued during the course of our analysis. Discussions have been held with the Massachusetts Historical Commission (MHC) to establish their involvement in and procedures for potential archaeological/historical resources associated with the sites in the Boston Harbor Island State Park.* The MHC is involved in several reviews relative to the Boston Harbor Islands State Park which have a direct bearing on the SDEIS analysis.

MHC had indicated that information known at the outset of the SDEIS work suggested that both Deer Island and Long Island have potentially significant archaeological and historical sites that required further investigation and possible inventory. Nut Island is not considered significant.

---

*Ms. Barbara Luedtke, Professor of Anthropology, University of Massachusetts, is a Coordinator of the SDEIS effort and will lead the summer excavation project. Mr. Duncan Ritchie, Project Archaeologist for PAL, Inc., is in charge of the archaeological analysis.

Deer Island was found to be largely disturbed and therefore of low significance/sensitivity. Surveys have been conducted on Deer Island as part of the MDC's previous facility planning work and again for the SDEIS. Parts of the island including the drumlin area were evaluated.

Long Island is considered to be of particular significance based on past and recent site investigations. It has been studied for the SDEIS during an archaeological excavation project by faculty of the University of Massachusetts-Boston and key archaeologists of the Public Archaeology Lab, Inc.

This effort and indeed any activities on the island is subject to a review process that involves the Thompson Island Archaeological Board, an advisory group to the MHC made up of prominent academics and other professional experts in this field.

The overall significance of the islands in the Boston Harbor Islands State Park as viewed by the State relates to their past geography and usage by Pre-settlement Indians and siting for post industrial facilities. Several sites are considered as Indian habitats during the 16th and 17th centuries. The Deer Island Wastewater Treatment Plant is noted for its still-operating steam pumping station, and the Long Island Hospital Facility is noted for its examples of modern architecture. Based on these combinations of prominent elements, the State is preparing to nominate the entire Boston Harbor Islands State Park to the National Register of Historic Places.

That proposed nomination, as well as the significant elements of these sites as expressed by the State, establishes a specific sequence of steps for the EIS analysis to follow. First, as part of a Step I, Phase I review, our on site walkover survey is needed to identify any potential areas of archaeological and historical significance (Phase II, Step 1). If any such locations are found, a written summary is submitted to MHC and the Thompson's Island Archaeological Board for their review and comment. This report is contained in the SDEIS (see following section). Next, depending upon the results of this initial survey, a more detailed site analysis may be required (Phase II, Step 2). The location of proposed new development in relation to potential resource sites would improve a judgement in this regard.

Then, if further survey is required and if notable resource elements are identified, a detailed site inventory and resource mitigation procedure may be called for (Phase III). Such mitigation procedures can range from comprehensive inventory of on-site resources to actual excavation and removal of found artifacts, or avoidance of resource areas according to the degree of significance and uniqueness of the resources identified and their site characteristics.

For the EIS process now underway, the investigations have been carried out (through Phase II, Step 1) and these review elements will entail a division of the Federal-State coordinating steps.

Following the site excavations carried out during the summer, and comments on the SDEIS during the upcoming Public Hearing period, the remaining inventory descriptions, site evaluations, and regulatory reviews under the Phase II and Phase III (if necessary) process will be incorporated into an Addendum Report to the SDEIS. This will be developed, as necessary, in the Final EIS to be completed in 1985. If deemed necessary, Phase III mitigation analysis will be carried out in conjunction with facility final design and reviews.

It will be necessary to submit site survey and project information to the National Advisory Council in Washington, D.C. for their Federal "106" review concurrence, in light of the proposed National Register nomination. It is anticipated, at this time, that such Federal review will follow the State review and comment, as described above, in order to assure full compliance with the MHC priorities and findings as a basis for subsequent evaluations and recommendations on siting options, particularly if these would involve mixed use.

12.10.2

AN INTENSIVE LEVEL ARCHAEOLOGICAL SURVEY ON DEER AND LONG ISLANDS, BOSTON HARBOR, MASSACHUSETTS

Duncan Ritchie
Joan Gallagher

With a contribution by
Barbara E. Luedtke
Department of Anthropology
University of Massachusetts, Boston

Prepared for:

CE Maguire, Inc.
One Davol Square
Providence, Rhode Island 02903

Under EPA Contract #68-04-1010

Prepared by:

The Public Archaeology Laboratory, Inc.
217 Angell Street
Providence, Rhode Island 02906

September 1984

PAL, Inc. 51-01

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF TABLES

MANAGEMENT ABSTRACT

In June and July, 1984, an intensive level archaeological survey was conducted on sections of Deer and Long Islands in Boston Harbor, Massachusetts by the Public Archaeology Laboratory, Inc. (PAL, Inc.). Two project areas ranging from about 60 acres on Deer Island to between 20 and 115 acres on Long Island were stratified into zones of expected archaeological sensitivity on the basis of a comprehensive literature search and walkover survey. Both project areas had been subjected to several episodes of previous disturbance and it was expected that there would be large areas of moderate to low archaeological sensitivity. Background research on the Long Island Hospital was also done and provided information on the complex history of this institution over the last century. Limited subsurface testing verified that both the Deer and Long Island project areas had been extensively modified during the construction of recent (World War I and II) military installations (Fort Dawes and Fort Strong, respectively). Areas with high archaeological sensitivity were located on Long Island including several historic cemetery areas associated with Long Island Hospital and undisturbed sensitive areas on the southern half of Long Island.

Survey efforts on Long Island were coordinated with the University of Massachusetts, Boston field school in archaeology.

The field school surveyed the southern end of Long Island in June and July, 1984 and located five prehistoric sites. These sites show evidence of important occupations during the Terminal Archaic (ca. 3,600 to 2,500 B.P.), Middle and Late Woodland (ca. 1,650 to 500 B.P.) periods. One site (Hull-11) may have been used in the Early Archaic period, ca. 8,500 years ago.

From the combined results of the Phase I survey by the PAL, Inc. and the UMass Boston field school, Long Island is considered to be a significant complex of prehistoric and historic period cultural resources. All of the identified sites may be eligible for inclusion in the National Register of Historic Places as elements of a multi-resource district. The cluster of prehistoric sites on Long Island may be one of the most intact in the harbor district and the integrity of their physical setting is an integral part of their research value and significance. All the archaeological sites and standing structures on Long Island must be viewed collectively. It has been strongly recommended that plans for any development on Long Island consider the relative costs of the large scale data recovery program that would be necessary to mitigate impacts to the cultural resources on that island versus the feasibility of alternate locations. The Deer Island project area is not considered to be archaeologically sensitive due to the extent of previous disturbance and no further investigation has been recommended.

INTRODUCTION

This final report presents the findings and conclusions of an intensive level archaeological survey of two project areas on Deer Island and Long Island in Boston Harbor, Massachusetts (see Figures 1 and 2). This Phase I, Step II study was conducted by the Public Archaeology Laboratory, Inc. (PAL, Inc.) under contract with CE Maguire, Inc.

CE Maguire has been conducting analyses and preparing materials to complete an environmental assessment for the siting of wastewater treatment facilities in Boston Harbor. Preparation of a Supplemental Draft Environmental Impact Statement (SDEIS) is being done by CE Maguire, Inc. for the U.S. Environmental Protection Agency. The preliminary findings of the Phase I survey were described in two previous management summaries prepared as interim reports during work on the SDEIS. The conclusions of this inventory and analysis of archaeological and historic resources presented in this report is incorporated into the Supplemental Draft EIS document.

A series of plans to upgrade Boston's wastewater treatment facilities and replace the inadequate facility presently operating on Deer Island and Nut Island have been proposed over the last several years. A recent plan (Nut Island--Site Options Study 1982) developed for the Metropolitan District Commission (MDC) by Metcalf and Eddy, Inc. identified numerous alternative siting options for

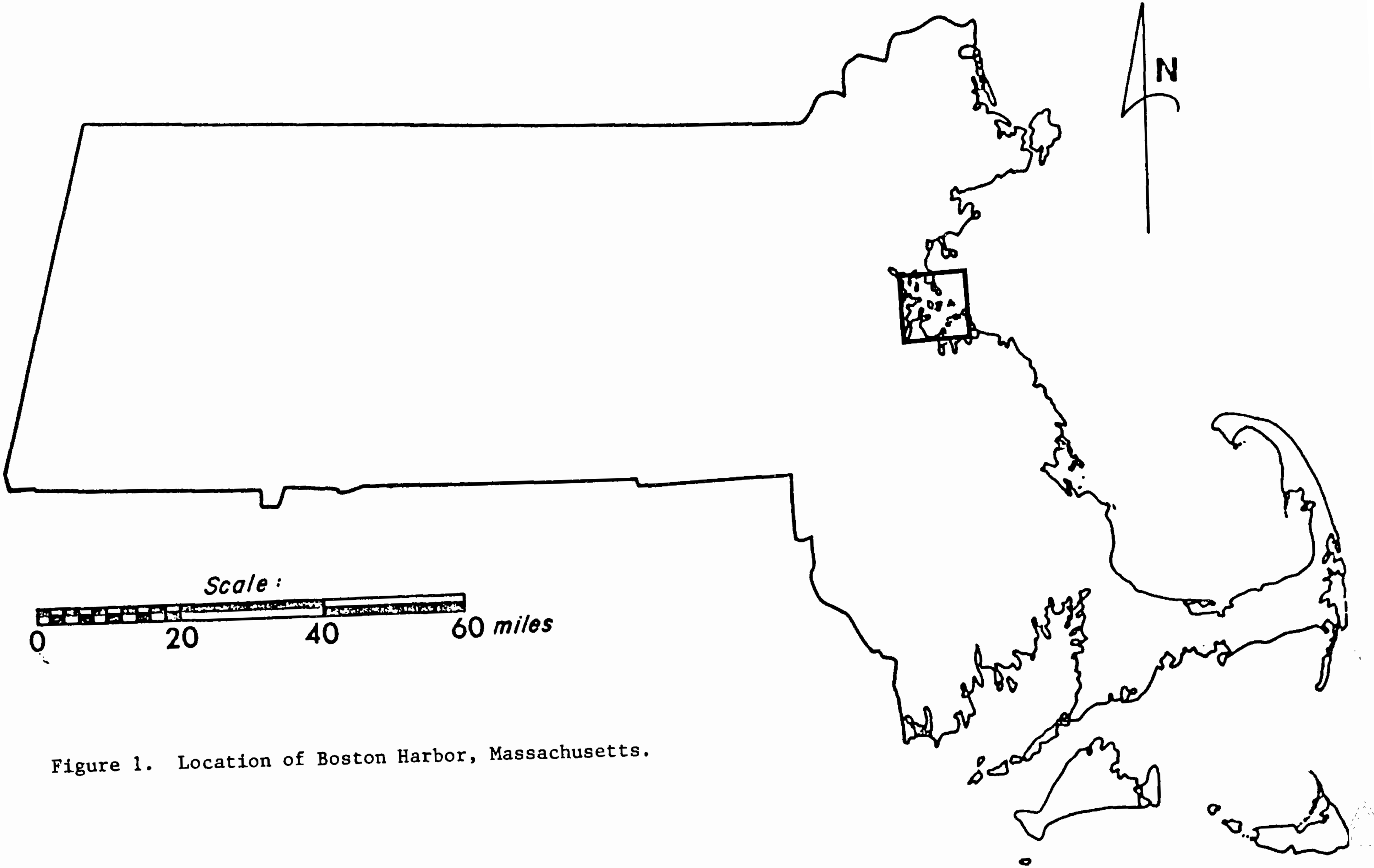


Figure 1. Location of Boston Harbor, Massachusetts.

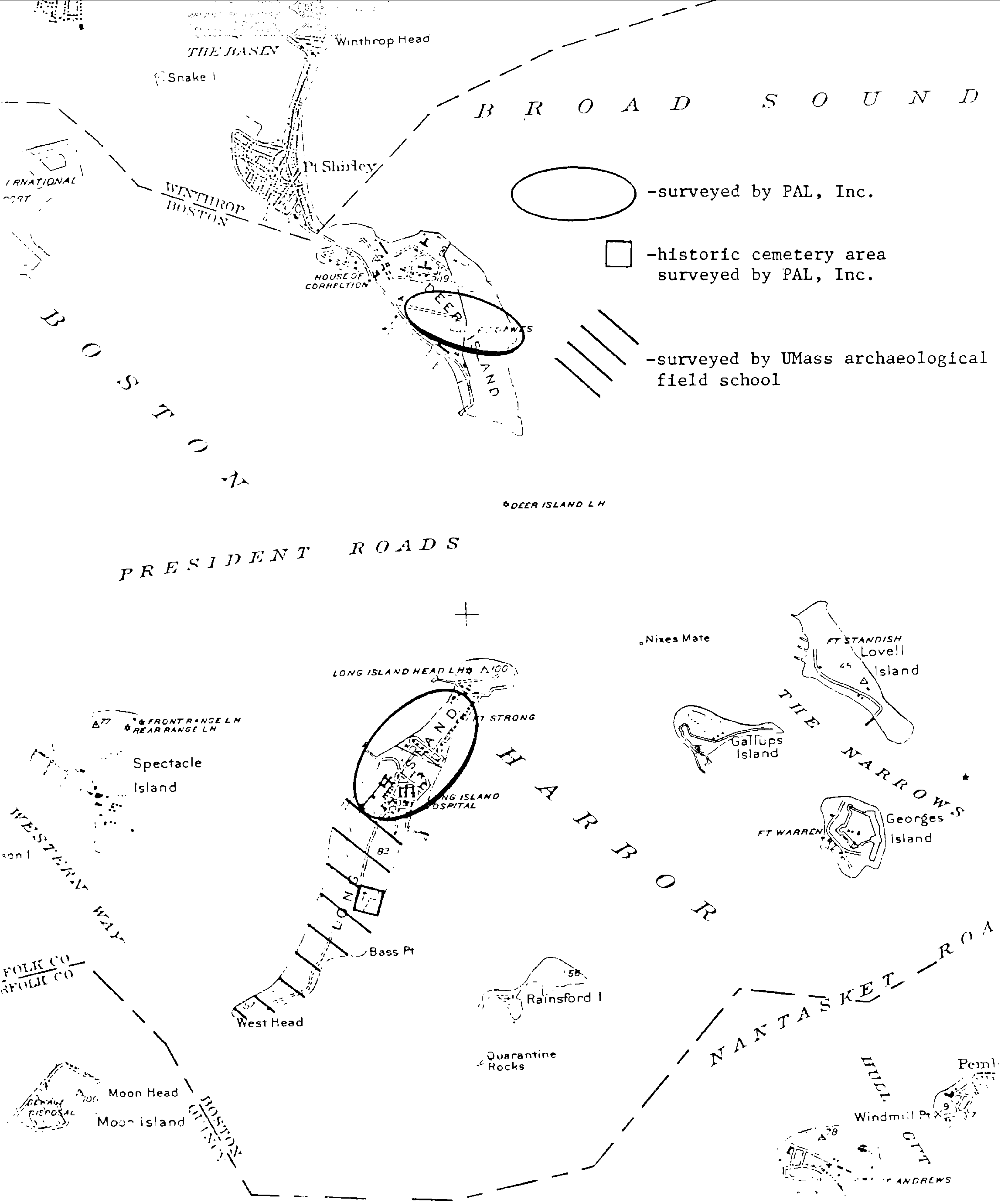


Figure 2. Location of project areas on Deer and Long Islands, USGS Hull quadrangle 7.5' series.

new wastewater treatment facilities to be located in Boston Harbor. These siting options and some additional new locations were reviewed and eight alternatives were selected for detailed study and environmental impact assessment. Included in the list of alternatives are sites on Nut, Deer and Long Island which encompass various levels of treatment and range in size from 2 acres to in excess of 100 acres.

The Phase I, intensive level archaeological survey was limited to sections of Deer and Long Islands that might be impacted by construction of proposed treatment facilities. On Deer Island an area covering the central drumlin which had never been investigated was surveyed. An earlier Phase I archaeological survey conducted by the Institute for Conservation Archaeology, Harvard University, covered a small area on the southern tip of Deer Island (Randall 1981) and the existing treatment plant site made up the remainder of the project area. A larger project area reflecting the lack of prior investigation and undisturbed condition was surveyed on Long Island (see Figure 2). Nut Island was considered by the Massachusetts Historical Commission to have no cultural resource potential because of extensive previous disturbance and was excluded from the archaeological survey.

Several different treatment sizing options requiring approximately 18, 62, 82 and 100+ acres were originally under consideration for Long Island. These were initially sited based on the MDC's facility plans (Nut Island Site Options Study 1982). The smaller, 18 acre primary treatment design option took advantage of an abandoned Nike missile base on the southwestern side of the island and some adjacent open land. The middle sized 62 acre primary option required a substantial portion of the open land in addition to the Nike base on the southwestern side of the island. The two largest options of 82 to 100+ acres for secondary treatment alternatives encompassed the entire southern half of Long Island and the area in the center of the island now occupied by the Long Island hospital complex.

The middle sized 62 acre option was subsequently determined to be unacceptable and is no longer under active consideration. Upon review of the remaining seven options involving all sites, revisions were made to siting plans for the Long Island treatment facility. Based on the unacceptable adverse environmental impacts that would result from the initial siting locations, current plans include the 18, 82 and 96 acre options. The largest alternatives involve utilization of the hospital grounds and the northwest side of Long Island.

An essential component of the archaeological assessment of Long Island was coordination of the PAL, Inc. survey effort with the University of Massachusetts, Boston (UMass) archaeological field school conducted on the southern end of the island in June and July, 1984. The field school was directed by Barbara Luedtke, Associate Professor at UMass who also served as overall archaeological technical coordinator for CE Maguire on the SDEIS. All stages of the intensive survey, including analysis of survey results and preparation of the final report were coordinated with Ms. Luedtke by PAL, Inc.. In a preliminary meeting in May, 1984, it was decided that the UMass field school would survey the southern half of Long Island for prehistoric sites and the PAL, Inc. survey would cover the parade ground section of Fort Strong, the hospital complex and the historic cemetery areas south of the hospital. The remaining portions of Long Island were not involved as potential siting locations.

The intensive survey by PAL, Inc. and the UMass field school were both performed under permit #634 issued by the Massachusetts Historical Commission (State Archaeologist) and approved by the City Archaeologist (Boston).

Background research for the survey began in April, 1984. Fieldwork on the Deer Island project area was carried out in June, 1984. Intensive survey fieldwork on Long Island was completed in August, 1984, when permission to carry out field investigations was granted by the City of Boston and by the Division of Health and Hospitals, Director of the Long Island Hospital. The overlapping schedules of the PAL, Inc. intensive survey and the UMass field school on Long Island allowed in-field consultation and coordination between PAL, Inc. staff and Ms. Luedtke.

PAL, Inc. personnel for the Deer Island and Long Island survey were Duncan Ritchie, Joan Gallagher (Senior Archaeologists) and Ann Davin (Project Archaeologist).

The PAL, Inc. would like to acknowledge the assistance provided by a number of individuals who shared their knowledge of

the history of Deer and Long Islands. Steve Krueger (Deer Island Plant Manager) and Ken Donovan of the Metropolitan District Commission described the history and operation of the Deer Island treatment facility and the earlier (1890s) pumping station and screening plant. Meribah Stanten (Director), Ruth Sullivan and Lt. Kearney (security) of the Long Island Hospital provided PAL, Inc. researchers with documentary material relevant to the twentieth century history of the hospital complex and military activity during World War II. Peter Scarpignato, City of Boston, Department of Public Facilities, assisted on numerous occasions by providing background information and coordination with City Hall, particularly during the difficult deliberations involved in granting access to Long Island.

RESEARCH DESIGN

The research design for the intensive level survey of Deer and Long Islands was based on several current models of prehistoric and historic land use/settlement systems. Those research problems felt to be most appropriate for the interpretation of prehistoric activity in the project areas were discussed with the technical advisor for the project (B. Luedtke). An important aspect of the research design was the core-periphery model employed by the Massachusetts Historical Commission in the statewide survey program (MHC 1982, 1984). This model has been applied to the study of both prehistoric and historic land use patterns and also provided a way to coordinate the findings of this survey with large-scale cultural resource management planning.

For the prehistoric period elements of three general models describing adaptation to gradual changes in coastal environments were the basis for interpreting sites located during the survey. Luedtke's (1980) diachronic model of changes in the use of inner versus outer Boston Harbor islands and Braun's (1974) model of shifts in prehistoric exploitation of shellfish species in the Harbor provided a solid framework for discussing land/resource use patterns at the local level. Some other recently developed hypotheses about observed differences between Middle/Late Archaic and Late Woodland period settlement patterns in coastal environments of Narragansett Bay were useful for a broad scale, regional perspective on sites in the Boston Harbor district (Cox and Thorbahn 1982; Cox, Thorbahn and Leveillee 1983).

In summary, Luedtke's model suggests that throughout the prehistoric past the islands were used as base camps for procuring and processing various plant, animal and lithic resources from the surrounding coastal zone environment. During the Late Archaic period in particular, inner harbor islands, like Deer and Long Islands, would have seen the most repeated short term use, due primarialy to their larger size and accessibility. Outer islands, i.e., Calf Island, were also used to a lesser extent, possibly for special resource procurement trips. With populations in coastal zones like Boston Harbor steadily increasing in the Middle/Late Woodland periods (after 1500 years ago) inner islands may have been intensively used for horticulture. These inner islands would have been included in the territories of mainland groups and should have some evidence of long term use by the end of the Late Woodland period (Luedtke 1980:72-73).

Braun's (1974) model suggests that at the local level prehistoric groups in coastal southern New England had developed adaptations which were responsive to variation in the availability of several species of shellfish by about 4,000 years ago. In Boston Harbor a pattern of gradual decline in the exploitation of oyster, quahog and bay scallops beginning in the Terminal Archaic peiod ca. 3,000 years ago is matched by a marked increase in the use of soft shell clam. This trend continued through the Early and

Middle Woodland periods and by the Late Woodland, ca. 1,000 years ago, soft shell clam was used almost exclusively over other shellfish species (Braun 1974:591). This model will be particularly appropriate for any shell midden sites which are expected to be present on Long Island. Long Island is also the largest of the inner harbor islands and is most likely to contain evidence of intensive occupation during seasonal exploitation of shellfish resources.

From recent surveys in Narragansett Bay there are indications of high site densities and intensive land use during the Terminal Archaic period, ca. 4,000 to 3,000 years B.P. The same coastal river drainages and offshore islands do not appear to have been important to previous, Middle Archaic populations, ca. 7,000 to 6,000 years ago. The apparent low density of sites dating to before 4,500 B.P. cannot be explained by inundation of site locations due to rising sea level. A final episode of intensive settlement in coastal/estuarine environmental settings took place during the Late Woodland and Contact periods, about 1,000 to 500 years ago (Cox, Thorbahn and Leveillee 1983; Cox and Leveillee 1984). This concentration of Late Woodland subsistence/settlement activities in close proximity to more recently formed estuarine environments is probably a regional pattern covering much of southeastern New England.

An important research question regarding the increased use of the Boston Harbor islands during the Middle/Late Woodland period concerned how these sites may have fit into a larger settlement system. These harbor island procurement/processing locations could have formed the outer perimeter of settlement systems with centers or cores focused on the heads of estuaries along the Neponset, Charles, Mystic, Fore, and Saugus River drainages. For example, Long Island lies just off the mouth of the Neponset River and could have been part of the seasonal round of prehistoric groups based further up the drainage.

For the historic period cultural resources on Deer and Long Islands the basic research questions guiding the Phase I survey were:

(1) The role of the islands in providing support facilities for the adjacent urban core of Boston.

(2) The extent and different types of change in land use on the islands through time.

(3) The degree and type of variability among the developmental histories of the harbor islands.

In examining these questions, the resources employed were both primary and secondary sources, including city histories, previous research reports, harbor charts and maps. These sources place the islands within an historic context, allow an assessment of natural and cultural topographic alteration, and identify the configuration of structures and types of land use present on the islands at varying chronological periods.

The model used in creating a framework for addressing these questions was the core-periphery model used successfully in other regional studies (Gallagher and Davin 1983) and compatible with the research orientation of the Massachusetts Historical Commission's (MHC) statewide survey program (MHC 1982, 1984). This insured that the results of the intensive (Phase I) survey could be integrated with MHC plans for preservation and management of historic resources within the proposed Boston Harbor National Regional District.

The definition of a core area is essentially a zone characterized by overlapping focal points of activity, which can include population, civic/ecclesiastical/institutional, transportation, or economic activities. Peripheral areas are characterized by few or no focused activities. Those that do occur are usually specialized and relate to a specific core, or may be perceived as unpleasant or undesirable. Fringe areas are peripheral zones that are specifically characterized by negative or undesirable activities, whether social, industrial or institutional (MHC 1982:8-9).

For much of their history, the Harbor Islands have been used as peripheral areas. At different periods, they became fringe areas, when their spatial isolation within close proximity to the core led to the placement of institutions and facilities on the islands that can be described as the less desirable elements (prisons, quarantine stations, chronic disease hospitals, sewage treatment plants) of complex urban centers.

From other investigations of urban historic sites in Boston, archaeologists have found that historic land modification processes and the way they change over time is an important factor in predicting site survival in an urban or intensively developed area. A basic model of archaeological site survival for the Boston urban core area was developed from several recent projects in Charlestown. The St. Mary's Elderly Housing (Bower, Cheney, Gallagher 1984), Town Hill Condominium (Cheney and Mrozowski 1983) and Central Artery Phase II (Pendery et al. 1981) projects were located in three different topographic zones. It was found that the lowest rate of site survival was in the most elevated zone (Town Hill) where extensive grading of a hillside had taken place in the nineteenth and twentieth centuries. Successively higher rates of site survival were found in the moderately elevated (St. Mary's Elderly Housing) and lower (Central Artery) project areas. The most intensive grading and alteration of the original topography had taken place on hillsides while seventeenth/ eighteenth century ground surfaces and fill/construction sequences were well preserved in the less elevated zone (Bower, Cheney, Gallagher 1984). Both the Deer and Long Island project areas had elevations (glacial drumlins) that were extensively modified for various institutional, military and other (reservoir) uses.

Archaeological investigation of one of the major military sites in Boston Harbor (Fort Independence, South Boston) provided numerous examples of large-scale demolition, grading and construction sequences. Castle Island has been the site of seven different fortifications beginning in the early seventeenth century and with each fort there were modifications to the island's topography (Ritchie and Moran 1976; Stokinger 1978). Military installations may be more likely to undergo numerous episodes of grading, demolition or construction than other kinds of sites because of the necessity for an active fort to contain up-to-date weapon systems or ordnance. The longer a location or facility remains in active use the greater the probability of modification. Islands like Deer and Long that are well situated for use as harbor defensive sites could be expected to show evidence of sequential military development.

SURVEY STRATEGIES AND METHODOLOGY

The primary objective of an intensive archaeological survey is to locate any previously unknown prehistoric and historic sites within the project area. In order to achieve this result a testing strategy, designed to investigate a representative sample of the project area (as well as the sites within it) was employed. The strategy used by the PAL, Inc. divided the Deer and Long Island project areas into zones of expected archaeological sensitivity. This is defined as the probability of locating prehistoric and historic cultural resources from surface finds or subsurface testing. Prior to this survey, one prehistoric site had been identified on the southern end of Long Island, but none were known in the project area itself.

In order to determine the probability of sites occuring in the project area two different strategies were employed:

(1) Stratify the project area in terms of its expected archaeological sensitivity on the basis of comprehensive background research and a preliminary walkover survey or surface inspection.

(2) Conduct limited subsurface testing within the archaeologically sensitive sections of the project area of a level sufficient to identify any previously unknown prehistoric or historic cultural resources.

This section of the final report contains a description of how these strategies were integrated to provide an accurate inventory and assessment of the project areas on Deer and Long Island.

Succeeding sections discuss implementation of these strategies and evaluate the results of the survey.

Background Research

Background research provided the primary information for assessing the expected archaeological sensitivity of the two project areas. By reviewing known prehistoric cultural resources and comparing their locational attributes with the environmental settings in the project areas some base line estimates of sensitivity could be made.

Review of the historic developmental/land use sequences on both islands provided the data necessary to assess the extent of previous modification or disturbance of soil conditions in the project areas. A wide range of documentary and cartographic sources were consulted during the background research phase. These include:

(1) State and city level archives.

(2) Reports of state and city commissions or boards for various institutions.

(3) Maps and charts of Boston Harbor including Deer and Long Islands.

(4) State level cultural resource inventories/site files maintained by the Massachusetts Historical Commission. This included sites or properties listed on or in the process of being nominated to the National Register of Historic Places.

(5) Previous reports on the history and archaeology of Boston Harbor including cultural resource management studies.

In addition, informants familiar with the history and development of Deer and Long Islands were consulted to collect information not available from documentary sources.

The physical environmental setting of the Deer and Long Island project areas was investigated by reviewing data from the fields of geology/geomorphology, paleoenvironmental reconstruction and ecology.

Walkover Survey

In general, a synthesis of environmental criteria and data from all five of the data categories listed above was used to make an initial stratification of the Deer and Long Island project areas. Locational data from both prehistoric and historic sites (cemetery) identified by the UMass field school was particularly helpful for stratifying these areas and estimating construction related impacts. This stratification scheme was further refined during the preliminary walkover survey and surface inspection of the project areas. Maps based on aerial reconnaissance photographs (1 inch - 200 feet) with topographic information (5 foot contour interval) provided by CE Maguire, Inc. were used to guide the walkover survey. These maps provided information on general land form and were particularly useful for locating buildings, military structures and roadways for assessing the degree of previous disturbance in the project areas. Environmental settings and topographic features noted during the background research were investigated in more detail. The walkover included a surface inspection of beaches, wave cut slopes along the perimeter of both islands and other exposed soil profiles for evidence of prehistoric cultural materials or features (shell midden) or historic trash/ fill deposits. Examples of eroded prehistoric sites were known from Thompson and Calf Islands where features have been exposed. Erosion rates of as much as 1/2 foot (15 cm) per year had been recorded at West Head on Long Island and it was expected that some sites might be found in eroded condition (Kaye 1967; Luedtke 1980; Barber 1983). The historic cemetery area south of the hospital grounds was also inspected during the walkover; its general condition and probable original extent were noted.

The original plan for the walkover survey described in the technical proposal was to use Hoffer soil augers to examine soil profiles at fixed intervals along transect lines. Attempts to use soil augers on the compacted, rocky glacial till derived soils found in both the Deer and Long Island project areas were generally unproductive. The augers were barely able to penetrate the rocky topsoil left in the project areas after extensive grading and landscaping.

In less rocky soil conditions the 40 cm deep auger cores are an effective means of identifying soil anomalies resulting from past cultural activity, such as charcoal, shell fragments, brick, coal or oxidized subsoil. Subsurface testing during the survey was done with small shovel test pits which exposed a full topsoil/ subsoil profile.

Following the walkover inspection the Deer and Long Island project areas were given a final stratification into zones of high, moderate to low archaeological sensitivity or previously disturbed areas with no archaeological potential. More intensive investigation consisting of subsurface testing was planned for those zones of moderate to low sensitivity within both project areas. The only areas of high archaeological sensitivity were several historic cemetery areas which were investigated through documentary and cartographic sources.

Subsurface Testing

Sections of the project areas considered to be archaeologically sensitive were investigated with shovel test pits placed at 20 m intervals along random and judgementally oriented transects. Since the PAL, Inc. intensive survey did not include any of the Long Island project area considered to have high archaeological sensitivity, 10 m test pit intervals were not used and the 20 m interval was felt to provide sufficient coverage.

This procedure was consistent with the subsurface testing scheme used by the UMass field school on the more sensitive southern half of Long Island. For that survey shovel test pits were placed at 10 m intervals in zones of greater expected sensitivity such as areas close to sources of fresh water or where test pits encountered prehistoric cultural material. A testing interval of 20 m was used in areas showing visible evidence of previous disturbance (see Appendix). For the random transects a standardized system for selecting random angles which were then converted to compass headings was used to orient the transect locations.

Test pits averaged 50 x 50 cm in size and were excavated with a shovel in 10 cm arbitrary levels. All soil from the shovel test pits was hand screened through 1/4 inch mesh hardware cloth to recover any cultural material. Prehistoric and historic cultural material from test pits and soil profiles were recorded in the field on standardized forms. Munsell Soil Color charts were used to standardize descriptions of soil horizons observed in test pit profiles. Following subsurface investigation the location of the random and judgemental test pit transects was field mapped. Cultural features (roadways, concrete bunkers, demolition rubble, dump areas, historic foundations, etc.) relating to previous episodes of historic/recent activity were also mapped.

At the completion of the subsurface testing phase of the survey, documentary photographs in both black/white and color were taken of the most significant and representative historic structures within the project areas. On Deer Island this included the pumping/screening building from the earlier (1890) treatment plant, wood frame carriage house and various military facilities such as the radar station/command post on Signal Hill. The historic cemetery area, representative building facades within the hospital complex and concrete bunkers were documented on Long Island. Prehistoric and historic cultural material collected from the surface or excavated from test pits was placed in marked bags in the field and returned to the PAL, Inc. for processing. The initial stages of laboratory processing involved washing, measuring and cataloging all the historic cultural material recovered during fieldwork.

Historic cultural materials found as small fragments of field trash were cataloged according to material (glass, ceramic, brick, iron) and functional categories (bottle, plate, building materials). More temporally sensitive artifact ceramics were identified as to type such as redware, creamware, pearlware, etc.

Following cataloging and analysis all cultural materials were packed in sealed and labelled polyethylene bags and durable cardboard boxes for curation at the PAL, Inc., in Providence, Rhode Island.

ENVIRONMENTAL SETTING

Extending out from the northern edge of Boston Harbor in a southeasterly direction, Deer Island is separated from Long Island by Presidents Road, the main shipping channel in the harbor. Long Island is located in the approximate center of Boston Harbor and because of its northeast/southwest orientation Long Island Head is only about 1520 m (5,000 ft) south of the tip of Deer Island. Deer Island currently forms a large peninsula connected at its northern end with the mainland in Winthrop. This island was always separated from Winthrop by Shirley Gut, a shallow channel that gradually silted in during the late nineteenth century, while the present causeway is a recent development completed in 1936.

Boston Harbor is a continuation of the Boston Basin, a structural and geologic basin. The topography within the basin is typical of glacial outwash with numerous drumlins. There are about 180 drumlins in the general basin area (La Forge 1932). Bedrock outcrops occur mostly in the upland sections of the basin where the cover of glacial drift is thin. A few outcrops appear in the harbor such as Squaw Rock in Squantum and others on Slate Island and in Hingham Harbor in the southern part of the submerged basin. Most of the islands are drumlins; some of the smaller ones may represent the tops of larger drumlin features that are submerged or buried in deposits of marine clay. The distribution of drumlin islands within the harbor may be related to the topography of the buried bedrock surface. Those large islands with northeast/ southwest orientations like Long and Peddock's Islands occupy higher bedrock ridges that follow the strike of several local fault zones. The drumlins themselves do not appear to have bedrock cores. The Boston Harbor drumlins are typically composed of dense, green-grey glacial till and silty clay with some gravel layers and containing pebbles, cobbles and few boulders. The pebbles and cobble inclusions are generally of locally derived grey argillite or slate from the Cambridge Argillite, the major bedrock unit underlying the harbor. The upper surface of the till is usually oxidized to a light tan or buff color (Kaye 1976:46-51).

The prominent drumlin on Deer Island, Signal Hill, is oriented S 75o E, the general direction of movement of the glacial ice sheet that covered the Boston area during the latest Wisconsin period glaciation ca. 14,000 years ago (Brenninkmeyer 1976:207). Long Island is a drumloidal complex composed of a small, well-formed drumlin at the northeast end (Long Island Head), a large, central complex and a remnant of a small drumlin at the southwest end (West Head). The drumlin complex in the center of the island is compound in structure, made up of three drumlins grouped together. The three sections of Long Island are connected by other glacial and littoral deposits (Kay 1967:158, 1976:521). The cobble covered beaches and eroding shoreline of the islands probably provided some lithic resources such as large cobbles and boulders of felsite that would have been used by prehistoric groups as sources of raw material for chipped stone tools. Glacial till deposits or saltmarsh sediments were probably the source of clay used by prehistoric potters for the manufacture of ceramic vessels.

The shallow offshore waters surrounding Deer Island contain a large mud flat on the protected harbor side (west/southwest) and rocky shoals on the east/northeast side. Great Fawn and Little Fawn shoals extend out from the northeast shore of the island where they are exposed at low tide and provide temporary feeding areas for various species of shore birds. Similar flats extend out from the east/southeast shores of Long Island and evidently provided suitable habitat for formation of shellfish beds that were an attraction to prehistoric populations.

During most of the extended period of prehistoric use of the Boston Harbor Islands, Deer and Long Island would have presented somewhat different environmental settings than they do today. Lowered sea level during the post glacial period roughly 11,000 years ago would have left both islands as elevated drumlins above the floodplain of the Charles, Mystic and Neponset Rivers. By 7,000 years ago marine inundation had covered estuaries now under Boston Harbor and over the next several thousand years salt water proceeded up the Charles and other river drainages flooding former freshwater wetlands. This process appears to have stopped by about 2,500 years ago allowing the formation of tidal mudflats in Boston Harbor. This was an important environmental event since the shellfish beds which occupied the tidal flats became a focus of prehistoric settlement/ subsistence patterns. Minor changes in the configuration of the harbor and the temperature and/or salinity of its waters appear to have continued over the last 1,500 years. Prehistoric sites were located near tidal flats or covets that have been altered or disappeared behind beach ridges. Changes in the species composition of the shellfish beds near these sites due to various environmental factors also appears to be reflected in the shell remains found in midden deposits (Dincauze 1974; Braun 1974).

Prehistoric groups visiting sites on Calf and Thompson Islands caught a wide variety of fish from Boston Harbor including cod, tautog, dogfish and sturgeon and the offshore waters around Deer and Long Island probably contained a similar range of species (Luedtke 1980:56-57; Barber 1983:9). Both Deer and Long Islands had small sources of fresh water, either in wetlands or small springs. On Deer Island two ponds, now filled in, were in active use during the nineteenth century (Cow Pond, Ice Pond) and may have been created by artificially enlarging existing springs or freshwater marshes.

There are two areas of existing freshwater and saltwater marshes on the west end of Long Island, one adjacent to the barrier beach on the southwest shore and another cattail marsh at Bass Point on the southeast side of the island. Prehistoric sites were found along the edges of both wetlands by the UMass archaeological field school and they were clearly an important resource for the prehistoric hunter/gatherer groups using the harbor islands.

These two islands were originally forested but this natural resource was rapidly depleted in the seventeenth and eighteenth centuries due to the demand for timber and firewood in the rapidly urbanizing Boston core.

Palynological analysis of a sediment core taken from a salt marsh on Calf Island indicated that the former forest cover on that outer harbor island may have been mostly pine and oak with maple, birch, walnut/hickory, basswood and sassafras (Kaplan 1975).

On Thompsons Island, just north of Long Island, the present vegetation includes a grove of large oak trees that probably approximates the original appearance of the harbor islands. The present vegetation on Long Island consists mostly of smaller, tree species typical of early succession in abandoned farmland such as chokecherry, aspen, pitch pine and black locust. Common shrubs include sumac and bay laurel. Some stands of mature trees also remain around the Long Island Hospital complex.

On Deer Island, the continuous processes of historic land use including the prison, treatment plant and military installations have been responsible for maintaining land in cleared condition. Most of the project areas covered in the Phase I survey were open meadow-like areas with tall grasses and various weeds (goldenrod, milkweed, etc.).

PREHISTORIC LAND USE AND SETTLEMENT PATTERNS

The prehistoric cultural resources of the Boston Harbor district are an important component of the available data base of cultural resources in coastal, eastern Massachusetts. These sites have survived several hundred years of varying degrees and types of historic land use. To fully understand and appreciate the prehistoric sites which were identified in the Phase I survey it is necessary to view them in the broader interpretive context provided by the known data base.

The Boston Harbor islands have not been the subject of investigations by avocational archaeologists like the coastal areas to the north (Salem/Beverly, Ipswich) and south (North River drainage, Plymouth) of Boston or the Blue Hills and Neponset River drainage on the southwest edge of the Boston Basin.

The Boston metropolitan area is unusual in comparison to other urban areas because some early collections of prehistoric material were preserved from sites that are now gone. Collections assembled in the late nineteenth century from sites along the lower Charles and Mystic River drainages by local prehistorians (J. W. Fewkes, G. B. Frazar, F. Putnam) have been valuable sources of information about sites long since destroyed. Sites located at the confluence of various streams with the Charles River near Magazine Beach and Mt. Auburn Hospital in Cambridge, Watertown Arsenal and the Perkins School for the Blind in Watertown were visited by collectors during various episodes of development and construction. An important locus of prehistoric activity at the confluence of the Mystic River and Alewife Brook in Arlington was also the source of at least one (G. B. Frazar) large collection.

The Boylston Street fish weir was first discovered during subway construction in 1913. Several later multi-disciplinary studies (1939, 1946) were among the first paleoenvironmental reconstructions carried out in southern New England and outlinend the process of marine inundation of the lower Charles River (Johnson 1942).

Dincauze's survey of archaeological resources in the greater Boston area conducted in 1967-1968 was the first large-scale inventory and assessment of prehistoric sites. This survey included the Boston Harbor islands revealing some of the important research potential contained in the sites located in the harbor district (Dincauze 1974:39).

A later investigation of twelve harbor islands was the first archaeological survey to focus specifically on the islands. An important product of this survey was a model of how prehistoric land use/settlement patterns changed from the Late Archaic to Late Woodland periods (Luedtke 1975, 1980).

With the exception of the earliest Paleo-Indian period (ca. 11,000 B.P.), a complete sequence of prehistoric occupation within the Boston metropolitan area can now be constructed from available data (see Table 1).

Table 1. Prehistoric Cultural Chronology for Southern New England.

General Period	Identified Temporal Subdivisions*	Cultural Aspects
Paleo-Indian		
12000-8000 B.P.** (10000-6000 B.C.)	(1) Eastern Clovis (2) Plano	Big-game hunting in small groups with a specialized and uniform lithic technology was the rule for a few, highly mobile groups of small size.
Early Archaic		
9500-7000 B.P. (7500-5000 B.C.)	(1) Bifurcate-Base Point Assemblages	Socioeconomic patterns unknown but the basic Archaic lithic technology was established. Small, widespread populations were probably practicing diversified hunting and gathering.
Middle Archaic		
8000-4500 B.P. (5500-2500 B.C.)	(1) Neville (2) Stark (3) Merrimack (4) Otter Creek (5) Vosburg	Hunting and gathering especially within drainage systems. Fishing gear appears and local lithic sources used. Social organizations probably at band level.
Late Archaic		
4500-3000 B.P. (2500-1000 B.C.)	(1) Brewerton (2) Squibnocket (3) Small Stemmed Point Assemblages	Intensive hunting and gathering was the rule over entire region in diverse environments. Shellfish were exploited for first (?) time. Perhaps population and group sizes were at maximum for the Archaic period.

*Termed Phases or Complexes
**Before Present

Table 1. (Continued).

General Period	Identified Temporal Subdivisions*	Cultural Aspects
Transitional		
3600-2500 B.P. (1600- 500 B.C.)	(1) Atlantic (2) Watertown (3) Coburn (4) Orient	Same economy as the earlier periods, but there may have been groups migrating into New England, or local groups developing technologies strikingly different from those previously used. Trade in soapstone became important. Burial rituals became complex.
Early Woodland		
2600-1500 B.P. (600 B.C.-300 A.D.)	(1) Meadowood (2) Lagoon	There was apparent population decline. Sites of this period are rare. Pottery was first (?) made. Little is known of social organization or economy.
Middle Woodland		
1650-1000 B.P. (300- 950 A.D.)	(1) Fox Creek	Economy focused on coastal resources. Horticulture may have appeared late in period. Hunter-gathering was still important. Population increased from the previous low in the Early Woodland.
Late Woodland		
1000- 450 B.P. (950-1500 A.D.)	(1) Levanna	Horticulture was established by now. Coastal areas seemed to be preferred. Large groups sometimes lived in fortified villages and were organized in complicated political alliances. Some groups may have still relied solely on hunting and gathering.

Table 1. (Continued).

General Period	Identified Temporal Subdivisions*	Cultural Aspects
Proto-Historic and Contact		
450- 300 B.P. (1500-1650 A.D.)	(1) Algonquian Groups	Groups such as the Wampanoags, Narragansetts, and Nipmucks were decimated by disease(s) just prior to arrival of European settlers. Political, social and economic organizations were very complex, but collapsed in face of disease and European expansion.

The discovery of a potential Early Archaic component on the Hull-11 site on Long Island during the Phase I survey filled in one minor gap in this sequence. This site is particularly important because the other coastal locations used around 8,500 to 8,000 years ago are under Boston Harbor. A few sites representing other aspects of Early Archaic settlement patterns in the Boston area are located on large river systems draining into coastal waters. A large terrace of glacial outwash sand/gravel above the Charles River in East Watertown was apparently occupied by Early Archaic groups; a single bifurcate base projectile point was collected there in the late nineteenth century (Dincauze 1973:32).

Along the Saugus River north of Boston Harbor, Early Archaic hunter/gatherers were among the first groups to extract fine grained, red-pink volcanic material (Saugus jasper) from the Saugus Quarry site, a small lithic source area within the Lynn Volcanic complex. Several other bifurcate base point find spots representing temporary camps used by Early Archaic hunter/gatherers were recorded from the three major river drainages (Mystic, Charles, Neponset) emptying into Boston Harbor (Dincauze 1974:45).

Marine transgression and the creation of Boston Harbor drowned most of the sites located near the coastal/estuarine environmental settings of 7,500 to 6,000 years ago. The available information on Middle Archaic period settlement patterns and other activities in the harbor district is limited in comparison to adjacent, inland sections of the Boston Basin. One of the prehistoric sites located on the southern end of Long Island by the UMass field school, Marsh Locus 1-2, yielded a broken Neville point (see Appendix I). If this large non-midden site does contain more Middle Archaic material it could be an important source of information needed to reconstruct settlement and resource use patterns in the harbor around 7,000 years ago. Earlier survey work in the Boston Basin suggested that the majority of Middle Archaic sites not under shallow, offshore waters were in three general environmental settings, adjacent to rivers, lakes and marshes or bogs (Dincauze 1974:45).

Extensive Middle Archaic depositions possibly the result of brief but intense seasonal use of favored site locations have been located in the Neponset and Cochata River drainages along the southern boundary of the Boston Basin. At the Green Hill, Ponkapoag and Gill's Farm sites, Middle Archaic groups carried out a wide range of activities including manufacture of chipped and ground stone tools from lithic raw materials obtained in the Blue Hills and at other lithic source areas along the Neponset River. Processing of other resources (fish, meat, plants) collected from riverine wetlands or other environments was carried out on these sites creating numerous pit and hearth features. Middle Archaic groups quarried large amounts of matamorphosed slate (hornfels) and rhyolite from lithic source areas in the Blue Hills and many sites around the perimeter of this area were used as temporary workshops. At the Green Hill, Ponkapoag and other Neponset drainage sites hundreds of broken, discarded preforms for chipped and ground stone tools (projectile points, adzes/gouges, semi-lunar knives) have been excavated from Middle Archaic contexts (Cote 1958; F. Carty, personal communication 1983).

Like many other areas of coastal southern New England, significantly more data is available on Late Archaic activity in Boston Harbor in comparison to earlier time periods. Relatively high densities of Late Archaic sites have been recorded in the Boston metropolitan area. The Boylston Street fish weir was constructed early in this period (ca. 4,500 years B.P.) in the recently formed Charles River estuary. This wood and brush facility for trapping fish in the inter-tidal zone appears to have been maintained/repaired on a seasonal basis by hunter/gatherers of the Small Stem Point tradition. Investigation of a shell midden on Peddock's Island uncovered a vary unusual Archaic inhumation burial under the midden deposit. A radiocarbon date of 4135 $\pm$ 225 years ago (GX-2528) indicated that it was probably affiliated with a Small Stem Point deposition pre-dating the formation of the midden (Dincauze 1974:48).

Other Late Archaic populations, particularly those affiliated with the Susquehanna tradition, used the Boston Harbor islands and other locations along the Charles River estuary. One of the sites (Hull-11) on Long Island was apparently used by Susquehanna tradition people (see Appendix I). The Calf Island site in the outer harbor probably contained a fairly substantial Late Archaic deposition that was mostly destroyed by rising sea level and subsequent erosion. One of the subsistence related activities carried out by Late Archaic hunter/gatherers may have been construction and operation of a fish trap or weir between Calf and the Brewster Islands. Sea level would have been about five feet lower than at present and Calf, Little Calf and the Brewsters would have been connected creating a funnel-like channel with its apex near the Calf Island site. This would have made this site area a good location for a weir or fish trap facility (Luedtke 1980:64).

By around 3,000 years ago, Terminal Archaic populations were still using some of the same site locations that had been parts of earlier Archaic settlement patterns in the harbor district. The Hull-11 site on Long Island is a good example; steatite vessel sherds found there by the UMass field school probably belong to a Terminal Archaic or Early Woodland component. The largest sites possibly representing the cores of Terminal Archaic (Orient complex) and Early Woodland settlement patterns in some coastal drainages were near the head of estuaries along the Mystic and Charles Rivers (Dincauze 1974:50). There are indications that the harbor islands contain important Early Woodland sites, mostly shell middens. Small midden sites probably occupied around 2,500 years ago were recorded on Thompson Island (Shaw 1984) and during the 1984 UMass field school on Long Island. The Early Woodland and first half of the Middle Wodoland period mark an important shift in basic subsistence/settlement patterns not only in Boston Harbor but across the southern New England region as well.

Exploitation of several species of shellfish (soft shell clam, scallop, oyster, quahog) intensified rapidly during the Middle Woodland period in response to the stabilization of sea levels and establishment of suitable habitat (tidal flats) for the formation of shellfish beds. Some large shell midden sites were created in the Boston Harbor district and they have a much wider distribution across the islands than sites of most preceding time periods. Both midden and non-midden Middle Woodland sites were located near estuarine environments along the shore of the harbor and at the estuary head base camps used by previous Terminal Archaic and Early Woodland groups in the Charles and Mystic River drainages (Braun 1974:589-591; Dincauze 1974:51). Surveys by both avocational and professional archaeologists along the southern shore of the harbor district in Weymouth have also identified significant Middle Woodland sites (Huntington 1979).

The concentration of settlement/subsistence activities in the coastal/estuarine and off-shore island environments of the harbor district continued into the Late Woodland period, after about 1,000 years ago. It is estimated that a majority of the small shell midden sites in the harbor district of unknown cultural affiliation are probably Late Woodland sites (Dincauze 1974:53). This estimate seems to be supported by recent survey information from various harbor islands which has identified many large and small midden sites of probable Late Woodland affiliation. Calf Island in the outer harbor appears to have functioned as a base for specialized resource procurement and processing activities. Recently discovered sites on Long Island include similar procurement/ processing loci and possibly a Late Woodland farmstead. On nearby Thompson Island most of the midden sites appear to contain some Late Woodland deposits resulting from intensive collection and processing of shellfish (Luedtke 1980; Barber 1983; Shaw 1984).

In general, the Boston Harbor islands seem to contain many different elements of Late Woodland settlement systems that would have been based at large estuary head base camps. During the late prehistoric period just prior to European contact it appears that the ecologically diverse estuary head environments were selected as the location for major base camps forming the core of river basin territories. Certain inner harbor islands were used for intensive shellfish processing and probably for farming (Long Island, Peddocks Island, Thompson Island, etc.) and could have been important parts of the territories of groups based in the Charles, Mystic, Neponset or other river basins. Outer harbor islands, like Calf Island and the Brewsters would have been occupied on brief, seasonal trips for exploiting specific marine resources (fish, shellfish, sea birds) (Dincauze 1974:53; Luedtke 1980:72-73).

HISTORIC LAND USE AND DEVELOPMENT PATTERNS

The historic development of Deer and Long Islands is directly related to urban processes in the city of Boston and reflects various stages of its growth and expansion.

Deer Island

Deer Island's role in supporting the functioning of the city was examined within the core-periphery framework. Preliminary research indicated that from the time of the earliest recorded use of the island by Europeans, it served as a resource base for the inhabitants of Boston (Sweetser 1882:194). It was granted to the city, along with Long, Hog and later Spectacle Islands, in 1634. Later, funds generated by the rental of the island went toward the support of the Boston school fund.

The island's use as a fringe zone within Boston's periphery began in 1675-76, when many Native Americans were interned there during King Phillip's War. These people were placed on the island under extremely harsh conditions, and petitioned the Court to be sent elsewhere, citing a lack of food and firewood that threatened their lives (Massachusetts State Archives 1676:30/200a). They were to remain there until the end of the war, however, when the island was used to imprison defeated Native American soldiers.

The role of the island as the location for individuals and institutions considered undesirable within the core continued for many years. It was used to quarantine seamen suspected of carrying smallpox (Massachusetts State Archives 1677:61/166), and later for the quarantine of great numbers of Irish immigrants in the 1840s. The quarantine area was subsequently used as the site of the new Almshouse, built in 1850-1852, and designed by Luther Briggs, Jr. The older Almshouse and House of Industry, in South Boston, was removed not only because the structures were dilapidated and overcrowded, but because it was contributing to the decline of a core area neighborhood (Committee on Public Buildings, 1847). Again, Deer Island served as a convenient location for institutions considered unsuitable for the city itself.

The trend continued throughout the next century, with a prison (1858), sewage treatment plant (1889 and 1968), cemetery (1907) and other ancillary structures constructed since the mid-nineteenth century.

The prison is now part of the Suffolk County Correctional Facility. In 1896, it incorporated the 1850-1852 Almshouse and the 1854 House of Industry and House of Reformation. By 1904, the prison complex was the largest in the State, with 1793 prisoners. In that year, a new prison for women was added (Board of Prison Commissioners 1904).

During the late nineteenth century, the complex was, like the hospital complex, on Long Island, developed as a self-sufficient community. The 1,200 to 1,500 inmates ranged in age and condition from adult convicts to pauper children. The institution grew much of its own food, and maintained a herd of cows and large numbers of pits (Sweetser 1887:198-199). Cattle were watered at the Cow Pond and ice for the institution taken from the Ice Pond, two freshwater ponds that have now been filled. Inmates produced goods in workshops and convicts carried out the traditional penal activities of breaking rocks.

The self sufficient nature of the institution was emphasized by its spatial isolation from Boston. Connected by a ferry that crossed the shallow, narrow passage of Shirley Gut, it effectively removed inmates from the community, one that was seen as contributing to their downfall (Sweetser 1887:200).

The sewage treatment plant was built in 1889, by the Metropolitan District Commission (MDC). It was part of the MDC's North Sewer District. In the 1890s, effluent was gravity-fed to the East Boston Station, then pumped up about 12 to 15 feet to Deer Island (Kenneth Donovan, personal communication, July 1984). The pumping engines were powered by coal that was brought in on barges that drew up on wharves in front of the pumping-screening plant. Associated with the plant was a four to six family wood frame residence known as the "chief's building" and a large carriage house with a single family residence on its east end. The "chief's building" has been demolished, and the residence/carriage house is in poor repair, currently used for storage by the MDC.

In 1968, the pump/screening station on Deer Island was upgraded and enlarged. It now serves 22 communities which made up the North System of the Metropolitan Sewerage District (MSD), and is connected to seven area pump stations (Commonwealth of Massachusetts 1971). It covers about 26 acres of the central section of the island.

The cemetery and other burial grounds were either relocated or disturbed in the subsequent construction activities that occurred on the island. Military functions, too, were peripheral activities that took place on the island. The large drumlin in the north central section of the Island was known as Signal Hill for many years, having been used as a signal station since the War of 1812. Naval engagements took place near the island during the Revolution, and in the War of 1812, the U.S.S. Constitution was said to have sailed around the island in an attempt to evade British warships.

The island's strategic position in relation to Boston Harbor required that it be fortified during World War II. Fort Dawes was built by the U.S. Department of Defense on the southeastern section of the island between 1941 and 1943. It consisted of a series of concrete bunkers, gun emplacements, a small observation tower, and a radar station on top of Signal Hill. Never used to house troops or munitions, the fort is now under the jurisdiction of the US Navy, having been placed under "caretaker status" in 1946 (Massachusetts Area Planning Council 1972).

Long Island

Long Island's historical development was studied within the same context as that of Deer Island. Like Deer, Long Island was first used as a pasturage and wood-collection area for Boston. Unlike Deer, however, Long Island's resources were assigned to 37 different individuals who quickly deforested the island. By 1639, it was laid out in lots, and the land rented for the benefit of the town school. The agreement was not kept up, however, and the land passed into private hands by 1667.

Land use on the island was primarily agricultural in nature. Deeds of the mid to late seventeenth century refer to island properties comprising "uplands, meadows, outhouses and gardens" (Tennta 1983:12). During King Phillip's War in 1675-1676, Indians confined on Deer Island were given land for planting on Long Island (Massachusetts State Archives 30:194). The land belonged to Henry Mayer, who agreed to allow them to improve 100 acres.

For many years, almost the entire island was owned by John Nelson, a famous military hero, who gave his name to the island. He began to acquire land on the island in the 1680s, but later mortgaged it. His heirs reacquired his 200 acre estate in 1724, but it then passed to James Ivers, whose heirs held possession of most of the island until it was purchased by the Long Island Company in 1847.

During this period it is difficult to assess the precise type of agricultural land use on the island. It is recorded that the Americans removed the "cretors" or livestock from the island in 1775, consisting primarily of sheep and cattle. Assuming that the inhabitants of the island were relatively self-sufficient, they probably cultivated orchards, small vegetable gardens, and some acreage in grain to support themselves.

Military functions were peripheral activities that augmented the primarily agricultural land use of the island up to and during the Revolution. The British occupation of the island ended with the American capture of the livestock that sustained the garrison. After the British withdrawal, the Continental Army constructed defenses on the Eastern bluff (Mikal 1973:72). These same heights were later fortified during the War of 1812. A lighthouse and keeper's house were built in 1819, on the same bluff. The Long Island lighthouse has been nominated to the National Register of Historic Places and is under review by the National Park Service. This site is adjacent to the proposed siting area.

During the Civil War, the island was used to quarter Union troops. At the end of 1863, there were 1,000 conscripts and several companies of heavy artillery on the island (Sweetser 1882:167) in what was then known as Camp Wightman near Long Island Head. A battery of guns was constructed on the Head immediately before the war. Its usefulness as a military site was attributed not only to its "sanitary merits," but to the "security it affords against desertions" (Sweetser 1882:167).

In 1867, the fort on the Head was renamed Fort Strong; the original Fort Strong was located on Noddle's Island. It was extensively redesigned during the Spanish American War, when gun batteries were installed (Kales 1976:72). Around 1910, some of the guns were allegedly removed and taken to fortify the island of

Corregidor in the Phillipines (R. Sullivan, personal communication, July 1984). Troops were again stationed in the Fort during World War I. During World War II, the Fort served as a mines operation center. The most recent military use of the island was the installation of a Nike missile base on the southern end of the island. While the missiles have been removed from the underground silos, the base remains intact, and has been used as a temporary archive for volumes from the Boston Public Library.

The peripheral nature of the island was also expressed in its use as a resort in the 1840s. While some recreational activities were carried out on Deer Island between the end of the Revolution and the 1840s, the scale of the Long Island resort was far more extensive. It was a speculative venture, and the Long Island House and Long Island Hotel were built as part of a planned community. Its role was to be an elaborate recreational community in close proximity yet completely different in density from Boston.

The Long Island resort complex was originally owned by the Long Island Company, a group of speculators who purchased a major portion of the Island between 1847 and 1866. In that almost 20 year period, the company constructed a hotel building of three stories, at least one two-story frame cottage, and several wooden outbuildings. They intended to develop much of the island as a seaside community, but did not succeed. After several changes of ownership, by 1882, the planned streets were occupied only by "a feeble group of shabby cottages" (Sweetser 1882:168).

The hotel buildings were used as the headquarters for Camp Wightman during the Civil War. After the war, it returned to a recreational mode, but the island's development as a resort was hindered by its access to petty criminals and gangs. The isolation of the island from urban stress broke down in the 1880s.

Perhaps the most visible and extensive cultural feature on Long Island is the present Boston City Hospital complex. The City purchased land belonging to the Long Island company in 1882. The first municipal institution established was the city almshouse. Using the old hotel property, the city housed 650 paupers on the island in 1885 (Massachusetts Area Planning Council 1972:71).

Like the institution on Deer Island, the city almshouse was located on Long Island to free the city from maintaining municipal charities and prisons in South Boston and West Roxbury. The pattern was established when thirty years before, the city had moved the almshouse from South Boston to Deer Island.

The history of the Long Island institution is extremely complex. It evolved slowly from a poorly equipped pauper home with additional hospital facilities to a fine medical facility. Between 1882 and the present, over 20 structures and ancillary facilities have been constructed, altered, remodelled and sometimes abandoned. A brief outline of the institution's development is presented below.

The city purchased land belonging to the Long Island Company in 1882, and a tract of 182 acres was taken by order of the City Council in 1885 (Boston City Document #5 1929). Initially, the years of operation, there were close administrative ties between the two island institutions. The laundry for both was done on Rainsford Island, for example, as no laundry was built on Long Island until after 1890. By 1892, the Long Island complex was made up of a large brick administration building (built in 1887), a hospital building and a large farm. The complex was originally intended to be a "Home for the Indigent." Women were transferred from the Austin Farm in 1887 and men from Rainsford Island in 1889 (Connelly 1932:20).

In 1898, the City of Boston, under the personal sponsorship of Mayor Josiah Quincy, constructed a summer camp for boys in the southern section of the island "on the southeast slope of the western promontory of Long Island," near the present causeway (Boston City Document #144, 1898). The boys were housed in thirteen tents, and fed in a wooden pavilion. Plans were made to fill lowlying areas near the camp, but there is no record of this actually being performed. At that time, no road connected the camp to the hospital complex, and supplies were brought overland by horse and wagon borrowed from the hospital.

In the 1890s and early 1900s the institution was open to any "adult pauper" who applied for admission. From a central office, these individuals could be assigned to any of the city's charitable institutions. They included a small almshouse section of the Deer Island complex, the old Charlestown Almshouse for the Aged, the Austin Farm for Women, or the Rainsford Island Almshouse. Poor institutions. They included a small almshouse section of the Deer Island complex, the old Charlestown Almshouse for the Aged, the Austin Farm for Women, or the Rainsford Island Almshouse. Poor children were sent to the Marcella Street home, when their parents were unable or unwilling to care for them. Those applying for relief could be "aged, sick, demented, criminals or lewd women" (Boston City Document #122 1892:30). As a result, the Long Island institution gained a reputation as a haven for the dissolute. Of particular concern to reform minded administrators was the pass system. Inmates could routinely request passes to look for work, visit family or any other reason. Unfortunately, many of the clients exhibited self-destructive behavior, drinking to excess or committing crimes. Many were found to rotate between the penal institutions on Deer Island and the Long Island Almshouse. For years, then, the medical component of the institution suffered somewhat from underfunding and overcrowding, as it was felt that "an almshouse hospital is good enough for the people for whom it is intended" (Boston City Documents #15 1904).

By 1904, the situation began to improve. The institution was becoming more a hospital for the treatment of the chronically ill than an almshouse. Many of the patients admitted at this time suffered from tuberculosis, the disease which predominated as the cause of death for Boston's citizens in the late nineteenth century (City of Boston Board of Health 1885). So many were admitted, in fact, that the authorities were forced to house tubercular patients with relatively healthy inmates of the dormitories.

The high population of severely ill patients naturally led to the necessity for burial of those who succumbed to their condition. In some years, hundreds of deaths took place in the hospital. Friends and relatives claimed many for burial (Boston City Documents #29 1904), but others were interred in an institutional cemetery near the property line with Fort Strong.

By the 1920s, many of the existing buildings were in need of repair. They included the central administration building, built in 1887, the dormitory for women and superintendent's house, built in 1895 and the chapel, built in 1886. New buildings then included the 1916 men's ward buildings and nurse's home and the 1914 domestic buildings. The funding necessary for these improvements was apparently granted consistently between 1900 and 1920. At least part of this public funding, however, was offset by the highly productive farm run in part by male clients.

Until the early twenties, when rising prosperity made it difficult to procure farm laborers, the hospital was able to produce much of its own food. The pasture for cattle was well fenced with barbed wire, and the piggery was well stocked. As a result, milk and pork were the most valuable farm products of the institution in 1904. The workers also cut ice for preservation, and mowed the fields to produce hay and fodder for livestock. The land was also heavily cultivated, yielding eighteen different kinds of vegetables. Such self-sufficiency was also a phenomenon at other state institutions, notably the Worcester Hospital for the

Insane and the Bridgewater State Prison. Deer Island itself maintained a thriving farm in conjunction with the prison complex. This agricultural use of the hospital grounds continued well into the 1920s, when cultivation resumed during the early years of the Depression.

New construction and alteration of older buildings continued throughout the succeeding decades. In 1929, a new children's hospital was built (Boston City Document #15, 1928). In 1932, a new recreation building was constructed under the sponsorship of Mayor Curley. At this time, the complex contained over 1,225 inmates, of which 450 were hospital patients.

A major innovation was the creation of a treatment program for alcoholics in 1941. From the early years of the institution, superintendents and visiting physicians had recommended the segregation and treatment of alcoholics.

A study of the institutional population in 1947 revealed that even by that date, the popular perception of the hospital was that it was "still just the Boston poor farm" (Rosenbluth Associates 1948:13). In 1948, the hospital housed both chronic invalids and destitute individuals, 415 men and 65 women in the institutional section and 480 custodial patients. In 1952, additional facilities were constructed for the care of chronic invalids. It now houses up to 400 patients and indigents and has a staff of approximately 400. Many of the 20 buildings are now unused, due to the greatly reduced client population and disrepair of the structures.

Changes in Land Use

Deer Island

The natural processes of erosion and subsequent deposition have changed the outline of the island. As early as 1763, the town of Boston appointed a committee to determine what measures could be taken to prevent the encroachment of the sea upon the island (Massachusetts State Archives 1763:118/104).

The filling of Shirley Gut, the former channel separating Deer Island from the mainland, was initially a natural process. In the late eighteenth and early nineteenth centuries, the channel was fairly deep and distinct. By the mid-nineteenth century, the passage was beginning to be passable in winter. By the late nineteenth century, prisoners were able to swim across (Sweetser 1882:193), although it remained navigable. It was only a few feet deep at high tide, however, by 1935, when it was effectively filled, and Deer Island joined in the mainland (Randall 1981:8). Other changes on the island were culturally determined. While residence on the island occurred as early as 1642, with the exception of interned Native Americans, there was little permanent occupation until the mid-nineteenth century.

A map drawn in 1817 (Figure 3) shows three structures on the island and a map of 1830 (Figure 4) shows one structure. These may represent the hotel kept by William Tewksbury in the early nineteenth century (Snow 1971). With construction of the almshouse in 1850-1852, the House of Industry in 1854, and the House of

Figure 3. Early 19th century map of Deer Island (Wadsworth 1817) showing location of structures.

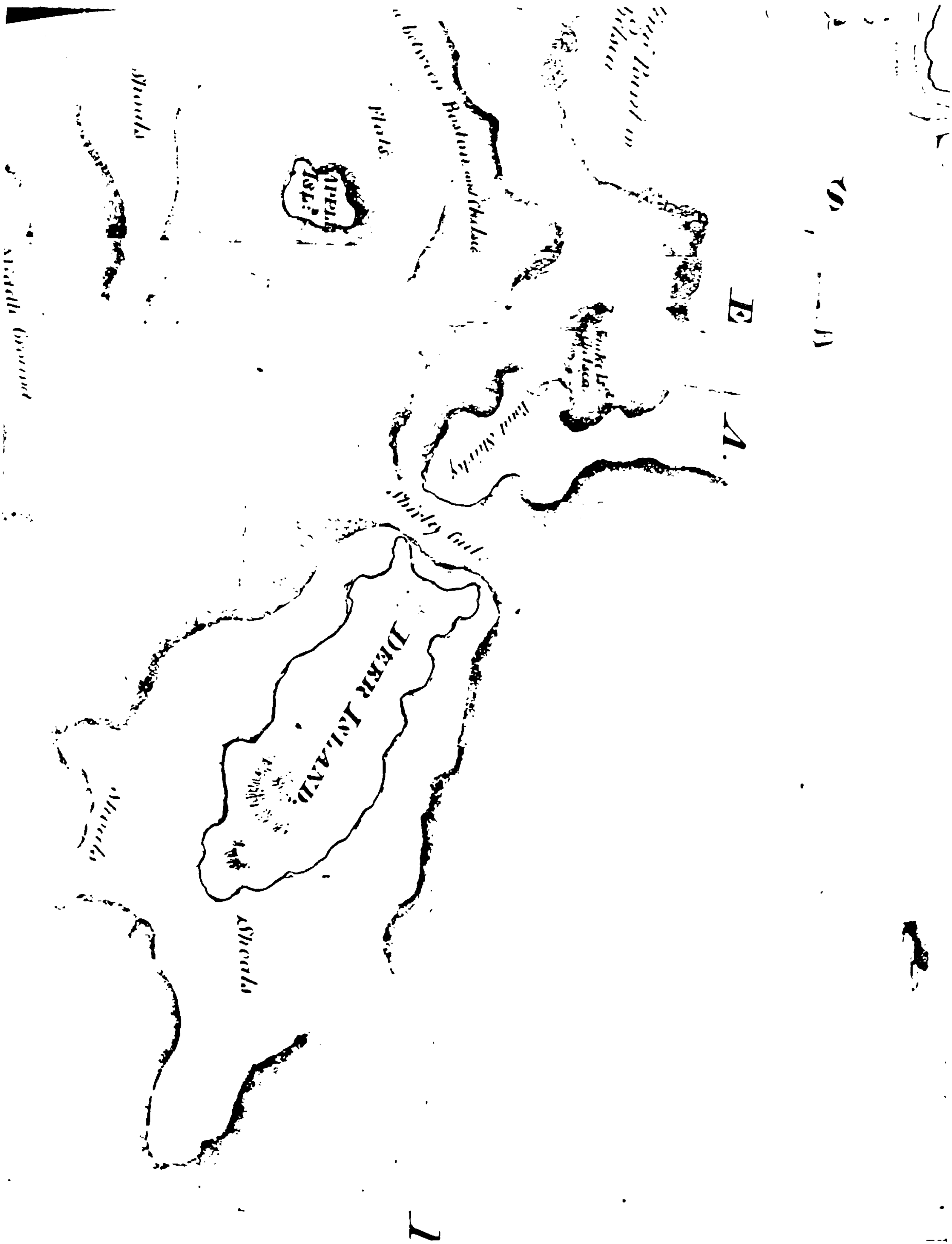


Figure 4. 1830 map (Hales 1830) of Deer Island.

Reformation, the population swelled to 1,500 by the 1880s (Sweetser 1882:194).

The increase in the number of structures necessary to house this population changed the earlier appearance of the island. The landscape was affected by the excavation of a great number of unmarked burials, the construction of ancillary structures, the creation of dumping areas and other alterations concomittant with change in land use. It was in the twentieth century that the most visible change took place. A cemetery in the western section of the island was moved in the construction of Fort Dawes in 1940, the old Cow Pond was filled in and the sewage treatment plant constructed by the MDC in 1889 was expanded in 1968.

Long Island

The types of land use and the manner in which they changed on Long Island through time has been studied as a component of the project's research design. In general, changes in historic land use have been functional in nature (i.e., from agricultural to recreational) and relatively undisruptive. However, military usage caused significant alterations to the island's topography. Another early example of this type of physical change was the construction of seawalls in the nineteenth century to retard the loss of shore frontage. Thus, relatively little shoreline change has been caused by erosion or aggregation.

Well into the nineteenth century, the landscape of the island was a relatively treeless plain, with some low ridges in the eastern end. Early records refer to dwelling houses, probably small farmsteads, on the island in the 1670s and 1680s (Tennta 1983). Throughout the eighteenth and early nineteenth centuries, scattered dwellings and outbuildings constituted the low density settlement pattern of an agricultural landscape.

The use of the island at an early date for the collection of wood and as pasture for sheep and cattle created an almost treeless landscape by the early nineteenth century. At this point, however, the number of structures began to decline from four in 1817 (see Figure 5) to "a single farmhouse" (Sweetser 1882:161) in 1840. This single structure appears on a map of the harbor made in 1830 (see Figure 6). Evidently, a second growth forest developed on the southern part of the island by the 1860s, as a Civil War era record describes "the south side, thickly studded with trees" (Sweetser 1882:167).

Non-agricultural land use was confined to the construction of military fortifications and a lighthouse until the mid-nineteenth century. In 1776, American forces set up gun emplacements on East Head. During the War of 1812, a battery of guns was set up in approximately the same location, possibly reusing the old Revolutionary fortifications. The lighthouse on Long Island was built on the same bluff in 1819, although some sources refer to an earlier beacon construction in 1794 (Tennta 1983:8).

The island was virtually abandoned by the 1840s, when the Long Island Company began to purchase acreage for the construction of its resort complex. During the hotel construction, both large

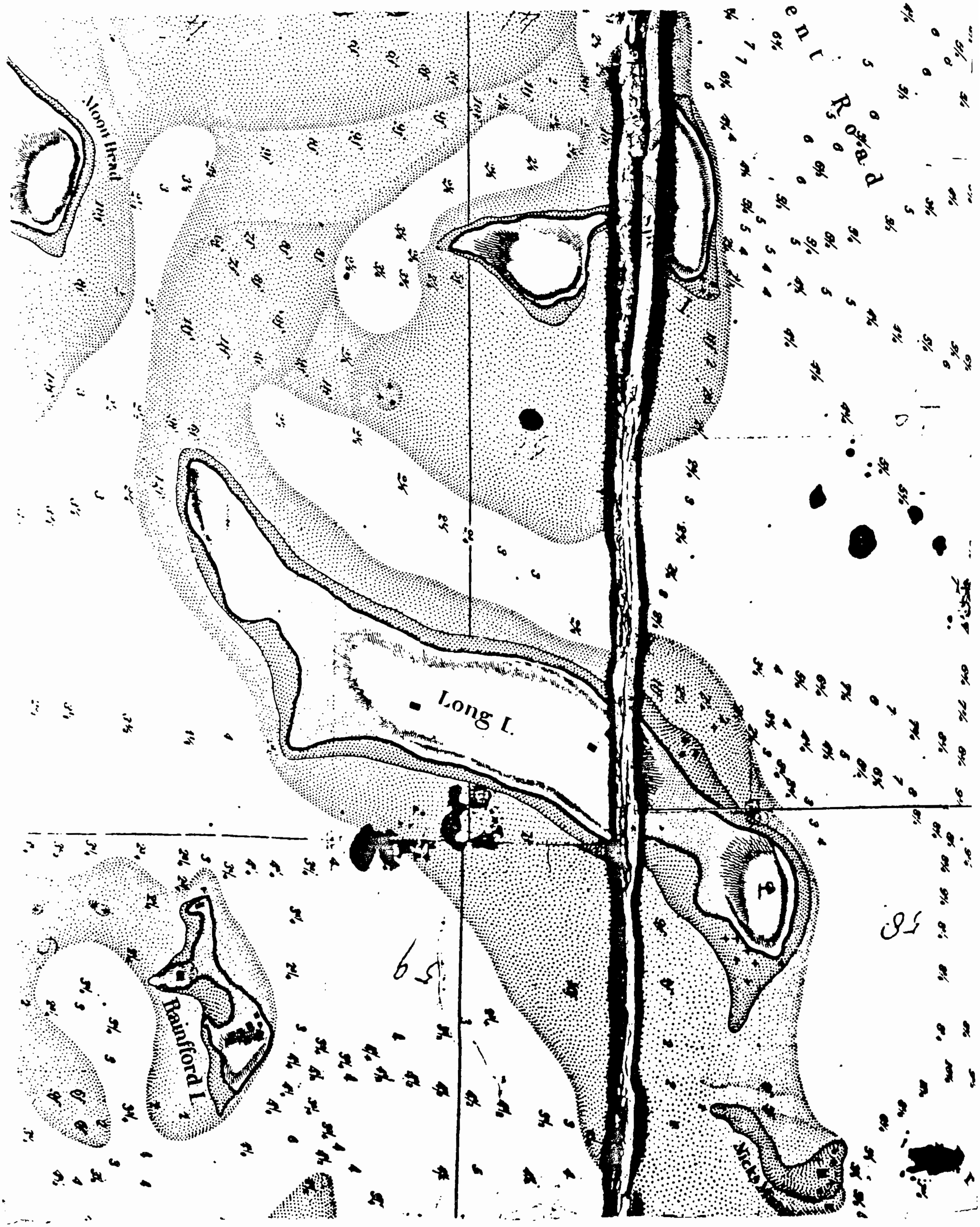


Figure 5. Early 19th century map of Long Island (Wadsworth 1817) showing location of structures.

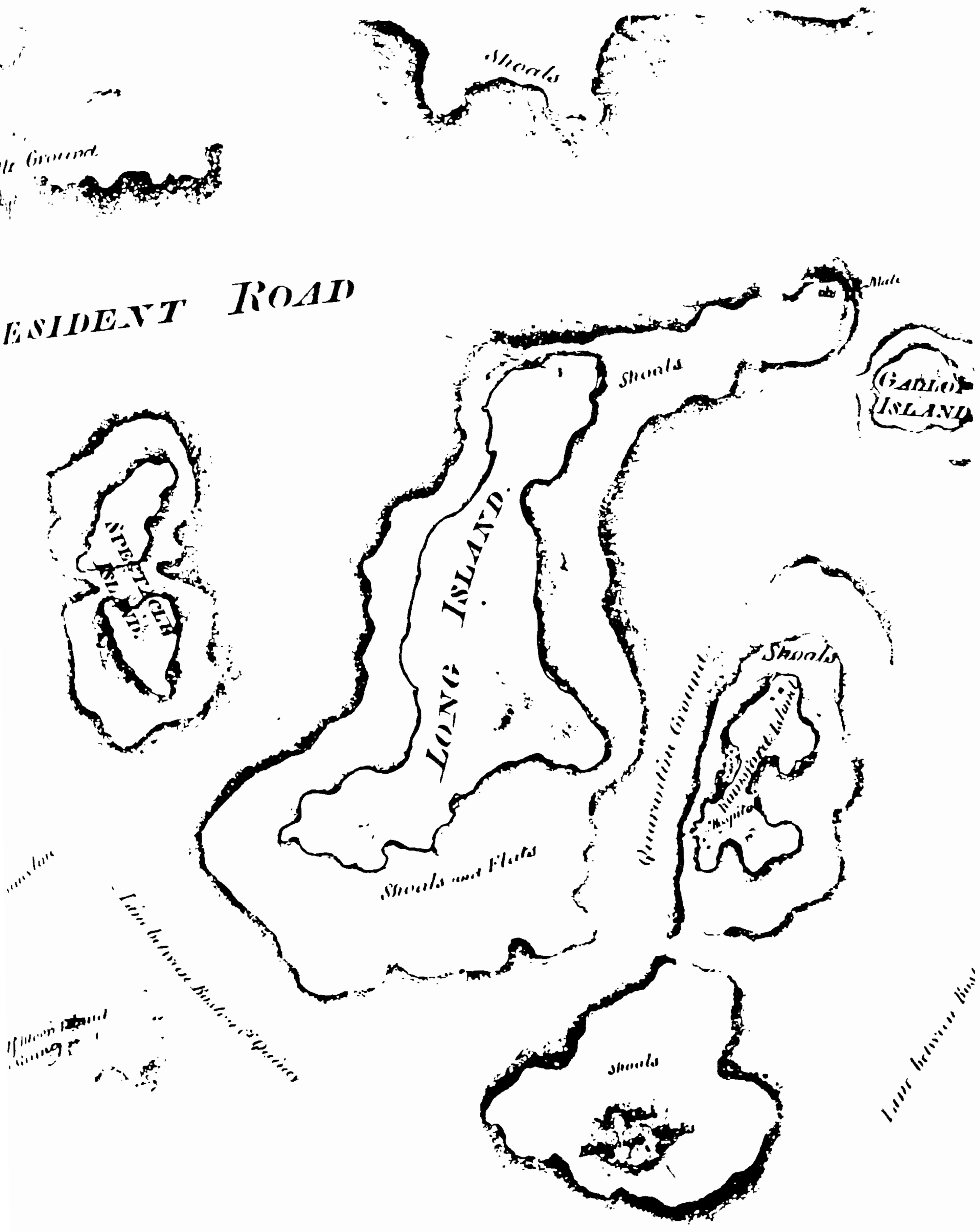


Figure 6. 1830 map (Hales 1830) of Long Island

and small structures were built in the central part of the island, including the main houses, cottages and outbuildings (see Figure 7). A colony of Azorean Portuguese fishermen occupied the coastline near the hotel from the 1850s. They were supposedly evicted in the 1880s by the city. however, a contemporary map of the island shows that their huts were still extant in 1900 (see Figure 8).

The most striking topographic change came with the grading and construction necessitated by the creation of Fort Strong on Long Island Head. Above the natural bluff are abandoned bombproofs, a moat and several low grassy mounds that appear to be natural in origin. By the early twentieth century, the fort contained several avenues of officers' houses, a rail spur, ferry landing, fortifications and an extensive parade ground. Most of these structures were demolished by the City of Boston after acquiring part of the US Government's holdings in the 1960s.

The most prominent feature of the island's landscape today is the complex of over 20 buildings that comprises the city's Chronic Disease Hospital, erected over a period of approximately 70 years, between the 1880s and the 1940s. It represents the area of highest structural density on the island.

The increasing density of structures is shown on USGS topographic maps issued between 1900 and 1946. At the turn of the century, the complex consisted of nine structures, without formal roadways or any expansion to the southern portion of the island (see Figure 9). By 1903, the complex had increased in complexity,

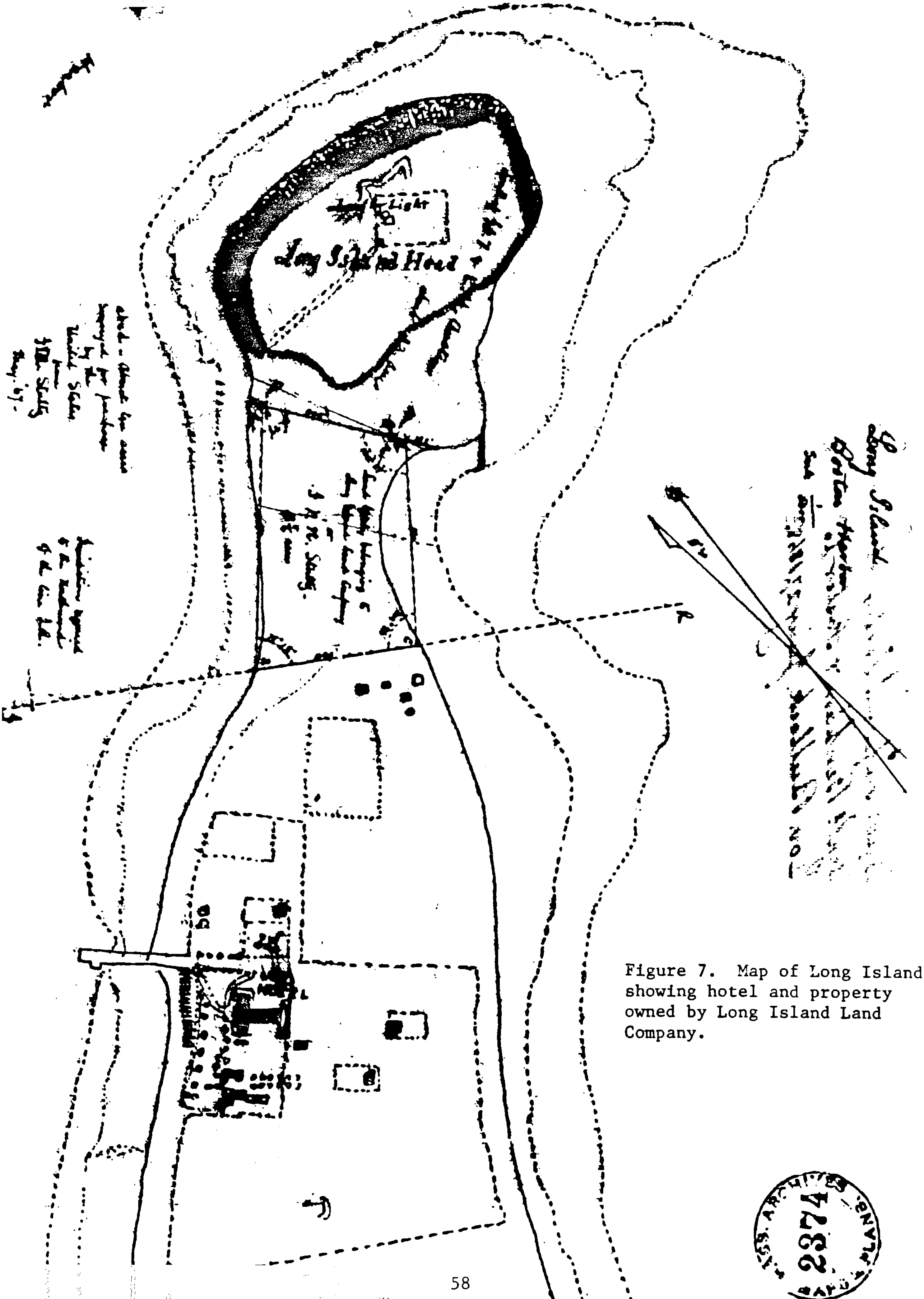


Figure 7. Map of Long Island showing hotel and property owned by Long Island Land Company.

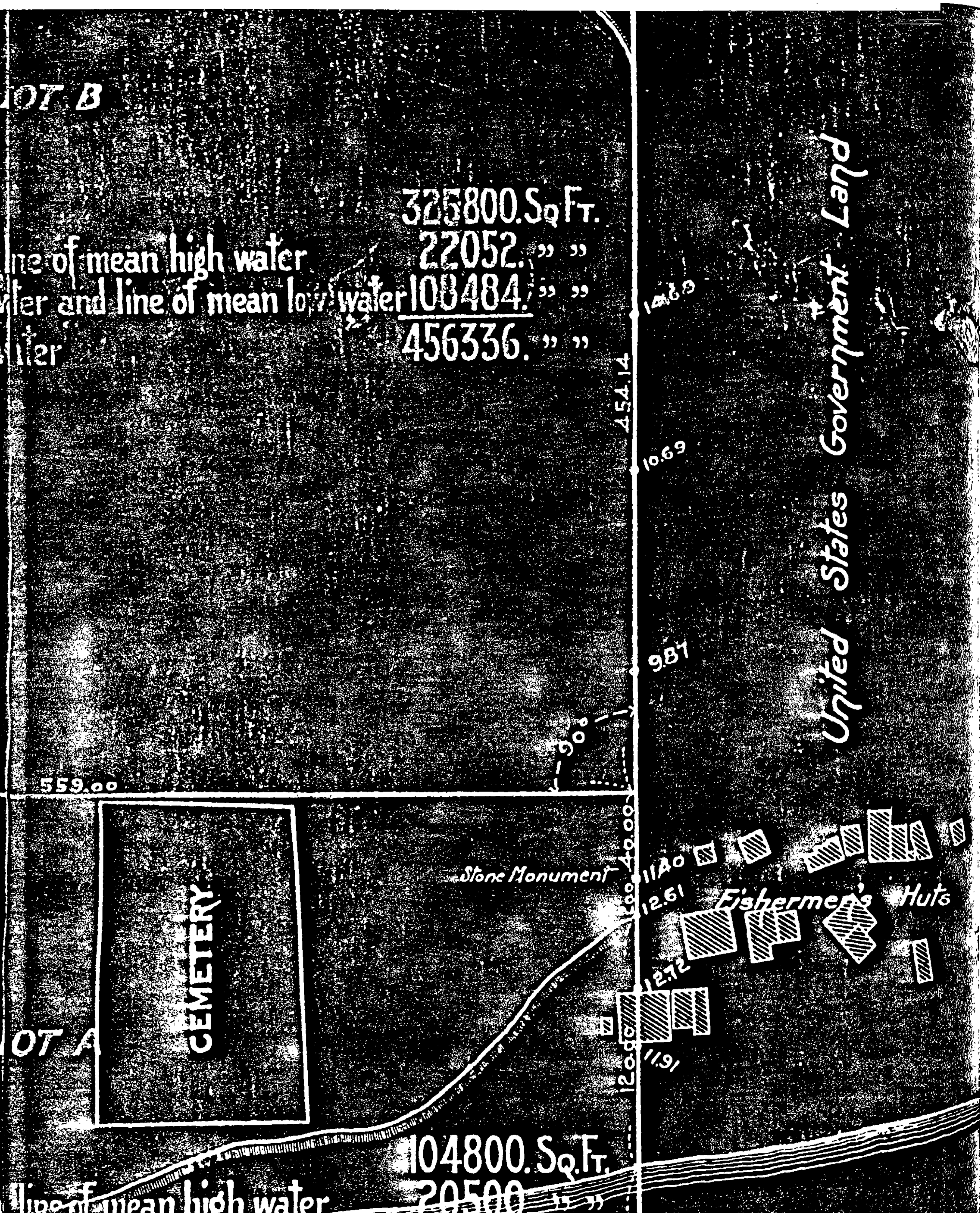


Figure 8. Location of cemetery in parcel of land purchased by City of Boston in 1900. From "Plan Showing a Portion of Long Island" Hyde and Sherry, Civil Engineers, August, 1899. Scale: 1"=50'.

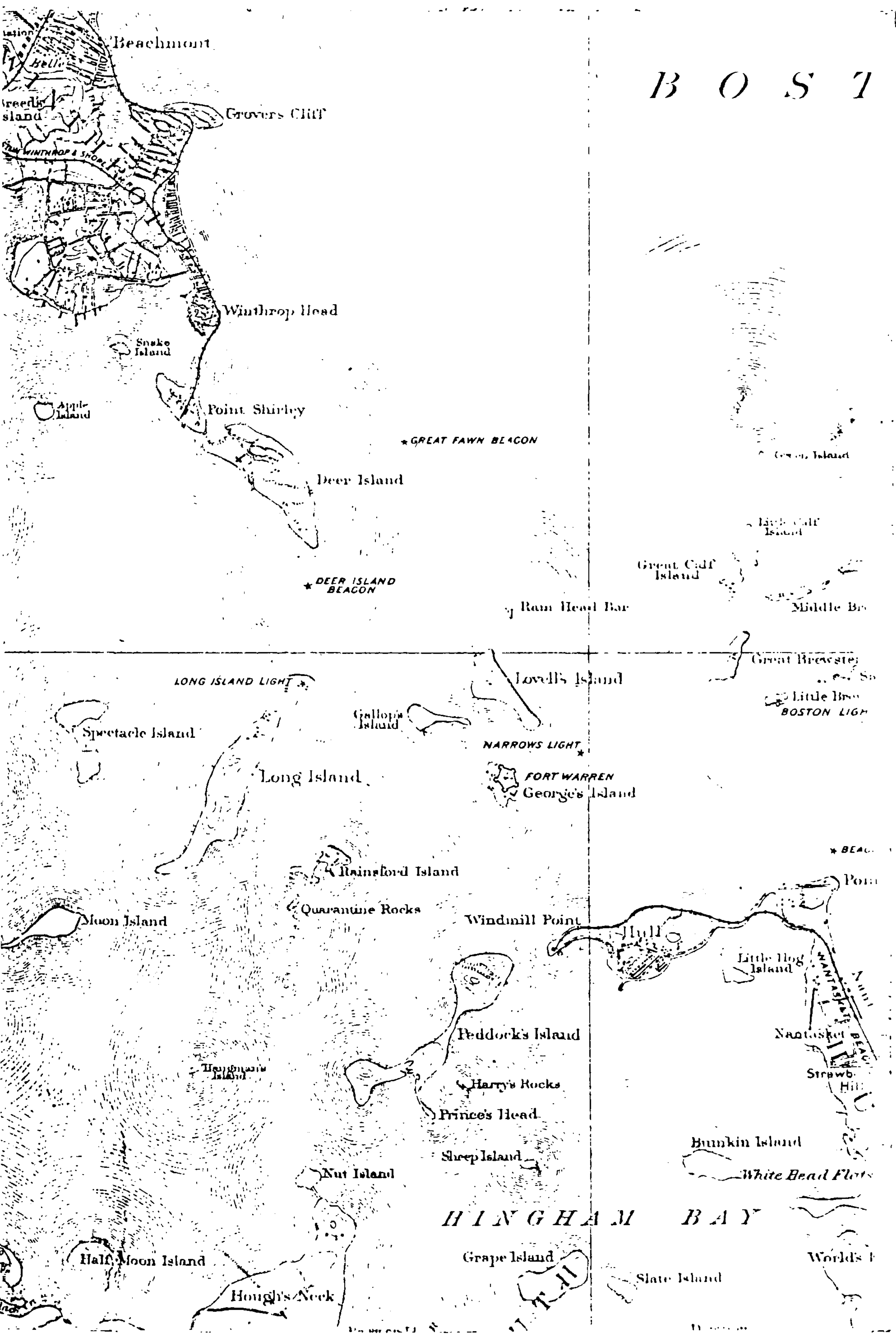


Figure 9. 1892 USGS Boston Bay Quadrangle 1/62,500 reprinted 1900.

with larger structures joined by a series of roads and two elaborate wharves for the reception of staff and inmates using the ferries joining the facility to the mainland (see Figure 10). Less than a decade later the hospital had expanded further, with most structures interconnected, an elaborate system of roadways in place, and an extension of the roads almost to the southern tip of the island of West Head (see Figure 12).

The presence of unrecorded and unmarked burials is one important component of the island's land use. During the Revolution, a naval battle off the shore of Long Island resulted in the deaths of 36 British troops. They were buried in an unrecorded location on the island. It is also possible that the inhabitants in the late seventeenth to early nineteenth centuries maintained the kind of small family plot cemeteries that are a common feature throughout the New England region. After the Civil War, 79 veterans who had been buried on Rainsford Island were reinterred on the southern end of Long Island (Tennta 1983:10). A memorial marks the area. With the establishment of the city almshouse and other institutions in 1882, the city began to bury the deceased patients and inmates of the facilities. A map of 1900 shows a cemetery to the east of the main hospital buildings, between the hospital and the complex on East Head (see Figure 8). By the 1940s, a large cemetery was located on the southern end, near the Civil War marker (see Figure 12). It is now directly east of the abandoned Nike base to the south of the hospital complex. Over 2,2000 unmarked graves are said to be located on the island (Kales 1976:71). The

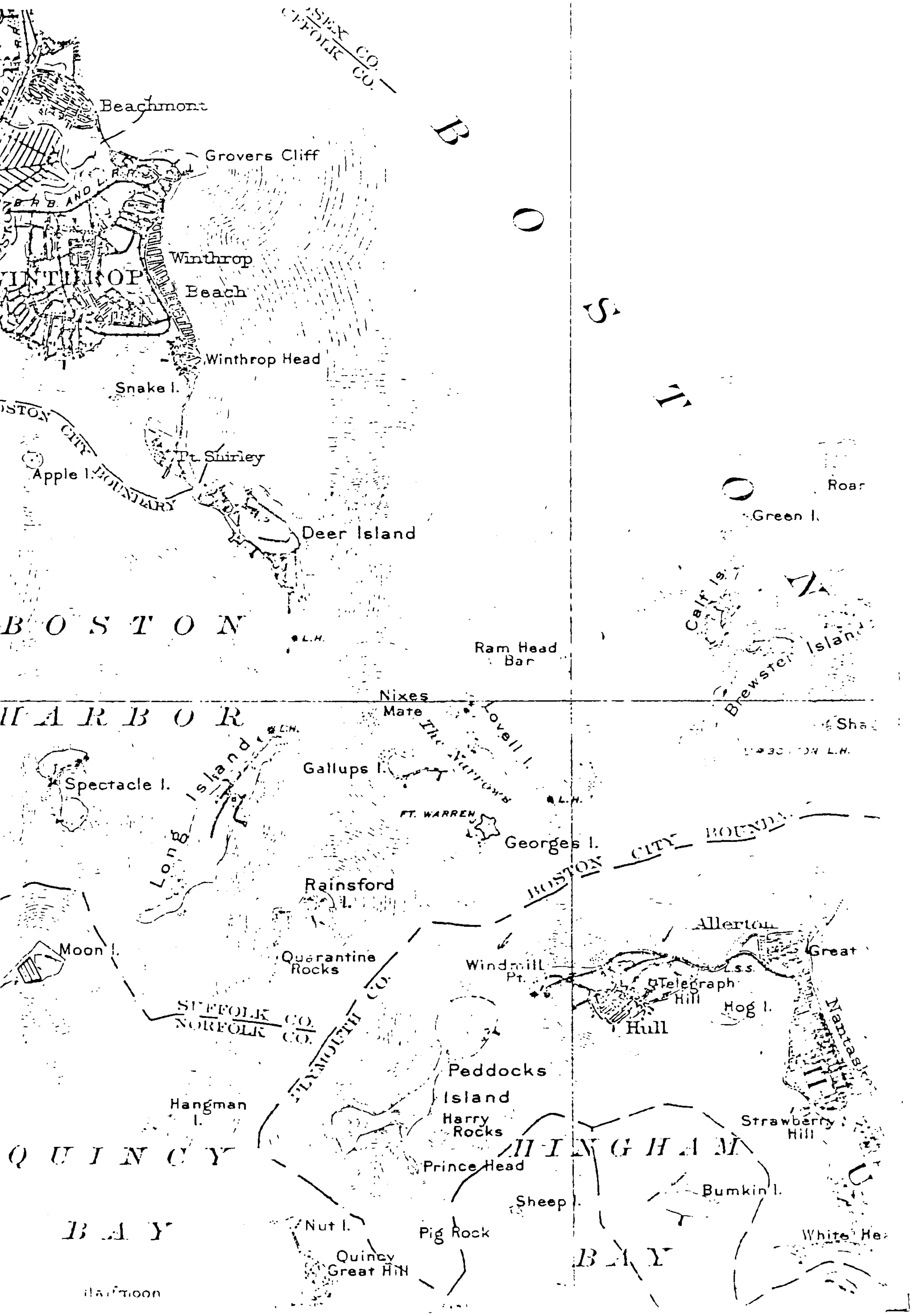


Figure 10. 1903 USGS Boston Bay Quadrangle 1/62,500 reprinted 1939.

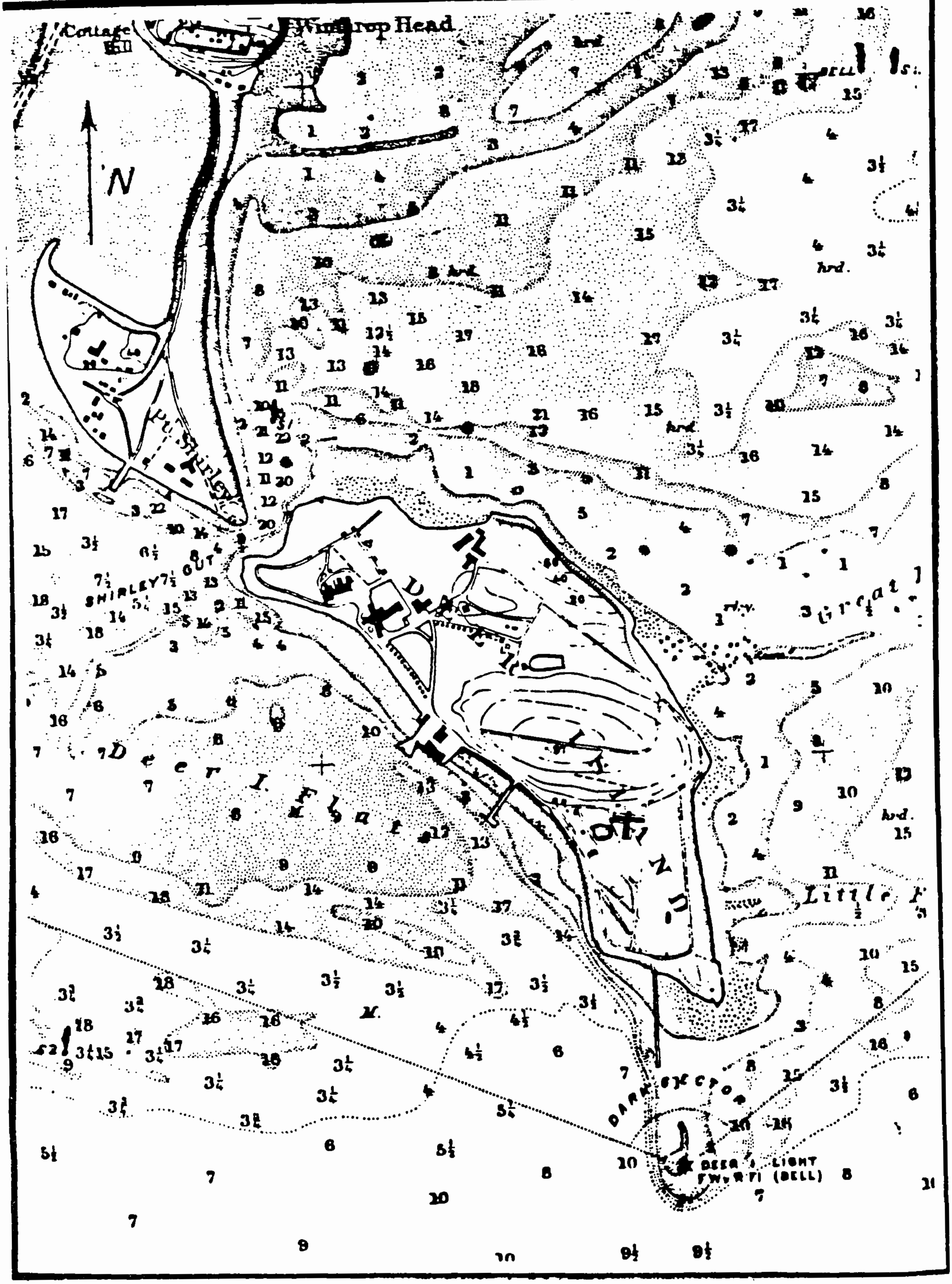


Figure 11. 1904 USGS topographic map of Deer Island. Source: (Randall 1981).

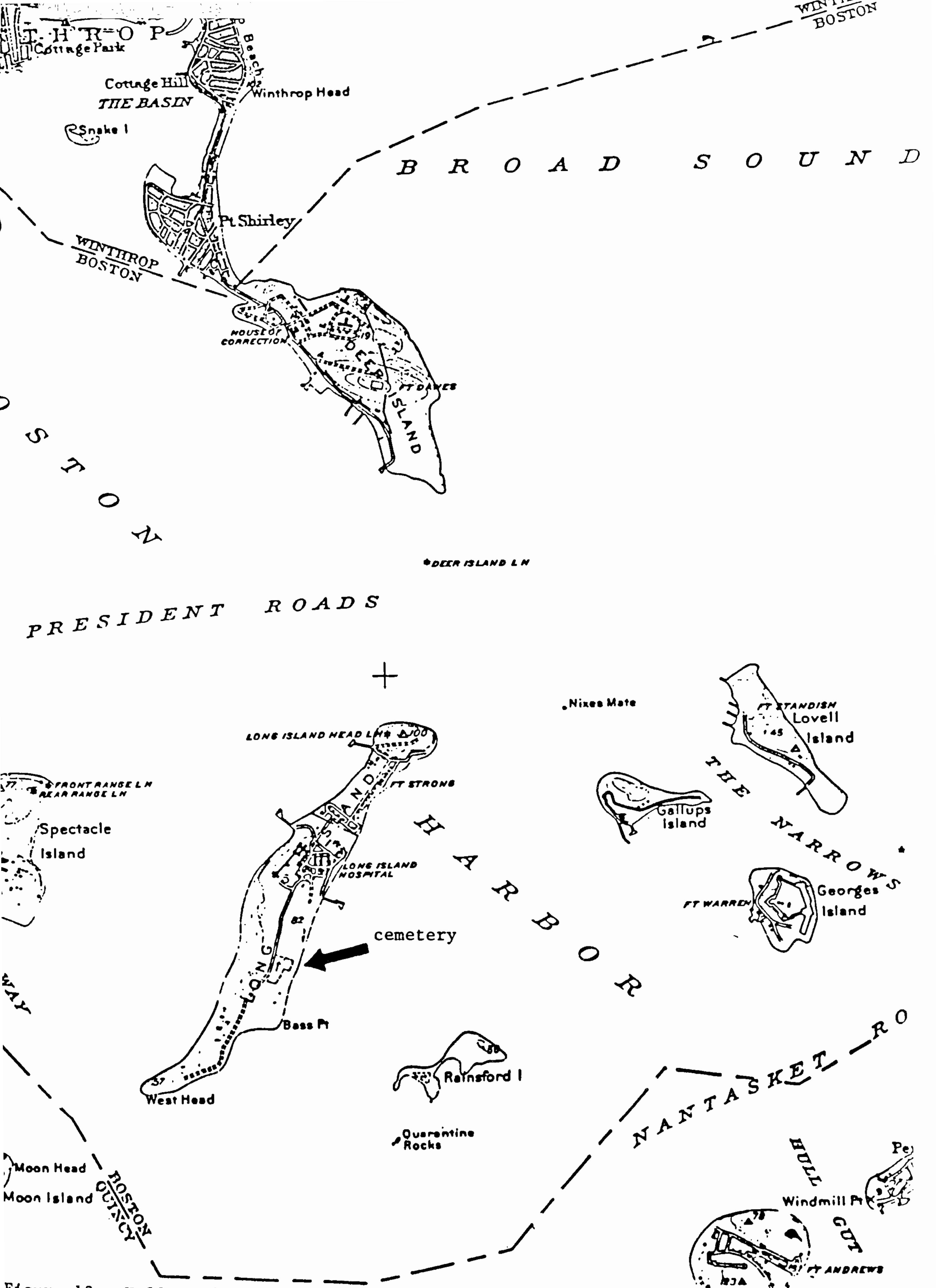


Figure 12. Hull Quadrangle, USGS, 1946 edition, revised 1950 showing large

cemetery was subdivided into Catholic and Protestant sections (Mr. Kearney, personal communication), but graves in both areas were either unmarked or indicated only by plain concrete markers.

In summary, changes in the island's topography and structural density through time can be correlated with discrete changes in the institutional administration of the island. While in the hands of private owners, from the late seventeenth to the mid-nineteenth centuries, the island was essentially an agricultural settlement with low structural density. After the acquisition of large parcels of land for real estate speculation by the Long Island Company, many new structures were constructed in the northern section of the island. These structures were used to some extent for military purposes during the Civil War. The encampments were primarily tents, however, which had little permanent impact on the island. Construction of a later military installation (Fort Strong) after the Civil War did have a major impact on the topography of Long Island Head and the level area north of the hospital. Fort Strong remained in active use through World Wars I and II. A series of bunkers or bombproofs, gun emplacements and other structures of reinforced concrete remain on the parade ground area and the east head of Long Island (Mikal 1973:74).

The unique characteristics of Deer and Long Islands are more difficult to define than their similarities. Both islands exist in a peripheral relationship to the city of Boston and they share a functionally similar early history. They contain fringe institutions such as prisons, hospitals, waste treatment facilities, cemeteries and military installations. Their topography has been altered to varying degrees by successive episodes of grading, construction and demolition. On both islands, areas of open space remain undeveloped, in contrast to the majority of space in the urban core.

The character of the two islands, including their open areas, are different in both extent of development and nature of uses. Deer Island's continued institutional expansion makes the presence of these multiple institutional uses and the effects of topographical alteration more striking. Previous archaeological survey determined that much of the island has been so altered during previous episodes of construction that there is little likelihood of recovering intact archaeological deposits or original ground surfaces (Randall 1981) while the burials there had been disturbed or relocated in prior activities. On Long Island, however, despite extensive alteration in the northern section of the island, the southern section remains relatively intact. The major impacts to the southern section have been the construction of the causeway in 1951, the establishment of the cemeteries after 1939, and the construction of the Nike missile base in the 1960s. Here, archaeological survey has shown that despite these activities, major prehistoric archaeological sites remain intact (see Appendix I). Between Deer and Long Islands, the major difference, therefore, lies in the relative amounts of disturbance to the islands themselves.

The similarities in both islands are attributable to their sharing of a common relationship to the city of Boston. In the seventeenth century, both islands aided in the functioning of the urban core through their utilization as collection areas for firewood and as a pasture for domestic animals. These were crucial functions, as Boston Neck was almost devoid of firewood from the earliest years of settlement, and the need for grazing and protection of domestic animals was an essential component in the early agricultural economy of the urban village.

Rent paid by those who used, improved and exploited the islands during this early period was levied to defray the cost of the Boston School. The income derived from the use of the islands, then, was used to support core institutions.

Native Americans were interned on Deer Island during King Phillips War in the winter of 1675-1676. After the first months, harsh conditions and meager supplies prompted the authorities to consider placing these prisoners elsewhere. They were finally granted 100 acres to improve on Long Island, although there is little evidence that they actually occupied the island.

RESULTS OF THE INTENSIVE SURVEY

The results of the comprehensive background research indicated that the Deer Island and Long Island project areas were within a coastal environmental zone with a complex record of prehistoric and historic period land use. The high natural resource potential of the harbor district in general, made it attractive to prehistoric hunter/gatherer groups over at least the last 8,000 years and some fairly high densities of prehistoric sites are known from various islands. However, in the case of Deer and the eastern end of Long Island, intensive land use over the last 300 years has eradicated any traces of prehistoric cultural resources.

Historic period land use patterns on both islands were very similar primarily because of the peripheral position of these islands in relation to the urban core represented by the city of Boston. Background research indicated that historic land use on Deer and Long Islands during the seventeenth and eighteenth century was primarily agricultural and pastoral in nature (planting fields, pasturage for animals) or involved the collection of resources (wood, fish, shellfish). There was a small amount of short-term military use such as the prisoner-of-war camp on Deer Island (1675-1767) and construction of a small gun battery on Long Island Head during the Revolution (1775-1776). These activities probably had a relatively minor impact on the prehistoric sites on the islands.

In contrast, later nineteenth and twentieth century land use patterns and developments were of types that caused significant alteration or modification to the topography of these islands. These included construction of institutional (almshouse, prison, hospital complex), military and waste (sewage) disposal facilities.

On Long Island, construction and possibly landscaping/grading in connection with development of recreational facilities (Long Island Hotel) and real estate speculation in the mid-nineteenth century was responsible for some changes to the island. In its earliest stages the institution reused the existing recreational buildings (hotel) but rapidly expanded beyond it.

On the basis of the background research, available environmental data (geomorphology, ecology, etc.), a walkover inspection and the preliminary findings of the UMass field school, the Deer Island and Long Island project areas were stratified into three zones of high sensitivity, moderate to low archaeological sensitivity, and previously disturbed. In addition, a large percentage of the project area on both Deer Island and lesser degree on Long Island had been previously disturbed and therefore had little or no archaeological potential.

For the general purposes of this Phase I inventory and assessment survey, the southern end of Long Island investigated by the UMass field school was included in the stratification scheme. In ranked order of known and expected sensitivity for prehistoric and historic period archaeological resources those zones are:

(1) <u>High Sensitivity</u> - This included the locations of known prehistoric sites, historic cemeteries and suspected locations of unmarked cemeteries or burial grounds. It also includes undisturbed areas in environmental settings that would have been used by prehistoric or historic populations. These are generally areas suitable for settlement or in close proximity to environmental zones with high natural resource potential. These conditions would have led to prehistoric or historic use resulting in the deposition/discard of varying densities of cultural material.

(2) <u>Moderate to Low Sensitivity</u> - In some sections of Deer and Long Island this includes areas that are relatively undisturbed but have locational attributes that are not completely favorable for intensive land use. For example, areas with excessively rocky or steeply sloped surfaces tend to limit the kinds of activities people might have carried out there in the past. Other areas of poor to moderate sensitivity are wetlands or places with poorly drained soils. Some of the activities carried out there (farming, collecting resources) may not have resulted in the deposition of cultural materials or construction of features that could be readily identified as archaeological sites. Other areas of moderate to low sensitivity have somewhat favorable locational attributes but show some evidence of previous alteration or modifications. Sites can occur in these less sensitive settings

but they are usually difficult to locate and identify or have lost some integrity through earlier disturbance.

(3) Previously Disturbed, Not Sensitive - In these areas, historic or recent alterations of the original ground surface have been severe enough that any archaeological deposits would have been substantially disturbed or destroyed. Within these areas there is little or no likelihood of finding archaeological sites. Examples are former building sites, access roads, borrow pits or places where the soil has been stripped by heavy machinery.

Deer Island

The approximate locations and extent of these three strata or zones on Deer Island is shown in Figures 13 and 14. Figure 13 illustrates the stratification of the Deer Island project area in terms of archaeological sensitivity. The majority of the area has been previously disturbed. During the walkover it was found that the entire western slope of the drumlin had been graded, probably during the 1967-1968 construction of the existing treatment plant. In addition, borrow material has been excavated from a fairly large pit on the western end of the drumlin crest. Loam topsoil possibly stripped from the area of this borrow pit was found in several large piles immediately west of the reservoir occupying the drumlin crest. Much of the top of the drumlin has been altered by the construction of the reservoir and a bunker/radar facility associated with Fort Dawes. Other large bunkers, including one gun emplacement have been constructed on the north and east facing

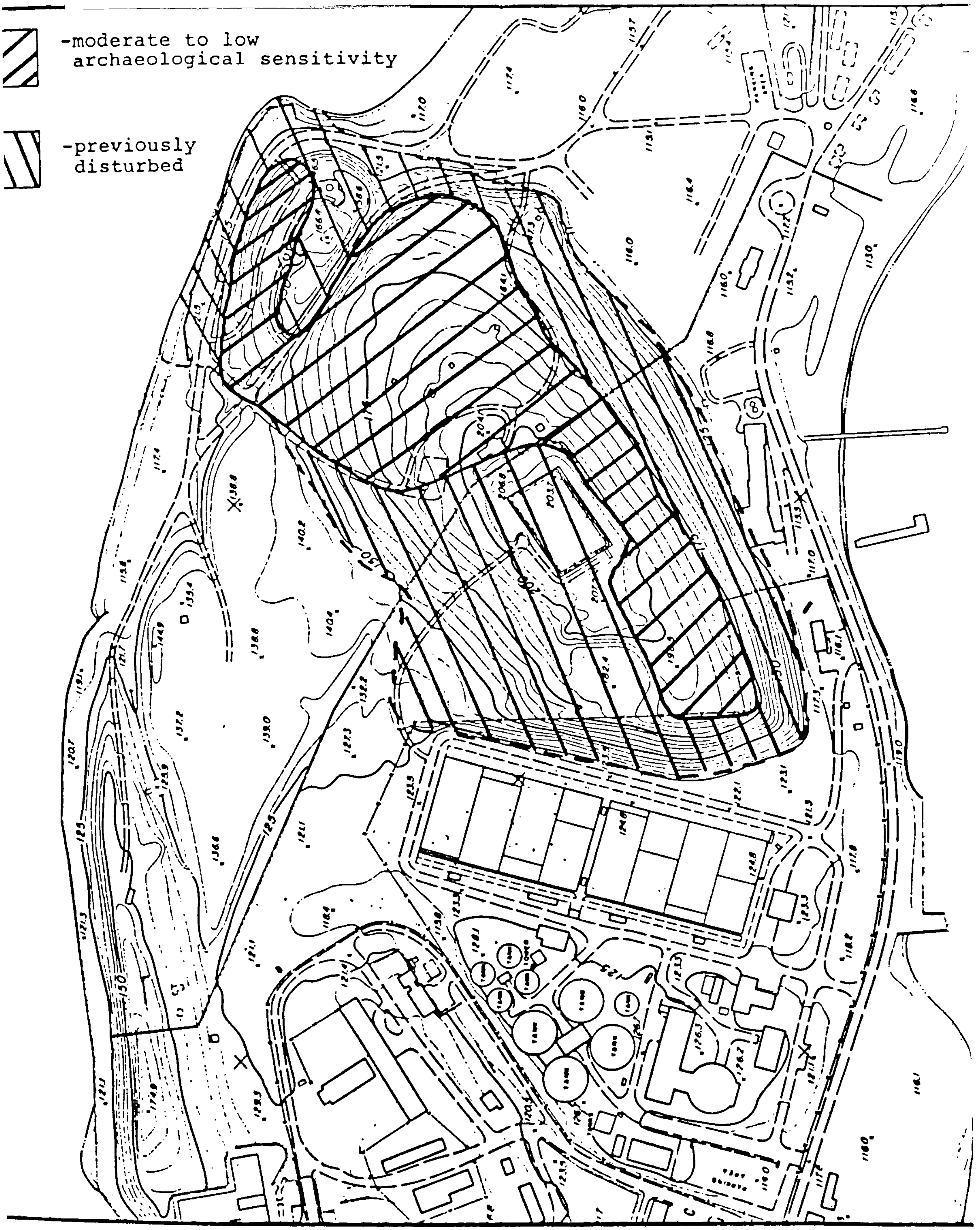


Figure 13. Stratification of Deer Island project area in zones of archaeological sensitivity.

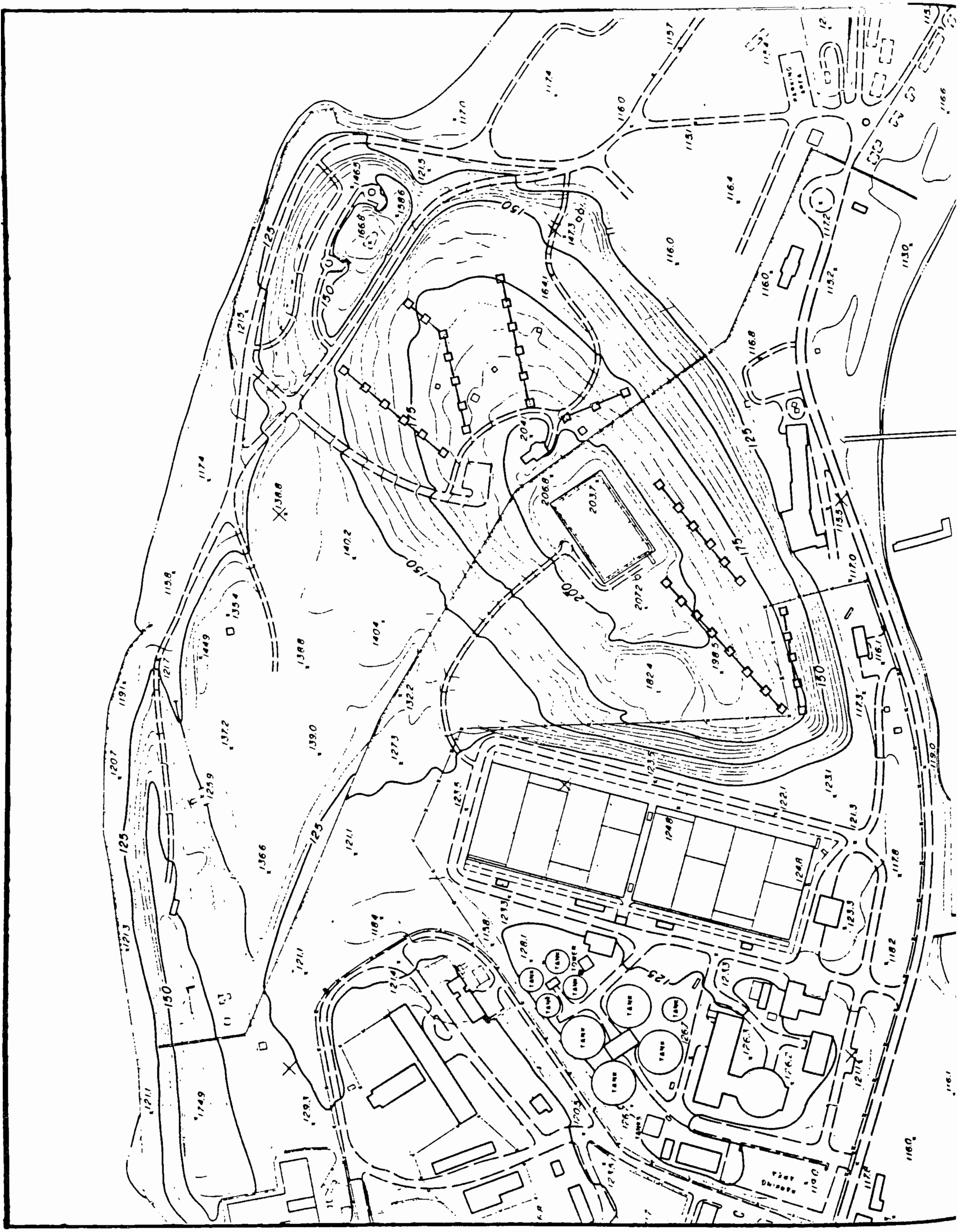


Figure 14. Location of subsurface testing within Deer Island project area.

slopes (bay side) and around the base of the drumlin. Construction of a high granite block seawall and a perimeter road below the large gun emplacement/bunker on the east end of the drumlin totally removed the original shore line within the project area. It was originally expected prior to actual fieldwork that this might be the most archaeologically sensitive portion of the project area due to its locational attributes.

The area of low to moderate sensitivity included most of the upper slope of the drumlin on the southern, eastern and northeastern facing sides below the crest (reservoir area). Subsurface testing was concentrated in this zone and consisted of a series of eight judgementally placed test pit transects with a combined length of over 1,000 meters. A total of 50 test pits averaging .5 x .5 m in size were excavated at 20 m intervals along these transects. These test pit transects were oriented to provide the most even coverage of the less disturbed sections of the crest, southwest and north/northeast slopes of the drumlin (see Figure 14). The soil profiles observed in the test pits along these transects were generally similar, consisting of a dark grey-brown stony loam (plowzone) topsoil over compact rocky, light yellow, grey glacial till subsoils.

The only exception to this pattern were a few test pits at the eastern end of transect ST-7. Near the reservoir deep deposits of loam topsoil extending to 50 cm below surface were observed in several test pits not far from the large loam piles mentioned earlier.

In general, the subsurface testing confirmed that a majority of the project area has been disturbed heavily by several episodes of construction activity. The earliest episode may have been during the construction of the reservoir on the drumlin crest. From cartographic evidence it appears that the reservoir was built sometime in the first half of the twentieth century, between 1904 and the end of World War II since it first appears on a USGS quadrangle map issued in 1946 (see Figures 11 and 12). The major construction episode on the Deer Island drumlin was during World War II when Fort Dawes was installed and most of the observed disturbance can be attributed to it.

Test pits excavated in the central-eastern portion of the drumlin showed that in most areas the topsoil has been removed or densely compacted by machinery, making hand excavation extremely difficult. For example, on transect ST-4 all of the test pits located near a bunker/gun emplacement associated with Fort Dawes showed compacted soils and the pits closest to the buildings had no topsoil at all. All transects had some test pits in which the soil had been disturbed.

No prehistoric cultural material of any kind was found during the course of the subsurface testing. Scattered historic field trash (i.e., glass, ceramic sherds) dating to the mid or late nineteenth to early twentieth century was found in a number of isolated test pits. This historic material was recovered from plowzone contexts and is not associated with any specific site or structure.

Long Island

The final stratification of the parade ground section (Fort Strong) of the Long Island project area is shown in Figure 15. As the background research indicated, the construction of Fort Strong altered the original topography over much of the northern end of Long Island. The physical effects of intensive military development were noted during a preliminary walkover of the parade ground area carried out in early July, 1984. Concrete bunker/gun emplacements, access roads and brick or concrete left from the demolition of military structures occupied a large percentage of the parade ground perimeter. The parade ground itself had been carefully graded to a level surface suggesting that underlying soil horizons are altered or show truncated profiles. Inspection of the topographic maps (1" = 200') used to guide the walkover survey showed that the present surface of the parade ground only varied about 1 1/2 ft (113.1 ft to 114.7 ft) in elevation. The initial stratification of the parade ground indicated that it consisted mostly of areas with low to moderate sensitivity and visible evidence of previous disturbance.

The only area of high archaeological sensitivity in this section of Long Island was the suspected location of an historic cemetery just beyond the western boundary of the parade ground. This small cemetery plot appeared on an 1889 map of property purchased by the City of Boston (see Figure 8). Based on this map the estimated location of the unmarked cemetery was a rectangular parcel of land bounded by several asphalt roadways (see Figure 15).

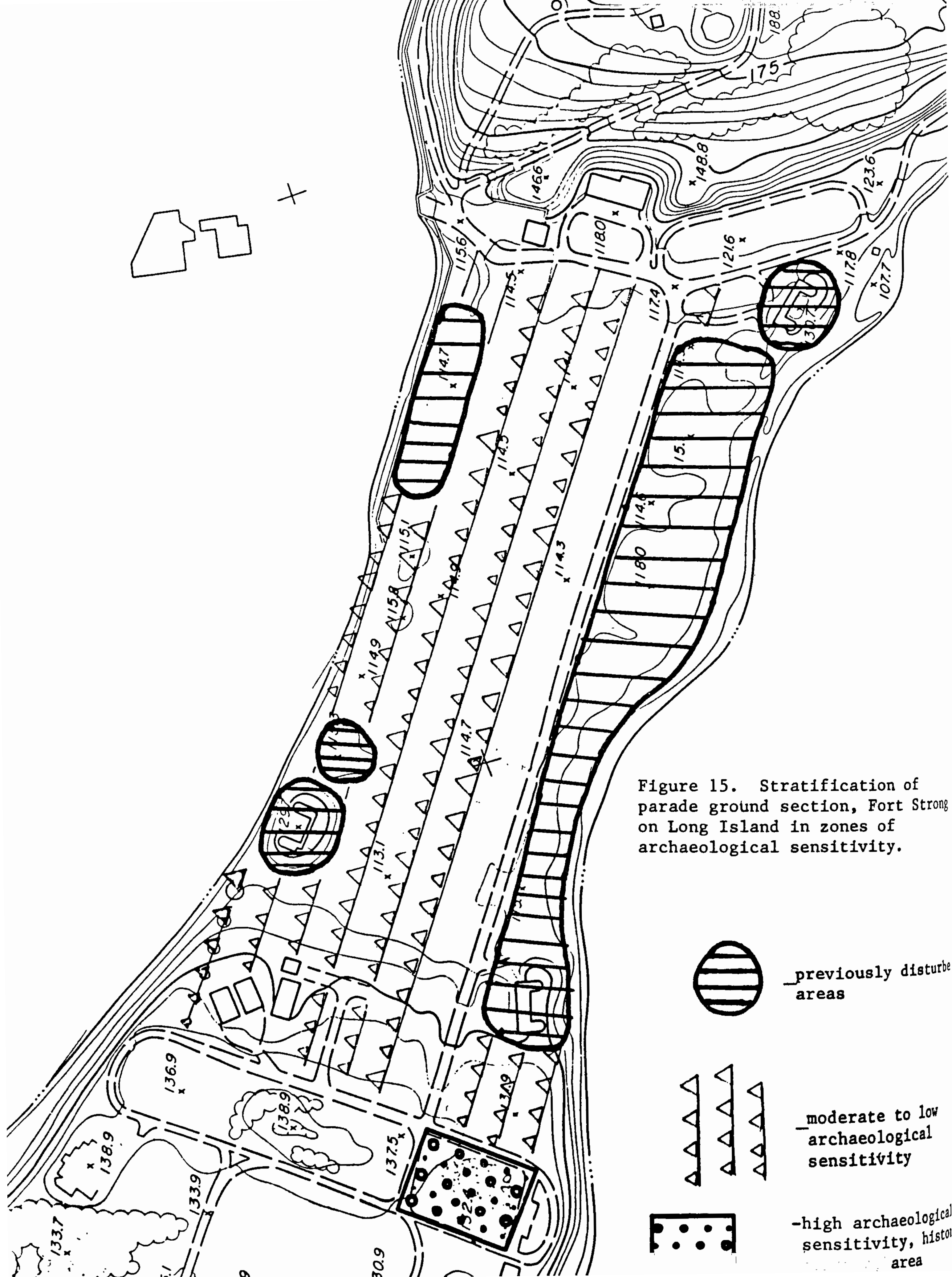


Figure 15. Stratification of parade ground section, Fort Strong on Long Island in zones of archaeological sensitivity.

This parcel could not be inspected during the walkover survey since it is enclosed by a chain link security fence. Subsurface testing in the parade ground area verified and slightly refined the original stratification scheme by determining that all of the parade ground had been previously disturbed.

Eight randomly oriented test pit transects with a combined length of 600 m were used to investigate the parade ground and some adjacent areas. A total of 37 test pits averaging 50 x 50 cm in size were excavated at 20 m intervals along these transects (see Figure 16). Truncated and disturbed soil profiles were observed in all of these test pits. No prehistoric cultural material was found and historic materials consisted entirely of structural debris (brick, concrete, burnt wood/charcoal, window glass). Several transects crossed extensive deposits of brick, concrete and stone rubble and filled-in foundations resulting from the demolition of structures following World War II. The open parade ground area has been altered by grading and apparently some filling with beach sand/gravel. Small open areas around demolished buildings now covered with brush had all been graded and disturbed.

On the southern end of Long Island, inspection of the cemetery along the side of the main access road showed that the presently unmarked burial ground north of the Civil War monument was probably much larger than the area now being maintained. Small square concrete blocks like those visible under thick grass in the burial ground were found in bulldozed dirt piles beyond the present eastern boundary. The depressed area (elev. 147.8 ft) containing

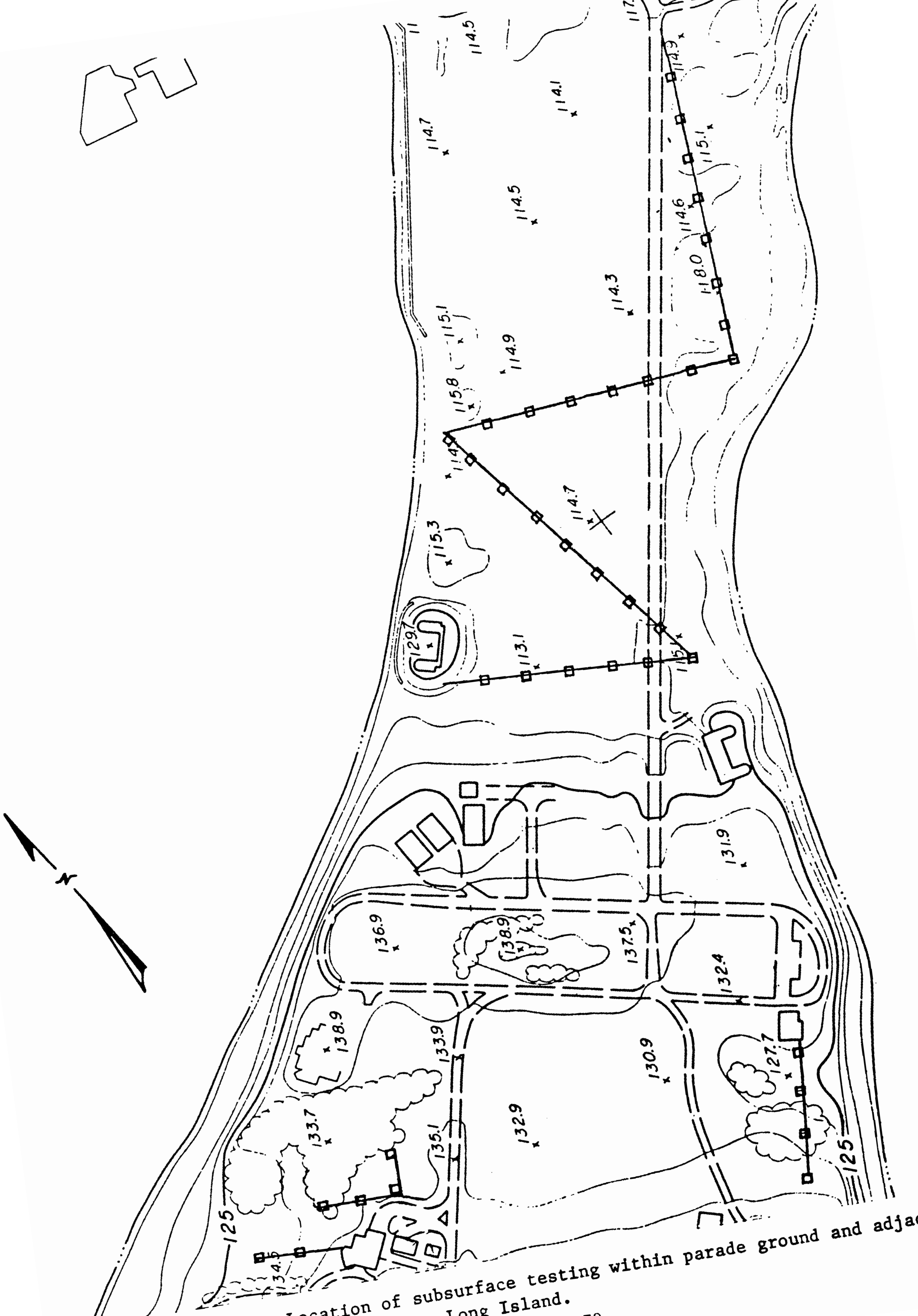
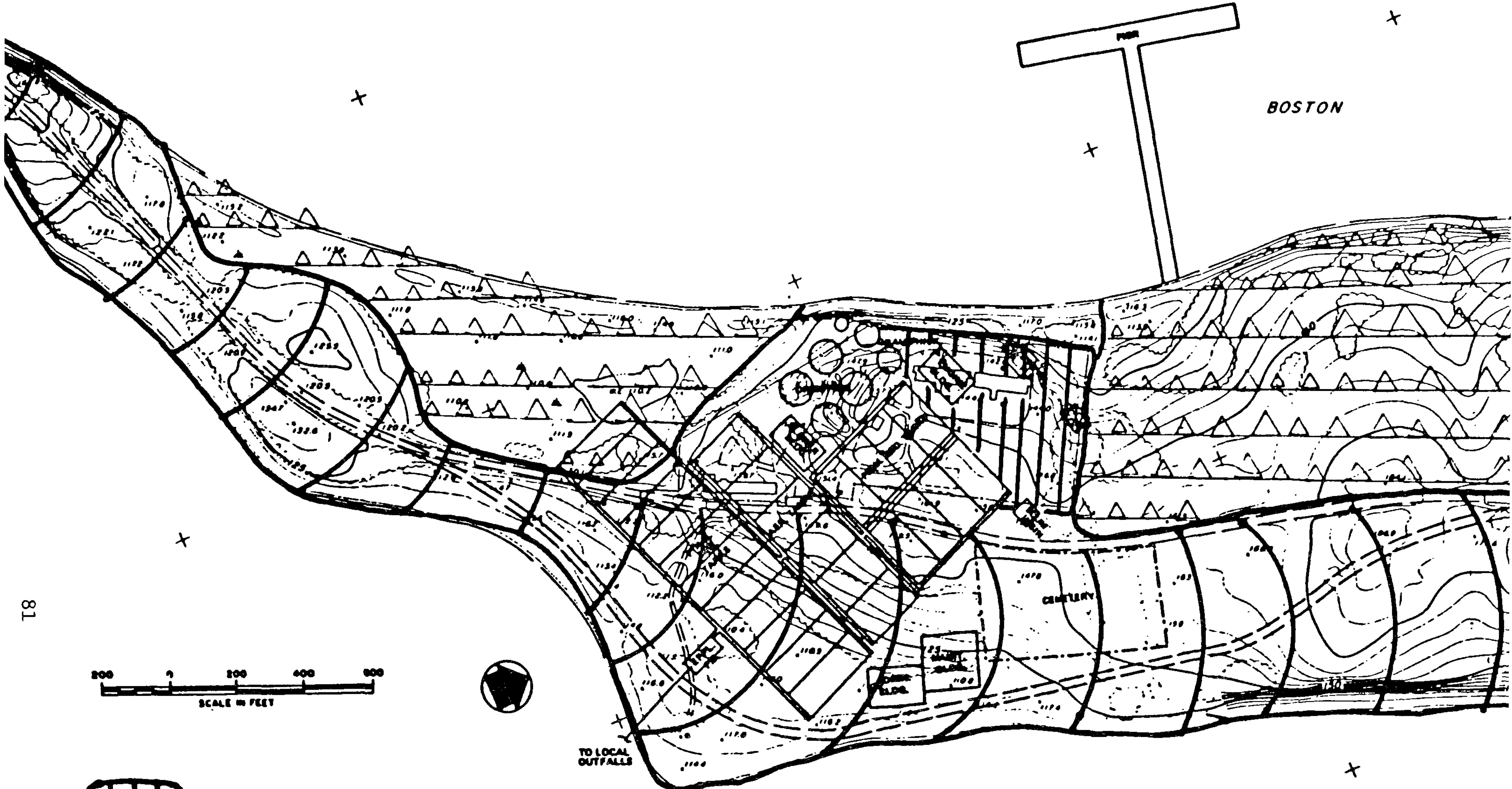


Figure 16. Location of subsurface testing within parade ground and adjac
sections of Fort Strong on Long Island.

this unmarked burial ground also has several overgrown asphalt/ gravel pathways. Several gravestones including a late eighteenth century slate stone have been found under dense vegetation in the overgrown area east of the plot now being maintained. Rows and hummocks marked by a few holes (collapsed grave shafts ?) were also very visible in an overgrown meadow area east of the large white cross marking the northernmost cemetery plot. This cemetery also appears to have originally covered a much larger area. One informant (Lt. Kearney) indicated that it formerly extended almost to the upper edge of the beach along this section of the southeast shore of the island. This description conforms to the L-shaped configuration for the cemetery shown on a 1946 topographic map (see Figure 12).

Intensive subsurface testing completed during the UMass archaeological field school yielded the majority of the data now available for prehistoric activity on the southern half of Long Island. The procedures used to locate the five prehistoric sites that were identified and a summary of the cultural materials and features found on those sites is presented in Appendix I of this report.

A general stratification of the southern end of Long Island into zones of known and expected archaeological sensitivity is shown in Figure 17. This sensitivity map was based on the results of the UMass field school on combination with background research and surface inspection by PAL, Inc. staff.



Previously disturbed areas

moderate to low archaeological sensitivity

high archaeological sensitivity including locations of known prehistoric and historic sites.

Figure 17. Stratification of southern end of Long Island in zones of archaeological sensitivity.

SUMMARY AND RECOMMENDATIONS

The Phase I, Step II survey of Deer and Long Islands assembled and analyzed a diversified body of information from various sources to provide an inventory and assessment of cultural resources that should serve as a useful planning tool and document.

Although the survey did not identify any prehistoric sites on the Deer Island drumlin or the northeastern end of Long Island, a large amount of information on historic/recent period activities on these islands was reviewed. This data should be of some value for future research and cultural resource management in the Boston Harbor district.

The most important result of the Phase I survey was the identification of six prehistoric sites on the southern end of Long Island by the UMass field school. As a group these sites are probably the largest known cluster of prehistoric cultural resources on the Boston Harbor islands.

The general conditions encountered in the military installations (Fort Dawes, Fort Strong) on Deer and Long Islands were quite similar in terms of previous disturbance. However, there are major differences between the two project areas because of the hospital complex and the large, relatively intact, open area on the southern half of Long Island. The significant cultural resources on Long Island and the potential impacts to them posed by the proposed wastewater treatment facilities require special consideration. For this reason, separate summaries of survey results on Deer and Long Islands and recommendations for mitigating project impacts are presented in this section of the report.

Deer Island

In general, the results of the PAL, Inc. Phase I survey paralleled those of the previous intensive survey conducted on Deer Island by the Institute for Conservation Archaeology (ICA), Harvard University in 1981 (Randall 1981). Extensive disturbance was found throughout the project area and there was a very low probability of locating any archaeological sites in good condition. It is unlikely that any prehistoric sites still exist on the southern half of Deer Island. Both the ICA and PAL, Inc. intensive surveys were unable to identify any on the elevated drumlin or the lower area occupied by Fort Dawes.

The various structures belonging to Fort Dawes are of some historical interest as examples of twentieth century military development in Boston Harbor but would not be considered eligible to the National Register of Historic Places because they are less than 50 years old and lack integrity. Given their poor condition and the fact that much of the original machinery has been removed, the same may be true of the brick pump station/screening plant and wood frame carriage house/residence associated with earlier sewage treatment facilities on Deer Island (Randall 1981). The pump station was built in 1889 and the historical significance of this structure is related to its role in the technological advancement of wastewater treatment for the metropolitan Boston area. Further examination of the pump station/screening plant is necessary to evaluate its present condition and integrity. These structures were documented on an MHC area form prepared by PAL, Inc. as part of the Phase I survey on Deer Island.

The data on historic period and recent land use patterns has been useful for reconstructing the chronological sequence of development and its relationship to the expansion of Boston as an urban core area. It could also be used to estimate when the prehistoric resources that probably existed on Deer Island might have been destroyed.

In summary, no potential significant prehistoric or historic period cultural resources were identified on Deer Island during the Phase I, Step II archaeological survey conducted by the PAL, Inc. and no further investigation is recommended.

Long Island

The Phase I survey on Long Island was able to collect documentary and archaeological information from almost the entire island. The very different kinds of historic/recent land use to which the northeastern and southern parts of the island had been subjected was evident after completing the background research and walkover inspection. Subsurface testing in both sections of the island by PAL, Inc. and the UMass archaeological field school verified these observations and led to the identification of six prehistoric sites on the southern half of the island. Recent structural remains consisting of concrete bunkers, foundations and brick demolition rubble marking the locations of buildings associated with Fort Strong were the only cultural resources found in the open, parade ground area east of Long Island Hospital.

Fort Strong covers the northeast end of Long Island and has a history of active military use beginning in the Civil War, however, no evidence of that first episode appears to have survived within the project area. All the structures represented by foundations and demolition rubble around the perimeter of the parade ground were part of the World War II garrison. Earlier maps (1892, 1903) show structures in the parade ground area of Fort Strong but they do not appear to match the locations of foundations and rubble now bordering the parade ground. The available evidence suggests that earlier structures were removed during extensive reorganization of this military facility prior to or during World War II. No standing structures with the exception of concrete bunkers/gun emplacements remain on the parade ground.

Like Fort Dawes, the structural remains on the parade ground of Fort Strong are important as recent examples of the long history of military land use in Boston Harbor. However, it is unlikely that they would be eligible to the National Register of Historic Places since they do not meet the minimum age requirement and lack integrity. This area of Long Island would not be involved in any construction of proposed wastewater treatment facilities and there are no expected project impacts.

The estimated location of the small historic cemetery plot east of the hospital complex as indicated in Figure 15 is also outside the area that would be affected by any proposed development. Like the other poorly documented, unmarked cemeteries associated with the hospital complex, it represents a very sensitive historic period cultural resource. Any additional archival or historic background research on the Long Island Hospital complex should include this cemetery so that its exact location, period of active use and extent can be determined. This small plot may contain some of the 2,000 marked and unmarked graves believed to exist on Long Island.

On the northeastern half of Long Island, episodes of intensive institutional and military construction and development in the mid nineteenth to mid twentieth centuries probably destroyed any prehistoric sites that might have been located there. In general, the shift in land use on this island from basic resource collection (firewood, etc.) and agricultural or pastoral activities in the seventeenth and eighteenth centuries to large scale institutional and military development in the mid-nineteenth century was probably a critical point. This shift almost certainly reflects important structural changes which were taking place simultaneously in the urban core area represented by the city and port of Boston. Support facilities such as almshouses, military defenses and prisons were moved out of the core area itself and into the peripheral zone of the harbor islands.

The significant cluster of six prehistoric sites on the southern end of Long Island represent archaeological resources that survived the period of intensive institutional and military development. An important factor in their survival seems to have been the use of this part of Long Island for mostly agricultural purposes. Agricultural land use is less destructive; prehistoric sites may suffer some minor physical alteration (formation of plowzone) from cultivation but can remain essentially intact. Other cultural material (historic ceramics, glass, coal ash, etc.) seems to have been added to these sites as field trash or from minor episodes of dumping institutional refuse (Long Island Hospital) but their integrity is still good. Shell midden deposits and various other features (pits, lithic workshops) remain on these sites and have important research potential.

We know from documentary research that from the late nineteenth century to about the 1960s the Long Island Hospital supported itself by intensive farming and cultivation of the open areas on this island. These fields were probably located for the most part to the south and west of the hospital complex in the area surveyed by the UMass archaeology field school. From other documentary and cartographic sources the construction date of the cemetery (1930s) and main access road (1939-1946) on the southern half of Long Island was established. These two small scale developments also appear to have infringed on prehistoric site areas. The most recent military installation, the Nike base on the southern end of Long Island, may have destroyed a site due to its location on an elevation overlooking a wetland. Subsurface testing around the perimeter of the base by the UMass field school revealed evidence of disturbance but the area northwest of the Nike base is considered to be archaeologically sensitive. Since they have survived a long sequence of historic land use the prehistoric sites on Long Island and the categories of data they contain are important resources for reconstructing the prehistory of the greater Boston area.

The results of preliminary analysis of the prehistoric sites found by the UMass field school, interpretations of their probable function and some explanation of their significance is presented in Appendix I. The following information is a general summary of these findings.

The six prehistoric sites investigated by the UMass field school are considered to be a major contribution to the data base for the Boston metropolitan area. As the original Phase I, Step II management summary mentioned, any newly discovered sites on Long Island would be important for investigating research problems and current models of prehistoric subsistence/settlement patterns at both local and regional scales. The City Archaeologist (Boston, Department of the Environment) has indicated that because of the scarcity of intact prehistoric sites like these in greater Boston, it is essential that these sites be preserved. At this time, there is insufficient information available to be able to evaluate adequately the significance of these resources, which include unique classes of data. The best example is Hull-11, which is now the only known site with an Early Archaic component in the Boston metropolitan area. A data recovery or mitigation program only collects what is judged to be a statistically adequate sample of any site. The lack of comparable sites in this environmental setting makes the determination of an adequate sample extremely difficult.

Investigation of Hull-11, the only previously known site, revealed evidence of several older, Archaic components underlying the Woodland shell midden deposit. An Early Archaic bifurcate base projectile point (ca. 8,500 years old) was recovered from this site and is a very significant discovery. This is the first evidence of Early Archaic occupation found in the Boston Harbor district and Hull-11 may contain important data needed to reconstruct settlement/subsistence patterns for this time period. Steatite (soapstone) vessel fragments of probable Terminal Archaic (ca. 3,200 to 2,500 B.P.) affiliation and sherds of typical Early, Middle and Late Woodland ceramic wares were also found. In addition to midden deposits resulting from intensive processing of shellfish (softshell clam), this site also contained evidence suggesting that large, glacial erratic boulders of felsite were quarried for raw material. Very high densities (roughly 400 pieces per square meter) of felsite chipping debris and boulders with large flake scars were found during the UMass field school investigation.

The five smaller prehistoric sites generally consisted of low density clusters of chipping debris and burnt rock, although one site yielded a midsection fragment of a bifacial tool blade that may be of Late Archaic affiliation (Susquehanna tradition, ca. 3,800 to 3,000 B.P.). Some small hearth features were also found that contain charcoal suitable for radiocarbon dating. One of these small sites near the southern end of the island has a northerly aspect and is apparently the first site to be identified on the north side of a Boston Harbor island. Ceramic vessel sherds from this site indicate it was occupied during the Middle and Late Woodland periods, ca. 1,500 to 500 B.P.

The "Hill" site, a Late Woodland period camp was found in an unusual location far from any freshwater source, but on light, sandy soil that might have been well suited to horticulture. Small Late Woodland agricultural sites were predicted as part of a model of Woodland period land use/settlement patterns on the harbor islands and this site could be used to test that model (Luedtke 1980 and personal communication, July 1984). In general, the five small sites appear to be camps occupied for specific activities (resource collection/processing, farming) and are important additions to the data base for the metropolitan Boston area.

Light scatters of prehistoric chipping debris found along the shovel test pit transects are an indication that prehistoric hunter/gatherer groups were using the whole island rather than restricting activity to only specific site areas.

From the available data and results of preliminary analysis we are recommending that all the prehistoric sites on Long Island be considered together as elements of a multi-resource National Register District such as the Boston Harbor District now being assembled by the Massachusetts Historical Commission. A more detailed survey and examination of these sites at the Phase II level of investigation should be conducted to determine the extent and evaluate the significance of these sites. Their research value is greatly enhanced because they can be viewed together as integral components of prehistoric settlement/land use systems rather than as single sites.

Like the prehistoric cultural resource, the Long Island Hospital can be most effectively evaluated as a complex of interrelated structures and sites. This complex is an excellent example of a fringe or peripheral zone institution providing support for an adjacent urban core and "fits" well with the theme of the proposed Boston Harbor National Register district. Its significance at the local level lies primarily in the major position this institution has held in serving the city of Boston and it would be an integral part of any historic district. At the state-wide, regional level the Long Island Hospital complex is representative of a pattern of relatively economically self-sufficient institutions that took care of those persons in need of state support (the insane, chronically ill, indigent-paupers, prisoners).

The architecture of the hospital complex reflects its history of institutional use and the functional changes that took place there during the last century. For example, the core of the hospital complex is a large building built as a dormitory that now contains administrative offices. Other buildings have designs that reflect specific functions and contain wards, medical treatment areas or maintenance/physical plant facilities such as the laundry and heating system. The entire plan and appearance of the hospital complex reflects constant construction and/or alteration of buildings beginning in 1904 and continuing steadily through the 1920s and 1930s until the early 1970s.

Preservation of this complex should be considered as a future management option. The hospital still serves as a treatment center for chronically ill and alcoholic persons for the city of Boston.

The entire complex may be National Register eligible, and this would include associated cemetery areas on the southern half of the island. The open, southern end of Long Island represents the original physical setting for these historic resources and any development would be an alteration of their context.

These cemeteries were in active use until fairly recently (1940s) and are an integral component of the complex. Cemeteries like these are inherently sensitive, especially more recent plots because of the legal procedures involved in reinterment. In addition, human burials are protected by a recently enacted state law (Chapter 659 of the Acts of the 1983 Legislature). This protection is extended to unmarked burials such as those in the large plot south of the hospital. Even if it were possible to move these cemeteries, the expense in terms of project delay and actual dollar cost of archaeological monitoring would be tremendous.

To provide a base line of information for National Register nomination processes the Public Archaeology Laboratory, Inc. has completed an Area form (Massachusetts Historical Commission record) for the Long Island Hospital. A large amount of additional data exists and an in-depth study beyond the scope of this Phase I inventory is needed to assess this data. To record the hospital complex adequately, the expertise of an architectural historian and archive quality photographic documentation is needed.

At present, three design options for wastewater treatment facilities involving project areas of approximately 18, 82 and 96 acres are under consideration. The former Nike Missile Base located on the southern end of Long Island has been identified as the most likely site for a portion of a treatment facility which would occupy roughly 18 acres. Archaeological survey work in the areas surrounding the Nike base was conducted as part of the UMass field school. Subsurface testing with shovel test pit transects covered the entire perimeter of the base and sections of the open area to the northeast. Although no prehistoric or historic archaeological resources were identified by the field school survey there is a strong possibility that sites may exist in areas not covered by this survey (B. Luedtke, personal communication).

Even if the 18 acre size option were selected not all of the proposed facility would fit within the area occupied by the Nike base. An additional area of five or six acres west of the main access road would probably be necessary to accommodate components of the facility such as sedimentation tanks and provide space for storage of construction materials and machinery. Secondary impacts during construction could involve as much as 25 acres and would extend beyond the Nike base into areas which are considered to be archaeologically sensitive. One favorable aspect of this option is that it would not require any relocation of the existing access road further east. Relocation would adversely affect a Civil War monument/cemetery along the road and at least one prehistoric site area on Bass Point.

The 18 acre option poses a less severe potential impact to cultural resources than the two larger options but it would still require some additional archaeological investigation. Due to its smaller area it may be possible to develop a mitigation plan for this size option. At a minimum, this plan should include additional archaeological survey work in the area northeast of the Nike base to supplement the data collected by the UMass field school. Time constraints on the field school limited the amount of subsurface testing that could be carried out there, but it is considered to be archaeologically sensitive. Certain locational attributes such as the small wetland just north of the Nike base and a small ridge beyond it are favorable for prehistoric sites. More intensive survey work is needed to establish the presence or absence of archaeological sites in this area.

The larger proposed facilities requiring project areas of 82 and 96 acres would necessitate the removal of the Long Island Hospital complex and would involve large areas known to contain prehistoric sites and historic period cemeteries. To properly document and mitigate project impact on the entire hospital complex prior to demolition would require large expenditures of both state and federal funds. This would probably have a net effect of prolonging project planning and design of the wastewater treatment facilities for a minimum of several years.

Other major alterations to the present configuration of Long Island such as relocation of the main access road to the hospital could lead to serious adverse affects on prehistoric sites (Hull-11, Hill site, etc.) which are considered to be potentially eligible to the National and State Registers of Historic Places. Equally as important is the large unmarked cemetery plot bordering the east side of the access road. Selection of either large scale option would require extensive Phase II site examination level archaeological investigations to delineate accurately the extent and content of both prehistoric site areas and unmarked cemetery plots on the southern half of Long Island. The cemeteries present a particularly difficult situation since the available data suggests that other unmarked graves may be located beyond the presently maintained plots bordering the road.

In general, the 82 and 96 acre size options may not represent a situation in which avoidance of cultural resources is possible. Given their large scale relative to the total area of Long Island these proposed options could pose a serious disruption to the physical context of various cultural resources and may prove to be difficult to mitigate.

As we have discussed in several previous management summary/

memoranda, several very important issues regarding the adverse effects of this project on cultural resources must be considered while the project is in the planning stages. Resolution of these issues will require negotiation between the various federal (EPA, Advisory Council on Historic Preservation) and state agencies (MHC, MDC) involved and the City of Boston (Department of the Environment). Since construction designs for the proposed treatment facility have not been finalized, it is difficult to discuss impacts to specific archaeological sites or historic structures. However, it appears that any planned construction regardless of size will constitute some form of impact to resources on Long Island. Even at the smallest scale (18 acre facility) the proposed sewage treatment facility may affect the overall integrity and character of Long Island. Much of the significance of both the prehistoric and historic resources lies in the fact that Long Island is the largest island in Boston Harbor with relatively intact, open areas. Groups of prehistoric and historic sites in physical settings that retain most of their original integrity are rare in the Boston metropolitan area. Given its restricted area and distinct geographic boundaries it may be appropriate to discuss context for cultural resources on Long Island in terms of the whole island. In real terms, this would mean that any mitigation of project impacts or data recovery program may need to include the entire island. At a minimum, it should focus on the site areas and zones of direct and secondary impact from proposed construction of wastewater treatment facilities.

REFERENCES CITED

Barber, Russell
1983 Archaeological Survey and Testing on Thompson Island, Boston Harbor: The 1982 Field Season. Unpublished ms. on file at Thompson Island Education Center.

Board of Prison Commissioners
1904 Public Document Number 41, 4th Annual Report of the Board of Prison Commissioners of Massachusetts for the year ending September 30, 1904. Wright and Potter Printing Company, Boston.

Boston Board of Health, City of
1885 14th Annual Report.

Boston City Document, No. 122
1892 Final Report of the Special Committee Appointed by the Mayor to Inspect the Public Institutions of Boston.

Boston City Document, No. 144
1898 Report on the Boston Municipal Camp for Boys on Long Island; Initial Season ending September 3, 1898.

Boston City Document, Numbers 15 and 29
1904 Volume 2, Annual Report of Pauper Institutions Trustees, Document 29.

Boston City Document, No. 15
1928 Annual Report of Institutions Department, 1928.

Bower, Beth, John Cheney and Joan Gallagher
1984 Intensive Survey of St. Mary's Housing for the Elderly Project Area, Charlestown, Massachusetts. Submitted to the Archdiocese of Boston, Office of Planning. Prepared by The Public Archaeology Laboratory, Inc., Providence and the Museum of Afro-American History, Roxbury.

Braun, David P.
1974 Explanatory Models for the Evolution of Coastal Adaptation in Prehistoric Eastern New England. American Antiquity 39:582-596.

Brenninkmeyer, Benno M.
1976 Dynamics of Sedimentation and Coastal Geology from Boston to Plymouth. In Geology of Southeastern New England, edited by Barry Cameron, pp. 205-223. 68th Annual Meeting New

England Intercollegiate Geological Conference. Science Press, Princeton.

Cheney, John and Stephen Mrozowski
1983 Archaeological Investigations for the Town Hill Condominium Project. The Public Archaeology Laboratory, Inc. Report. Submitted to Paramount Develpoment Association, Framingham.

Connelly, Patrick J.
1932 Islands of Boston Harbor, 1630-1932. Chapple Publishing Company, Dorchester.

Committee on Public Buildings
1847 Report on the Removal of the Houses of Industry and Other Public Institutions at South Boston to Deer Island. Boston Committee on Public Buildings, J. H. Eastburn, Boston.

Cote, W. C.
1958 Observations and Conclusions Regarding the Archaeology of the Cochato River Valley Area. Bulletin of the Massachusetts Archaeological Society 19(2):22-26.

Cox, Deborah C. and Peter F. Thorbahn
1982 Archaeological Investigations in Narragansett, Rhode Island, the Campbell and Sprague I Sites. Department of Anthropology, Brown University Report. Submitted to Lee, Pare and Associates, Inc., Pawtucket, Rhode Island.

Cox, Deborah C., Peter Thorbahn and Alan Leveillee
1983 An Archaeological Assessment of the Pettaquamscutt River Basin. The Public Archaeology Laboratory, Inc., Report #12-1. Submitted to Rhode Island Historical Preservation Commission.

Cox, Deborah, Ann Davin and Alan Leveillee
1984 Final Report on the Archaeological Data Recovery Program at the Jamestown Bridge Site (RI-711). The Public Archaeology Laboratory, Inc. Report. Submitted to R. A. Cataldo and Associates, Inc., Pawtucket.

Dincauze, Dena F.
1972 The Atlantic Phase: A Late Archaic Culture in Massachusetts. Man in the Northeast 4:40-61.

1973 Prehistoric Occupation of the Charles River Estuary: A Paleographic Study. Archaeological Society of Connecticut Bulletin 38:25-39.

1974 An Introduction to Archaeology in the Greater Boston Area. Archaeology of Eastern North America 2(1):39-67.

Huntington, Frederick
1979 Archaeological Investigations at the W. K. Webb State Park, Weymouth, Massachusetts. Institute for Conservation Archaeology, Peabody Museum, Harvard University.

Johnson, Frederick (editor)
1942 The Boylston Street Fish Weir. Papers of the R. S. Peabody Foundation for Archaeology 2. Andover, MA.

Kales, Emily and David
1976 All About the Boston Harbor Islands. Harman Publishing Co., Inc., Boston.

Kaplan, Lawrence
1975 Paleoethnobotany. In Final Report on the Archaeological and Paleobotanical Resources of 12 Islands in Boston Harbor, pp. 112-127. Report submitted by Barbara Luedtke to Massachusetts Department of Natural Resources.

Kaye, Clifford A.
1967 Erosion of a Sea Cliff, Boston Harbor, Massachusetts. In Economic Geology in Massachusetts, edited by O. C. Farquhar. University of Massachusetts, Amherst.

1976a Outline of the Pleistocene Geology of the Boston Basin. In Geology of Southeastern New England, edited by Barry Cameron, pp. 46-63. 68th Annual Meeting New England Intercollegiate Geological Conference. Science Press, Princeton.

1976b The Surficial Geology of the Boston Basin. In Geology of Southeastern New England, edited by Barry Cameron, pp. 158-159. 68th Annual Meeting New England Intercollegiate Geological Conference. Science Press, Princeton.

LaForge, L.
1932 Geology of the Boston Area, Massachusetts. USGS Bulletin 839, 105 p.

Luedtke, Barbara
1980 The Calf Island Site and the Late Prehistoric Period in Boston Harbor. Man in the Northeast 20:25-76.

Massachusetts Historical Commission
1982 Historic and Archaeological Resources of the Boston Area. The Massachusetts Historical Commission, Boston.

1984 Historic and Archaeological Resources of the Connecticut Valley. The Massachusetts Historical Comission, Boston.

Massachusetts State Archives
1676-1763 Manuscript on file at the State House, Boston.

Metropolitan Area Planning Council
1972 Boston Harbor Islands Comprehensive Plan. On File at Massachusetts Department of Natural Resources.

Mikal, Alan
1973 Exploring Boston Harbor. Christopher Publishing House, North Quincy.

Pendery, Steven; Claire Dempsey; Edward Gordon; John Cheney; and Russell Barber
1982 Phase II Archaeological Site Examination of the Project Area for the Central Artery, North Area, Charlestown, Massachusetts. Institute for Conservation Archaeology, Peabody Museum, Harvard University, Cambridge, Massachusetts.

Randall, Debra
1981 Archaeological Survey of the Proposed MDC Sludge Management Plant, Deer Island, Massachusetts. The Institute for Conservation Archaeology, Harvard University. Submitted to MDC and Havens and Emersn, Inc., Boston.

Ritchie, Duncan and Geoffrey Moran
1976 Phase I Archaeological Investigations of Fort Independence, South Boston, Massachusetts. Department of Anthropology, Brown University Report. Submitted to Metropolitan District Commission, Boston.

Rosenbluth and Associates
1948 Finance Commission of the City of Boston, Administrative Survey of the Government of the City of Boston. Report No. 36, parts 1 and 2.

Snow, Edgar R.
1971 The Islands of Boston Harbor, 1630-1971. Dodd, Mead and Company, New York.

Snow, Leslie C.
1984 Archaeological Survey and Testing on Thompson Island, Boston Harbor: The 1983 Field Season. Unpublished report on file at Thompson Island Education Center, Boston.

Stokinger, William
1978 A Final Report of Archaeological Investigations of Fort Independence: 1976-1997. Department of Anthropology, Brown University Report. Submitted to Metropolitan District Commission.

Sweetser, M. F.
1882 King's Handbook of Boston Harbor. Moses King, Cambridge.

Tennta, Lisa
1983 Long Island Research Project. Unpublished ms. on file at University of Massachusetts, Boston, Department of Anthropology.

12.11 Legal and Institutional Constraints on Long Island and Deer Island

WARNER & STACKPOLE

RESEARCH MEMORANDA

LEGAL AND INSTITUTIONAL CONSTRAINTS TO THE SELECTION OF THE LONG ISLAND ALTERNATIVES

August 28, 1984

and

THE DEER ISLAND ALTERNATIVES

November 27, 1984

PREPARED FOR
C. E. MAGUIRE

Prepared by
Warner & Stackpole
28 State Street
Boston, MA 02109
(617) 725-1400

Under EPA Contract #68-04-1010

Table of Contents

PAGE

Long Island

INTRODUCTION

We have been requested to conduct a preliminary analysis of the legal and institutional constraints affecting the acquisition and use of Long Island, in Boston Harbor, for a sewage treatment facility serving all or part of the Metropolitan Boston area. The request is made in the context of a larger analysis being conducted as part of the alternatives analysis prepared for inclusion in the Environmental Impact Statement (EIS) required by the National Environmental Policy Act, 42 U.S.C. 4321 et seq. (NEPA). The use of Long Island is being considered in conjunction with several alternatives for sewage disposal in Boston Harbor, some of which involve the further use of Deer Island and Nut Island.

There are issues common to the use of any harbor island, such as the generally applicable standards established to issue state and federal permits. These needed approvals include wetlands protection, waterways, and ocean disposal permits from state agencies, and dredge and fill, construction in navigable waters, and effluent discharge permits from the United States Environmental Protection Agency (EPA) and the United States Army Corps of Engineers (Corps). They will be discussed in this memorandum only to the extent that significantly different issues or concerns can be anticipated with respect to Long Island which would not be raised with Deer Island or Nut Island.

In general, our objective has been to identify both legal and administrative issues which may affect the use of Long Island for a sewage treatment facility, recognizing that many of these issues may be contested in litigation. In most cases, we have not attempted to predict the outcome of such controversies, but have merely offered an estimate of the magnitude of the problem presented.

Our analysis relies upon the accuracy of certain facts with respect to environmental conditions, legal ownership, and positions taken by various public bodies. Because of time and cost limitations involved in this effort, we have not conducted an independent verification of many of these matters. We have attempted to identify those assumptions in this memorandum, and can discuss what might be done to clarify these points.

Every effort has been made to avoid bias in favor of or against selection of the Long Island alternative. As will become apparent below, the ultimate selection will depend very heavily on political considerations and, possibly, actions taken or not taken by the Massachusetts legislature. Because of this, many of the issues discussed herein may be seen as merely creating the landscape upon which the debate will take place.

QUESTIONS PRESENTED

A. Does the Metropolitan District Commission (MDC) presently have the authority to acquire, by eminent domain, all or part of Long Island to construct and operate a sewage treatment facility? Would the proposed Metropolitan Water Resources Authority have such power?

B. Assuming the MDC has the requisite statutory authority, what legal and institutional impediments exist to construction of such a facility?

STATEMENT OF FACTS

In responding to the questions presented we have found it important to rely upon certain facts regarding Long Island. Foremost among these are the ownership of Long Island and the current use and condition of the property. At present, all of Long Island is held in fee by the City of Boston, under the care, custody and control of the City of Boston Department of Public Health and Hospitals (Health and Hospitals). In the event Health and Hospitals no longer uses the island for health and hospital purposes, care and control will revert to the City of Boston Public Facilities Commission (Public Facilities). Public Facilities could subsequently transfer care, custody and control to another city agency, lease the property to any private or public entity, or begin the process of selling the property.

Historically, Long Island has been used for residential and agricultural purposes, and several public institutional uses, including an alms house (poor house), a defense installation, recreation, and public health and hospital uses (its current use). It contains many historic and archaeologic artifacts and up to 2000 unmarked graves, which may be scattered across the island. A formal cemetery has been identified on one part of the island, which is known to contain the remains of civil war soldiers

The island consists of an upland area, known as the "head," and a lower expanse on which the former military installation and hospital are located. The island contains an area considered to be a barrier beach, and areas which are wetlands as defined by the Wetlands Protection Act. It is probable that some portions of the island provide a habitat for wildlife, and that some fisheries and shellfisheries resources can be found off the island's shore.

Some sources have reported that the hospital building complex is being considered for nomination to the State and National Register of Historic Places. We have, however, been unable to verify these reports.

The most recent draft of the Boston Harbor Island State Park Master Plan Update, prepared by the Department of Environmental Management (DEM), proposes to develop all of Long Island except for the hospital area as part of the Boston Harbor Islands State Park. Katherine Abbott of DEM has indicated that only preliminary discussions between the DEM and the City of Boston have taken place regarding a long-term lease of parts of Long Island for this purpose.

SUMMARY

The availability and future uses of Long Island are affected by a number of important legal and administrative requirements discussed in this memorandum. Because the City of Boston Department of Public Health and Hospitals has been given care, custody and control of Long Island, any subsequent public use of the Island may be subject to the applicability of the Prior Public Use Doctrine, which requires a majority of the legislature to approve the transfer of use. Similarly, the legislature is required to approve the acquisition of burial grounds in Massachusetts; there may be areas of Long Island which might be defined as a burial ground. The Massachusetts Department of Environmental Management has been given control over the use and disposition of the Boston Harbor Islands by a special act of the legislature, thus requiring the Metropolitan District Commission to obtain approval of its proposed acquisition of Long Island from that state agency. Under the provisions of a relatively recent state law, the Executive Office of Administration and Finance must approve the acquisition of land by state agencies, including MDC takings for waste water treatment purposes. The proposed Metropolitan Water Resources Authority, intended to assume the water and sewer responsibilities of the Metropolitan District Commission, would be subject to these same legal requirements, with the possible exception of Administration and Finance approval.

Both the Massachusetts Historic Commission Act and the National Historic Preservation Act require the applicable state and federal agencies to consider alternatives which would avoid or mitigate adverse effects of the proposal on properties listed or nominated for listing on the state or national Register of Historic Places. This process does not mandate adoption of any particular alternative, but does impose consultation processes, and at the federal level, may involve a determination by the U.S. Secretary of Interior. The state and federal Coastal Zone Management consistency determinations similarly involve consultative processes designed to ensure that state and federal actions are consistent with the policies of the state Coastal Zone Management Program. Conflicts between state agencies on this consistency issue are resolved by the state Secretary of Environmental Affairs, conflicts between state and federal agencies may be resolved by the U.S. Secretary of Commerce. Finally, the federal Executive Orders on Wetlands and Floodplains are applicable to the proposed project if federally funded, and require that EPA avoid direct and indirect support of floodplains and wetlands development wherever there is a practicable alternative.

To the extent that proposed construction activities on Long Island could be restricted to areas away from sensitive environmental resources, historic and archaeologic resources and existing hospital activities, impacts on these resources can be minimized, perhaps avoiding some regulatory problems. Some of the issues discussed herein may also apply to a lesser extent to the Deer Island alternative.

DISCUSSION

A. MDC Authority to take Long Island by Eminent Domain for Construction and Operation of a Sewage Treatment Facility

1. Statutory authority

The MDC is statutorily empowered to take land by eminent domain. M.G.L. c.92 §77 grants the MDC the power to "take by eminent domain . . . any lands . . . necessary for carrying out the provisions of this chapter relative to the construction, maintenance and operation of systems of sewage disposal . . . ." In addition, sections 78 through 80 of this chapter grant the MDC eminent domain power for the purpose of establishing and maintaining reservations, metropolitan water systems, and boulevards.

The Massachusetts Supreme Judicial Court (SJC) has characterized the breadth of the MDC's eminent domain powers under these statutes as "extensive." Commonwealth v. Massachusetts Turnpike Authority, 346 Mass. 250, 255 (1963). There have been no reported successful challenges to land takings by the MDC on grounds that the MDC has attempted to take land outside the bounds of its authority.

2. Prior Public Use Doctrine

The well-accepted Massachusetts common law doctrine of Prior Public Use states that public lands devoted to one public use cannot be diverted to another inconsistent public use without plain and explicit legislation authorizing the diversion. Robbins v. Dep't of Public Works, 335 Mass 328, 330 (1969); see also, Higginson v. Treasurer of Sch. House Comm'rs of Boston, 212 Mass. 583 (1912). An important threshold question, then, is whether the circumstances surrounding the ownership and use of Long Island support the contention that the island is protected by this Doctrine. If it is so protected, the Massachusetts legislature must approve the transfer of use from hospital use to sewage treatment facility use. Because of this Doctrine's importance, we will examine its application in some detail.

Two questions arise in determining whether the Prior Public Use Doctrine would bar the MDC from taking Long Island for the construction of a sewage treatment plant without explicit legislative authorization: (a) has Long Island been devoted to a specific public use, and (b) would the construction of a sewage treatment facility be an inconsistent public use?

(a) <u>Has Long Island been devoted to a specific public use</u>?

Long Island presently contains a state hospital, an abandoned federal defense base and undeveloped land. It could be argued that the headland areas, and possibly the defense base area, are not used, and thus not "devoted" to a public use. If these areas were not devoted to a particular public use, one might argue that the geographic scope of the Doctrine's application was limited only to the hospital area.

One test, however, for discerning whether a prior public use exists is whether the land has been appropriated to a particular public use by some governmental body. <u>Newburyport Redevelopment Authority</u> v. <u>Commonwealth</u>, 9 Mass. App. Ct. 206, 239 (1980). In the case of Long Island, however, the legislature has reportedly placed the island, in its entirety, under the care, custody and control of the City of Boston Department of Public Health and Hospitals. It could alternatively be argued, therefore, that a public use of the entire island presently exists, regardless of any lack of actual use of portions of the island.

(b) <u>Will the construction and operation of a sewage treatment facility on Long Island be "inconsistent" with the prior public use</u>?

The Prior Public Use Doctrine does not address all changes in use, but only those that create a new use "inconsistent" with the original use. Case law indicates that uses are not necessarily inconsistent simply because the later taking may impair the original use. Op. Att'y Gen. May 25, 1967, 223, citing Easthampton v. County Commissioners of Hampshire, 154 Mass. 424 (1891).

The courts have set a high threshold for determining that an inconsistency exists. For example, in Easthampton, the court held that a strip of land could be taken from a schoolhouse lot for a needed town way without legislative approval, despite the fact that taking the strip would "injure the lot considerably for school purposes, but [would] not prevent its use . . . ." Easthampton, 154 Mass. at 424.

In another case, Muir v. City of Leominster, 2 Mass. App. 514, 317 N.E.2d 212 (1974), the court's analysis of this issue focused on whether the land in question was clearly devoted to a public use at the time of the proposed transfer. The Court reasoned that because the property was not presently in public use, and could be devoted to any number of public uses, no further legislative action was required.

In the case of Long Island, proposed configurations of the primary sewage treatment facility would not physically and directly involve the actual hospital buildings area. Configurations of the secondary treatment facilities would involve relocation of the hospital. If one considered the geographic scope of Health and Hospital's use to include only the buildings and associated grounds, or assumed that the construction and operation of a sewage treatment facility on adjacent land would not prevent the use of the hospital buildings, then it could be argued that the Prior Public Use Doctrine would not apply in the case of primary facilities, either because the particular area on which the sewage facility would be constructed was not devoted to a prior public use, or because the new use would not be inconsistent with the hospital use.

(c) Protection afforded by the Doctrine

If the protection of the Prior Public Use Doctrine is triggered, the Doctrine requires legislative approval by a majority vote of the legislature. Op. Att'y Gen. April 12, 1976, 159. The legislation authorizing the diversion in use must explicitly identify the land to be taken, the existing public use and the new use. Brookline v. Metropolitan District Commission, 357 Mass. 435, 440-41 (1970).

3. Article 97 of the Massachusetts Constitution

Article 97 of the Massachusetts Consititution (amending Article 49 of the Constitution) creates a codified variation of the Prior Public Use Doctrine applicable to certain resources. In brief, Article 97 provides that public land taken or acquired for conservation, scenic, historic or recreation purposes may not be used for other purposes or otherwise disposed of without a two-thirds vote of the legislature. Op. Att'y Gen. April 12, 1976, 157. The scope of applicability of Article 97 is therefore narrower than that of the Prior Public Use Doctrine, since Article 97 applies only to those public uses specifically enumerated in the article. Furthermore, regardless of subsequent use, the land in question must specifically have been taken or acquired for one of the enumerated purposes, and not merely devoted to such use. Newburyport Redevelopment Authority v. Commonwealth, 9 Mass. App. Ct. 206 (1980) (land used by public to provide access to National Historic District was not taken or acquired for that purpose and therefore not subject to Article 97).

The potential applicability of Article 97 to Long Island turns on whether Long Island was ever taken or acquired for any of the public purposes enumerated in Article 97. Although it is known that the City of Boston operated a summer camp on Long Island in 1898, the records do not indicate that any land was taken or acquired for that purpose. No research has revealed that any portions of Long Island have been acquired in a manner which would invoke the provisions of Article 97.

The SJC has opined that the operation of Article 97 is retroactive, and therefore applies to property acquired prior to the effective date of the 1972 constitutional amendment. Opinion of the Justices, 1981 Mass. Adv. Sh. 1361, 1384. However, it is clear that the passage of Article 97 has had no effect on the separate requirements and applicability of the Prior Public Use Doctrine. The Attorney General has concluded that, where the Prior Public Use Doctrine applies but Article 97 does not, the common law requires simple majority approval. Op. Att'y Gen. April 12, 1976, 159. Article 97 was designed to supplement, not supplant, the common law doctrine of prior public use. Op. Att'y Gen. June 6, 1973, 139, 146.

4. <u>Consent required by the Department of Environmental Management</u>

The MDC's authority to acquire Long Island is affected also by chapter 742 of the 1970 Acts and Resolves of the Massachusetts legislature. Section 8 of that Act provides:

> [I]n, under or bordering Boston Harbor there shall be no acquisition of land by any . . . public agency or instrumentality other than the [Department of Environmental Management (DEM)] without the approval of the [DEM], and no public land on or bordering said area may be . . . used as a . . . refuse disposal area, and no sand, gravel or soil may be removed therefrom or deposited thereon, and no structure may be built thereon, without the approval of the [DEM].

Because Long Island lies within Boston Harbor, the DEM's approval is required to allow both the MDC's "acquisition" of the land, which term appears broad enough to encompass an eminent domain taking by the MDC, and the construction of the facility.

Any decision by DEM with respect to the use and disposition of Long Island is likely to be affected by the DEM's plans to add areas of the island to the Harbor Islands State Park, and by comments made by other state and local agencies in the Coastal Zone Management consistency review process. As discussed later in this memorandum, under the state Coastal Zone Management regulations, the Secretary of the Executive Office of Environmental Affairs is generally empowered to resolve these conflicts between state agencies. However, it is possible that the provisions of chapter 742 would diminish the Secretary's authority under those regulatory provisions.

5. <u>Restriction on the Acquisition of Burial Places</u>

As discussed earlier, Long Island may contain up to 2,000 unmarked graves, in addition to a known civil war cemetery. M.G.L. c.114 §17 provides as follows:

> A town shall not alienate or appropriate to any other use than that of a burial ground, any tract of land which has been for more than one hundred years used as a burial place; <u>and no portion of such burial ground shall be taken for public use without special authority from the general court</u>. "Burial place", as referred to in this section, shall include unmarked burial grounds known or suspected to contain the remains of one or more American Indian. (emphasis added)

Thus, legislative approval would be required for the MDC's taking of any portion of Long Island which constitutes a "burial ground." Because the exact locations of the graves are not known, but are suspected to be clustered in several different locations on the island, it is conceivable that much land on the island is subject to the legislative approval requirement. It is also possible that further examination and research may reveal only a few identifiable "burial places" on Long Island, as that term is narrowly defined. The M.G.L. c.114 §17 requirement is considered to be a legislative confirmation of the Prior Public Use Doctrine, requiring a majority vote of approval by the legislature. Op Att'y Gen., June 6, 1973, p. 139. However, should the MDC determine that it can avoid use of any "burial ground," or if it determines that the proposed use is not inconsistent with use as a burial ground, the MDC might proceed without legislative approval.

One issue which may arise is whether areas of unmarked, random burials of persons constitutes "burial grounds" within the above statute. In interpreting the definition of "burial ground" under the statute, the case of Town of Sudbury v. Dept. of Public Utilities, 351 Mass. 214 (1966), should be noted. In Sudbury the Department of Public Utilities (DPU) concluded after a hearing that the remains of one human being (in this case, an American Indian) and the possibility of others scattered throughout the area were not, in its opinion, a basis for designating the land as a burial ground within the statute. *Id.* at 226. The Sudbury court affirmed the DPU's finding on the basis that the statute, at the time consisting of only the first sentence of the present version, "plainly refers to a tract of land definable and readily identifiable as a burying ground." Thus, the existence of randomly buried American Indians was held to fall outside the coverage of the statute.

The Sudbury case apparently was the impetus for the 1983 amendment to the statute, which added the definition of "burial place." Read literally, that definition states only that areas containing the remains of one or more American Indians shall fall within the ambit of the statute. Presumably, however, most or all of the persons thought to be buried on Long Island are not American Indians. The amended statute therefore serves only to alter the narrow Sudbury holding, since neither the amended statute nor case law defines whether the remains of one or more randomly buried non-American Indians, as may exist on Long Island, constitute a burial ground under the statute. Consequently, it is not clear whether the statute as amended would create any stronger presumption that any random burial sites on Long Island are entitled to the protection afforded by the law.

6. Massachusetts Division of Capital Planning and Operations Jurisdiction

The deputy commissioner of the Massachusetts State Division of Capital Planning and Operations (DCPO) has the discretionary power to approve or disapprove acquisition of real property by state agencies such as the MDC. This power is given to the deputy commissioner by chapter 579 of the Acts of 1980, which created the Division of Capital Planning and Operations within the Massachusetts Executive Office of Administration and Finance. The authority of the DCPO is described in M.G.L. c.7, §§39A-43G.

The deputy commissioner performs both a coordination function and an acquisition function. He is responsible for the "integrated and coordinated planning and budgeting of capital facilities on an annual and long-term basis." M.G.L. c.7, §39B(a). A water resource improvement by the MDC, such as a sewage treatment facility, is specifically included within the definition of a "capital facility." Id. at §39A(f).

The deputy commissioner is also responsible for the "acquisition, allocation and disposition of real property." Id. at §39B(b). To carry out this responsibility, the deputy commissioner of the DCPO has the authority to acquire and control real property on behalf of state agencies. Id. at §40E. This power is given by section forty E (40E) notwithstanding previous similar delegations to the agencies themselves, including the MDC.

The deputy commissioner may re-delegate this power to state agencies but for this delegation to be effective, the deputy commissioner must give written approval before the transaction is finalized. M.G.L. c.7, §40E.

By withholding approval, and thus refusing to delegate, the deputy commissioner of the DCPO could block the acquisition of property that the MDC wishes to use for a wastewater treatment facility. The Massachusetts legislature could remove this impediment by adopting legislation authorizing the MDC to acquire the necessary real property notwithstanding the provisions of chapter seven.

Purchase or acquisition by eminent domain by the new Metropolitan Water Resources Authority (the "Authority") of land for a sewage treatment facility appears not to require approval by the deputy commissioner of the DCPO. The Metropolitan Water Resources Authority Act, House Bill 5915, would apply only four relevant sections of chapter seven to the Authority: sections thirty-nine C (39C) (information filing requirements); forty A (40A) (record keeping and reporting); forty J (40J) (disclosure statements); and forty K (40K) (inventory of public property and central depository for deeds and records of public property). These serve only to provide information to DCPO in its role of coordinator of state capital projects, and specifically do not relinquish power to DCPO.

7. Applicability of Federal Executive Orders to the Land Acquisition

We have reviewed the possiblity that an acquisition of Long Island by the MDC might be subject to the federal Executive Orders on Floodplains (E.O. 11988) and Wetlands (E.O. 11990) on the theory that the acquisition might constitute a federal action. The Executive Orders, and regulations of EPA promulgated thereunder (at 40 C.F.R. 6.302) provide that the Orders shall apply to federal financial assistance as well as direct federal activities. The MDC's purchase of land to be used for the sewage treatment facility, however, appears to be entirely independent of the federal government, since the costs of land acquisition will not be reimbursed by EPA.

Although it may be argued that the state's purchase is an "integral part" of major federal action, *see*, *e.g.*, *Citizens for Balanced Environment and Transportation, Inc.* v. *Volpe*, 376 F. Supp. 806, 813 (D. Conn.), *aff'd per curiam*, 503 F.2d 601 (2d Cir. 1974), or that the state is a "partner" of the federal government, *see*, *e.g.*, *Monarch Chemical Works, Inc.* v. *Exxon*, 452 F. Supp. 403, 501 (D. Neb. 1978), and that, therefore, the state may be enjoined from exercising its power to acquire land, the instances in which injunctions have been appropriate all involved more federal action than is present here. *See*, *e.g.*, *Monarch Chemical*, 452 F. Supp. at 501-02 (city to use federal funds to purchase land and to be reimbursed by state); *Greenspon* v. *Federal Highway Administration*, 488 F. Supp. 1374, 1381-82 (D. Md. 1980) (relocation expenses of railroad, including acquisition of land by City of Baltimore, to be reimbursed by federal government). No eminent domain cases have been located in which the taking was considered to be a "federal action" without substantial federal funds being involved in the actual purchase of the land. There are a great many cases in which private parties have unsuccessfully attempted to enjoin projects after the state agency acquired the land. See, e.g., Citizens for Balanced Environment and Transportation, Inc. v. Volpe, 376 F. Supp. 806; see also, Citizens for Responsible Area Growth v. Adams, 680 F.2d 835 (1st Cir. 1983) (airport expansion not "federal" if no federal funds involved); Friends of the Earth, Inc. v. Coleman, 518 F.2d 343 (9th Cir. 1975) (individual parts of airport expansion may be severable). Based on existing case law, it appears that all obligations under the Executive Orders will arise only after the state acquires the land. A discussion of the impact of these Orders is included later in this Memorandum.

B. Proposed Metropolitan Water Resources Authority Statutory Power to acquire all or parts of Long Island by eminent domain

As part of our analysis regarding the feasibility of a state agency acquiring all or part of Long Island to construct a sewage treatment facility, we have examined the most current proposed bill to create the Metropolitan Water Resources Authority (the "Authority"), House Bill 5915 (the "Bill") submitted to the legislature April 19, 1984 by Governor Michael Dukakis. Several sections of the Bill contain provisions relevant to the Authority's power to acquire real estate for its statutory functions, including the provision of sewage treatment and disposal services. These sections are discussed below.

Section 6 of the Bill contains the general powers provision for the Authority. Section 6 (j) provides that the Authority may "acquire and take and hold title in its own name by purchase of any [real] property and to exercise the power of eminent domain" in the same manner as is presently afforded to the MDC for similar purposes. No other statutory limitations are proposed in the Bill with respect to exempt properties or areas which would preclude the full exercise of the right to acquire real property by eminent domain.

By express statutory provision, the Authority would be subject to the provisions of the Prior Public Use Doctrine, and Article 97 of the state Constitution, where the Authority sought to acquire land devoted to a prior public use, or acquired for certain public purposes. Section 4(c) of the Bill provides that:

> Under this act (i) no lands or easements taken or acquired for the purposes authorized by article ninety-seven of the amendments to the constitution of the Commonwealth shall be used for other purposes or disposed of, and (ii) no lands devoted to a public use shall be diverted to another inconsistent public use, except in all instances in accordance with the laws and the constitution of the Commonwealth.

This provision of the Bill appears to codify the provisions of Article 97 and the Prior Public Use Doctrine, and expressly subject the Authority to their requirements.

More notable, however, is a provision contained in Section 9(a) of the Bill, which modifies the requirements for approval under the Prior Public Use Doctrine applicable to the Authority. That section states:

> (a) In addition to every manner of acquiring interests in property authorized generally by this act or by other law, the authority may acquire from any person [defined by the Bill to include cities and towns] real . . . property . . . by eminent domain in accordance with the provisions of chapter seventy-nine or chapter eighty A of the General Laws; provided, however, that no property or rights already appropriated to public use shall be so taken without the prior approval of the governor. (emphasis added)

This requirement for approval by the governor, apparently to be applied to proposed takings of property protected only by the Prior Public Use Doctrine, is unlike the present statute governing the MDC, and adds another level of independent governmental approval before a taking of lands appropriated or dedicated to public use will be allowed. Thus, while the proposed Authority would have the same powers as the MDC to acquire Long Island by eminent domain, to the extent parts or all of Long Island have been appropriated to public use, not only the legislature, but the executive branch must authorize the acquisition. While it may be possible for the legislature to override a governor's veto of a Prior Public Use Doctrine bill, the Bill would give the governor absolute veto power.

Finally, the Authority would be subject to all of the statutory and regulatory requirements discussed in later sections of this Memorandum. Although the Authority is intended to be an independent entity, it has not been made exempt from the applicability of state environmental or historic statutes and regulations

It has, however, apparently been proposed to be exempt from the requirements for approval by the DCPO.

C. Legal and Administrative Impediments to the Use of Long Island

Although the MDC may be able to acquire Long Island with the approval of the legislature, DCPO and DEM, the construction and operation of a sewage treatment facility at Long Island would be subject to a number of state and federal requirements limiting the island's development. The most important problems expected to be encountered in facility siting, design, and construction are raised by the Massachusetts Historical Commission Act, M.G.L. c.9 §§26-27D, the National Historic Preservation Act, 16 U.S.C. §470 *et seq.*, the Coastal Zone Management Act, 16 U.S.C. §1451 *et seq.*, the Executive Order on Wetlands, E.O. 11990, and the Executive Order on Floodplains, E.O. 11988. Each of these major issues is discussed below.

1. Massachusetts Historic Commission Jurisdiction

The Massachusetts statute establishing the Massachusetts Historical Commission (MHC), M.G.L. c.9 §§26-27D (hereinafter the "Act"), establishes procedures which require each state agency which undertakes a project to determine if the project will "affect" a property on the State Register of Historic Places (the "State Register"). If a project will affect a State Register property, the state agency is to seek comments from the MHC, including whether the project will have an adverse effect on the State Register property. If the MHC finds such an "adverse effect" the state agency is required to consult with the MHC and consider alternatives to the project which would minimize those adverse effects.

The Act, which closely parallels its federal counterpart, the National Historic Preservation Act (NHPA), 16 U.S.C. 470 et seq. (1976), is primarily a notification and comment statute. The Act does not require the state agency to accept modifications and alternatives put forth by the MHC. Nonetheless, the Act poses several obstacles to the MDC project if the Act's procedures are applicable. First, there is the potential for long delays during the review and consultation process, during which period the project may not proceed. Second, if an "adverse effect" is found by MHC, the MDC and other state agencies involved will be required to consider alternatives mitigating the adverse effects, and to document the reasons for not accepting them. Because of the potential significance of this law, we will explain its procedures in some detail.

(a) Summary of the Act

The threshold question governing applicability of the Act is whether the project "affects any property listed on the state register of historic places." The State Register contains (1) all districts, sites, buildings, or objects determined eligible for listing or listed in the National Register of Historic Places; (2) all local historic districts established pursuant to M.G.L. c.40C, or a special law; (3) all landmarks designated under local ordinance or by-law; (4) all structures and sites subject to a preservation easement approved or held by the MHC pursuant to

M.G.L. c.184 §32; and (5) all historical or archaeological landmarks certified pursuant to M.G.L. c.9 §27.

At the present time, Long Island is not listed in the State Register. However, subsequent listing of all or part of the island is a possibility. Because of the possible presence of significant historical and archaeological features, Long Island may be placed on the State Register through eligibility for the National Register or designation as a landmark district by the Boston Landmark Commission (BLC). Although Long Island may contain archaeological or historical landmarks, certification as a historical or archaeological landmark is a consensual procedure and requires written consent of the person claiming ownership and others with recorded interests in the site or structure. M.G.L. c.9 §27.

With respect to National Register listing or eligibility, which would place the site on the State Register, the Massachusetts regulations list the federal procedures which, if followed, will suffice to list a property. The procedures are those listed in the federal regulations implementing the NHPA (36 C.F.R. Part 60 (listing on the National Register) and 36 C.F.R. Part 63 (eligibility for listing on the National Register)). The criteria for eligibility are also listed in the federal regulations (36 C.F.R. 60.4).

As to landmark status, the Boston Landmarks Commission ("BLC"), has the authority to designate landmarks, landmark districts, architectural conservation districts, or protection areas in the Boston Harbor. Thus, all or part of Long Island could be designated a landmark district or landmark by the BLC pursuant to the procedures and criteria in the statute creating it. St. of 1975, c.772 §4.

(b) Effect on State Register Property

Under state law, the affected state agency must determine if the project will "affect" any property listed on the State Register as early as possible in the planning process, prior to such state agency funding, licensing or construction. The determination must occur prior to any action that would foreclose alternatives that could eliminate, minimize or mitigate adverse effects, or would limit the MHC's ability to comment. (950 C.M.R. 71.07(11)).

The regulations of the MHC prescribe a two-step procedure of identification and assessment of effect to be undertaken by the state agency to determine if there is an effect on a State Register property. Initially, each state agency is to identify any State Register properties within the area of potential impact of the project, defined as that geographic area within which direct and indirect effects generated by the project could reasonably be expected to occur and thus cause a change in the historical, archaeological or cultural qualities possessed by the State Register property. (956 C.M.R. 71.03). The regulations provide that not only are properties actually listed on the State Register which are within the area of potential impact of the Project to be identified, but also, "to the extent feasible," those properties which "may be eligible for listing on the State Register"

(950 C.M.R. 71.07(1)(a)(2)). The MHC is charged with maintaining an Inventory of Historic and Prehistoric Assets and is to assist state agencies in identifying them.

If there are State Register properties within the area of impact, a determination is to be made by each state agency whether the project will have an effect on the characteristics which qualified the property for inclusion on the State Register. 950 C.M.R. 71.07(1)(b). This requirement of determination of effect, on its face including only properties listed on the State Register appears more limited in scope than the requirement of identification of properties, including properties which may be "eligible" for listing on the State Register. The criteria of effect to be applied to make this determination are quite broad:

> "a project shall be considered to have an effect whenever the project causes or may cause a change in the integrity of the location, design, setting, material, workmanship, feeling or association of property listed in the State Register. The effect of a project on a State Register property is evaluated in the context of the historical, architectural, archaeological or cultural significance possessed by the property. A project shall be considered to have an effect whenever the project causes or may cause any change, beneficial or adverse, in the quality of the historical, architectural, archaeological or cultural characteristics that qualify the property to be listed on the State Register. An effect may be direct or indirect."

950 C.M.R. 71.05(1).

It is possible that the proposed construction of the treatment plant on Long Island would be deemed to have an effect on State Register property if any part of Long Island were being considered for inclusion on the State Register.

(c) Adverse Effect and Consultation

If the state agency determines the project will have an effect on a State Register property, notice (on a form provided by MHC) so stating is to be sent to MHC, triggering the MHC review process. The Executive Director of the MHC then has thirty (30) days to determine if the project will have an "adverse effect" on the State Register properties. M.G.L. c.9 §27C. "Adverse effect" is not defined in the statute or the regulations, but each of the listed examples included in the regulations might be applicable to the Long Island situation:

> 1. the destruction or alteration of all or part of a State Register property;
>
> 2. the isolation or alteration of a State Register property from its surrounding environment;
>
> 3. the introduction of visual, audible or atmospheric elements that are out of character with the State Register property;
>
> 4. the neglect of a State Register property resulting in deterioration or destruction; or
>
> 5. the transfer or sale of a State Register property without adequate conditions or restrictions regarding preservation, maintenance or use.

950 C.M.R. §71.05(2).

If MHC finds an "adverse effect" a consultation and negotiation process between the state agency and the MHC commences, in which the state agency and the Executive Director of the MHC discuss alternatives to the project and means of mitigating any adverse effect. The Act and regulations do not make clear whether "alternatives" may be limited to different site configurations, or whether consideration of other sites is required.

Because of an inconsistency between the state law and implementing regulations, it is not clear whether the state agency must adopt the mitigation measures recommended. Although the regulations require the state agency to "consider alternatives to the project that could eliminate, minimize or mitigate adverse effects on the State Register property." (950 C.M.R. 71.07(3)) the Act requires the state agency, in implementing its final plans, to adopt all prudent and feasible measures that eliminate the adverse effect. M.G.L. c.9 §27C. If the state agency fails to agree to comply with alternatives suggested by the Executive Director of the MHC, and the Executive Director refuses to accept the adverse effect because there are no prudent and feasible alternatives (950 C.M.R. §71.07(3)(b)), then the full MHC must meet to consider the Executive Director's proposal of prudent and feasible alternatives, and may prepare its own statement of prudent and feasible alternatives. If the state agency still refuses to agree and to sign a Memorandum of Agreement so indicating, the state agency may proceed with the project, but it can do so only after submitting an explanation of its position on the MHC comments, and only after a ten day waiting period.

(d) <u>Impediments Presented By The Act</u>

(i) Suspension of activity on project.

If there is no State Register property within the project's area of potential impact, or if the state agencies find no affect on a State Registry property, the project may proceed. The state agency may also agree with the suggested measures to avoid or minimize the adverse affects and then may proceed. See e.g., 950 C.M.R. §71.07(5)(e). However, if the MHC is required to comment, i.e. if there is an effect, the state agency is effectively precluded from proceeding with the project until the administrative process is completed. Section 950 C.M.R. 71.07(1)(b)(4) provides that until the Commission issues its comments, "the state agency shall not take or sanction any action or make any irreversible or irretrievable commitment that could result in an adverse effect on a State Register property or that would foreclose the consideration of modifications or alternatives to the proposed project that could eliminate, minimize or mitigate such adverse effects." It should be noted that if the state agency ultimately refuses to accept the MHC's alternatives, "no state agency may proceed with the project until 10 days after the submission" of reasons for such failure to accept comments to the MHC. 950 C.M.R. 71.07(5)(e). It would appear that all state agencies, (DEM, DCPO, DEQE) and not just the state agency submitting the statement of reasons, are precluded from proceeding with the project.

(e) Unmarked Skeletal Remains Suspected of Being 100 Years Old or More: M.G.L. c. 9 §27C

An additional, related impediment may be raised by M.G.L. c.9 §27C, wich provides that all activity, including construction activity, cease until such time as the state archaeologist has completed a site evaluation and until disposition of the remains has been agreed upon if "any person, corporation, agency or authority of the commonwealth or any of its political subdivisions discovers unmarked human burial or skeletal remains suspected of being one hundred years or more." In addition, in arranging for the disposition of such human remains, the state archaeologist is required to consult with the site's owner and other interested persons to determine whether "prudent and feasible alternatives" exist to avoid, minimize or mitigate harm to the burial site. If the skeletal remains are suspected of being an American Indian burial site, the Commission of Indian Offices is to be notified and will have a role in the consultations. M.G.L. c.7 §38. If no prudent and feasible alternative is agreed to, the state archaeologist is permitted to excavate the site and recover the remains. The project is then allowed to proceed.

It is possible, given the history of Long Island and the results of recent archaeological studies indicating the existence of numerous unmarked burial sites on Long Island, that human burial and skeletal remains will be found during the pre-construction and construction phases of the sewage treatment facility. If such conditions are encountered, construction activity will be unable to proceed without state archaeologist involvement. However, the provisions of this section do not appear to pose any permanent impediment to site development.

2. Applicability of the National Historic Preservation Act of 1966

(a) Introduction

In addition to MHC jurisdiction, procedures under the National Historic Preservation Act of 1966 ("NHPA") will be implicated if the project is federally funded or permitted. NHPA's procedures closely parallel the Act involving the Massachusetts Historic Commission, and the potential legal and institutional impediments posed by NHPA are similar to those described earlier. The key section of NHPA for purposes of the proposed Long Island treatment plant states:

> "the head of any Federal agency having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking in any state and the head of any federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any federal funds on the undertaking, or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. The head of any such Federal agency shall afford the Advisory Council on Historic Preservation . . . a reasonable opportunity to comment with regard to such undertaking."

16 U.S.C. §470(f).

The MDC's Long Island project, which will require EPA approval if federally funded, is clearly such an undertaking. 36 C.F.R. §800.2(c). Further, language in 40 C.F.R. 6.602(a), regulations governing EPA's obligations to participate in impact assessments, specifically provide that even NPDES permit approvals require such review.

(b) <u>Summary of NHPA</u>

(i) Listed on or Eligible for Listing on National Register.

The NHPA, its implementing regulations, and Executive Order 11593 require EPA to identify all properties within or about the project area that are listed in or are eligible for inclusion in the National Register of Historic Places which may be affected by the project. 16 U.S.C. §470(f); see 36 C.F.R. 800.4(a); Romero-Borcelo v. Brown, 643 F.2d 835, 839 (1st Cir. 1981), rev'd on other grounds, 456 U.S. 305 (1982). Listing of a site or district on the National Register is accomplished by certain nomination and review procedures. See 36 C.F.R. 60. Because of conflicting federal district court interpretations, it is unclear whether a site or district must be identified for study by EPA only where there has been a determination by a state or Federal agency that the site or district is eligible, or where it merely meets the "eligibility criteria." (Compare Committee to Save the Fox Building v. Birmingham Branch of the Federal Reserve Bank of Atlanta, 497 F. Supp. 504, 512 (1980)(requiring determination) with Hough v. Marsh, 557 F. Supp. 74, 88 (D. Mass. 1982)(no determination needed)). Some support for the latter interpretation, however, may be found in EPA regulations at 40 C.F.R. 6.301(a), which require the identification of properties "potentially eligible for listing on the National Register."

The specific area to be examined for eligible properties is the "area of the undertaking's potential environmental impact" (36 C.F.R. 800.4(a)), which is defined as the "geographical area within which direct and indirect effects generated by the undertaking could reasonably be expected to occur." 36 C.F.R. 800.3(o). EPA must consult the State Historical Preservation Officer ("SHPO") when determining the area of potential environmental impact and the scope of surveys needed to identify eligible properties within that area. 36 C.F.R. 800.3(o), and 800.4(a)(2). The extent of the studies required to determine if there is an eligible property will vary, but a standard of reasonableness seems to have developed. Wilson v. Block, 708 F.2d 735, 754 (D.C. Cir. 1983).

The determination in each case of a property's eligibility is the responsibility of the agency and of the SHPO: See C.F.R. 800.4(a)(3). In the absence of an abuse of discretion, their application of the regulations to the facts will be sustained. Wilson v. Block, supra at 746.

Section 800.4(a)(3) of 36 C.F.R. states that when a "question" exists as to a property's eligibility, the Secretary of the Interior shall be requested to make a final determination. Section 63.2(c) of 36 C.F.R. states that a "question" exists "when the [federal] agency and the State Historic Preservation Officer disagree or when the agency determines that a question exists."

(c) Effect on Listed or Eligible Property

Section 800.4(b) of 36 C.F.R. requires each agency, in consultation with the SHPO, to determine for each listed or eligible property within the potential environmental impact area, whether the project will affect the historical, archaeological, or other characteristic of the property that qualified it for inclusion in the National Register. The agency is to determine whether an effect is present according to the criteria of 36 C.F.R. §800.3(a). 36 C.F.R. 800.4(b)(1). If, however, the agency determines merely that the project will have no adverse effect, the agency's determination must be submitted to the

Advisory Council on Historic Preservation for review and comment, 36 C.F.R. 800.4(d), 800.6(b).

(d) Adverse Effect Consultation

If EPA finds an adverse effect pursuant to the criteria of 36 C.F.R. 800.3(b), which are identical to the State criteria of adverse effect, then the Federal Agency official, the State Historic Preservation officer, and the Executive Director of the Advisory Council of Historic Preservation (the "Executive Director") must formally commence the consultation process to consider feasible and prudent alternatives to the undertaking that could avoid, mitigate, or minimize adverse effects on a National Register property or eligible property. 36 C.F.R. Part 800.6. EPA is obligated to provide all information necessary to consider alterations and modifications which could avoid or mitigate the adverse effects (36 C.F.R. §800.4), but an important limitation may be that alternative sites need not be considered, only changes to the existing proposal. Wicker Park Historical District Preservation Fund v. Pierce, 565 F. Supp 1066, 1074-75 (N.D. Ill., 1982). Upon the failure of the consulting parties to agree upon the terms of a Memorandum of Agreement which would incorporate feasible and prudent alternatives to avoid or satisfactorily mitigate the adverse effects of the undertaking, the Executive Director may recommend that the entire Council undertake consideration of the proposed undertaking to the chairman of the Council. The chairman is to decide, within fifteen days, that such a meeting would be beneficial. If so, a panel representing the Council will consider the matter within thirty (30) days of the chairman's decision or the full Council will consider it not less than sixty (60) days from the date of the chairman's decision. The Council or the panel is to issue its comments within fifteen (15) days after its meeting. If EPA decides not to follow the panel's comments, the chairman of the Council may convene the full Council to consider the matter within thirty (30) days after receipt of the notice that the Agency will not follow the comments. After receipt of the Council's comments, the EPA Administrator is obligated to take the comments into account in reaching a final decision with regard to the proposed undertaking. 36 C.F.R. 800.6(d)(7). In addition, although EPA may not accept the Council's comments, EPA must submit a detailed written report to the Council including the actions taken in response to the Council's comments and the effect that the actions will have on the effected National Register or eligible property. The Council may issue a final report to the President detailing EPA's action and making recommendations for changes in Federal policy and programs. 36 C.F.R. §800.6(d)(1) Once this final report has been given to the Council, EPA will have satisfied its obligations under the NHPA, and may proceed.

(e) Impediments Posed by NHPA

(i) Suspension of Activity.

NHPA, like its Massachusetts counterpart, contains provisions that preclude EPA from taking any action that could result in an adverse effect on a National Register or eligible property during the pendency of the review and consultation process. *See* 36

C.F.R. 800.4(e); 36 C.F.R. 800.6(c)(3); 36 C.F.R. 800.6(d)(6). NHPA also contains statutory review periods: the Executive Director has 30 days to object to Determinations of No Adverse Effect, 36 C.F.R. 800.6(a); the Executive Director has 15 days to recommend consideration by the Council if the consulting parties cannot agree, 36 C.F.R. 800.6(b)(7); the Chairman has 15 days to determine whether the undertaking will be considered by the Council, 36 C.F.R. 800.6(d)(1); the panel meets within 30 days of the Chairman's decision to consider, 36 C.F R. 800.6(d) (2)(i); the full Council will consider the project at the next regularly scheduled meeting, but <u>not</u> <u>less</u> than 60 days after the Chairman's decision to consider, 36 C.F.R. 800.6(d)(2)(ii); the Council is to issue comments within 15 days after a meeting, 36 C.F.R. 800.6(d)(5); the Council may meet to review the project within 30 days of notice that EPA will not follow the Panel's recommendations, 36 C.F.R. 800.6(d)(6).

However, the consultation process itself has no specific time limit and the NHPA requires EPA to provide the information necessary for an adequate review of the effect of a proposed undertaking or a National Register or eligible property and for adequate consideration of modifications or alterations to the proposed undertaking that could avoid, mitigate or minimize adverse effects. 36 C.F.R. 800.4.

(ii) Public Participation, Litigation.

The NHPA, like the Massachusetts Act, encourages public participation, 36 C.F.R. 800.15 (public participation encouraged);

36 C.F.R. 800.5(b)(3) (public information meeting to be held during consulting process if requested by one of the consulting parties). Such public participation and the thorough procedures for the consideration of alternatives to avoid or mitigate adverse effects have created significant delays because of litigation. See, e.g., Wicker Park Historical District Preservation Fund v. Pierce, supra at 1074-1075, listing several potential causes of action, and standards of review.

3. Coastal Zone Management Issues

(a) Introduction.

The Massachusetts Coastal Zone Management Program (CZMP) is an administrative program approved under the provisions of the Federal Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451 et seq. As an administrative program, no state statutes specifically empower the Massachusetts Office of Coastal Zone Management to review and regulate activities in the coastal zone; rather, Coastal Zone Management policies were developed to be administered within the existing state permitting and licensing framework to ensure compliance with the objectives of the Coastal Zone Management Act. Although the Massachusetts CZMP has been in place since 1978, only in 1983, by Chapter 589 of the Acts of 1983, was the Office of Coastal Zone Management formally placed within the Massachusetts Executive Office of Environmental Affairs. See Ch. 589 of the Acts of 1983, 4A.

Regulations of the Massachusetts CZMP are promulgated at 301 C.M.R. 20.00 (state consistency program) and 301 CMR 21.00 (federal consistency program). The state consistency program requires the application of CZMP policies to state permitting and licensing activities (to which only the regulatory policies apply) and state financial assistance and direct state actions (to which both regulatory and non-regulatory policies apply). The federal consistency program requires the determination of consistency between the CZMP policies and federal activities (direct federal actions), federal permitting and licensing, and federal financial assistance to state and local government. Because the proposed construction of a new sewage treatment facility at Long Island or Deer Island will involve direct state action (construction by the MDC), state permitting and licensing (issuance of state wetland permits and water pollution discharge permits, among others) federal permitting (NPDES permit) and possible federal financial assistance to state and local government (the EPA Construction Grant), both state and federal consistency regulations are applicable. Further, subsequent federal permits required for facility construction, including section 404 and section 10 permits, would also be subject to federal consistency review. Because these federal permits are issued by the U.S. Army Corps of Engineers, however, it will be the Corps of Engineers which must make the consistency determination for those permits.

(b) State Consistency Issues

Under the state program, three EOEA agencies are potentially subject to the CZMP policies and must make their actions conform to the policies to the greatest extent possible. The actions of the MDC, a defined EOEA agency, are required by 301 C.M.R. 20.06 to be consistent with the CZMP policies to the fullest extent practicable. The MDC actions involved in the proposed Project include both the acquisition, by eminent domain or purchase, of land needed for the sewage treatment facility, and the construction of the facility. The Department of Environmental Quality Engineering (DEQE), an EOEA agency, will be required to issue approvals for the project under state waterways, water pollution and wetland protection statutes. It can be argued that the DEM, as the agency empowered by Section 8 of Chapter 742 of the Acts of 1970 to control the use and disposition of the Boston Harbor Islands (including Long Island and Deer Island), must ensure that its decision under that authority is consistent with the CZMP policies, although it is not clear whether the statutory provisions of chapter 742 may allow the DEM to act in contravention of CZMP policies without recourse. In addition, the DCPO may be subject to the consistency requirement, although its action would be substantively identical to that of the MDC.

In determining whether any of the above-described actions are consistent with the CZMP, the agencies concerned must give special attention to all of the regulatory policies of the CZMP. However, four of these policies deserve specific mention:

> Regulatory Policy number 1: Protect significant resource areas (salt marshes, shellfish beds, dunes, beaches, barrier beaches, and salt ponds) for their contributions to marine productivity and value as natural habitats and storm buffers.

301 C.M.R. 20.05(3).

The implementation of this policy is focused on actions taken in areas subject to the jurisdiction of the Massachusetts Wetlands Protections Act, M.G.L. c.131 §40, and the Coastal Wetland Restriction Program, M.G.L. c 130 §105; on the issuance of Waterways licenses under M.G.L. c.91, and in reviews by the Division of Marine Fisheries (where impacts on shellfish areas are involved) and by DEM (where impacts on an ocean sanctuary will be considered). Long Island is known to contain a coastal wetland and barrier beach. In evaluating the siting alternatives, these resources may suggest that this policy would discourage use of Long Island. Note that impacts on ocean sanctuaries may be the same whether Long Island or Deer Island is involved in the decision; however, new shellfish areas adjacent to Long Island may raise concerns with the Division of Marine Fisheries not raised at Deer Island. Similarly, the fisheries and shell fisheries values protected by M.G.L. c.242 §40 may be more significant at Long Island than at Deer Island.

> Regulatory Policy number 2: Protect complexes of marine resource areas of unique productivity (Areas for Preservation or Restoration (APRs)/Areas of Critical Environmental Concern (ACECs); ensure that activities in or impacting such complexes are designed and carried out to minimize adverse effects on marine productivity, habitat values, water quality, and storm buffering of the entire complex.

301 C.M.R. 20.05 (3).

Although no part of the Boston Harbor Islands is presently classified as an APR or ACEC, such a proposal for designation has been made in past years and could be made again on a limited, island-specific or harbor-wide basis. The policy specifically provides that direct discharges from new sewage treatment facilities are prohibited within the water bodies comprising an APR/ACEC (once the water segments are classified anti-degradation), and that the siting of new municipal sewage treatment plants are prohibited within APRs. The presence of scenic quality, historic significance, recreation value and the presence of or habitat for rare, threatened or endangered species make areas likely candidates for designation as an APR/ACEC. All of these characteristics are thought to exist on Long Island.

> Regulatory Policy number 12: Review proposed developments in or near designated or registered historic districts or sites to ensure that federal, state and private actions requiring a state permit respect their preservation intent and minimize potential adverse impacts.

301 C.M.R. 20.05 (3).

This policy is intended to protect significant historic and cultural features in the coastal area. It should be noted that the word "near" includes activities within 300 feet of the historic site or district. Implementation of this policy will be achieved through MEPA determinations that all practical means and measures have been taken to minimize damage to the environment, including destruction, damages or impairment, actual or probable, to historic districts or sites. Further, implementation of the Massachusetts Historic District Act, M.G.L. c.40C, and the National Historic Preservation Act, both discussed above, are intended to support administration of this policy. At the present time, however, no part of Long Island contains a designated or registered historic site or district.

> Regulatory Policy number 13: Review developments proposed near existing public recreation sites in order to minimize their adverse impacts.

301 C.M.R. 20.05(3).

Although it is known that DEM has proposed inclusion of parts of Long Island in its revised Boston Harbor Islands State Park Plan, no area of the island is presently used as a public recreation site entitled to protection under this policy. However, in the event the DEM plan is implemented prior to the MDC actions, this policy may raise problems in consistency review. One may argue that the development of Long Island would affect the recreational use of the Boston Harbor Islands State Park in general, as enjoyment of the State Park may be considered to involve not only the land areas (islands) of the park, but the water areas as well. However, it could also be argued that without any new treatment facility in the harbor, the environmental conditions in the Park will deteriorate.

Considering the anticipated positions of the various EOEA agencies expected to be involved in the selection and development of a site for a new sewage treatment facility, it is possible for a conflict to arise between EOEA agencies. While the MDC may desire to select Long Island for the proposed facility, the DEM and DEQE may oppose this action on a number of environmental quality or other state policy reasons (including recreation and historic/archaeologic resource protection). Further, the Office of Coastal Zone Management may independently raise the issue of consistency of the MDC action, creating a need for resolution of conflict between the EOEA agencies. When and if inconsistency between agency positions arises, the CZMP regulations provide a means of dispute resolution, described at 301 C.M.R. 20.06 (2) through (12). The Secretary of EOEA has the power and duty to resolve administrative or jurisdictional conflicts between two or more EOEA agencies under M.G.L. c.21A §4, in a process intended to accomodate and foster political compromises. As noted earlier, however, it is not clear whether the Secretary could override a decision of the DEM made under chapter 742 of the Acts of 1970.

The State program regulations also contain provisions for continuing consultation with local, regional and other state agencies. See 301 C.M.R. 20.06 (27) through (34). Specific public notice, comment and consultation procedures are required for EOEA actions that conflict with any local zoning ordinance, decisions or other local actions. The state actions subject to this requirement specifically include a taking by eminent domain or purchase of land in the coastal zone. 301 C.M.R. 20.06 (31)(d). A procedure for conflict resolution in these instances is also provided in 301 C.M.R. 20.06 (34).

(c) Federal Consistency issues

Federal consistency procedures are addressed in 301 C.M.R. 21.00. These procedures track the requirements for federal consistency determinations set forth in Section 307 of the federal Coastal Zone Management Act and regulations promulgated thereunder at 15 C.F.R. 930.00 et seq.

The substantive issues which might be raised in federal consistency review are the same as those discussed above with respect to state consistency review and the applicability of the identified CZMP policies. Many of the environmental policies discussed above have a relationship to federal permitting and licensing requirements, and to Executive Orders, such as the Executive Orders on Wetlands and Floodplains.

Because the triggering mechanism for federal consistency review is federal financial assistance to state and local government, relatively abbreviated procedures may be followed, described at 301 C.M.R. 21.23 through 21.25, and at 15 C.F.R. 930.90. In the event that a state agency objects to the federal assistance on the grounds that it would be inconsistent with a CZMP policy, the Secretary of Commerce may resolve the dispute by determining that the activity is consistent with the objective or purposes of the Coastal Zone Management Act, or is necessary in the interest of national security. 15 C.F.R. 930 subpart H. This procedure may require public notice, comment and hearings.

4. <u>Executive Orders on Wetlands and Floodplains</u>

Federal funding of this project will be subject to Executive Orders 11988, Floodplain Management, and 11990, Protection of Wetlands. These Orders direct federal agencies to examine the impact of major federal actions on floodplains and wetlands, and to seek practical alternatives. Both Orders adopt NEPA policies and procedures and authorize regulations by affected agencies.

EPA has promulgated regulations on both Floodplains and Wetlands Executive Orders at 40 C.F.R. 6.302(a), (b). These regulations incorporate the EPA's Statement of Procedures on Floodplain Management and Wetlands Protection (Jan. 5, 1979) (Appendix A to 40 C.F.R. 6). Under the statement of procedures, no substantive distinction is made between floodplains and wetlands. The stated policies are to avoid destruction of wetlands, to minimize occupancy and alterations of floodplains and wetlands, and to withhold support from development of floodplains and wetlands whenever there is a practicable alternative. 40 C.F.R. 6, app. A, sec. 3(a). An EIS for a project proposed near a floodplain or wetland must address compliance with both Wetlands and Floodplains Executive Orders, and the subsequent agency decision must satisfy the Orders' concerns. Specifically, the agency must provide: (1) a determination that the proposed action is located on or will likely effect floodplains or wetlands; if no adverse effects are identified, the action may proceed without meeting further requirements; (2) public notice at an early stage; (3) an assessment consisting of the proposed action, its effects on floodplains and wetlands, and a discussion of alternatives; (4) public review of the assessment pursuant to the requirements of NEPA; (5) if no practicable alternative exists, a statement of action by the agency to minimize the potential harm to floodplains and wetlands; and (6) a public decision by the agency, accompanied by a statement of findings, which shall include: (a) reasons why the proposed action must be located in or affect the area; (b) the facts considered in making the decision on location; (c) a statement indicating whether the action conforms to local standards; (d) a description of the steps taken to minimize the harmful effects; and (e) an indication of how the action affects the floodplains and wetlands. 40 C.F.R. 6, app. A, sec. 6. To the extent possible, these requirements are to be satisfied in the existing NEPA process.

The heart of these requirements is the investigation of alternatives. If a "practicable" alternative exists, the agency is barred from proceeding with the original proposal. Notably, the statement of procedures includes a definition of practicability: "'Practicable' means capable of being done within existing constraints. The test of what is practicable depends upon the situation and includes consideration of the pertinent factors such as environment, community welfare, cost, or technology." 40 C.F.R. 6, app. A, sec. 4(g). Thus, EPA will have to make a finding that Long Island is the most "practicable" option for siting the facility, considering all factors identified above. Failure to make and adequately support this finding will create a risk of litigation on this basis.

LEGAL AND INSTITUTIONAL CONSTRAINTS TO THE SELECTION OF THE DEER ISLAND ALTERNATIVE

VI. Introduction

In the course of preparation of the Supplemental Draft Environmental Impact Statement for the development of sewage treatment facilities in Boston Harbor, several questions have been raised regarding legal issues affecting use of Deer Island. These questions have been posed to us for our research and review, with the expectation that our analysis will be considered in the selection of a site or sites for treatment facilities. A similar memorandum has been prepared by this office to discuss issues affecting the development of Long Island; that memorandum is entitled "Legal and Institutional Constraints to the Selection of the Long Island Alternative", dated August 28, 1984.

The Long Island memorandum presented a considerable discussion of the application of the Massachusetts "Prior Public Use" Doctrine and Article 97 of the Massachusetts Constitution, as well as several other provisions of state and federal law. Available time and resources preclude a similar complete assessment of all of these laws as they affect Deer Island. However, we have been requested to discuss the applicability of the Prior Public Use Doctrine and Article 97 to Deer Island, and to conduct a preliminary assessment of the relationship between proposed sewage facility expansion and the existing House of corrections on Deer Island.

In reviewing these issues, we were provided with the draft archaeological report entitled "An Intensive Level Archaeological Survey on Deer and Long Islands, Boston Harbor, Massachusetts", by Duncan Ritchie and Joan Gallagher, dated September 1984. We were also given several plans of Deer Island, obtained by C.E. Maguire. From these documents and materials we have drawn certain conclusions regarding the applicability of various laws. We did not attempt, however, to verify the information presented in these materials independently. Similarly, much information regarding present land ownership on Deer Island was obtained through interviews with various persons identified in the memorandum. Because of our resource limitations, no confirmation of their statements was obtained, except where noted.

VII. Summary

The presence of public lands on Deer Island have raised the possibility that the siting decision would be subject to the applicability of Article 97 of the Massachusetts Constitution or the Prior Public Use Doctrine. Although all municipal lands on the island are charged to the authority of the Boston Penal Institutions Department, current case law suggests that in this instance legislative approval may not be required because there is no active use of the land outside of the prison fence. Article 97 is not applicable because no lands were acquired for any of the purposes protected by that constitutional provision. The existing cemetery on Deer Island is protected by the state statute governing acquisition of burial grounds, but at this time development plans would not require the acquisition of the cemetery.

Developmental constraints include the possible discovery of unmarked skeletal remains, which could be discovered on the island. Historic and archaeological resources on Deer Island are very limited, and do not appear to be a significant limitation on development. Natural resources, such as wetlands, are not as predominant on Deer Island as they are on other harbor islands. While facility development will still be subject to the provisions of the Wetlands Protection Act (for coastal structures), Coastal Zone Management and Department of Environmental Management review, the substantive issues and concerns appear to be manageable.

VIII. Public Protection of Deer Island Properties

A. History of Deer Island

The historic/archaeologic report prepared as part of the Environmental Impact Statement indicates that the land now known as Deer Island was granted to the City of Boston in 1634 by the Crown. During the King Phillip's war, in 1676, a prison was constructed to hold captured Indians. This prison was apparently constructed of stone and mortar, and a portion of the original wall is reportedly still observable near the present prison facility.

In the eighteenth century parts of Deer Island were used for agricultural use, including wood gathering and grazing. Records indicate that profits from leases of the land from the city were used to support the Boston School, but that no land was sold by the city during this time. One history reports that a hotel was located on Deer Island in the early 1800's (William Tewksbury

Hotel, reported in Snow, The Islands of Boston Harbor, 1630-1971.) The Registry of Deeds, however, contains no deeds or leases from the City of Boston from 1800 to 1850 which would provide evidence of that use or structure.

In 1847, a smallpox hospital was established on Deer Island, primarily to quarantine large numbers of Irish immigrants with that disease. The history notes that many hundreds of unmarked graves could be found in the grounds surrounding the hospital.

Construction of a city almshouse began in 1849, and was completed in 1852. The poorhouse was used only until 1858, when the structure was used as a reformatory, run by the city. Reformatory use continued until 1896, when penal department reorganization designated the structure as the Deer Island House of Correction. Maps of the Boston Redevelopment Authority (BRA), useful in reconstructing building locations on Deer Island, indicate that the present correctional facility is located in the same area as the reformatory, and before that, the hospital.

Sewer facilities serving the City of Boston were originally constructed on Deer Island in 1879 near the present sewage facility location. The southeastern point of Deer Island contains Fort Dawes, constructed by the U.S. Department of Defense in 1941. This property, however, is now classified as surplus property, and is controlled by the General Services Administration (GSA). All records reviewed for this memorandum indicate that the City of Boston has owned all of Deer Island, except for Fort Dawes and the Metropolitan District Commission (MDC) parcels, since the seventeenth century.

B. Applicability of Article 97

Article 97 of the Massachusetts Constitution (amending Article 49 of the Constitution) provides that public land taken or acquired for conservation, scenic, historic or recreation purposes may not be used for other purposes or otherwise disposed of without a two-thirds vote of the legislature. Op. Atty Gen. April 12, 1976, 157. Mere use by the public of public lands for these enumerated uses is not sufficient to invoke the protection of Article 97, nor is governmental "dedication" of public land for those uses adequate. Newburyport Redevelopment Authority v. Commonwealth, 9 Mass. App. Ct. 206 (1980).

Reviewing the uses of Deer Island, only the hotel and recreation uses reported in the early 1800's raise the possibility of Article 97 application. However, because the City of Boston received the Deer Island property for purposes unrelated to the hotel uses, and in fact appears to have acquired all of Deer Island by royal grant, there is nothing to support the application of Article 97 to any portion of Deer Island owned by the City of Boston.

C. Applicability of the Prior Public Use Doctrine

The Prior Public Use Doctrine, a long-standing Massachusetts common law doctrine, states that public lands devoted to one public use cannot be diverted to another inconsistent public use without a majority vote of approval by the legislature. Robbins v. Department of Public Works, 335 Mass 328, 330 (1969). As the MDC considers a substantial expansion of sewage treatment facilities on Deer Island, it is important to identify which properties, if any, are subject to the jurisdiction of this Doctrine, possibly requiring legislative actions for facility expansion.

There are two questions to be answered in determining the Doctrine's applicability. First, what portions of Deer Island have been devoted to a prior public use? And second, is the construction of expanded sewage treatment facilities an "inconsistent" public use? We are asked to look at the applicability of the Doctrine to Parcels A, B and C, as shown on a plan entitled " Deer Island, Boston Harbor", City of Boston, Public Works Department, dated May 26, 1977.

Parcel A contains the Deer Island House of Correction, a 40 acre facility separated from the rest of the parcel by security fencing. Parcel B, an 18 acre parcel, is located along the southwest boundary of Parcel A, between the House of Corrections and the Mean Low Water line of Boston Harbor. Parcel C, a 6 acre parcel near the southerly end of Deer Island, is surrounded by the land now controlled by the General Services Administration. Our analysis looks at the subject property in two parts: the land contained within the Deer Island House of Correction, approximately 40 acres, and the balance of land in Parcels A ,B, and C outside the prison fence.

1. <u>Deer Island Correctional Facility</u>

The Deer Island Correctional Facility, also known as the Suffolk County House of Correction, is run by and is under the jurisdiction and control of the City of Boston Penal Institutions Department. The facility is contained within a fenced area, and consists of several buildings and related structures.

The first question posed is whether the 40 acre area within the prison fence is land subject to the jurisdiction of the Prior Public Use Doctrine, dedicated or devoted to a particular public use. In this instance, the land within the fence is used exclusively for prison purposes, and is apparently devoted to prison use. Further, according to Peter Scarpignato, Director of Planning and Development for the Boston Public Facilities Department, the land within the fence has been administratively charged to the care, custody and control of the Boston Penal Institutions Department, and is thus administratively dedicated to a particular public use. From these facts, it is not difficult to conclude that the area within the fence is subject to and entitled to the protection provided by the Prior Public Use Doctrine.

After determining that the land is subject to the jurisdiction of the Doctrine, however, one must still decide whether the proposed use would constitute an inconsistent public use, prohibited without the consent of the legislature. The question of inconsistency is one of fact, to be determined in consideration of the existing and proposed uses. Not all public uses may be considered to be inconsistent with each other. Further, the initial responsibility for the determination lies with the agency proposing the new use.

Because the integrity of the prison facility would be affected by any physical intrusion into the prison yard, diverting part or all of the prison facility inside the prison fence for sewage treatment expansion would fairly clearly constitute an inconsistent public use. The nature of secure correctional facilities would seem to support the conclusion that the present prison use would be adversely affected by the loss of prison space for another public use. Consequently, a proposal to construct additional treatment facilities involving physical encroachment into the active prison facility would require legislative approval. It is noted that none of the proposals for the construction of primary or secondary treatment facilities on Deer Island would involve the land inside the prison fence.

2. Land Outside the Correctional Facility

Information on the current ownership and administrative status of the balance of Parcels A, B and C has been provided by Peter Scarpignato and Paul Roche, counsel for the Boston Public Facilities Department. According to the Boston Public Facilities Department, the rest of Parcels A, B and C is under the care, custody and control of the Boston Penal Institutions Department, although the property outside the correctional facility is not actively used for any municipal purposes.

As described by Peter Scarpignato, land held by the City of Boston is often transferred to the care, custody and control of various municipal agencies and departments for particular public purposes, and is considered to be "devoted" to those purposes. These lands, however, can be cleared of such dedication by the controlling agency declaring the property to be surplus land. When such a declaration is made, the Boston Public Facilities Commission must approve that determination, whereupon the matter is referred to the City Council. The City Council may then approve the transfer of the parcel from the original agency to the Public Facilities Department, which holds the land as surplus property, and may dispose of the property by sale.

If we assume that all of Parcels A, B and C are under the care, custody and control of the Penal Institutions Department, an argument can be made that such land has been administratively dedicated or devoted to a public use (in this case, correctional use), and that the lands are subject to the protection of the Prior Public Use Doctrine. However, one might also argue that, notwithstanding the administrative jurisdiction into which public land has been placed, the Doctrine would not apply unless the land was actually used or developed for a particular public purpose. Some support may be found for this argument in Muir v. City of Leominster, __ Mass.App. ____, 317 N.E.2d 212 (1974), in which active use was required to invoke the Doctrine.

An application of the Doctrine as interpreted in Muir, supra, may discount the fact that the Penal Institutions Department has administrative charge of the open areas of Deer Island, and restrict the Doctrine's applicability to the active prison area. With respect to the issue of administrative jurisdiction, we note that the administrative assignment of the Deer Island property appears to bear no relationship to either the present use or future plans for the Penal Institutions Department. As described by Mr. Scarpignato, there are no present plans to use any of the land outside the prison fence for prison use, and there are no institutional or administrative purposes served by continuing to extend the Penal Institutions Department's authority beyond the prison fence. In Muir, the court required some existing functional use of property to invoke the applicability of the Prior Public Use Doctrine, and was not persuaded by the past public use of the parcel. Because the land outside the prison serves no function to the correctional facility, the MDC may determine that the Doctrine does not apply.

Even assuming the land is subject to the jurisdiction of the Doctrine, the Doctrine's protection would continue to apply unless or until (i) the land was transferred to the Public Facilities Department as surplus property, or (ii) it was determined that another proposed use (such as expanded sewage treatment facilities) was not inconsistent with the present public use. In Inhabitants of Easthampton v. County Commissioners of Hampshire, 154 Mass. 424 (1891), the court determined that the taking of a portion of a schoolyard for a town way was not so inconsistent as to require legislative approval, notwithstanding its finding that the taking would "injure the lot considerably." In a recent opinion of the Attorney General, 79 Op. Atty. Gen. 141 (Mass) January 11, 1979, the Attorney General concluded that the Massachusetts Port Authority's present use of Belle Isle Marsh as a "runway clear zone" (a passive use) was not inconsistent with the Metropolitan District Commission's (MDC's) proposed use of the same land for conservation and passive recreation uses, notwithstanding the fact that the Port Authority might have used the land in the future for runway expansion. (The Attorney General noted, however, that state environmental regulations would have effectively prohibited such development of the property involving the alteration of the wetlands). The opinion referred to an 1898 Massachusetts decision, stating:

> The question whether such interference or inconsistency would arise is not to be settled with reference to every possible manner in which the land might be used for the purpose for which it had been acquired, but with a reasonable regard to the way in which it would naturally and reasonably be used in putting it to that purpose. Boston v. Inhabitants of Brookline, 156 Mass. at 176 (1898).
>
> Id.

From these opinions, one may reasonably conclude that no inconsistency would arise between the present use of the city's property (outside the prison fence) and the proposed treatment facility. Even assuming that the Prior Public Use Doctrine applies, a new treatment facility would not affect the existing passive "use", and would only limit speculative future uses of the land.

D. Protection Afforded by the Doctrine

If the protection of the Prior Public Use Doctrine is triggered, the Doctrine requires approval by a majority vote of the legislature. Op. Atty. Gen. April 12, 1976, 159. The legislation authorizing the diversion in use must explicitly identify the land to be taken, the existing public use and the new use. Brookline v. Metropolitan District Commission, 357 Mass. 435, 440-41 (1970).

E. <u>Applicability of M.G.L. c.114 §17E</u>

The historical survey indicates that Deer Island contains one known cemetery, which was connected with the prison, and may date back to the smallpox quarantine hospital. A second cemetery, located near Fort Dawes, was relocated to an area off Deer Island during construction of the military facilities. The existence of this cemetery raises the potential applicability of M.G.L. c.114. that statute provides as follows:

> A town shall not alienate or appropriate to any other use than that of a burial ground, any tract of land which has been for more than one hundred years used as a burial place; <u>and no portion of such burial ground shall be taken for public use without special authority from the general court</u>. "Burial place", as referred to in this section, shall include unmarked burial grounds known or suspected to contain the remains of one or more American Indian. (emphasis added).

Thus, legislative approval would be required for the MDC's taking of any portion of Deer Island which constitutes a "burial ground." Although the exact location of all graves are not known, preliminary research has placed the graves in an area near the prison. The cemetery is more than 100 years old and would thus be subject to the legislative approval requirement. The M.G.L. c.114 §17 requirement is considered to be a legislative confirmation of the Prior Public Use Doctrine, requiring a majority vote of approval by the legislature. Op. Atty Gen. June 6, 1973, p. 139. However, should the MDC determine that it can avoid use of any "burial ground," no legislative approval would be necessary. Based upon the proposed plans for sewage facility construction, it appears that no burial grounds would be used for project development.

Although no evidence of other human remains has been found during past work on Deer Island, there is some possibility that other human remains may be discovered in the course of construction. Random burials of persons may constitute "burial grounds" within the above statute, and bring other areas of Deer Island within the scope of the statute. In interpreting the definition of "burial ground" under the statute, the case of Town of Sudbury v. Dept. of Public Utilities, 351 Mass. 214 (1966), should be noted. In Sudbury the Department of Public Utilities (DPU) concluded after a hearing that the remains of one human being (in this case, an American Indian) and the possibility of others scattered throughout the area were not, in its opinion, a basis for designating the land as a burial ground with the statute. Id. at 226. The Sudbury court affirmed the DPU's finding on the basis that the statute, at the time consisting of only the first sentence of the present version, "plainly refers to a tract of land definable and readily identifiable as a burying ground." Thus, the existence of randomly buried American Indians was held to fall outside the coverage of the statute.

The Sudbury case apparently was the impetus for the 1983 amendment to the statute, which added the definition of "burial place." Read literally, that definition states only that areas containing the remains of one or more American Indians shall fall within the ambit of the statute. The amended statute therefore serves only to alter the narrow Sudbury holding, since neither the amended statute nor case law defines whether the remains of one or more randomly buried non-American Indians, constitute a burial ground under the statute. Consequently, it is not clear whether the statute as amended would create any stronger presumption that any random burial sites which may be found on Deer Island are entitled to the protection afforded by the law.

The effect of M.G.L. c.114 §17 on plans for facility development appear to be limited because the known cemetery location does not conflict with the proposed facility site. However, should several skeletal remains be discovered, presenting evidence of a burial ground, further legislative action may be required.

F. Comparison to Long Island Issues

In the research memorandum covering the potential development of Long Island, the analysis was separated into a discussion of those issues applicable to site acquisition, and those issues which may affect subsequent facility development. This memorandum has addressed only the legal and institutional issues raised in site acquisition. However, in providing some comparative analysis of the legal and administrative hurdles affecting the implementability of each site, it is necessary to briefly mention non-acquisition issues as they relate to Deer Island.

Many issues and potential problems discussed in this memorandum are also relevant to the consideration of sewage treatment facility expansion on Long Island. Although neither island appears to contain parcels which have been taken or acquired for purposes triggering the applicability of Article 97, both islands contain land dedicated or devoted to a prior public use. In the case of Long Island, the entire island has been administratively placed under the care, custody and control of the city Department of Public Health and Hospitals. Since hospital relocation is a pre-requisite to siting the secondary waste water treatment facilities currently under consideration on Long island, legislative approval will probably be required. On Deer Island, all city-owned land is under the care, custody and control of the Penal Institutions Department. However, it should be noted that the current prison use on Deer Island may provide support for an argument that sewage treatment use of land outside the prison fence is not inconsistent with prison use. As such, legislative approval may not be required.

Both islands are known to contain cemeteries more than one hundred years old, which are subject to the protection of M.G.L. c.114 §17. On Deer Island, the only known cemetery has been generally located, and does not appear to interfere with the proposed location of sewage treatment facilities. On Long Island, however, there is both a known Civil War cemetery occupying land affected by the facility proposal, and also large areas near the hospital buildings and elsewhere on the island which may contain a significant number of unmarked graves and may constitute a "burial ground" as that term is defined by the law.

In addition to the factors affecting the acquisition of development sites, there are several implementation-related issues to consider. Historic and archaeologic resources may be found on both islands. Because of Long Island's significant archaeologic value and the possible eligibility of the Long Island Hospital, including grounds, for Historic Register listing, the Long Island site may be subject to administrative delays under the state and federal Historic Preservation Acts. Assuming that these resources justify eligibility under the National Historic Preservation Act, section 106 of that Act would require consideration of alternative sites to avoid impacts. In contrast, the Deer Island site contains only one structure, an abandoned pump station, which may be eligible as a historic structure, although its historic integrity is limited. Deer Island is also less likely to present significant administrative delay because of its limited historic or archaeologic values.

Massachusetts General Law chapter 9 section 27C, the Unmarked Skeletal Remains statute, has potential applicability to both proposed sites. The law requires that all excavation and earth moving cease once skeletal remains greater than 100 years old are found to allow the State archaeologist to conduct a site evaluation, and to determine whether prudent and feasible alternatives exist to avoid, minimize or mitigate harm to the burial site. The Ritchie study indicates that almost all of Deer Island has been disturbed by major construction there in the past one hundred years, and that discovery of additional remains is unlikely. Long Island, however, contains several areas which may not have been disturbed by construction activity, and which may contain significant American Indian remains. Based on this information, it is more likely major construction on Long Island will encounter delays caused by M.G.L. c.9 §27C.

The location of environmental resources, such as inland and coastal wetlands, and barrier beaches, will affect the specific siting proposals on both islands. To avoid administrative requirements imposed by state and federal regulations protecting wetlands and land subject to flooding, the facility siting proposals should minimize effects on these wetland areas.

IV. Prisoner Rights Impacts

We have also been requested to determine whether the proposed expansion of sewage treatment facilities would be affected by any outstanding court orders regarding the Deer Island House of Correction. Specifically a question has been raised with respect to the possible existence of a judicial order which would prohibit any reduction of the size of the Deer Island House of Corrections, or otherwise prohibit the expansion of a sewage treatment facility on Deer Island.

In researching this matter, we have interviewed Diane McLaughlin, of the Massachusetts Correctional Legal Services Office, Mary Prosser, Director of the Deer Island Legal Services Office, and John Larivee, of the Crime and Justice Foundation, who served as Special Court Appointed Master in the recent Massachusetts case concerning prison conditions at Deer Island. We have also reviewed the Department of Environmental Quality Engineering (DEQE) inspection reports for Deer Island, provided to us by Ms. McLaughlin.

We are informed that over the past several years the operations of the existing sewage treatment facility on Deer Island have caused a number of environmental problems at the

House of Correction, including smoke, odor, and other air pollution problems. Because of the proximity of the diesel powered pumps at the sewage facility, smoke and oil-laden diesel exhaust reaches the prison, reportedly causing respiratory problems. It was reported, but has not been confirmed, that perhaps one-third of all prisoners at the facility experience respiratory problems possibly related to the sewage facility emissions. In addition, there has been at least one incident of a significant chlorine gas leak at the sewage facility which required the evacuation of portions of the prison.

John Larivee stated that the Massachusetts Superior Court proceeding, Department of Corrections v. Penal Institutions Department of City of Boston and Public Facility Department, its Director and Members, C.A. 474-63 (Fine, J.) (April 30, 1981, June, 1984) was completed in July 1984, and that none of the orders issued by the Court addressed or affected the sewage treatment facility or related environmental conditions at Deer Island. He noted, however, that the judge in the case often commented during numerous on-site inspections that the existing operations of the sewage facility exacerbated the poor conditions in the House of Corrections.

Because the objectionable environmental impacts of the existing sewage treatment facility are related not to its size, but to its age and malfunction, it is generally believed by those we interviewed that an enlarged but modern sewage treatment facility would improve environmental conditions by eliminating the diesel smoke problems. None of those interviewed anticipated any adverse impacts caused by a large treatment facility, unless the expansion would affect prison crowding or conditions inside the fenced area. Neither of these are proposed by the present plans; further, both the U.S. Environmental Protection Agency and the MDC view relocation of prison as desirable.

V. Conclusion

Unlike Long Island, only restricted portions of Deer Island appear to be subject to the jurisdiction and protection of the Massachusetts Prior Public Use Doctrine, and the provisions of M.G.L. c.114 §17. A strong argument may be made that legislative approval will be required only if the active prison facility and nearby cemetery must be acquired for sewage treatment facility construction. This memorandum has suggested that, notwithstanding Boston Penal Institutions Department control over all municipal lands on Deer Island, the land outside the prison has no function requiring protection, or, alternatively, the proposed development would not be inconsistent with the land's current use. Administrative transfer of the property has also been suggested as a means for avoiding the necessity of legislative action.

Available information suggests that there is little possibility that sewage facility expansion would be affected by "prisoner rights" claims, provided that non-construction environmental conditions (smoke, noise, odor) are made better, and that prison facilities are not made smaller. It is expected that short term impacts from construction activities will occur.

12.12 SDEIS Screening Report

BOSTON HARBOR

SUPPLEMENTAL DRAFT

ENVIRONMENTAL IMPACT STATEMENT

REPORT OF FINAL SCREENING RESULTS

Prepared for:

U.S. Environmental Protection Agency
Region I
Environmental Evaluation Section
John F. Kennedy Federal Building
Boston, Massachusetts 02203

May 16, 1984

Prepared by:

CE MAGUIRE, INC.
Architects • Engineers • Planners
One Davol Square, Providence, Rhode Island 02903
THE MAGUIRE GROUP

TABLE OF CONTENTS

1.0 SUMMARY OF CONCLUSIONS

This report defines the process followed in the first phase of the Supplemental Draft EIS (SDEIS) analysis by which eighteen siting options for wastewater treatment facilities to serve the Boston metropolitan area were screened to select the eight most feasible for further detailed study.

These eight alternatives include four primary treatment and four secondary treatment options. Siting of major treatment facilities are proposed either at Deer Island (DI), Nut Island (NI) or Long Island (LI) in varying combinations as follows:

Secondary Treatment (with harbor outfalls)

Option No.	
1a.2	Secondary Treatment at DI, Headworks at NI.
1b.2	Secondary Treatment at DI, Primary Treatment at NI.
2b.1.	Secondary Treatment at LI, Headworks at DI and NI.
2b.3.	Secondary Treatment at LI, Primary Treatment at DI, Headworks at NI.

Primary Treatment (with extended outfall)*

Option No.

4a.2. Primary Treatment at DI, Headworks at NI.

4b.2. Primary Treatment at DI, Primary Treatment at NI.

5a.2. Primary Treatment at DI, Primary Treatment at LI, Headworks at NI.

5b.2. Primary Treatment at LI, Headworks at DI and NI.

These alternatives were selected on the basis of an analysis of social, technical, economic, environmental, political, legal, and institutional impacts with input from those involved in the public participation process and comment by federal, state and local agencies.

The most important criteria used in determining the feasibility and suitability of options were:

1. Engineering feasibility and economic cost.

2. Environmental impacts as they affect the people living and working in the communities impacted by the construction and operation of the proposed facilities.

*Extended outfall with primary treatment is the stated preference of the Massachusetts Executive Office of Environmental Affairs and is the alternative submitted by the MDC under the federal review of a waiver from secondary treatment.

3. Site suitability, including size and accessibility, and the availability of buffer areas.

4. Potential for consolidation of treatment facilities to limit impacts, provide centralized construction and operations, and facilitate sludge disposal.

5. Opportunities for mitigation of adverse impacts.

The following sections address the background studies leading to this SDEIS analysis, the objectives and scope of the analysis, formulation of the initial set of options, evaluation of the options, and detailed descriptions of the findings under each option.

2.0 BACKGROUND

2.1 Previous Wastewater Studies

The SDEIS study now underway will supplement a prior EPA Draft EIS (DEIS) completed in 1978 and titled Draft Environmental Impact Statement on the Upgrading of the Boston Metropolitan Area Sewerage System. The DEIS examined a variety of wastewater management proposals presented by the Metropolitan District Commission (MDC) in the report, Wastewater Engineering and Management Plan for Boston Harbor - Eastern Massachusetts Metropolitan Area (EMMA Study) completed in 1976.

The principal recommendations of the EMMA Study report were:

1. To upgrade the existing Deer Island and Nut Island treatment plants from primary to secondary treatment.

2. To dispose of sludge by means of incineration, as recommended in a separate report prepared for the MDC in 1973 entitled A Plan for Sludge Management.

3. To alleviate combined sewer overflows (CSO).

4. Construction of two advanced waste treatment plants on the Charles and Neponset Rivers.

5. Extension and improvement of the MDC's interceptor system.

After analysis and assessment of the impacts of the MDC's proposals, the Draft EIS (1978) concluded that some elements of the EMMA Study (1976) were not suitable. The Recommended Draft EIS (1978) Plan included:

1. Centralized secondary treatment of all wastewater flows at a new facility on Deer Island with discharge to Boston Harbor.

2. Sludge disposal of primary sludge by incineration and ash landfilling at Deer Island (as recommended by EPA in a separate Final EIS on primary sludge disposal completed in 1979).

3. Sludge disposal of secondary sludge by a combination of incineration at Deer Island, landfilling at an unspecified MDC landfill, and composting at Squantum in Quincy.

4. Upgrade of the existing interceptor sewer systems for the northern and southern Metropolitan Sewer District (MSD) areas to provide for expansion of the MDC system.

5. No construction of satellite advanced waste treatment plants discharging to tributary rivers at inland sites.

6. No specific proposals for alleviating CSO problems; separate CSO plans beyond the scope of the Draft EIS (1978) were being formulated and reviewed by the State and EPA.

The recommendations of the Draft EIS (1978) were controversial and drew considerable public comment. Also, changes to the federal Clean Water Act occurred at that time which included provisions for waivers from secondary treatment levels (§301(h) waiver).

As a result of these events, EPA and the MDC reached agreement that detailed facilities planning should proceed on the upgrading of the wastewater treatment facilities in a flexible segmented fashion in order to accelerate actions needed to remedy the chronic problems and immediate upgrade needs of the MDC wastewater treatment plants and still provide for sequential decision making on an overall program for Harbor cleanup.

Meanwhile, the MDC began work on a 301(h) waiver application for its proposed harbor treatment plant(s). This entailed an extensive analysis of water quality in Boston Harbor and designation of an extended effluent discharge location approximately seven miles into the ocean. An assessment of further wastewater treatment alternatives was also undertaken by the MDC in development of their facilities plans.

First-phase recommendations were presented in the Nut Island Wastewater Treatment Plant Facilities Planning Project, Phase I

Site Options Study, June 1982. This plan, referred to hereafter as the Site Options Study (1982), was prepared by Metcalf & Eddy, Inc. consultants to the MDC. It concluded that upgrading to primary treatment at both Deer Island and Nut Island with discharge via harbor outfalls was both environmentally sound and economically preferable.

2.2 Previous Sludge Studies

EPA undertook a separate Draft and Final Sludge Management EIS which was concluded in 1979. This document provided an environmental evaluation of the MDC's proposals for sludge disposal and concluded that incineration at Deer Island was the most cost-effective and environmentally acceptable sludge disposal method. EPA issued a Record of Decision on sludge management in 1980. The Record of Decision directed the MDC to continue environmental evaluation of incineration, as well as to examine further the feasibility of composting for the MDC system. This included EPA's funding of a pilot composting facility located at Deer Island. MDC then issued a Sludge Management Update (1982) report to address these issues. Study of sludge management options continued by MDC and the State, focusing primarily on alternate disposal methods of composting, incineration, and ocean disposal.

A state policy on sludge management has recently been formulated. It states that the preferred disposal method is composting, with ocean disposal and incineration as possible back-up methods. The

SDEIS will review the three options under study to determine their influence on siting of harbor treatment facilities and any associated impacts resulting from sludge disposal facilities. EPA has not, as yet, reached a final decision on those issues remaining following the Record of Decision on sludge disposal and expects to conclude this review jointly with the State following development of sludge disposal facility plans.

2.3 Legal and Institutional Background

While these studies were under way, a series of legal actions and State initiatives were instituted to improve water quality and coordinate State, Federal, and local facility planning efforts. The City of Quincy instituted a lawsuit against the MDC because of pollution of Quincy Bay by the Nut Island treatment plant. The Conservation Law Foundation instituted a separate lawsuit, also aimed at addressing the problems of pollution in Boston Harbor, against EPA, MDC and the Massachusetts Division of Water Pollution Control (DWPC) for alleged deficiencies in administrative and regulatory reviews required of these agencies. This legal suit is still pending.

The State court under the Quincy lawsuit appointed a Special Master to establish the facts in this suit. Following submission of his Findings of Fact in the case, the Court issued a ruling outlining a 10-year plan to clean up the harbor. The schedule for completion of the SDEIS conforms with this plan.

Also, an independent advisory committee, known as the Boston Harbor Water Quality Committee (or Sargent Committee), was appointed by Governor Dukakis to examine programs and plans to improve water quality in Boston Harbor and to make recommendations to the Governor on the overall clean-up of the harbor.

In further actions, on June 8, 1983, EPA issued a <u>tentative decision</u> denying the MDC's application for a waiver from secondary treatment requirements. This tentative finding was issued because of expected water quality and marine life impacts at the proposed outfall locations. The MDC has formally stated to EPA that it will reexamine those water quality impacts which led to a denial, and resubmit the application to EPA within one year. A final decision by EPA on the MDC Waiver Application will be made by March 1985.

Concurrent with these events, the preparation of a SDEIS and Final EIS conforms with the overall schedule established by the Court. This schedule coordinates the various facilities planning elements which are being developed by federal, state and local parties. The SDEIS will be prepared and a draft copy reviewed during August of 1984. A final copy of the SDEIS will be distributed in October and a Public Hearing scheduled sometime that month or the next. Once all comments have been received following the close of the comment period, a Final EIS will be prepared and distributed in January of 1985. A Record of Decision by EPA on siting of wastewater treatment plants will consolidate the question of level of treatment and siting preference and is expected to be issued in March of 1985.

3.0 REPORT OBJECTIVES

The SDEIS being prepared will enable EPA to provide funds for facilities proposed for the MDC System in Boston Harbor. The objectives of this report are to clearly define the first-phase screening process of the SDEIS by which the numerous siting options for wastewater treatment facilities to serve the Boston metropolitan area were narrowed to those judged to be most feasible. The report describes the steps followed in the analytical process leading to a determination of the most feasible options which will be subject to further detailed study. Supporting criteria and data utilized to reach these conclusions are presented.

The results of this screening process are a final set of eight siting alternatives for further study, whose impacts will be analyzed in greater detail in the second phase of the SDEIS analysis. This set of eight options was derived from an initial listing of eighteen siting alternatives which were proposed at both coastal and inland sites.

4.0 SCOPE OF THE ANALYSIS

Data from existing studies was used to perform the preliminary screening of all reasonable alternatives for the SDEIS. The principal sources used were:

- EPA Draft Environmental Impact Statement on the Upgrading of the Boston Metropolitan Area Sewerage System (August 1978).

- MDC Nut Island Wastewater Treatment Plant Facilities Planning Project, Phase 1, Site Options Study (Metcalf & Eddy, June, 1982) [Site Options Study].

- MDC Wastewater Engineering and Management Plan for Boston Harbor - Eastern Massachusetts Metropolitan Area (Metcalf & Eddy, 1976) [EMMA Study].

- MDC Application for Modification of Secondary Treatment Requirements for Its Deer Island and Nut Island Effluent Discharges into Marine Waters (Metcalf & Eddy, 1979 and 1983) [reapplication due in June 1984].

- MDC Wastewater Sludge Management Update (Havens & Emerson, 1982).

- MDC Deer Island Facilities Plan, Vol. I, Fast-Track Improvements (Havens & Emerson/Parson Brinckerhoff, January 1984).

Most of the data came from the MDC Site Options Study (1982). This data was updated and refined where applicable, and all previous cost figures were updated to an ENR of 4200. Meetings and discussions were also held with representatives of a variety of governmental and private organizations to obtain current information and copies of work in progress. These additional sources included:

- Metropolitan District Commission
- Executive Office of Environmental Affairs
- Department of Environmental Quality Engineering
- Division of Water Pollution Control
- Department of Environmental Management
- Coastal Zone Management Office
- Metcalf & Eddy, Inc. (Consultants to the MDC for Nut Island Facility Plan and 301(h) waiver application)
- Havens & Emerson/Parsons Brinkerhoff (Consultants to the MDC for Deer Island Facility Plan)

In addition to the above named sources, further analysis, data manipulation, and collection of new data was carried out during this first phase of the SDEIS. This was done because in some cases existing information was out of date or inapplicable to the current evaluation of options; in other cases, new options not previously examined, such as man-made islands in Boston Harbor, satellite treatment facilities discharging to wetlands, and primary treatment on Long Island, were identifed for evaluation. The process was structured to use existing data where available and new data where necessary to select an optimal set of alternatives for further detailed study based on the application of defined screening criteria.

The assessment undertaken was comparative in nature. The screening process enabled EPA to determine an optimal set of alternatives for further detailed study. The wastewater treatment facility options were examined for a determination of which options warranted further detailed study in the SDEIS. This was based on the application of the defined screening criteria, as noted above, and through the conduct of an evaluation of each option across several impact categories.

The information that was compiled in this screening process has been summarized and presented in a condensed matrix shown in this report (Attachment 1). The matrix summarizes the options and their impacts with data reported in the matrix referenced by its source. Where data gaps or inconsistencies exist, this is noted in the matrix. A copy of the full matrix is available upon request from EPA.

5.0 FORMULATION OF INITIAL OPTIONS

5.1 Introduction

This Supplemental Draft EIS (SDEIS) in large part constitutes an environmental impact analysis of the facilities proposed in the MDC's Site Options Study (1982). This facility plan evaluated eleven options for siting primary or secondary wastewater treatment facilities in Boston Harbor. The siting options evaluated in this facilities plan provided the initial definition and basis for options to be examined in the SDEIS.

At the outset of the SDEIS analysis, a series of public scoping meetings was conducted to solicit input from citizens groups and the public at large, plus federal, state and local agencies. Comments were received on the various site options proposed and on the critical issues which should constitute the primary basis for an evaluation of impacts. As a result of those scoping meetings, the following additional options were considered for evaluation:

1. Primary or secondary wastewater treatment facilities constructed on a new man-made island in Broad Sound (near the Brewsters or Lovells Island).

2. Consolidated primary and/or secondary wastewater treatment facilities sited on Long Island.

3. Separate primary wastewater treatment facilities sited on Long Island and Deer Island.

4. Sub-regional "satellite" facilities based upon recommendations previously presented in the MDC EMMA Study (1976) and the EPA Draft EIS (1978).

5. A proposal for satellite facilities, recently developed by the Quincy Shores Association Inc., with discharge into wetlands for effluent polishing and groundwater recharge.

The complete list of prior and new alternatives determined to be most appropriate for analysis in this first phase screening process are described in the following section.

5.2 Secondary Treatment Alternatives

5.2.1 Deer Island - Nut Island Treatment Facilities

a. Convert Nut Island to a headworks and construct secondary treatment facilities (either separate or combined system flows) at Deer Island; inter-island transport of effluent via tunnel.

b. Construct upgraded primary treatment at Nut Island and construct secondary treatment facilities (either separate or combined system flows) at Deer Island; inter-island transport of effluent via tunnel.

c. Separate secondary treatment facilities at Nut Island and Deer Island.

d. Satellite AWT treatment facilities on the Neponset River, Charles River, or other locations in association with one of the above options.

5.2.2 Nut Island - Deer Island - Long Island Treatment Facilities

a. Construct secondary treatment facilities (for north system flows) on Deer Island and secondary treatment facilities (for south system flows) on Long Island with preliminary treatment (either headworks or primary) facilities on Nut Island; inter-island transport of effluent via tunnel.

b. Construct secondary treatment facilities on Long Island for combined system flows with preliminary treatment facilities (either headworks or primary) on Deer Island and Nut Island; inter-island transport of effluent via tunnels.

c. Satellite AWT treatment facilities as noted above.

5.2.3 New Island Option

a. Construct a new island site for secondary treatment facilities in an appropriate outer harbor location.

5.3 Primary Treatment Alternatives

5.3.1 Deer Island - Nut Island Treatment Facilities

a. Construct combined primary treatment facilities at Deer Island with a headworks at Nut Island (and either a harbor or extended outfall); inter-island transport of effluent via tunnel.

b. Construct separate primary treatment facilities on Deer Island and Nut Island (and either separate harbor outfall or combined extended outfall).

5.3.2 Deer Island - Nut Island - Long Island Treatment Facilities

a. Construct separate primary treatment facilities at Deer Island (for north system flows) and Long Island (for south system flows) with headworks on Nut Island.

b. Construct combined primary treatment facilities on Long Island (with extended outfall) with pump station on Deer

Island and Headworks on Nut Island; inter-island transport of effluent via tunnels.

6.0 EVALUATION OF THE OPTIONS

6.1 The Matrix of Findings

A matrix was developed to compare all options on the basis of a specified list of impacts*. The impacts were defined in seven categories--social, technical, environmental, economic, political, legal, and institutional ("STEEPLI"). These formed the matrix rows while the options formed the columns. Within each impact category, several sub-categories were defined (see Attachment 2). The expected impact of each alternative was then noted in the appropriate cell of the matrix. For each impact and option, data was displayed either numerically or entered as a written description. The configurations of the various levels of treatment are displayed graphically in the matrix to show either headworks, primary or secondary treatment facilities.

6.2 Screening Criteria

The next step in the screening process was to develop a basis for elimination and/or consolidation of the options. A set of screening criteria was developed with input from both the CAC (Citizens Advisory Committee) and the TAG (Technical Advisory Group) participating on the project.

*Satellite treatment facilities are an adjunct to harbor treatment sites and are evaluated in a separate technical report (Appendix B) to this report.

ATTACHMENT 2

Impact Categories and Sub-Categories (STEEPLI)

<u>Social/Community</u>

Construction impacts
Traffic and safety
Noise/air quality/odor
Property value
Land use
Social consequence

<u>Technical</u>

Level of treatment and acres required: Nut, Deer, Long, and other islands

Average and peak daily flows and level of treatment in design year: north, south and combined systems

Construction period

System operation during construction

Energy requirements

Long-term viability and opportunity for expansion/upgrade

Relationship to other facilities' plans (including immediate upgrade of system)

Sub-regional systems and their relationship to harbor treatment facilities

<u>Economic</u>

Capital cost
Operation and maintenance costs
Present worth/annualized costs
Local share (by town)
User charges (per capita/family)
Affordability
Employment and wages
Secondary economic benefits

Environmental

Water quality standards
Recreational resources and visual quality (regional)
Fisheries
Habitats
Air quality/health
Other natural resources

Political

Federal:
- EPA EIS
- EPA 301(h)
- Army Corps of Engineers
- Other agencies

State:
- MEPA
- MDC
- DEQE/DWPC
- CZM
- Other agencies
- Legislature
- Governor
- Boston Harbor Water Quality Committee (Sargent Comm.)

Local:
- City of Boston/Suffolk County
- City of Winthrop
- Town of Quincy
- Other MDC member communities

Other:
- CACs
- Houghs Neck and other Quincy residents
- Point Shirley and other Winthrop residents
- Quincy Shores Association

Legal

Permits required
Statutory requirements/limits
Compliance with court actions

Institutional

Institutions involved/affected
Policies
Management of facilities
Other planning elements
Site ownership and acquisition

The CAC was asked to comment on the importance and relative weight of each of the "STEEPLI" impacts. They ranked the categories in the following order of importance: social, environmental, technical, institutional, economic, political, and legal. Within each category, the sub-categories considered significant to the siting process were identified as follows:

- <u>Social</u> - construction activities, odor, property values, and land use;

- <u>Environmental</u> - water quality, marine life, air quality, fisheries, and wildlife;

- <u>Technical</u> - engineering feasibility, land availability, infiltration/inflow impacts; and

- <u>Institutional</u> - future planning, and growth/expansion of system.

A Public Workshop was also held to solicit comment from the general public. The workshop audience placed a greater relative importance on economic impacts (cost of alternatives) than did the CAC, but in other areas expressed priorities and concerns comparable to those of the CAC.

The TAG was also consulted for agency views on the alternatives. A questionnaire was used to identify TAG preferences for final alternatives. The majority of responses indicated a clear preference of TAG members for use of the Deer and Nut Island sites with various combinations of wastewater treatment. A minority of responses indicated that Long Island options should be studied further. No support was received for the outer harbor options. The factors most cited in support of these conclusions were costs, continuation of established land uses, environmental impacts, and management advantages of consolidating facilities.

Upon review of the data developed, as arrayed in the matrix, and with consideration of comments from those participating in the EIS process, EPA and its consultants then determined which of the impact categories in the "STEEPLI" matrix were most critical to the screening process. These impacts, along with three other factors mentioned below, became the basis for the final screening. The principal impact categories that were applied to the screening process which distinguished the more feasible options were:

1. <u>Technical</u>: site suitability, including adequate land area and appropriate buffer; access; and engineering feasibility.

2. <u>Engineering</u>: consolidation of major treatment facilities in the harbor to take advantage of centralized construction and operation activities; reduced operation and maintenance requirements; and consolidation of sludge handling and disposal.

3. Social: reducing construction and operations impacts on abutting residential neighborhoods, primarily as a result of increased traffic, duration of construction, and associated disruption; opportunities to apply mitigation measures to reduce adverse impacts.

4. Environmental: environmental effects of large-scale dredge and fill activities; recreational resources and visual quality impacts.

Economic impacts are also an important criteria in selection of a final recommended plan, but were shown during the screening process to be secondary to the above criteria. This was based on estimated annualized costs for all of the various site options within their respective treatment levels which were within 10% of each other (with the exception of the new island alternatives)*. Thus cost could not be used to select between alternatives at this stage of review.

In addition to the impact categories of the "STEEPLI" matrix, three other elements were factored into the screening criteria. These included:

*This narrow cost range is reflected in a comparison of the acceptable primary and secondary options, respectively. The range for primary treatment options with a harbor outfall (no longer considered acceptable) reflect a 25% cost range.

1. MDC's preferred primary and secondary options, as identified in the Site Options Study (1982), and the proposed option in the 301(h) waiver application included to address the recommendations of the grantee.

2. State policy regarding the location of the primary treatment outfalls which led to exclusion from further study of alternatives involving primary treatment with harbor outfalls.

3. Public comment on the preliminary screening recommendations circulated for review at meetings in Quincy and Winthrop.

Analysis of these options during this phase of the SDEIS was based on a comparison of the screening criteria, preliminary analysis of impacts, outfall policy considerations, and public comment to develop a discreet set of options for further study in the following phase of the SDEIS analysis.

6.3 Findings of the Screening Process

In screening the numerous options being considered for wastewater treatment facilities in Boston Harbor, several important elements associated with review of siting alternatives became clear. First, it was found that no alternative siting or treatment option is without potentially significant adverse impacts. Such impacts are associated with the effects of construction and operation activities upon nearby residential areas and the adjacent community at large, the effects upon the natural environment, cost of the proposed actions, and the potential incompatibility of wastewater treatment facilities with surrounding land uses.

It must be noted also that none of the options satisfied all of the screening evaluation criteria. The combination of the size and complexity of the proposed project, the difficulty of siting such facilities in an urban area such as Boston, and the past poor performance of existing facilities has limited the acceptability of every option to one or another constituent group and neighboring community. Nonetheless, the alternatives selected best represent viable and realistic choices for further study of the siting feasibility of major wastewater treatment facilities in Boston Harbor.

6.3.1 Options Recommended for Further Study

Options recommended for more detailed study were those which best met the established criteria, when compared to other alternatives recognizing that no alternatives could fully meet all the critieria. Options lacked sufficient analysis at this stage to determine their full impacts and were carried to allow such a more detailed analysis to be conducted in the next phase.

Briefly summarized, the eight alternatives to be studied will examine both primary and secondary treatment options located at either Deer Island, Nut Island, or Long Island. Under secondary treatment levels, two options (1a and 1b) consider secondary treatment at Deer Island with either headworks or primary treatment at Nut Island; one option (2b.1)proposes either headworks or pumping facilities at both Deer Island and Nut Island with consolidated treatment at Long Island; and one option (2b.3) would site primary treatment at Deer Island, secondary treatment at Long Island and headworks at Nut Island. For primary treatment levels, two options (4a.2 and 4b.2) consider primary treatment at Deer Island with either headworks or primary treatment at Nut Island; one option (5a.2) would site primary treatment at both Deer Island and Long Island and headworks at Nut Island, and one option (5b.2) proposes either headworks or pumping facilities at both Deer Island and Nut Island with consolidated treatment at Long Island. Two of these options noted above (1b and 4b.2) involving expansion at Nut Island were also retained because they were the preferred plans of the MDC. Section 7.0 discusses these options in detail.

In order to reach a final recommendation in the SDEIS, subsequent detailed analysis in the second phase of the work plan will examine in greater detail the benefits and adverse effects of facilities at each of the three sites: Deer Island (DI), Nut Island (NI) and Long Island (LI). Each siting option will also be evaluated with analysis of mitigation measures to eliminate or limit potential adverse impacts.

6.3.2 Alternatives Eliminated

This section sets forth the options that have been dropped and the major reasons for their elimination from further consideration (as specified by Federal CEQ guidelines S1502.14(a)). The following section of the report also discusses these options in detail.

Four options (4a.1, 4b.1, 5a.1 and 5b.1) which included primary treatment and harbor outfalls were eliminated because of likely adverse impacts on water quality and the stated policy of the Commonwealth of Massachusetts that the harbor outfalls will not be considered further under primary treatment levels.

Two options (3a and 3b) which provided for creation of man-made islands seaward of Boston Harbor were eliminated because of excessively high costs, and limited engineering and operational feasibility.

Three options (1c, 1a.2 and 2b.2) which provided for expansion of the Nut Island wastewater treatment facility to secondary level were dropped because of lack of land availability and general absence of buffer space between the site and nearby residential neighborhoods. These plans would also require the greatest degree of decentralized plant operations and maintenance and would have resulted in adverse impacts across the broadest area of the harbor and land based areas.

One option (2a.1) involving separate secondary treatment facilities on Deer Island and Long Island was also eliminated because it too resulted in scattered, multiple impacts and decentralized plant operations and maintenance.

Subregional treatment or "satellite" facilities have been dropped from further study at this stage of analysis, because the anticipated benefits of such facilities are insufficient to offset their significant costs, questionable benefits and uncertain environmental impacts. Negligible system flow reduction would result from such plants. This conclusion is further documented in Appendix B issued as a separate volume to this screening report.

7.0 DETAILED DESCRIPTION OF OPTIONS

7.1 Summary of Analysis Results

The following tables (Attachments 3 and 4) summarize the key impact findings and costs for the options considered. The impact categories listed reflect those identified as having the greatest significance, based on analysis and public comment, for the comparative screening phase. These results show those impact categories by option which are projected to have the greatest impacts and, in some cases, unacceptable impacts in comparison to other options available. The final eight options selected for further study cover a range of possible alternatives for treatment plant siting among those alternatives which appear must suitable based on the established criteria and impact comparisons.

In addition, Attachment 4a presents a summary of recently revised costs for the eight preferred options to be studied in detail. These revisions reflect more recent reviews of the facility costs and O&M costs for the preferred options carried out as part of the impact assessment analysis. This was carried out following selection of the preferred options and was based in part on further analysis and verification of the data developed in both the MDC Site Options Study (1982) and EPA Draft EIS (1978). As a result of these further reviews, the costs shown in Table 4a update those in Table 4. It should be noted, however, that these updated costs do not alter the prior screening conclusions since the relationship of

SUMMARY OF OPTIONS AND THEIR IMPACTS[1]

ATTACHMENT 3

	TECHNICAL IMPACTS					SOCIAL/COMMUNITY IMPACTS				ENVIRONMENTAL IMPACTS		ENGINEERING & ECONOMIC IMPACTS	
	Sites, Level of Treatment, and (Acreage Required)					Construction Period (yrs)			Construction Impacts				
Option No.	Nut Island (17ac.exist)	Deer Island (210ac.exist)	Long Island (213ac.exist)	Man-Made Island** (Outer Harbor)	On-site Land Availability and Buffers	DI	NI	LI/Other	construction workers /trucks/ operations staff	Environmental Impacts of Dredge & Fill	Recreational/Visual Impacts	Consolidation Benefits	Mitigation Opportunities
SECONDARY													
1a(1&2)[+]	■ (2)	●▬ (115)			Limited at DI	7	3-4		Major traffic and disruption (428/975/152)	NA	Improved at NI; impacts at DI	Maximum	Possible
1b(1&2)[+*]	● (18)	●▬ (115)			Limited at both sites	7	5		Major traffic and disruption (448/970/185)	Bay filling (1-3ac.)	Impacts at NI and DI	Minimum	Unlikely
1c	●▬ (36)	●▬ (104)			Limited at both sites	9±	9±		Severe traffic and disruption (335/920/230)	Bay filling (20ac.)	Max. adverse at NI; impacts at DI	None	Unlikely
2a.1	■ (2)	●▬ (104)	●▬ (36)		Limited at both sites	8	3-4	7	Severe traffic and disruption (413/1065/227)	NA	Improved at NI; impacts at DI and LI	None	Limited
2a.2	● (18)	●▬ (104)	▬ (21)		Limited at all 3 sites	8	5-6	7	Severe traffic and disruption (435/1060/210)	Bay filling (1-3ac.)	Adverse at NI, DI and LI	None	Unlikely
2b.1[+]	■ (2)	■ (2)	●▬ (115)		Limited at LI	5	3-4	8-9	Major traffic and disruption (456/1010/170)	NA	Improved at NI & DI; impacts at LI	Maximum	Limited
2b.2	● (18)	● (52)	▬ (68)		Limited at NI & LI	5	5-6	8	Severe traffic and disruption (490/1125/181)	Bay filling (1-3ac.)	Adverse at all sites	None	Unlikely
2b.3[+]	■ (2)	● (52)	●▬ (81)		Limited at LI	5	3-4	8	Major traffic and disruption (453/1010/170)	NA	Adverse at DI & LI; improved at NI	Moderate	Limited
3a/b**	■ (2)	■ (2)		●▬ (154)	Limited feasibility	5	3-4	14±	Moderate traffic and disruption	NA	Improved at DI & NI; adverse at site	Maximum	Unlikely
PRIMARY													
4a.1	■ (2)	● (62)			NA		NA		NA	Eliminate	NA	NA	NA
4a.2[+,D]	■ (2)	● (62)			Available	5-6	3-4		Major traffic and disruption (427/515/102)	NA	Improved at NI; impacts at DI	Maximum	Possible
4b.1*	● (18)	● (52)			NA		NA		NA	Same as 4a	NA	NA	NA
4b.2*[+,D]	● (18)	● (52)			Limited at NI	6±	5-6		Major traffic and disruption (378/450/135)	Bay filling (1-3ac.)	Adverse at all sites	None	Limited
5a.1	■ (2)	● (52)	● (18)		NA		NA		NA	Same as 4a	NA	NA	NA
5a.2[+,D]	■ (2)	● (52)	● (18)		Available	6	3-4	6	Major traffic and disruption (430/452/135)	NA	Impacts at DI & LI; improved at NI	None	Possible
5b.1	■ (2)	■ (2)	● (62)		NA		NA		NA	Same as 4a	NA	NA	NA
5b.2[+,D]	■ (2)	■ (2)	● (62)		Limited at LI	5	3-4	7	Major traffic and disruption (381/425/110)	NA	Improved at NI & DI; adverse at LI	Maximum	Limited

Source: CE Maguire, Inc. (May 16, 1984).

KEY: ■ = headworks/pumping only ● = primary treatment ▬ = secondary treatment

D = deep ocean outfall; NA = not applicable; + = preferred options for detailed study

* = MDC's preferred options

**a = alongside Lovells Island; b = alongside the Brewsters

*** = Based on estimates in MDC Site Options Study (1982)

**** = Assumes no barging during construction

shading = selected for further study

[1]Note that some values in this table reflect preliminary data, current at that time, which was the basis of the review of the 20 options shown above. This data was consistent across all the options, therefore it was adequate for the initial screening carried out at that time. Subsequent analysis of the eight options remaining updated and revised this data as reflected in the previous sections of this SDEIS.

ATTACHMENT 4

BOSTON HARBOR SDEIS: SUMMARY OF OPTIONS AND THEIR INITIAL COSTS[1]

Option No.	Nut Island	Deer Island	Long Island	Other Island**	Capital	O&M	Annualized Costs*** ($Millions)
	Sites, Level of Treatment, and (Acreage Required)				Costs in $Millions		
SECONDARY							
+ 1a (1&2)	■ (2)	● ▬ (115)			852.6	43.7	131.3
+ 1b (1&2)*	● (18)	● ▬ (115)			887.4	45.2	136.4
1c	● ▬ (36)	● ▬ (104)			884.4	43.4	134.3
2a.1	■ (2)	● ▬ (104)	● ▬ (36)		897.9	46.0	138.3
2a.2	● (18)	● ▬ (104)	▬ (21)		915.5	46.1	140.2
+ 2b.1	■ (2)	■ (2)	● ▬ (115)		998.5	43.7	145.4
2b.2	● (18)	● (52)	▬ (68)		1001.8	48.9	151.9
+ 2b.3	■ (2)	● (52)	● ▬ (81)		983.5	48.5	149.6
3a/b**	■ (2)	■ (2)		● ▬ (154)	1515.9/2037.6	42.9+	198.7/252.3
PRIMARY							
4a.1	■ (2)	● (62)			390.5	22.7	62.9
+ 4a.2	■ (2)	● (62)			759.6 D	21.1	99.2
4b.1*	● (18)	● (52)			374.0	22.6	61.1
+ 4b.2*	● (18)	● (52)			774.8 D	22.0	101.7
5a.1	■ (2)	● (52)	● (18)		436.2	22.3	67.2
+ 5a.2	■ (2)	● (52)	● (18)		792.5 D	21.7	103.2
5b.1	■ (2)	■ (2)	● (62)		536.5	22.1	77.3
+ 5b.2	■ (2)	■ (2)	● (62)		861.4 D	20.5	109.1

KEY: ■ = headworks only ● = primary treatment ▬ = secondary treatment

D = deep ocean outfall * = MDC's preferred options **a = alongside Lovells Island b = alongside Brewster Islands

*** = Assumes 8-1/8% interest rate over 20 years. = preferred options for detailed study

[1]Assumes all costs updated only from those developed in the MDC Site Options Study (1982); these costs for the eight options have been revised based on the detailed analysis done subsequent to this preliminary screening. Revised costs are discussed in Section 12.4 of the SDEIS.

costs between options has not significantly changed, and, as stated previously, costs were not a primary determinant in screening.

The following discussion describes in greater detail each of the options considered and explains the basis for its inclusion or exclusion in further SDEIS analysis. The preferred eight options are listed first, followed by the remaining options considered. For each option, the information is summarized by the major impact categories analyzed - technical, social/community, engineering and economic, and environmental - with specific data presented by subcategories determined to be most significant. Attachment 5 further summarize these findings and conclusions for all options. For the category of impacts dealing with traffic and construction activities, no assumptions regarding barging of materials or workers have been factored into the analysis at this stage. This will be addressed in the detailed impact analysis for the SDEIS.

7.2 Options Recommended for Further Study

7.2.1. Secondary Alternatives

1a.2. Secondary Treatment (Separate Waste Flows) at DI, Headworks at NI.

Technical: This option would convert the 17-acre Nut Island (NI) site owned by the MDC to a 2-acre headworks to screen and pump waste flows of the southern MSD to a consolidated secondary treatment

Attachment 5

SUMMARY OF COMPARATIVE SCREENING RESULTS

Option	Facility Siting NI	DI	LI	Other	Screening Comments
SECONDARY TREATMENT					
1a (1 & 2)	H	P/S			Recommended for further study; 1978 Draft EIS preferred option; improvements at NI; community benefits in Quincy; consolidation of facilities; increased impacts of DI; lowest cost.
1b (1 & 2)	P	P/S			Recommended for further study; preferred by MDC for secondary treatment; increased impacts at NI and in Quincy; higher costs; greater impacts at DI and in Winthrop.
1c	P/S	P/S			Major construction and operations impacts at NI and DI; legal and environmental impacts to filling of Quincy Bay; higher costs; major separate plants at both sites; no apparent advantages.
2a.1	H	P/S	P/S		Major construction and operations impacts at DI and LI; possible preclusion of other uses at both sites; conflict with prison and hospital; higher costs; dispersed facilities at three sites; does improve conditions at NI, but not to any greater degree than other less costly more advantageous options such as 1a, 1b, or 2b.
2a.2	P	P/S	S		Increased construction and operations impacts at NI with no appreciable advantages at DI or LI compared to prior choice; higher cost; major facilities at all sites; Options 1a, 1b, and 2b appear preferable.

Option	Facility Siting NI	DI	LI	Other	Screening Comments
2b.1	H	H	P/S		Recommended for further study; significant potential benefits at NI and DI; consolidation advantages; among the highest cost; greatest impacts at LI with possible preclusion of other present and future uses; adverse impacts likely to occur in Squantum/Quincy with possible mitigation opportunities to minimize traffic or other effects.
2b.2	P	P	S		Additional impacts at DI; from expanded facility size; increased NI and LI impacts; higher costs; no advantage over Option 2b.3.
2b.3	H	P	P/S		Recommended for further study; improved at NI; DI increase in facility size and potential impacts in nearby community; major new impacts at LI with possible preclusion of other uses and likely conflict with the hopsital; higher cost; most removed from nearby residential areas.
3	H	H		P/S	Highest potential impacts; highest costs; difficult and long construction; greatest operational difficulties; environmental impacts high; improvements at NI and DI not sufficient to offset impacts/costs; other options afford better balance and likely acceptable cost effectiveness.

Option	Facility Siting NI	DI	LI	Other	Screening Comments
PRIMARY TREATMENT					
4a.1	H	P (Harbor Outfalls)			Harbor outfalls not recommended based on State 301(h) reapplication preference; independence of outfall from siting decision.
4a.2	H	P (Extended Outfall)			Recommended for further study; improved conditions at NI with reduced impacts in Quincy; impact at DI in Winthrop; consolidated facilities; comparable costs considering long outfall.
4b.1	P	P (Harbor Outfalls)			Not considered as noted above; MDC's Site Options Study preferred option.
4b.2	P	P (Extended Outfall)			Recommended for further study; MDC's 301(h) preferred option; increased impacts at NI; increased impacts at DI; separate facilities with associated construction effects and staffing/maintenance requirements; higher costs; maintins present facility siting; no consolidation.
5a.1	H	P	P (Harbor Outfalls)		Not considered as noted above.
5a.2	H	P	P (Extended Outfall)		Recommended for further study; improved conditions at NI and on Houghs Neck; community impacts in Quincy and in Point Shirley/Winthrop area; impacts introduced to LI, however, minimal (18 acre) area required; possible conflict with recreational plans; higher costs; separate treatment facilities with potential for mitigation of adverse impacts.
5b.1	H	H	P (Harbor Outfalls)		Not considered as noted above.

Option	Facility Siting NI	DI	LI	Other	Screening Comments
5b.2	H	H	P	(Extended Outfall)	Recommended for further study; reduced impacts at NI and DI with major facilities removed from proximity to residential areas; greatest impacts at LI with preclusion of some land uses, and possible conflict with hospital; adverse impacts likely in Squantum/Quincy with possible mitigation opportunities for the optins; higher costs potential benefits at NI and DI.

facility on Deer Island (DI). In this option, some buffer area would be available on NI to better separate the proposed facility from abutting residences. The headworks facility would be located on the site of the present treatment plant in the vicinity of the existing administration building.

On DI, the 210-acre site under multiple ownership could accommodate a proposed secondary treatment plant encompassing about 115 acres. The present primary treatment plant covers about 26 acres. Most of the expanded facility construction on DI would occur towards the southern portion of the site which is vacant. Additional buffer areas on DI would be limited due to the short causeway leading to the site from nearby residential areas, and the close proximity of the Suffolk County/City of Boston prison just to the north of the existing treatment plant. Some encroachment of an expanded treatment plant on the prison could occur, although future consolidation of the prison would make available additional land for siting of treatment facilities.

Social/Community: During construction, impacts would occur at both Deer and Nut Islands and in the adjoining communities of Winthrop and Quincy. At NI, an average of about 13 workers and 35 trucks daily would travel to the site. Construction activities would last 3 to 4 years, and impacts would be limited to the site, with moderate additional traffic in Quincy and through Houghs Neck. During future operations of the headworks, a total staff of 20 would be maintained over three daily shifts. This option would improve conditions on the site through a reduced facility use and minimize impacts upon abutting residential uses in Hough's Neck and in Quincy.

At DI, the construction period would last about 7 years. Major impacts would result from the daily transportation of an average of 415 construction workers, and up to a peak of 940 truck trips per day through Winthrop (as well as through Boston and other neighboring communities). This estimate and those for all options assumes (at this stage of the preliminary analysis) that no barging activity or other mitigation to reduce the truck or auto traffic is employed. Operations staff at DI would increase to 230 persons from the 160 presently employed at the plant.

Engineering and Economic: This option would consolidate treatment at a single facility on DI, thereby affording benefits of centralized operations and maintenance. Sludge disposal would likewise be consolidated at a single site. Treatment facilities proposed in this option would be located at the site of an existing treatment plant, allowing possible reuse of certain components at the site.

Preliminary cost estimates for this option are among the lowest of the secondary treatment options. Construction costs are estimated to be \$852.6 million with operations and maintenance (O&M) costs at \$43.7 million. The annualized costs for debt service (20 years at 8-1/8%) and O&M are \$131.3 million.

Environmental: This option would impose no additional adverse impacts upon the use, water quality, or recreational resources of the Harbor beyond the limited, controlled period of its construction. Visual quality at DI would be impacted due to the expansion in the size and number of treatment works there. Access to and use of the site would remain limited by the security requirements of the prison on the island. Buffer zones and screening could be established at DI, however, the expanded size of the facility would make it visible from numerous locations on land and from water. At NI, a reduction in the size of the facility to a headworks would allow the introduction of plantings or earthwork which may improve present visual intrusion upon nearby residences. Noise and odor problems emanating from the present plant would be lessened. However, the small size of the island limits its potential as a site for new recreational areas or other uses of benefit to the community.

This option is recommended for further study based on its having sufficient area on DI to accommodate expanded treatment facilities, its utilization of existing treatment sites and the advantages of consolidation as noted above, and the improvements to the NI site.

1b.2. Secondary Treatment (Separate Waste Flows) at DI, Primary at NI

Technical: This option expands the present treatment facilities at both NI and DI. It is the preferred choice of the MDC for secondary treatment. The 17 acre NI site would be converted to a larger primary treatment plant requiring a total of approximately 18 acres, of which 1 to 3 acres would be filled land added to Quincy Bay Expansion at NI would necessitate utilizing the full extent of the site for expanded facilities, reducing the already limited separation between the treatment plant and abutting residences.

The 210-acre DI site could accommodate a secondary treatment plant of 115 acres. While there is sufficient area on DI to accommodate the expanded plant, there may be some encroachment onto the site of the existing prison facility. Expansion on DI would utilize most of the presently vacant land on the island.

Social/Community: During construction, major impacts would result at both DI and NI and in the adjacent communities of Winthrop and Quincy. At DI, construction would last 7 years with an average of 412 workers and up to 880 truck trips daily passing through Winthrop during peak activity. Operational staff required at DI would be 215 persons. At NI, construction would last for 5 years and would be significant with 36 workers and 40 truck trips daily at peak. Operations staff at NI would be 83 persons.

Engineering and Economic: This option maintains separate primary treatment facilities and consolidates secondary facilities at two locations in the harbor. As such, it does not fully consolidate operations or maintenance and sludge disposal requirements, although savings are achieved at the secondary level from centralization at

DI. Preliminary costs of this option are $887.4 million for construction, $45.2 million for O&M, and $136.4 million annualized cost.

Environmental: This option would pose added environmental and water quality impacts as a result of harbor filling needed to expand the present site at NI. Constraints would exist due to the state prohibitions against harbor filling. Visual quality would be altered significantly at NI from the enlarged and expanded facilities and total utilization of the site with closer proximity and greater scale of treatment works to abutting residences. No buffer zones or screening would be possible. At DI, this option would be comparable to option 1a.2.

As one of the MDC's preferred facility plan options, this option is recommended for further study.

2b.1. Secondary Treatment at LI, Headworks at DI and NI

Technical: This option would convert the existing 26-acre DI treatment plant to a pump station (2-acre) and the 17-acre NI treatment plant to a headworks (2-acre) to respectively pump and screen waste flows to a new consolidated secondary treatment plant of 115 acres on Long Island (LI). The total area of LI, which is owned by the City of Boston, is 213 acres.

A treatment plant could be accommodated on LI; however not without encroachment upon existing and proposed future uses there. The LI Hospital currently occupies about 26 acres in the central portion of the island, with the remaining areas of the island vacant. An abandoned Nike missle base is also situated in the central part of the site with a former U.S. defense installation, Fort Strong, and a lighthouse located at the northern head of the island. There is a causeway and bridge connecting LI to Moon Island and Quincy. The condition of the bridge will have to be investigated relative to its use by heavy construction traffic.

Social/Community: Impacts of this option during construction would be significant, involving an estimated total peak level of 428 workers and 975 truck trips daily traveling through Quincy to both LI and NI. The construction period at these sites would be 3 to 4 years at NI and 9 years at LI. These levels of construction activity would impose major adverse impacts upon the Squantum community and moderate impacts upon nearby residential areas of Houghs Neck. Conditions on-site at NI would be improved with improvements for abutting residences. During operations, total daily staffing levels over these shifts would be 20 persons at NI and 215 persons at LI.

At DI, construction activities would require 28 workers and 35 truck trips per day over a 4 to 5-year period. This would impose moderate traffic impacts on the community while it improved conditions on-site and for abutting residential areas. Operational staff at DI would be 40 persons over three daily shifts.

Engineering and Economics: This option consolidates all treatment at a new site on LI with smaller headworks and pumping facilities at NI and DI, respectively. This would afford benefits of centralized operations, maintenance and sludge disposal. Preliminary costs of this option entail $998.5 million for construction, $42.7 O&M, and $145.4 million annualized cost.

Environmental: Improvements and potential benefits would result on both DI and NI from reduction to pump station and headworks respectively of the present treatment facilities located there. On NI, this would be most beneficial to abutting residences in Houghs Neck (as noted in option 1a.2), while on DI the reduction of the present treatment plant to a pump station would lessen the visual impacts and odor and noise problems currently experienced by residents of Point Shirley in Winthrop. However, the continued operation of the prison on DI and size of the pump station would limit access to and use of the site. Buffer areas and screening could be established on both DI and NI.

On LI, there would be major impacts due to the potential conflict of treatment facilities with the existing hospital and proposed recreational use under the Boston Harbor Islands State Park plan. In addition, known historical and archaeological resources, including a cemetary, would be impacted by siting of a treatment facility. Visual impacts on LI and of views from Boston Harbor would be significant with a large facility as proposed.

This option is recommended for further study based on its potential for benefits at DI and NI from reduction of treatment facilities and the improvements to abutting residential areas in both communities. It would site major treatment facilities furthest away from residential areas. Impacts on LI involving the hospital use, recreation plans and open space, visual quality, and preclusion of other use potential on the island will be analyzed in greater detail.

2b.3 Secondary Treatment at LI, Primary Treatment at DI, Headworks at NI

Technical: This option would construct new primary treatment facilities for southern MSD flows and consolidated secondary treatment facilities at LI. The size of the treatment facilities at LI would be about 80 acres of the 213-acre island. NI would be converted to a headworks (2-acre). At DI, the present primary treatment plant of 26 acres would be expanded to double its size (52 acres) to accommodate an upgraded primary treatment plant for northern MSD flows as presently is treated.

Land area is available at all three sites to accommodate the proposed facilities. At all three sites, also, sufficient area exists to allow for buffer zones with possible screening provided although NI affords the least opportunity for buffer.

On DI, expanded facility construction would occur on the vacant portion of the site to the south; on LI, construction would be in the central portion of the island in the area of the abandoned Nike installation.

Social/Community: During construction, the average number of construction workers at peak would be 360 at LI, 13 at NI and 80 at DI. Truck traffic would involve about 535 vehicle trips through Quincy, mostly through the Squantum community, and 335 vehicle trips through Winthrop. Construction would last about three to four years on NI, four to five years at DI, and eight years at LI. Operational staff for these facilities would number 130 persons at LI, 12 persons at NI and 41 persons at DI over the three daily shifts.

Impacts from traffic would be greatest in this option on LI and in Squantum and through parts of Quincy leading to LI. Access over the LI bridge would require further investigation. Impact on DI would be significant from an expanded and larger sized primary treatment facility with traffic impacts through the neighboring community. On LI, there would also be potential for impacts on historical and archaeological resources, like in option 2b.1, and encroachment upon the hospital site is possible. At DI, the treatment plant would require additional area which presently is unused open space although encroachment on the prison grounds may occur. At NI, reduced facilities to a headworks would improve site conditions and minimize impacts upon abutting residences.

Engineering and Economics: Separate primary treatment facilities on LI and DI with consolidated secondary treatment on LI would afford lessor consolidation advantages at the primary treatment level than other options noted above. Some reuse advantages could result on DI from siting at an existing facility. Preliminary costs for this option are estimated at $983.5 million for construction and $48.5 million for O&M, with $149.6 million in annualized costs.

Environmental: This option's environmental impacts are similar at LI to those described for option 2b.1. The acreage requirements would be slightly less; however, the extent of land area disturbed to accommodate treatment facilities and a relocated roadway would approach the disruption under the larger sized option. At NI, the impacts would be comparable to those under option 1a.2. At DI, impacts would result from the expansion of treatment works to double the present size. Encroachment upon the prison may occur. Under this option reuse potential of remaining open space areas to the south would be limited by the continued security restrictions of the prison. Visual intrusion of the treatment plant (and the prison) would continue and be increased by the expanded facility size.

7.2.2 Primary Alternatives

4a.2 Primary Treatment at DI, Headworks at NI (Extended Outfall)

Technical: This option would site an expanded consolidated primary treatment plant (62 acres) on DI with a headworks (2 acres) on NI. Present treatment facilities on DI encompass 26 acres of the total 210 acre site, while at NI they cover most of the 17-acre site. Both sites can readily accommodate a facility of the type proposed. Sufficient buffer area exists with screening possible to limit views from nearby residential areas and improve views from points in Boston Harbor.

Social/Community Impacts: Construction activities under this option would last between three and four years at NI and five to six years at DI. An estimated 414 workers and 480 truck trips per day would travel through Winthrop. In Quincy, there would be 13 workers and 39 truck trips daily. At NI, construction impacts due to traffic would be moderate with limited on-site disruption. Reduction of facilities on-site would improve conditions relative to abutting residences. At DI, site impacts would be significant from the expansion of the present facility. Traffic impacts on local roads are likely to cause disruption of normal traffic patterns and access through Winthrop and neighboring communities. Point Shirley residents would experience the greatest disruption from both increased heavy vehicle traffic and on-site activities. Operations staff at DI would require 136 persons over three daily shifts, while at NI the figure would 20 persons.

Engineering and Economics: This option maximizes consolidation advantages associated with operations, maintenance and sludge disposal at a single treatment plant on DI. Preliminary costs under this option are $759.6 million for construction, $21.1 million O&M, and $99.1 million annualized cost.

Environmental: Impacts under this option for DI and NI are comparable to those in option 2b.3. The slightly larger consolidated facility under this option (62 acres) would still be readily accommodated at DI with open space areas remaining to the south. However, the security requirements of the prison would limit, if not preclude, new recreational or other uses on DI. There would be construction impacts as noted on-site and in Winthrop. At NI, the reduced facilities would improve conditions on-site and lessen impacts to abutting residences, but the small ara of the site limits its future reuse potential.

This option is recommended for further study based on its consolidation advantages, the partial improvements expected at the NI site and benefits to nearby residences at Houghs Neck.

4b.2 Separate Primary Treatment at DI and NI (Extended Outfall)

Technical: This option would maintain and expand primary treatment facilities at both DI and NI. It is the preferred primary treatment choice of the MDC in their 301(h) waiver application. At DI, the present 26-acre treatment facility would be expanded to a 52-acre facility, while at NI the entire 17-acre site would be utilized for treatment works, plus new landfill would be required of one to three acres in Quincy Bay to accommodate an expanded treatment facility.

Sufficient area exists at DI to accommodate new facilities, including buffer areas and screening opportunities. However, there may be some encroachment on the nearby prison grounds. At NI the present site is inadequate for expansion, and filling of the harbor would pose additional constraints to construction (particularly in light of the local and state legal prohibitions against such action). Limited buffer area would be available at NI, and abutting residences would be even closer to treatment facilities which would be larger and more extensive than the presently in operation.

Social/Community Impacts: Construction activities at DI would involve and average of 340 workers and 355 daily truck trips through Winthrop. Impacts of traffic on local roads and of construction activities on site and to adjacent residential areas would be significant. The duration of construction activities would be six years. At NI, the number of average daily construction workers and trucks are 38 and 95, respectively, over the projected five-year construction period. Impacts on residents of Houghs Neck and in Quincy during construction from traffic and on-site activities would likewise be significant.

Operations staffing at DI would be 80 persons and at NI 55 persons over three daily shifts.

Engineering and Economics: This option would expand and maintain separate primary treatment facilities at two locations in Boston Harbor. No advantages of consolidation would be achieved in this option compared to other choices noted above. The preliminary costs of this option are estimated to be $774.8 million for construction, $22 million for O&M and $101.7 annualized cost.

Environmental: The impacts under this option are comparable for NI with option 1b.2 and for DI with option 2b.3. The impacts on the environmental and water quality resources of Quincy Bay from filling would be significant. On DI, the impacts of construction traffic on local roads in Winthrop and the effects of construction activities on the residents of Point Shirley would be significant.

This option is recommended for further study based on its recommendation by the MDC in their 301(h) waiver application, and the question of its possible operational advantages versus siting impacts at the NI site.

5a.2 Separate Primary Treatment at DI and LI, Headworks at NI (Extended Outfall)

Technical: This option would build a new 18-acre treatment plant on LI for southern MSD flows, a 52-acre treatment plant on DI for northern MSD flows, and a headworks at NI to screen flows prior to conveyance to LI. Sufficient area exists at all three sites to accommodate the proposed facilities. Buffer areas would be available and screening could be provided to minimize or enhance views of the facility. Some encroachment of proposed facilities with other site uses could result at DI with the prison and at LI with the hospital and recreational plans for the island.

Social/Community Impacts: Construction activities under this option are dispersed over three separate sites over a period of three to four years for the headworks at NI and six years each for treatment facilities at DI and LI. Daily average construction workers would number 77 at LI, 13 at NI, and 340 at DI. Truck trips during construction would number a total of 117 vehicles in Quincy at both NI and LI and 335 vehicles in Winthrop at DI. These impacts would be significant, disrupting local traffic and access in both Quincy and Winthrop and in their respective neighborhoods closest to the sites. On-site impacts at NI would be moderate affecting Houghs Neck in Quincy, while they would be greater at LI affecting Squantum also in Quincy. At DI impacts would be greatest impacting most upon Point Shirly in Winthrop and upon the on-site use of DI and the prison.

Engineering and Economics: Consolidation would not be achieved under this option. Separate primary treatment plants at DI and LI with further remote headworks at NI are proposed. Additional operations, maintenance and sludge disposal requirements and higher costs would result. Preliminary costs under this option are estimated to be \$792.5 million for construction and \$21.7 million O&M with \$103.2 million annualized cost.

Environmental: Impacts at NI and DI under this option are comparable to those described under option 2b.3. In addition, at LI there would be significant impacts from siting of a 18-acre facility adjacent to an existing hospital. Further significant impacts are likely from on-site archaeological and historical resources on LI and from possible incompatibility with the state's plans for recreational uses on the island.

This option is recommended for further study based on its potential benefits at NI and limited expansion at DI. Its limited siting on LI, although accommodated, requires further analysis to determine the extent of potentially significant impacts there and in Quincy.

5b.2 Primary Treatment at LI, Headworks at DI and NI (Extended Outfall)

Technical: This option would convert DI to a pumping facility and NI to a headworks (2 acres each), and would consolidate all treatment on LI (62 acres). All three sites can accommodate the proposed facilities with available buffer areas based on their existing acreages of 210 acres at DI, 213 acres at LI, and 17 acres at NI. Screening could further limit views of the facilities at all three sites from nearby residential areas or from Boston Harbor. Possible encroachment of proposed facilities may occur at LI with the hospital use there or with recreation plans for the island.

Social/Community Impacts: Construction activities would be moderate at DI and NI and greater at LI. At DI, an average of 28 construction workers and 39 truck trips occur over a five-year period. At NI, an average of 13 workers and 35 truck trips would occur over a three to four-year period. On LI, an average of 340 workers and 355 truck trips would last over a seven-year construction period. Disruption and impacts at DI and NI under this option would be moderate due to a reduction of facilities and are comparable to those under option 2b.1. At LI, traffic impacts in Quincy and to residents of Squantum would be major. The greater distance of the LI site from the nearest residences would minimize the influence of on-site construction impacts such as noise and dust.

Engineering and Economics: Consolidation under this option would be maximized with all treatment at LI, comparable to advantages under option 2b.1. Preliminary costs would be $861.4 million for construction, $20.9 million O&M and $109.1 million annualized cost.

Environmental: Impacts of this option at DI and NI are comparable to option 2b.1. At LI, the proposed facility (62 acres) could be accommodated, but not without impacts on the hospital and potential archaeological and historical resources in the vicinity of the site. Recreational plans for LI would possibly also be in conflict with the proposed treatment plant.

This option is recommended for further study in order to analyze issues such as that of access to LI via the bridge and the extent of improvements on-site at DI and NI, as well as to the neighboring communities of Winthrop and Quincy adjoining the two sites.

7.3 OPTIONS NOT TO BE STUDIED FURTHER

7.3.1 Secondary Options

1a.1 Secondary Treatment (Combined Waste Flows) at DI, Headworks at NI

This option was similar to 1a.2 as described in the previous section with only its internal piping of treatment flows configured differently. It was dropped from further consideration, since it was not appreciably different than Option 1a.2 and it did not appear to offer any significant advantages.

1b.1 Secondary Treatment (Combined Waste Flows) at DI, Primary Treatment at NI

This option is not considered further, since it is essentially the same as option 1b.2 described in a previous section as noted above.

1c. Secondary Treatment at DI and NI

Technical: This option would expand both existing treatment plants to separate secondary plants. At DI, this would entail a 104-acre facility; at NI, the proposed facility would require 36 acres. At NI, the existing 17-acre site would require about 20 acres of fill to Quincy Bay in order to accommodate the proposed larger facility. Buffer zones or screening would be limited at the NI site under this option. Proximity to nearby residential areas at NI would be greater. At DI, land is available to accommodate the larger facilities; however, encroachment on the prison area would likely occur. Other uses at DI would be limited under this option.

Social/Community: Impacts at DI would be comparable to those described under option 1b.2 as described in the previous section, with the modification of a longer nine-year construction period. There would be somewhat reduced traffic levels under this option with an average of 225 workers and 690 truck trips daily. Impacts on-site and in Winthrop would be significant. At NI, the impacts of such an expanded and larger facility at the site would pose severe adverse impacts and disruption to residents of Houghs Neck and

Quincy. Traffic during construction at NI would entail a daily average of 110 workers and 230 truck trips. Construction duration at NI would be for nine years also. Operating staff at DI would be 150 persons and at NI would be 80 persons over three daily shifts.

Engineering and Economics: This option offers no consolidation advantages. Its preliminary costs are estimated at $884.4 million for construction, $43.4 million O&M, and $134.3 million annualized cost. These costs are comparable to other options due to the elimination of a need for inter-island conduits to convey flows even though separate major treatment facilities would be built.

Environmental: This option impacts environmental parameters and particularly water quality in Quincy Bay, on-site land uses on DI and NI, and adjoining residential areas and communities to a greater degree than other options. It would preclude any on-site mixed uses and limits establishment of buffer zones. It also advisely impacts visual quality in the harbor by establishing separate major facilities of such large scale and visual intrusion.

This option is not recommended for further study based on its major on-site and neighborhood impacts and its clear unsuitability of siting a secondary treatment plant on NI.

2a.1 Secondary Treatment at DI and LI, Headworks at NI

Technical: This option would place separate secondary treatment plants at two harbor locations, while reducing one present site to a headworks. DI would be the site of a major 104-acre facility, while LI would be the site of a major 36-acre facility. Both sites can accommodate such facilities based on their 210 acre and 213 acres respective areas; however, at DI encroachment on the prison would result with limited buffer areas available, while at LI encroachment on potential archaeological and historical resources, proposed recreational plans and on the hospital are likely. NI would show improved site accommodation from location of a proposed 2-acre headworks.

Social/Community Impacts: Impacts at NI are moderate and comparable to those described under option 1a.2; DI impacts are significant and comparable to those described under option 1c. At LI, there would be an average of 150 construction workers and 340 truck trips daily. The duration of construction activities would be three to four years at NI and seven years at LI. At DI, construction is estimated to last eight years. Construction traffic, involving an average 250 workers and 690 truck trips at DI, and 163 workers with 375 truck trips at NI and LI, would pose significant impacts on the local roads in Winthrop and Quincy and would result in major disruption to the communities of Point Shirley and Squantum with lesser impacts at Houghs Neck. Operations staff at these sites would involve 12 persons at NI, 75 persons at LI and 140 persons at DI over three daily shifts.

Engineering and Economics: This option offers no consolidation advantages with major facilities sited at two separate island locations. Its preliminary costs are estimated at $897.9 million for construction, $46 million for O&M, and $138.3 million annualized cost.

Environmental: At DI and NI this option's impacts are comparable to those under option 1a. Under this option, some uses at LI would be precluded with significant impacts resulting. There exists at LI a potential for adverse impacts upon archaeological and historical resources, and encroachment on the hospital site is possible. Recreational uses may likewise be impacted under this plan. This option does not meet sufficient criteria relative to other choices to warrant its further study.

2a.2 Secondary Treatment at DI and LI, Primary at NI

Technical: This option would locate secondary treatment facilities of 104 acres at DI and 21 acres at LI, while siting a primary treatment plant of 18 acres at NI. There is adequate land area at both DI and LI to site such uses, although at DI a facility would encroach upon the adjoining prison site, while at LI encroachment may occur with regard to historical or archeological resources. Buffer areas are available at both locations with opportunities for screening of the facility from view. At NI, the present 17-acre site would require one to three acres of fill to Quincy Bay to accommodate a primary treatment plant.

Social/Community: Impacts of this option are major and wide ranging, given the distribution of traffic and construction impacts over three sites and two adjoining communities. These impacts are comparable for DI and LI to those described in option 2a.1 above. At NI, impacts would be comparable to those described in option 1b.2 described in the previous section.

Engineering and Economic: No consolidation advantages are attendant with this option to site three major separate treatment facilities at separate sites in Boston Harbor. Preliminary costs are estimated at $915.5 million for construction, $46.1 million O&M, and $140.2 million annualized cost.

Environmental: This option would impose major impacts at all three sites with filling of Quincy Bay a principal concern. Land use impacts and those on adjoining communities would be comparable at NI to those described under option 1b.2 and at DI and LI to those described under option 2a.1. This option is not recommended for further study based on the extent of impacts and lack of compliance with the established criteria relative to other options.

2b.2 Secondary Treatment at LI, Primary Treatment at DI and NI

Technical: This option would maintain and expand primary treatment facilities at DI (52 acres) and NI (18 acres) with a new consolidated secondary treatment facility on LI (68 acres). These facilities can be accommodated at both DI and LI with unavoidable encroachment on abutting land uses and resources at both sites. At NI, the proposed facility could not be readily accommodated requiring fill to Quincy Bay.

Social/Community: Construction impacts under this option from workers and trucking activities would pose major disruption to both adjoining communities and at each of the three sites. Impacts at NI are comparable to those described under option 1b.2 in the previous section. At DI and LI, impacts would be comparable to those described under option 2b.3, although the size of the LI facility is slightly smaller.

Engineering and Economic: This option affords no consolidation advantages with major treatment facilities at three separate locations in Boston Harbor. Preliminary costs are estimated to be among the highest at $1001.8 million for construction, $48.9 O&M, and $151.9 annualized cost.

Environmental: Impacts under this option would be major and wide ranging across all three sites and in both adjoining communities of Winthrop and Quincy. Filling of Quincy Bay would pose environmental and water quality impacts. Impacts are comparable at NI to those described under option 1b.2 described in the previous section; DI and LI impacts are comparable to those described under option 2b.3. This option is not recommended for further study based on its greater impacts and lack of compliance with the criteria.

3a/b. Man-Made Island Adjacent to Lovells Island or The Brewsters

Technical: This option introduces unique construction solutions in order to locate treatment facilities in the outer harbor furthest away from residential areas. DI and NI would be converted to pumping and headworks facilities respectively. It would require major dredging, filling and stabilizing of the island's shallow water areas; all-weather barging with no land backup would be the sole access; construction of additional storm barriers and protective jettys are needed; and the existing islands would be physically altered. This option would create a filled area of 154 acres adjacent to the existing island sites.

Social/Community: Construction impacts, in addition to the unique engineering and special construction practices necessary, would involve 400 to 500 construction workers at the outer harbor locations, plus another 13 workers at NI and 28 workers at DI. More than 900 truck trips daily would be required and converted to barge transport. These requirements alone make this option highly speculative. Operations staff would be 140 persons over three daily shifts to be barged to the treatment plant.

The only advantage of such a plan would be the removal of major treatment facilities furthest away from residential areas. However, the limitations of such an approach appear to outweigh its advantages.

Engineering and Economics: While this plan consolidates treatment at a single site, this is not as feasible a solution to achieve that goal as other options. Preliminary costs for this option are significantly higher than all others at $1515.9 to $2037.6 million for construction, $43 million plus for O&M, and $198.7 to $252.3 million annualized costs.

Enviromental: The considerable consequences for marine habitat and water quality during construction, plus the major additional costs associated with transport of staff and materials to the site during construction and operations are of such magnitude and uncertainty that the potential for adverse impacts far outweighs any of the possible benefits. In fact, other options offer far greater benefits at lower costs and with fewer likely adverse impacts. This option is therefore not recommended for further study.

7.3.2 Primary Options

41.2 Primary Treatment at DI, Headworks at NI (Harbor Outfall)

4b.1 Separate Primary Treatment at DI and NI (Harbor Outfall)

5a.1 Separate Primary Treatment at DI and LI, Headworks at NI (Harbor Outfall)

5b.1 Primary Treatment at LI, Headworks at DI and NI (Harbor Outfall)

All of the above primary treatment options with harbor outfalls into Boston Harbor are not consistent with the recently stated policy of the Commonwealth of Massachusetts Executive Office of Environmental Affairs and the MDC Commissioner, which favor an extended outfall with primary treatment. These options are not, moreover, among those proposed by the MDC under their 301(h) waiver application. Therefore, primary treatment options with harbor outfalls are not recommended for further study.

Since this conclusion only deals with the length and location of an outfall conduit and does not affect the siting of treatment facilities, any future change in policy regarding outfall locations could readily be accommodated to the EIS process at a later date.

8.0 REFERENCES

1. EPA Draft Environmental Impact Statement on the Upgrading of the Boston Metropolitan Area Sewerage System (August 1978).

2. MDC Nut Island Wastewater Treatment Plant Facilities Planning Project, Phase 1, Site Options Study (Metcalf & Eddy, June, 1982) [Site Options Study].

3. MDC Wastewater Engineering and Management Plan for Boston Harbor - Eastern Massachusetts Metropolitan Area (Metcalf & Eddy, 1976) [EMMA Study].

4. MDC Application for Modification of Secondary Treatment Requirements for Its Deer Island and Nut Island Effluent Discharges into Marine Waters (Metcalf & Eddy, 1979 and 1983) [reapplication due in June 1984].

5. MDC Wastewater Sludge Management Update (Havens & Emerson, 1982).

6. MDC Deer Island Facilities Plan, Vol. I, Fast-Track Improvements (Havens & Emerson/Parsons Brickerhoff, January 1984).

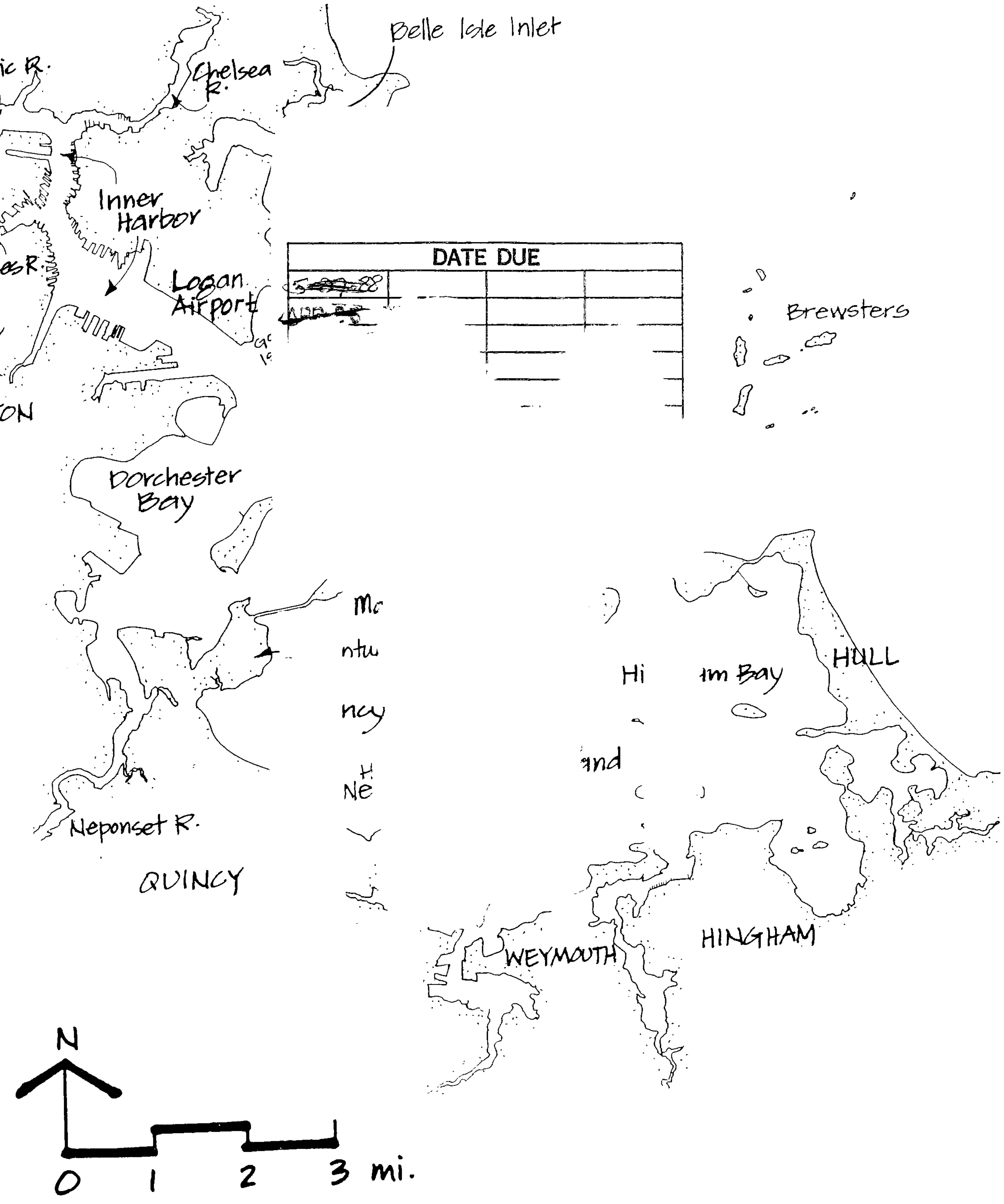
7. MDC, Discharges from Moon Island. Camp, Dresser & McKee, Inc. - Draft Report March 28, 1984.

8. MDC, Report on Combined Sewer Overflows in the Dorchester Bay Area. Camp, Dresser & McKee, Inc. - October 1980.

9. MDC, Combined Sewer Overflow Report, MDC, Inner Harbor Area Facilities Plan. O'Brien & Gere Engineers, Inc. - January 1981

☆ U. S. GOVERNMENT PRINTING OFFICE: 1985--500-645--614

Place Names in and around Boston Harbor




DEER ISLAND


LONG ISLAND


NUT ISLAND