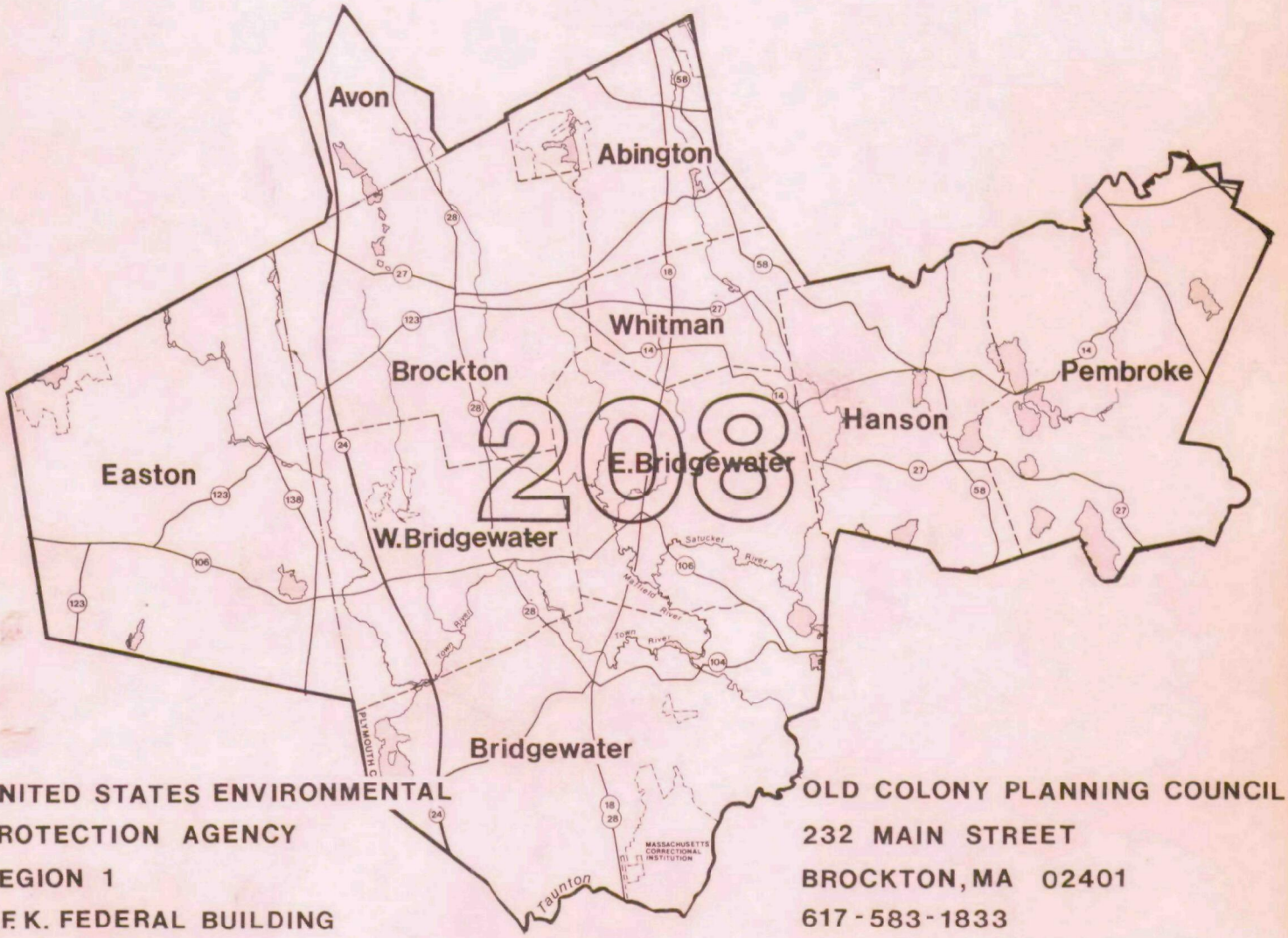
Toward Clean Water
Alternatives For Action
Vol. 1 Draft Environmental Impact Assessment



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TOWARD CLEAN WATER: ALTERNATIVES FOR ACTION

Volume 1: DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

August, 1977

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TABLE OF CONTENTS

	Page
Preface	
INTRODUCTION	I-1
Chapter 1: DOCUMENTATION OF WATER QUALITY PROBLEMS	
Description of Water Quality Study Program	1-1
Description of OCPC 208 Area Communities and Their Water Quality Problems	1-15
Chapter 2: PUBLIC PARTICIPATION	
On-Going Public Participation Programs	2-1
Future Public Participation Alternatives	2-6
Chapter 3: GROUNDWATER PROTECTION	
Significance of Groundwater Protection	3-1
Alternatives for Groundwater Protection	3-5
Chapter 4: MUNICIPAL WASTEWATER DISPOSAL	
Options Requiring Installation of a Local Collection System	4-3
Restoration and Maintenance of Septic System Operation	4-47
Septage Treatment and Disposal	4-76
Reducing Wastewater Disposal Problems Through Water Conservation	4-83
Chapter 5: INDUSTRIAL WASTEWATER DISPOSAL	
Categories of Industrial Wastewater	5-1
Industrial Discharges on the NPDES Permit Program	5-2
Alternatives for Industrial Wastewater Disposal	5-7

TABLE OF CONTENTS (continued)

	Page
Chapter 6: URBAN RUNOFF / CONSTRUCTION AND DEVELOPMENT	
Impacts of Urbanization	6-1
Controlling Urban Runoff in Brockton - Alternatives	6-4
Controlling Urban Runoff in Other Urbanized Areas - Alternatives	6-9
Adopting Preventive Measures for Future Development - Alternatives	6-11
Chapter 7: AGRICULTURE	
Agricultural Types and Acreage	7-1
Waterways Affected by Agriculture	7-3
Alternative Control Measures for Agricultural Pollution	7-6
Chapter 8: RESIDUALS MANAGEMENT	
Objectives of the Resource Conservation and Recovery Act	8-1
Alternatives for the Control of Residual Waste Disposition and Disposal	8-1
Chapter 9: LOCAL ENVIRONMENTAL MANAGEMENT PROGRAMS	
The Need for Local Environmental Management Programs	9-1
Identifying Environmentally Sensitive Areas	9-1
Alternatives for Environmental Management Programs	9-10
Chapter 10: REGIONAL WATER QUALITY MANAGEMENT ALTERNATIVES	
Reasons for a Regional Approach to Water Quality Management	10-1
Functions of a Regional Water Quality Management Agency	10-1
Alternative Means for Carrying Out Functions	10-4
APPENDIX: WATER QUALITY SAMPLING RESULTS	
Measures of Water Pollution	A-1
Sampling Sites and Results	A-4

LIST OF TABLES

Table Number	Title	Page Number
I-1	Major Streams in the OCPC 208 Area	I-7
I-2	Community Water Use	I-13
I-3	Regional Summary: Adequacy of Present Safe Yields to Meet Projected Maximum Day Consumption in 1995	I-14
I-4	Regional Summary: Adequacy of Estimated Potential Safe Yield to Meet Maximum Day Consumption in 1995	I-15
I-5	Water Quality Standards - Class B	I-18
I-6	Water Quality Standards - Class SB	I-19
I-7	Taunton River Basin Segmentation	I-20
I-8	North River Basin Segmentation	I-21
I-9	Old Colony 208 Area Population Growth, 1950-1975	I-21
I-10	Population Projections for the OCPC 208 Area, 1975-1995	I-23
I-11	Employment Trends, OCPC 208 Area, 1950-1975	I-26
I-12	OCPC 208 Area Employment Projections, 1975-1995	I-26
I-13	Existing Land Use By Community, 1975 (in acres)	I-31
I-14	Existing Land Use by Community, 1975 (percent)	I-33
I-15	1975 Summary of the Zoning By-Laws in the OCPC 208 Area	I-35
I-16	Residential Land Use Projections	I-37
I-17	Chapter of This Alternatives Document as It Affects Each 208 Community	I-39
I-18	Outputs of the OCPC 208 Program, July, 1977	I-41
1-1	OCPC 208 Sampling Programs	1-4
1-2	In-Community Source(s) of Water Pollution	1-11
2-1	208 Policy Advisory Committee, 1977	2-3
2-2	Newspapers in the OCPC 208 Area	2-5
2-3	Agencies, Organizations and Boards Contacted For the 208 Study	2-8

Table Number	Title	Page Number
4-1	Comparison of Alternative Conveyance Systems	4-9
4-1A	Liquid Processing	4-25
4-2	The Site Recommended in the OCWPCD Regional 201 Facilities Plan	4-32
4-2A	Comparison of the Physical Parameters of the Treatment Plant Sites	4-33
4-3	Comparison of the Economic Parameters of the Treatment Plant Sites	4-34
4-4	Costs to Abington of Tieing In to Brockton	4-38
4-4A	Comparison of Sewers, Community Septic Systems and Restoration of Septic System Operation	4-42
4-5	Community Septic Tank Installation Costs in Easton	4-46
4-6	Current Septic System Regulations	4-50
4-7	Costs of a Town-Owned Septage Truck	4-53
4-8	Present Worth Costs of a Town-Owned Septage Truck	4-54
4-9	Costs of Septage Pumping Trucks Required to Service Each Town	4-55
4-10	Months of Highest Groundwater in Massachusetts	4-65
4-11	Groundwater Levels in East Bridgewater	4-66
4-12	Number of Septic System Inspectors Required for a Mandatory Inspection Program	4-74
4-13	Alternatives for Water Conservation: Relative Significance by Community	4-86
5-1	Industrial Discharges in the OCPC 208 Area on the NPDES Permit Program	5-4
6-1	Subdivision Regulation Practices	6-15
7-1	Agricultural Land Use in the OCPC 208 Area	7-2
7-2	Documented Agricultural Pollution Problems and Recommended Preventive Programs	7-3
7-3	The NPDES Permit Program and "Concentrated Animal Feeding Operations"	7-9

Table Number	Title	Page Number
8-1	Industrial Cost Recovery Payments	8-7
8-2	Service Stations Connected to the Sanitary System	8-8
8-3	Major Restaurants	8-9
9-1	Communities With Detailed Soil Surveys in the OCPC 208 Area	9-2
9-2	Change in Wetlands, 1951-1971	9-4
9-3	Pond Profile: Cleveland Pond	9-7
9-4	Endangered Species in the OCPC 208 Area	9-8,9-9
9-5	Inventory of Lakes and Ponds in the OCPC 208 Area	9-11,9-12,9-13
9-6	Status of Local Wetland/Floodplain Regulations	9-19
9-7	SCS Floodplain Inventory, 1976	9-20
9-8	Community Conformance with Model Provisions of Wetlands, Floodplain, Watershed Protection Zoning	9-26
9-9	Current Earth Removal Regulations	9-33
9-10	Status of Local Conservation/Recreation Plans	9-39

LIST OF FIGURES

Figure Number	Title	Page
I-1	208 Water Quality Study Area	I-3
I-2	Regional Perspective	I-5
I-3	Wampanoag Canoe Passage	I-9
I-4	Location of Water Supplies	I-11
I-5	Stream Classification	I-17
I-6	Land Use/ Water Quality Relationships	I-29
1-1	Taunton River Water Quality Management Plan: Mean Total Coliform	1-2
1-2	Taunton River Water Quality Management Plan: Mean Dissolved Oxygen	1-3
1-3	Upper Taunton River Basin Water Quality - Average Dissolved Oxygen	1-6
1-4	Upper Taunton River Basin Water Quality - Mean Total Coliform	1-7
1-5	North River Basin Water Quality - Average Dissolved Oxygen	1-8
1-6	North River Basin Water Quality - Mean Total Coliform	1-9
1-7	Water Quality Sampling Sites	1-13
2-1	Major Watersheds in the OCPC 208 Area	2-9
3-1	Protection Areas for Existing and Identified Potential Wells	3-3
4-1	Recommended OCWPCD Interceptor Routes	4-5
4-2	Alternative OCWPCD Interceptor Routes	4-10
4-3A	Recommended Service Areas in the Local 201 Facilities Plan	4-13
4-3B	Bridgewater Service Area as Indicated in the OCWPCD 201 Plan	4-14
4-3C	East Bridgewater Service Area as Indicated in the OCWPCD 201 Plan	4-15
4-3D	Easton Service Area as Indicated in the OCWPCD 201 Plan	4-17

LIST OF FIGURES (continued)

Figure Number	Title	Page
4-3E	Hanson Service Area as Indicated in the OCWPCD 201 Plan	4-18
4-3F	Pembroke Service Area as Indicated in the OCWPCD 201 Plan	4-19
4-3G	West Bridgewater Service Area as Indicated in the OCWPCD 201 Plan	4-20
4-3H	Whitman Service Area as Indicated in the OCWPCD 201 Plan	4-21
4-4	OCWPCD Alternative Wastewater Treatment Plant Site Locations	4-30
5-1	Map of Existing Permitted (NPDES) Industrial Discharges	5-5
6-1	Bureau of the Census "Urbanized Areas" in the Old Colony 208 Area	6-10
8-1	Recommended Regional Landfill, Solid Waste Management Report, 1974	8-3
8-2	Landfill Sites in the OCPC 208 Area	8-4
9-1	Relative Percent of Land in Wetland	9-5
9-2	Area of Wetlands Restrictions Along the North River	9-24
9-3	Sand and Gravel Removal Operations	9-31
9-4	Hockomock Swamp	9-41

Preface

It is the belief of the Old Colony Planning Council 208 staff that public participation must involve the public in making decisions on recommendations for water quality achievement and maintenance, not just in reacting to staff-made recommendations. Therefore this alternatives document (Towards Clean Water: Alternatives For Action, Vol. 1, Draft Environmental Impact Assessment) outlines technologically, financially and institutionally feasible alternatives for solving the water quality problems of the region. It does NOT contain recommendations for their solution.

The next volume in the 208 process, prepared after public input through the Policy Advisory Committee and informal meetings, will be called Towards Clean Water: Alternatives For Action, Vol. 2, Draft 208 Plan and will contain staff recommendations for individual, local, regional, state and federal actions.

While the public will be asked to respond to the Draft 208 Plan, they will also have in hand reasonable alternatives should there be disagreement with the staff recommendations, which will enable them to make decisions based upon a wide range of information. It is felt that through this process the most implementable plan will be chosen by those who have to implement it and that this will result in true public participation.

The following Draft Environmental Assessment/Environmental Impact Statement (EIS) is a joint product of the cooperative efforts of the Old Colony Planning Council and the United States Environmental Protection Agency (EPA) Region I (Boston). It is part of a two year areawide water quality management planning process funded by the EPA as a result of the 1972 Federal Water Quality Act Amendments, Section 208.

This document, the Draft Environmental Impact Statement, summarizes the alternative technical control and management alternatives developed towards a composite areawide plan, the final stage of the planning process described above. It indicates the socio-economic and environmental impacts of each, both positive and negative. In order to do so, it first presents a documentation of the existing water quality problems in Chapter 1, including a summary of the existing environment. Chapter 2 summarizes the participation of the public in this plan development. Chapter 3 explores various methods of groundwater protection and Chapters 4 and 5 continue on the topic of water quality protection with their discussions of municipal and industrial, respectively, wastewater disposal. Chapter 6 is concerned with urban runoff and the related construction and development problems. Chapter 7 deals with agricultural problems, Chapter 8 with residuals management, and the final two Chapters are concerned with local and regional enviornmental management alternative programs.

The purpose of this EIS is to provide the public with a means of evaluating and commenting upon proposed actions resulting from the areawide water quality management planning process. This is mandated by the National Environmental Policy Act (NEPA) of 1969. Section 102(2)(c) of the Act requires an Environmental Impact Statement whenever a proposed action will "significantly affect the quality of the human environment." To the extent necessary, the environmental impact statement to follow must address:

1. The environment impacts of the proposed alternatives,
2. Any adverse environmental effects which cannot be avoided....
3. Alternatives for proper management of water bodies,
4. The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
5. Any irreversible and irretrievable commitments of resources which would be involved in the alternatives which have been explored.

Major decisions of the courts and guidelines by the Council on Environmental Quality have clarified and amplified the intent of this Act.

Additional copies of this EIS can be reviewed at all public libraries in this Planning Area and at the following addresses:

U.S. Environmental Protection Agency
Region I - Room 2203
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Old Colony Planning Council
232 Main Street
Brockton, Massachusetts 02401

Public meetings on the proposed alternatives, as discussed in this Draft EIS, will be held at times and locations which will be publicized by the Old Colony Planning Council, when they have been established. Public comment on all aspects of the proposed alternatives is invited both at the public meetings and by mail to EPA - Region I at the address mentioned earlier.

The Final EIS will be comprised of two chapters supplemental to the Draft EIS. One will summarize the final plan, and the other will describe the public participation process during the period of time between the publication of the Draft and Final EIS, including the public comments on the Draft EIS and our responses to them.

INTRODUCTION

WATER. Water is one of the most critical components of our environment. Its use governs the lives of us all. Whether its use is the sheer enjoyment of letting it trickle through your fingers on a lazy summer day or the work it does in industry, the preservation of its quality and quantity is vital to us all. When improper development occurs, when water is abused rather than used, water quality suffers. Flowing waters though have the ability to cleanse themselves once the sources of pollution are removed. It is the purpose of the 208 plan to describe a process for restoring and maintaining fishable/swimmable water quality.

This document, Toward Clean Water: Alternatives for Action, is in two volumes. Volume 1, Environmental Impact Assessment, outlines the present quality of the waters, the sources of pollution and different alternative means for restoring and maintaining water quality including the environmental, social and fiscal impact of these alternatives. After input from the residents in this area, the draft 208 plan, Toward Clean Water: Alternatives for Action, Volume 2, Draft 208 Plan, will be written on a town by town basis with the recommended alternatives discussed in detail along with their environmental, social and fiscal impacts.

Under Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972, a Section 208 Areawide Waste Treatment Plan "shall contain alternatives for waste treatment management, and be applicable to all wastes generated within the area involved" (Sec. 208 (b) (1)) and shall have as its objective "to restore and maintain the chemical, physical and biological integrity of the Nation's waters" (Sec. 101 (a)).

Thus, Toward Clean Water: Alternatives for Action identifies necessary treatment works for municipal and industrial waste treatment needs, contains a process to identify agriculturally-related nonpoint sources of pollution and construction activity-related sources of pollution, and contains a process to control the disposition of residual wastes and the disposal of pollutants on land or in subsurface excavations.

This volume, the Environmental Impact Assessment, is a joint effort of the Old Colony Planning Council under a grant under Section 208 of P.L. 92-500, the Federal Water Pollution Control Act Amendments of 1972 and the Environmental Protection Agency under P.L. 92-500 and the National Environmental Policy Act.

In the Introduction, a regional overview of the 208 area's physical environment, population, employment and land use are presented, projected as well as present. Chapter 1 documents the water quality problems by town. The remaining chapters discuss various alternatives for each of the sources of pollution found to be a problem in the 208 area and for implementation, i.e., Chapter 2 discusses alternative means of on-going public participation; Chapter 3 discusses groundwater protection alternatives; Chapter 4 discusses municipal wastewater disposal; Chapter 5, industrial wastewater disposal; Chapter 6, urban run-off and construction

and development in newly urbanizing areas; Chapter 7, agriculture; Chapter 8, residuals; Chapter 9, local environmental management options; and Chapter 10, regional water quality management options.

PHYSICAL DESCRIPTION

The Old Colony 208 Area (Figs. I-1, I-2) includes about 172 square miles, located just south of the Boston SMSA. It contains the communities of Abington, Avon, Bridgewater, Brockton, East Bridgewater, Easton, Hanson, Pembroke, West Bridgewater and Whitman. The area is characterized by more heavily urbanized communities in the northern part of the region, such as Brockton, Whitman, Abington, and to some extent Avon, and less urbanized communities in the southern portion of the region. This population distribution reflects somewhat the ease of travel to Boston. Brockton, Bridgewater, Easton and Pembroke have undergone a considerable amount of suburbanization in the last fifteen to twenty years. East Bridgewater, West Bridgewater, and Hanson still have strong rural and agricultural traditions (as does Bridgewater), but are also in a gradual transition from rural to suburban communities.

Physically, the region is characterized by a relatively flat topography, with small, slow-moving streams. The 208 area contains the headwaters of both the Taunton River and the North River (see Table I-1). This almost level, gently rolling topography was caused by glacial action. When the glaciers melted, much of what is now southeastern Massachusetts became the Leverett Sea. As the glaciers melted even further, the removing of that tremendous weight caused the land to rise (the Hubbard Uplift) much like a spring expands after being released from being compressed. Two remnants of the Leverett Sea are the Hockomock Swamp and Lake Nippenicket.

Both the relatively level topography and the area's position as the headwaters of the Taunton and North Rivers have important consequences for a water quality management plan. Combined they produce small streams, which are slow-moving and which therefore have very little assimilative capacity (ability to cleanse themselves). A major and necessary goal of a water quality plan therefore has to be to keep new discharges out of the streams.

Streams and ponds have been classified by the Massachusetts Division of Water Pollution Control (Fig. I-5) on the basis of their intended uses. The freshwater standards are Class A waters which are intended for use as a public water supply, Class B for fishing and swimming and Class C for non-water contact recreation. The salt water standards are Class SA which are for shellfishing and water contact sports, Class SB for fishing and swimming and Class SC for aesthetic enjoyment.

There is currently fishing in most of the streams in the region, with perch, hornpout, bluegill, bass, sunfish and pickerel being the most commonly caught. A complete correlation of water quality with aquatic life (invertebrate as well as fish) is contained in the report

The Old Colony Planning Council District

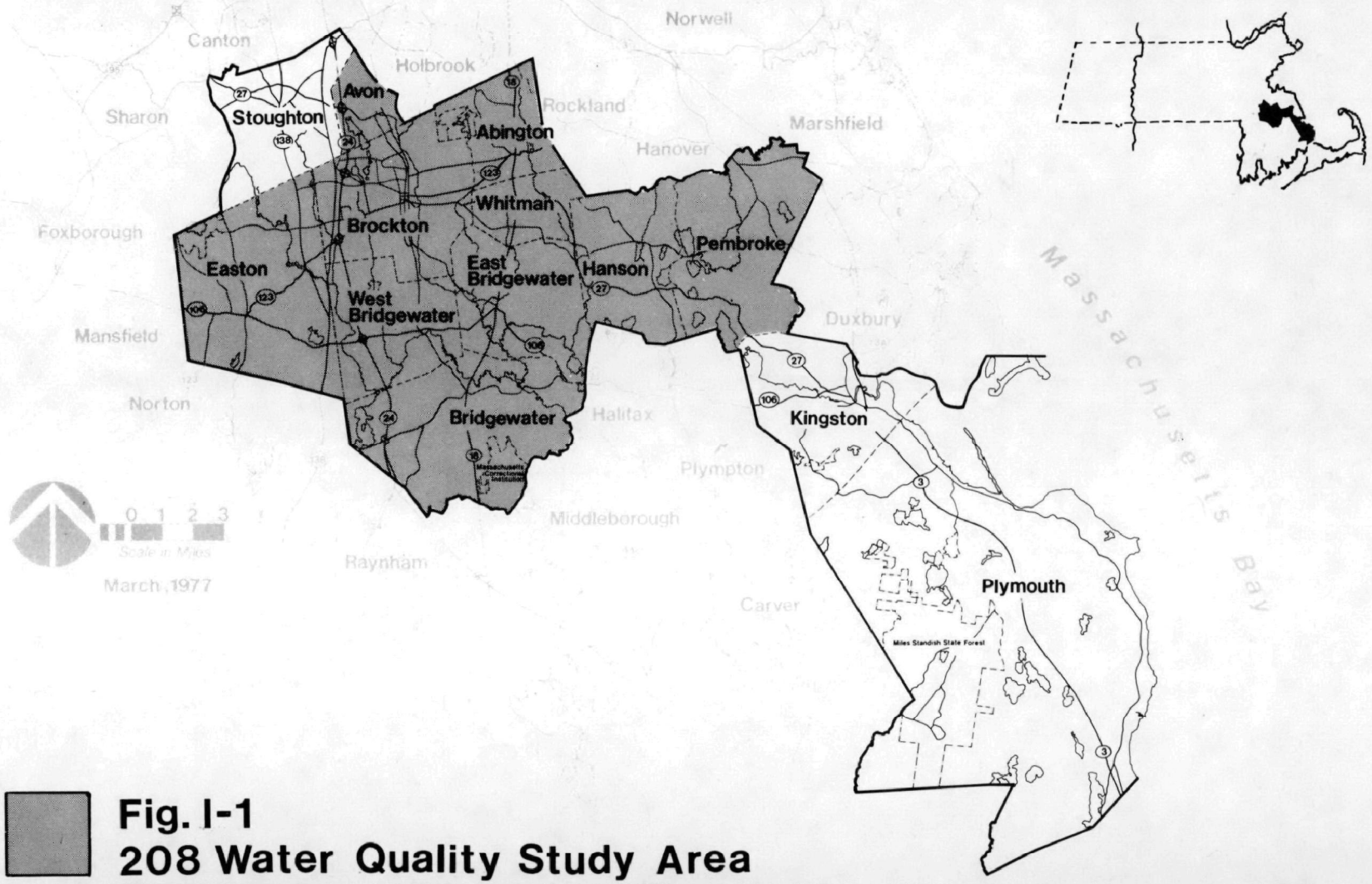


Fig. I-1
208 Water Quality Study Area
Old Colony Planning Council
208 Program Area, 1977

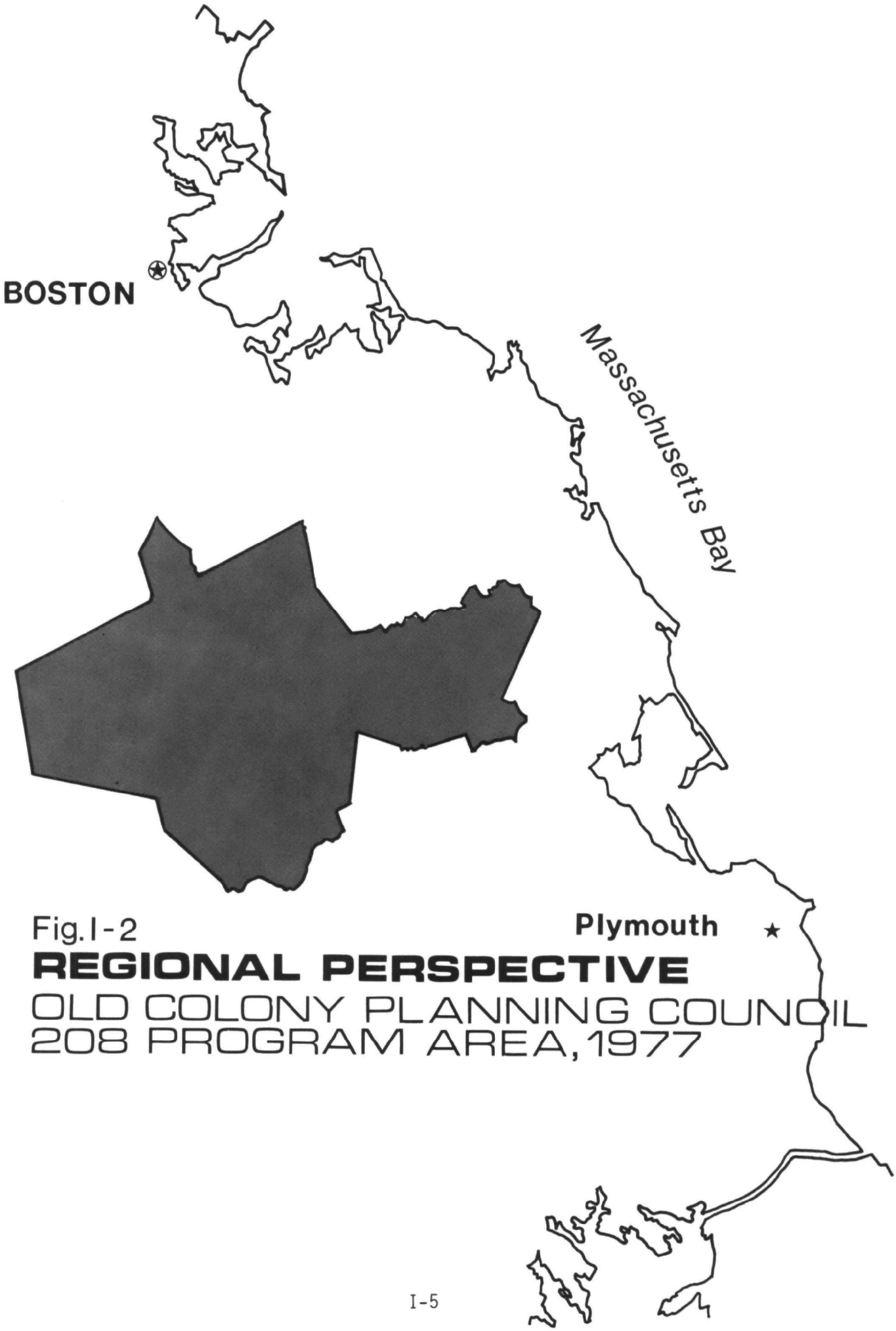


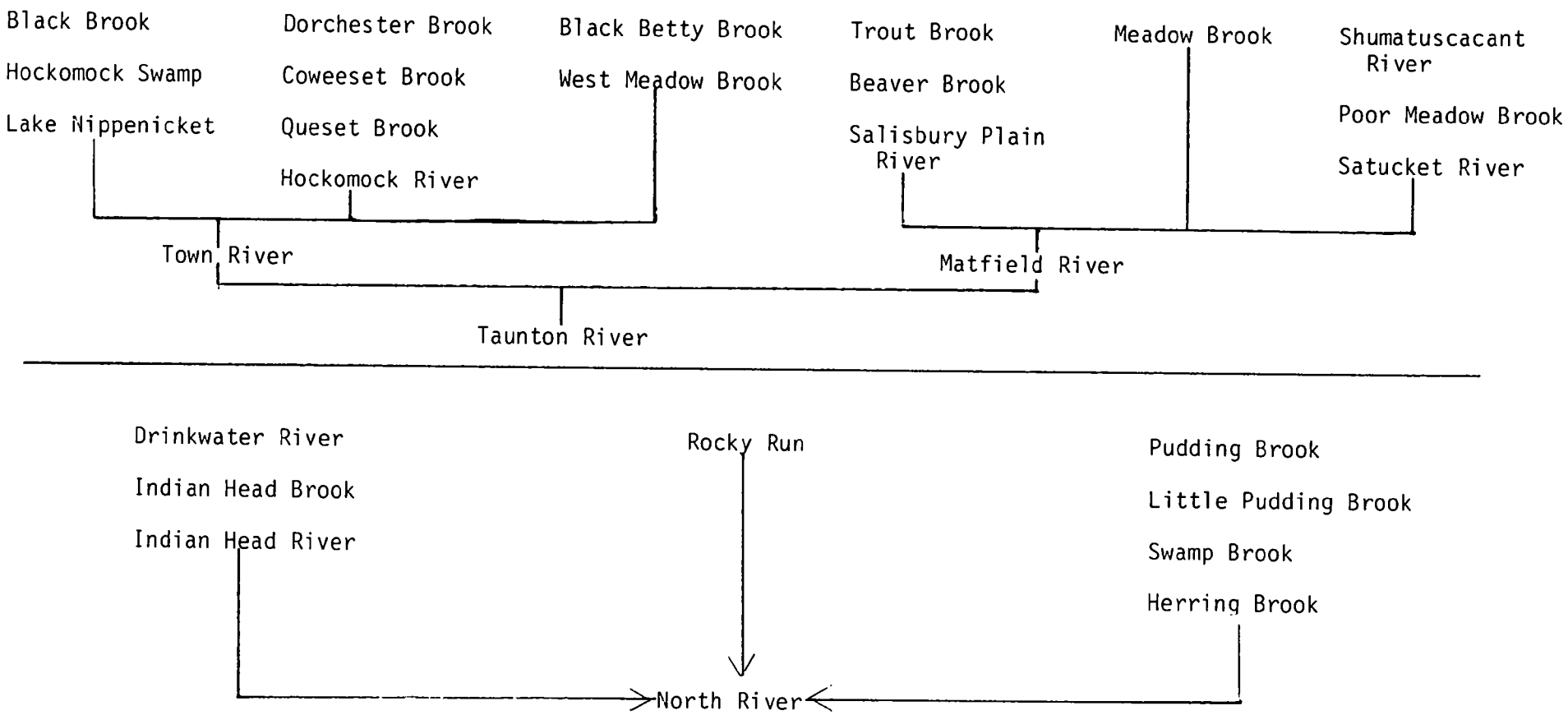
Fig. I-2

REGIONAL PERSPECTIVE

OLD COLONY PLANNING COUNCIL
208 PROGRAM AREA, 1977

TABLE I-1

MAJOR STREAMS IN THE OCPC 208 AREA



Fishing in the Old Colony 208 Area. The streams and ponds are also used for boating and swimming. See Figure I-3 for a map of the Wampanoag Canoe Passage.

Directly or indirectly, all communities in the Old Colony 208 Area are dependent on groundwater for public water supplies (Figure I-4). Six communities (Avon, Easton, West Bridgewater, East Bridgewater, Bridgewater, and Pembroke) have community water systems entirely supplied by groundwater; Abington, which has a joint water system with Rockland, uses a combination of ground and surface sources (Great Sandy Bottom Pond) in Pembroke, Abington and Rockland; and Brockton, Whitman and Hanson are supplied from surface water, principally from Silver Lake in Pembroke, but with diversions from Furnace Pond in Pembroke and Monponsett Pond in Hanson/Halifax. Since the surface water bodies used are hydrologically connected to regional groundwater aquifers, all of the 208 Area communities share an interest in groundwater preservation.

Although groundwater resources in this area are relatively plentiful compared with those in other sections of the nation or even the more mountainous parts of New England, several factors limit the sufficiency of groundwater. First, the most permeable sand and gravel deposits are distributed unevenly, so that some communities have sufficient supplies for some years to come while others are short on supply. Second, the organic, swamp-related deposits which are widespread in the region (particularly in the southern part of the planning area) give rise to problems of iron and manganese levels in excess of public aesthetic standards. Consequently, some groundwater sources which could provide sufficient quantities to make their development economically feasible have natural characteristics which make them unsuitable in terms of quality. Third, pressures of growth and urbanization put stress on water supplies by: a)creating additional demands, b)increasing the possibility of pollution, and c) foreclosing possibilities for future water supplies by causing incompatible development to occur over or near potential groundwater sources. Table I-2 lists the amount of water use in each community over the past few years.

Also important to the communities are comparisons of present safe yields and potential safe yields to projections of need based upon their present practices and upon an assumption of instituting water conservation practices. Table I-3 and I-4 show these comparisons.

For the purposes of water quality management, the waters of the 208 Area have been classified by the Massachusetts Division of Water Pollution Control. The corresponding classification to the fishable/swimmable goal of the Federal Water Pollution Control Act is Class B for fresh water and Class SB for salt waters. Figure I-5 shows the current stream classification and Tables I-5 and I-6 list the water quality standards for Class B and SB waters.

In addition to the classification, the rivers have been divided into segments and designated as either a water quality segment ("any segment where it is known that water quality does not meet applicable water quality standards even after the application of the effluent limitations") or an effluent limitation segment ("any segment where it is known that water quality is meeting and will continue to meet water quality standards or where . . . water quality will meet water quality standards after the application of the effluent limitations"). Table I-7 lists the Taunton River basin segmentation and Table I-8 lists the North River basin segmentation.

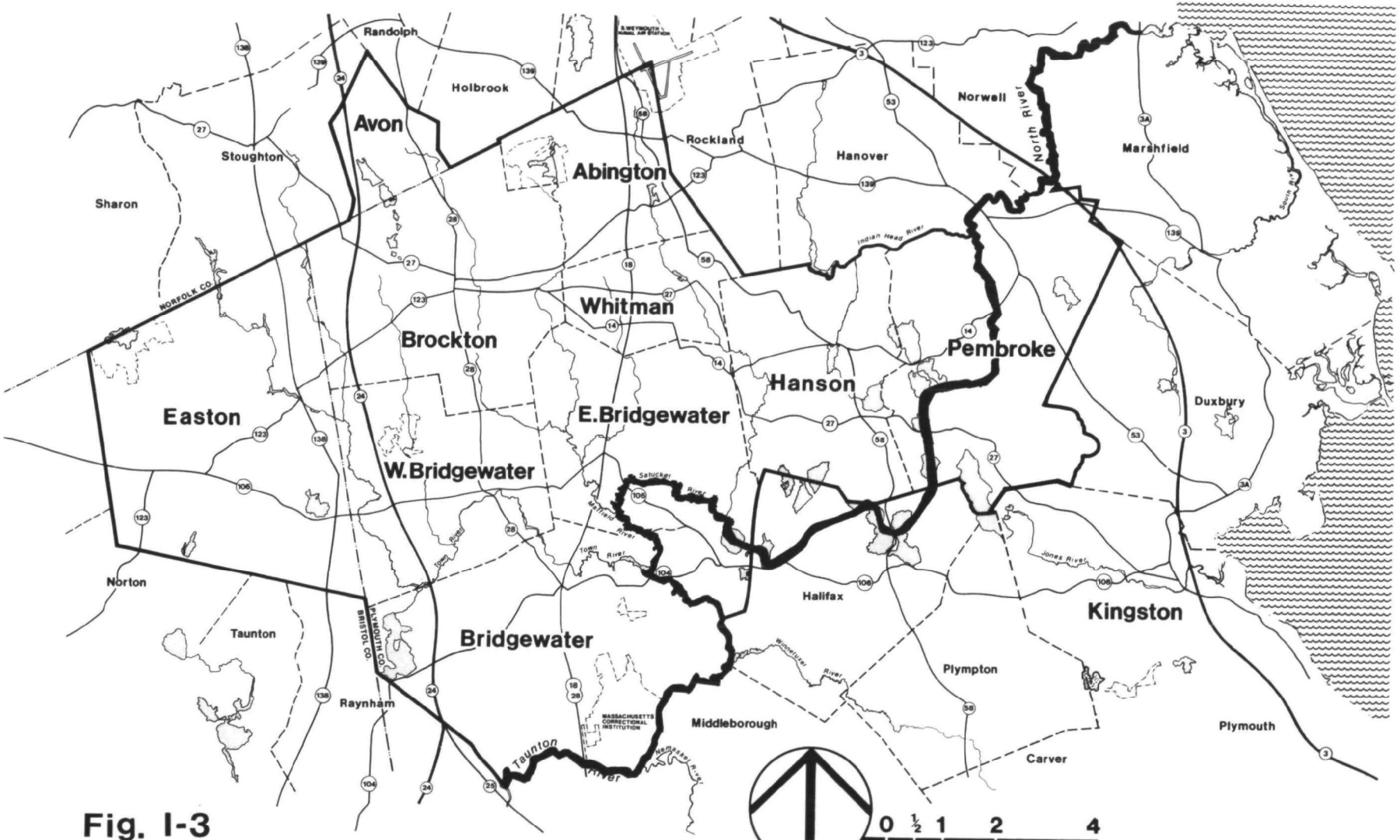
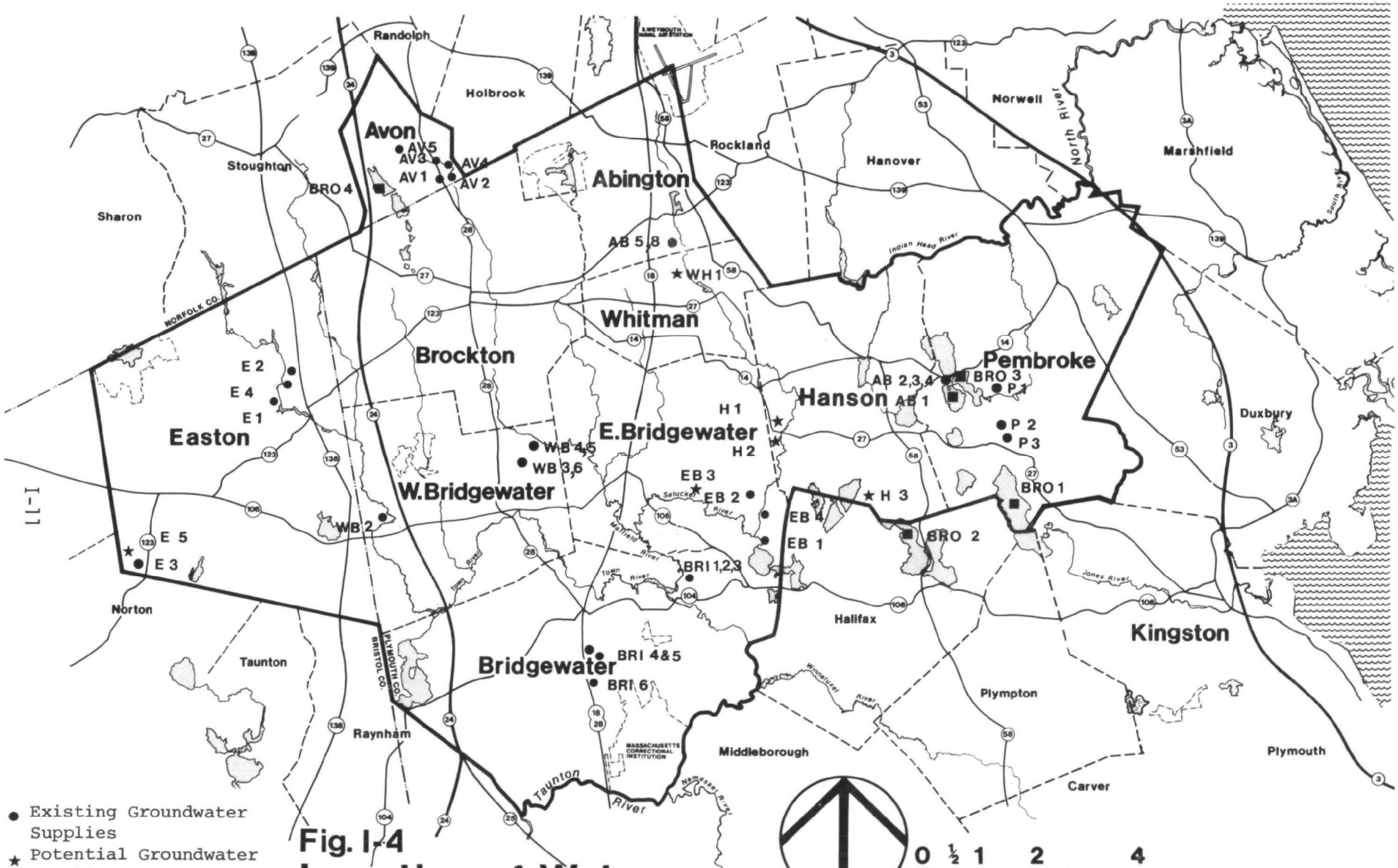


Fig. I-3

Wampanoag Canoe Passage
Old Colony Planning Council
208 Program Area, 1977



I-11

● Existing Groundwater Supplies

★ Potential Groundwater Supplies

■ Existing Surface Water Supplies

AB 7 Reference Number

Fig. I-4

Location of Water Supplies

Old Colony Planning Council / 208 Program, 1977

TABLE I-2

COMMUNITY WATER USE
(average daily use (residential, commercial and industrial)
in million gallons/day)

	1960 Population	1960	1965	1970	1975	1975 Population
Abington	10,607	0.64	0.72	0.78	N.A.	13,456
Avon	4,301	0.22	0.39	0.42	0.47	5,315
Bridgewater	10,276	0.53	0.83	0.77	1.19	15,100
Brockton	72,813	N.A.	7.16	9.60	11.25	95,688
East Bridgewater	6,139	0.34	0.30	0.67	0.73	9,485
Easton	9,078	0.77	1.00	1.04	1.43	14,090
Hanson	4,370	0.30	0.33	0.51	0.63	8,331
Pembroke	4,919	0.19	0.40	0.65	0.73	12,374
West Bridgewater	5,061	0.36	0.41	0.49	0.62	6,429
Whitman	10,485	N.A.	0.53	0.74	0.83	13,476

Sources: Mass. Department of Public Health, Water Supply Statistics
Water Supply and Water Use in the OCPC 208 Area (1976)

TABLE I-3

REGIONAL SUMMARY:
ADEQUACY OF PRESENT SAFE YIELDS TO MEET PROJECTED MAXIMUM DAY CONSUMPTION IN 1995

(all numbers in million gallons per day)

Community	Present Safe Yield	Projected 1995 Maximum Day Consumption			
		"Present Practices" Projection	System Surplus (Deficit)	"Conservation Practices" Projection	System Surplus (Deficit)
Abington*	4.40	4.82	(0.42)	3.66	0.74
Avon	0.70	0.84	(0.14)	0.66	0.04
Bridgewater	2.11	3.87	(1.76)	2.64	(0.53)
Brockton**	9.50	15.29	(5.79)	12.98	(3.48)
East Bridgewater	2.30	2.24	0.06	1.75	0.55
Easton	3.20	3.33	(0.13)	2.43	0.77
Hanson		Included in Brockton			
Pembroke	2.26	2.31	(0.05)	1.65	0.61
West Bridgewater	1.90	2.32	(0.42)	1.52	0.38
Whitman		Included in Brockton			
Regional Totals	26.37	35.02	(8.65)	27.29	(0.92)

*Represents totals for Abington-Rockland Joint Water Works System
**Represents totals for the Brockton water system (Brockton, Hanson, and Whitman)
Because the Brockton system relies on surface water, projected average consumption, rather than maximum consumption, is presented.

Source: OCPC, Opportunities for Water Conservation (1977)

TABLE I-4

REGIONAL SUMMARY:
ADEQUACY OF ESTIMATED POTENTIAL SAFE YIELD TO MEET PROJECTED MAXIMUM DAY CONSUMPTION IN 1995

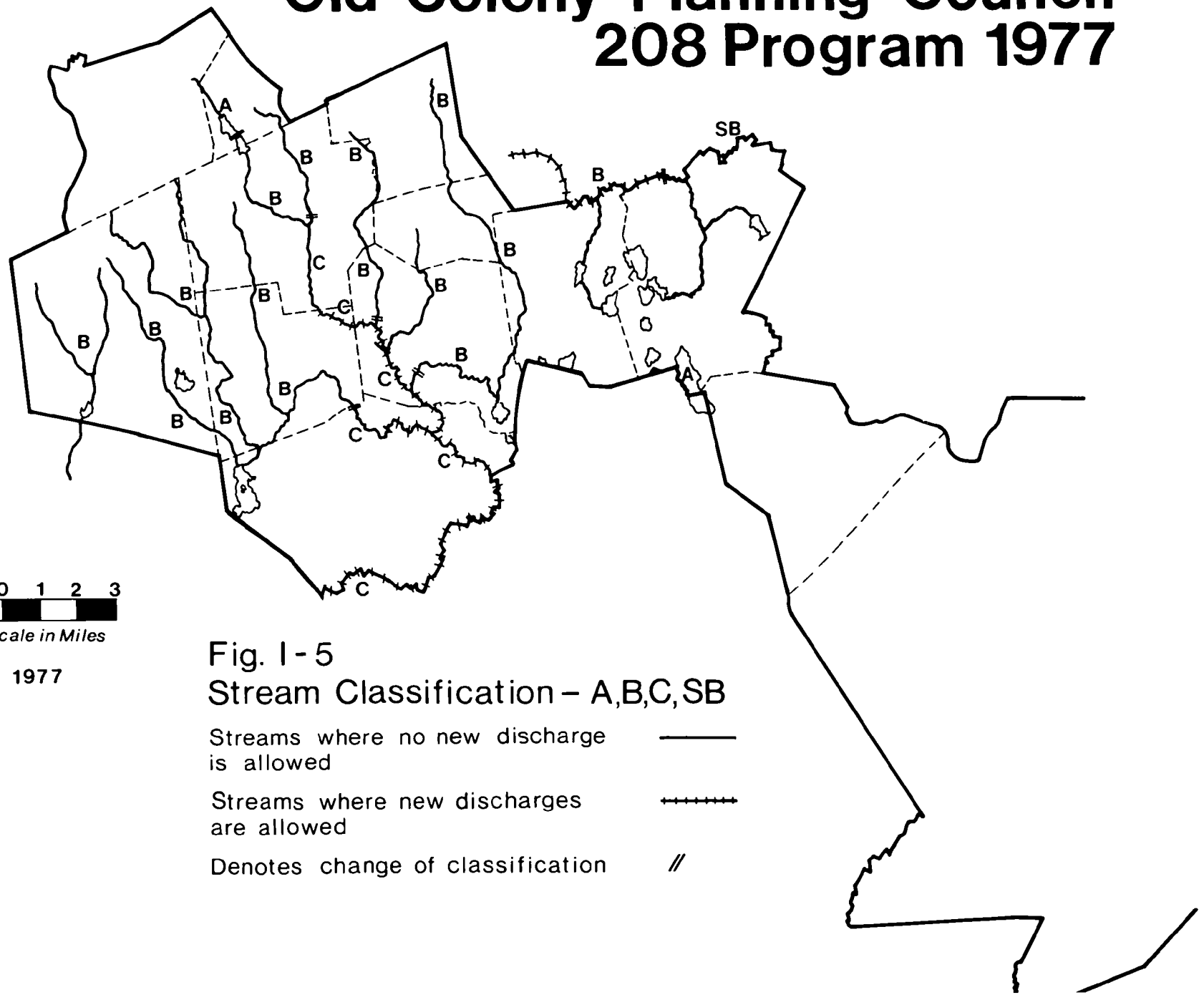
(all numbers in million gallons per day)

Community	Potential Estimated Safe Yield	1995 Maximum Day Consumption			
		"Present Practices" Projection	Balance (Deficit)	"Conservation Practices" Projection	Balance (Deficit)
Abington*	6.00	4.82	1.18	3.66	2.34
Avon	0.70	0.84	(0.14)	0.66	0.04
Bridgewater	2.11	3.87	(1.76)	2.64	(0.53)
Brockton**	9.50	15.29	(5.79)	12.98	(3.48)
East Bridgewater	2.80	2.24	0.56	1.75	1.05
Easton	4.20	3.33	0.87	2.43	1.77
Hanson		Included in Brockton			
Pembroke	2.26	2.31	(0.05)	1.65	0.61
West Bridgewater	3.68	2.32	1.36	1.52	2.16
Whitman		Included in Brockton			
Regional Total	31.25	35.02	(3.17)	27.29	3.96

*Represents totals for Abington-Rockland Joint Water Works System
**Represents totals for the Brockton water system (Brockton, Hanson, and Whitman)
Because the Brockton system relies on surface water, projected average consumption, rather than maximum consumption, is presented.

Source: OCPC, Opportunities for Water Conservation (1977)

Old Colony Planning Council
208 Program 1977



1977

Fig. I-5
Stream Classification – A,B,C,SB

Streams where no new discharge is allowed ——

Streams where new discharges are allowed +++++++

Denotes change of classification //

TABLE I-5

REGULATION II — Water Quality Standards

1. The Water Quality Standards adopted by the Massachusetts Division of Water Pollution Control on March 3, 1967 and filed with the Secretary of State on March 6, 1967 are hereby repealed, except that existing "River Basin Classifications" based on the 1967 Standards will remain in full force and effect until reclassified in accordance with the following standards.

2. To achieve the objectives of the Massachusetts Clean Waters Act and the Federal Water Pollution Control Act Amendments of 1972 and to assure the best use of the waters of the Commonwealth the following standards are adopted and shall be applicable to all waters of the Commonwealth or to different segments of the same waters:

FRESH WATER STANDARDS

Class A — These waters are designated for use as sources of public water supply in accordance with the provisions of Chapter 111 of the General Laws.

Water Quality Criteria

Item	*Criteria*
1. Dissolved oxygen	Not less than 75% of saturation during at least 16 hours of any 24 hour period and not less than 5 mg/l at any time. For cold water streams the dissolved oxygen concentration shall not be less than 6 mg/l. For seasonal cold water streams the dissolved oxygen concentration shall not be less than 6 mg/l during the season.
2. Sludge deposits-solid refuse-floating solids-oil-grease-scum	None allowable
3. Color and turbidity	None other than of natural origin.
4. Total Coliform bacteria per 100 ml.	Not to exceed an average value of 50 during any monthly sampling period.
5. Taste and odor	None other than of natural origin
6. pH	As naturally occurs
7. Allowable temperature increase	None other than of natural origin.
8. Chemical constituents	None in concentrations or combinations which would be harmful or offensive to humans, or harmful to animal or aquatic life.
9. Radioactivity	None other than that occurring from natural phenomena.

Class B — These waters are suitable for bathing and recreational purposes, water contact activities, acceptable for public water supply with treatment and disinfection, are an excellent fish and wildlife habitat, have excellent aesthetic values and are suitable for certain agricultural and industrial uses.

Item	*Criteria*
1. Dissolved oxygen	Not less than 75% of saturation during at least 16 hours of any 24 hour period and not less than 5 mg/l at any time. For cold water streams the dissolved oxygen concentration shall not be less than 6 mg/l. For seasonal cold water streams the dissolved oxygen concentration shall not be less than 6 mg/l during the season.
2. Sludge deposits-solid refuse-floating solids-oil-grease-scum	None other than of natural origin or those amounts which may result from the discharge from waste treatment facilities providing appropriate treatment. For oil and grease of petroleum origin the maximum allowable concentration is 15 mg/l.
3. Color and turbidity	None in such concentrations that would impair any uses specifically assigned to this class.
4. Coliform bacteria per 100 ml.	Not to exceed an average value of 1000 nor more than 1000 in 20% of the samples.
5. Taste and odor	None in such concentrations that would impair any uses specifically assigned to this class and none that would cause taste and odor in edible fish.
6. pH	6.5 - 8.0
7. Allowable temperature increase	None except where the increase will not exceed the recommended limit on the most sensitive receiving water use and in no case exceed 83°F in warm water fisheries, and 68°F in cold water fisheries, or in any case raise the normal temperature of the receiving water more than 4°F.
8. Chemical constituents	None in concentrations or combinations which would be harmful or offensive to human, or harmful to animal or aquatic life or any water use specifically assigned to this class.
9. Radioactivity	None in concentrations or combinations in excess of the limits specified by the United States Public Health Service Drinking Water Standards.

Class B1 — The use and criteria for Class B1 shall be the same as for Class B with the exception of the dissolved oxygen requirement which shall be as follows for this class:

Item	*Criteria*
1. Dissolved oxygen	Not less than 5 mg/l during at least 16 hours of any 24 hour period, nor less than 3 mg/l at any time. For seasonal cold water fisheries at least 6 mg/l must be maintained during the season.

SOURCE: Massachusetts Division of Water Pollution Control, Rules and Regulations for the Establishment of Minimum Water Quality Standards and for the Protection of the Quality and Value of Water Resources. 1974.

TABLE I-6

Class CI — The use and criteria for Class CI shall be the same as for Class C with the exception of the dissolved oxygen (and temperature) requirements which shall be as follows for this Class:

Item	*Criteria*
1. Dissolved oxygen	Not less than 2 mg/l at any time.

SALT WATER STANDARDS

Class SA — These are waters of the highest quality and are suitable for any high water quality use including bathing and other water contact activities. These waters are suitable for approved shellfish areas and the taking of shellfish without depuration, have the highest aesthetic value and are an excellent fish and wildlife habitat.

Water Quality Criteria

Item	*Criteria*
1. Dissolved oxygen	Not less than 6.5 mg/l at any time.
2. Sludge deposits-solid refuse-floating solids-oil-grease-scum	None other than of natural origin or those amounts which may result from the discharge from waste treatment facilities providing appropriate treatment. For oil and grease of petroleum origin the maximum allowable concentration is 15 mg/l.
3. Color and turbidity	None in such concentrations that will impair any uses specifically assigned to this class.
4. Total Coliform bacteria per 100 ml.	Not to exceed a median value of 70 and not more than 10% of the samples shall ordinarily exceed 230 during any monthly sampling period.
5. Taste and odor	None allowable
6. pH	6.8 - 8.5
7. Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use.
8. Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the waters for any other uses.
9. Radioactivity	None in concentrations or combinations in excess of the limits specified by the United States Public Health Service Drinking Water Standards.

Class SB — These waters are suitable for bathing and recreational purposes including water contact sports and industrial cooling, have good aesthetic value, are an excellent fish habitat and are suitable for certain shell fisheries with depuration (Restricted Shellfish Areas).

Water Quality Criteria

Item	*Criteria*
1. Dissolved oxygen	Not less than 5.0 mg/l at any time.
2. Sludge deposits-solid refuse-floating solids-oil-grease-scum	None other than of natural origin or those amounts which may result from the discharg from waste treatment facilities providing adequate treatment. For oil and grease of petroleum origin the maximum allowable concentration is 15 mg/l.
3. Color and turbidity	None in such concentrations that would impair any uses specifically assigned to this class.
4. Total Coliform bacteria per 100 ml.	Not to exceed an average value of 700 and not more than 1000 in more than 20% of the samples.
5. Taste and odor	None in such concentrations that would impair any uses specifically assigned to this class and none that would cause taste and odor in edible fish or shellfish.
6. pH	6.8 - 8.5
7. Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use.
8. Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the water for any other use.
9. Radioactivity	None in such concentrations or combinations in excess of the limits specified by the United States Public Health Service Drinking Water Standards.

Class SC — These waters are suitable for aesthetic enjoyments, for recreational boating, as a habitat for wildlife and common food and game fishes indigenous to the region, and are suitable for certain industrial uses.

Water Quality Criteria

Item	*Criteria*
1. Dissolved oxygen	Not less than 5 mg/l during at least 16 hours of any 24 hour period nor less than 3 mg/l at any time.
2. Sludge deposits-solid refuse-floating solids-oil-grease-scum	None other than of natural origin or those amounts which may result from the discharge from waste treatment facilities providing appropriate treat-

SOURCE: Massachusetts Division of Water Pollution Control, Rules and Regulations for the Establishment of Minimum Water Quality Standards and for the Protection of the Quality and Value of Water Resources. 1974.

TABLE I-7

TAUNTON RIVER BASIN SEGMENTATION

I. Taunton River Mainstem

Segment Number	Milepoint	Reach Definition	Segment Class
1	41.5-33.9	from its source to Nemasket River Confluence	water quality
2	33.9-21.7	from Nemasket River Confluence to Rte. 24 Bridge	water quality
3	21.7-18.5	from Rte. 24 Bridge to Mill River Confluence	water quality
4	18.5-13.0	from Mill River Confluence to Berkley Bridge	water quality
5	13.0-2.7	from Berkley Bridge to mouth of the Taunton River at Battleship Cove	effluent limitation*

II. Upper Taunton River Tributaries

6	entire length	Trout Brook	effluent limitation*
7	entire length	Salisbury Plain and Matfield Rivers	water quality
8	entire length	Satucket River and tributaries	water quality
9	entire length	Town River and tributaries	water quality
10	entire length	Nemasket River	water quality
11	entire length	Saw Mill Brook	water quality

Source: Division of Water Pollution Control Taunton River Basin Plan (1973)

TABLE I-8

NORTH RIVER BASIN SEGMENTATION

Segment Number	Milepoints	Reach Definition	Segment Class
1	20.6-19.4	French Stream, Weymouth Naval Air Station to No. Abington STP	water quality
2	19.4-18.7	French Stream, No. Abington STP to inlet Studley Pond	water quality
3	18.7-18.4	French Stream, Inlet Studley Pond to outlet Studley Pond	water quality
4	18.4-16.9	French Stream, Outlet Studley Pond to Rockland STP	water quality
5	16.9-15.7	French Stream, Rockland STP to inlet Forge Pond	water quality
6	15.7-15.3	Drinkwater River, Inlet Forge Pond to outlet Forge Pond	water quality
7	15.3-13.9	Drinkwater River, Outlet Forge Pond to outlet Factory Pond	water quality
8	13.9-12.9	Indian Head River, Outlet Factory Pond to So. Hanover Dam	water quality
9	12.9-11.6	Indian Head River, So. Hanover Dam to Curtis Crossing Dam	water quality
10	11.6-10.2	North River, Curtis Crossing Dam to Washington Street	effluent limitation
11	10.2-0.0	North River, Washington Street to Ocean	effluent limitation

Source: Division of Water Pollution Control North River Basin Plan (1975)

POPULATION AND ECONOMIC TRENDS

Population growth in the 208 area has been steady, but not evenly distributed. The greatest gain in absolute numbers since 1965 has been in Brockton, but the greatest gain in percentage was in Pembroke, which increased over 60 percent followed closely by Hanson which increased by 57 percent. Table I-9 details the population growth in the 208 area since 1950. The figures for the gross population density (persons per acre) closely reflect the urbanized/suburban character of each of the municipalities. Going from most dense to least dense, the population densities in the OCPC region in persons per acre are: Brockton -- 6.9, Whitman-3.0, Abington -- 2.1, Avon -- 1.5, East Bridgewater -- 0.9, Hanson -- 0.8, Pembroke -- 0.8, West Bridgewater -- 0.7, Bridgewater -- 0.7, and Easton -- 0.6 for 1975.

In order to estimate future needs for wastewater disposal facilities population, economic, and land use projections were also made. Table I-10 lists the population projections to 1995, Table I-11 the employment trends from 1950 to 1975 and Table I-12 the employment projections from 1975 to 1995.

LAND USE

A basic underpinning of the 208 water quality study has been a determination of land use and land use/water quality relationships. The reason for this is that land use decisions may have a direct impact on water quality, a secondary impact or an indirect impact. Examples of land use decisions which may have a direct impact are decisions on the siting of septic systems, the siting of sanitary landfills, the location of feedlots or salt piles, the construction of sanitary sewers which replace cesspools or septic systems and the construction of large, impervious, urban areas such as suburban shopping malls and parking lots. Land use decisions which have a potential for a secondary impact are the siting of sewage treatment plants or the location of certain water using industries. Land use decisions which may have an indirect impact on water quality are such decisions as rapid residential growth, building on floodplains or wetlands or the construction of sewer interceptor lines which result in the redistribution of growth.

The City of Brockton has shown many of the results of land use decisions which impacted water quality. The availability of sewers, along with new highway construction and proximity to Boston, allowed very rapid single family as well as multi-family residential growth in the City. This led to the over-loading of the sewage treatment facility resulting in severe degradation of the Salisbury Plain River to which it discharges and the downstream Matfield River and a need to upgrade and expand the facility. The construction of a large shopping mall with its associated urban runoff

TABLE I-9

OLD COLONY 208 AREA POPULATION GROWTH, 1950-1975

Community	1950	1955	1960	1965	1970	1975	Percent Change				
							50-55	55-60	60-65	65-70	70-75
Abington	7,152	9,407	10,607	11,790	12,334	13,456	31.5	12.8	11.2	4.6	9.1
Avon	2,666	2,994	4,301	5,175	5,295	5,315	12.3	43.6	20.3	2.3	0.4
Bridgewater	9,512	9,059	10,276	11,056	12,902*	15,100**	- 4.7	13.4	7.6	16.7	17.0
Brockton	62,880	62,628	72,813	83,499	89,040	95,688	- 0.3	16.3	14.6	6.6	7.5
East Bridgewater	4,412	5,359	6,139	7,460	8,347	9,485	21.4	14.5	21.5	11.9	13.6
Easton	6,244	7,324	9,078	10,130	12,157	14,090	17.3	23.9	11.6	20.0	15.9
Hanson	3,264	3,763	4,370	5,385	7,148	8,331	15.3	16.1	20.9	35.2	16.6
Pembroke	2,579	3,838	4,919	7,708	11,193	12,374	48.8	28.1	56.7	45.2	10.6
West Bridgewater	4,059	4,558	5,061	5,731	6,079*	6,429	12.3	11.0	13.2	6.1	5.7
Whitman	8,413	9,345	10,485	12,373	13,059	13,476	11.1	12.2	18.0	5.5	3.2
OCPC 208 Area	111,161	118,275	138,049	160,207	177,554	193,744	6.4	16.6	16.1	10.8	9.1

Source: U.S. and Massachusetts Census
*Office of State Planning estimate
**OCPC estimate

Source: OCPC, Population Projections in the OCPC 208 Area, 1977

TABLE I-10

POPULATION PROJECTIONS FOR THE OCPC 208 AREA, 1975-1995

Community	1975	1980	1985	1990	1995
Abington	13,456	14,200	15,500	16,600	17,100
Avon	5,315	5,500	5,700	6,000	6,100
Bridgewater	15,100	16,900	19,100	21,900	24,100
Brockton	95,688	101,500	105,500	108,500	111,000
East Bridgewater	9,485	10,500	11,400	12,600	13,300
Easton	14,090	15,700	17,400	18,700	20,000
Hanson	8,331	9,800	10,600	11,700	12,100
Pembroke	12,374	14,100	15,600	17,300	19,000
West Bridgewater	6,429	7,000	7,600	8,400	9,000
Whitman	13,476	13,800	14,600	15,400	15,900
208 Area Totals	193,774	209,000	223,000	237,100	247,600

Source: OCPC, Population Projections in the OCPC 208 Area (1977)

TABLE I-11

EMPLOYMENT TRENDS, OCPC 208 AREA (but including Halifax), 1950-1975

Employment Category	1950	1960	1970	1975	1975%
Manufacturing	15,345	13,853	14,458	11,883	21.0
Agriculture	153	144	214	173	0.3
Construction	1,156	1,530	2,061	1,813	3.2
T-C-U*	2,789	3,014	3,689	3,650	6.5
Wholesale	1,168	1,448	1,909	3,455	6.1
Retail	6,159	7,279	10,551	11,603	20.5
F-I-R-E**	795	991	1,471	1,851	3.3
Service	4,136	4,095	8,708	9,598	17.0
Government	N.A.	N.A.	7,080	8,414	14.9
Total Non-Manufacturing	16,356	18,501	35,683	40,557	71.8
Other	N.A.	N.A.	N.A.	4,045	7.2
TOTAL	31,701	32,354	50,231	56,485	100.0

*T-C-U: Transportation, Communications, Utilities
**F-I-R-E: Finance, Insurance, Real Estate

Source: Mass. Division of Employment Security; and OCPC survey.

(From: OCPC, Employment Projections for the Old Colony Region (1977))

TABLE I-12

OCPC 208 AREA EMPLOYMENT PROJECTIONS, 1975-1995

Employment Category \ Year	1975	1975%	1980	1985	1990	1995	1995%
Manufacturing	11,833	21.0	11,970	13,010	14,065	15,220	19.4
Agriculture	173	0.3	205	225	255	270	0.3
Construction	1,813	3.2	1,895	2,045	2,180	2,320	3.0
T-C-U	3,650	6.5	4,045	4,637	5,165	5,580	7.1
Wholesale	3,455	6.1	3,940	4,665	5,470	6,170	7.9
Retail	11,603	20.5	12,470	13,530	14,580	15,660	20.0
F-I-R-E	1,851	3.3	1,975	2,207	2,445	2,670	3.4
Service	9,598	17.0	10,855	12,580	14,270	15,850	20.2
Government	8,414	14.9	9,580	10,245	10,920	11,460	14.6
Total Non-Manufacturing	40,557	71.8	44,965	50,134	55,285	59,980	76.5
Other	4,045	7.2	3,657	3,382	3,157	3,210	4.1
Total	56,435	100.0	60,592	66,526	72,507	78,410	100.0

T-C-U: Transportation, Communications and Utilities
F-I-R-E: Finance, Insurance and Real Estate
*Includes Halifax

Source: 1975 Mass. D.E.S.; 1980-1995 OCPC

(From: OCPC, Employment Projections for the Old Colony Region (1977))

led to the closing of the nearby swimming pond, the only natural pond for swimming in Brockton. With the increasing population, the City's water source (Silver Lake in Pembroke) has become taxed and City officials are looking to the possibility of diverting water from the Jones River to Silver Lake. Water from Furnace Pond in Pembroke and Monponsett Pond in Hanson/Halifax is already being diverted to Silver Lake. It is clear then that land use decisions can have a major impact on both ground and surface water quality. Figure I-6 is a schematic of land use/water quality relationships.

1975 land use maps were prepared for all communities, either from field surveys or by up-dating recent land use maps. The acreages in each land use category (single family residential, multi-family residential, commercial, industrial, agricultural, utility, semi-public, public and vacant-including lakes, ponds and wetlands) were totalled and recorded for each community. Table I-13 lists land use in acres, and Table I-14 lists land use as a percent of the entire 208 area. (See Land Use/Water Quality Issues In The Old Colony 208 Area for a complete discussion of land use.)

Once the present land use is obtained, it is important to make land use projections, for a number of reasons. First projecting current development trends enables you to identify possible conflict areas between development and public policy decisions. For example, future septic system failures which necessitate costly solutions can be obviated if development is kept off of unsuitable areas or if health regulations are strictly enforced. Prime agricultural land can be protected. And natural systems can be protected for their natural functions, such as aquifer recharge areas, wetlands, shorelines and mature forests. Secondly, lands suitable for alternative solutions can be identified before they are developed for other purposes such as land suitable for land disposal, floodplains, and lands which act as natural filters such as wetlands for water and forests for air. Thirdly, future sewerage needs, the location of sewers, and secondary impacts of sewering can be identified.

Using the current land use, zoning (see Table I-15) and projected population as a base, residential land use projections were made. Each town was divided into Basic Analysis Zones (the same as the transportation staff uses) and the projected housing units were placed spatially inside each BAZ. In order to make the land use projections, it was necessary to subtract non-developable vacant land, such as ponds, bogs, and deep water marshes from the vacant land. Vacant land includes land currently in agricultural use, but excludes land considered so wet that economic as well as environmental constraints would prevent development, and land that is precluded from development by governmental regulation. Table I-16 lists the residential land use projections by acreages and number of housing units.

The acreages projected are then placed spatially on a map under two separate sets of assumptions, the first being that land would be developed as it is under current regulations and the second assuming that all sensitive lands such as well recharge areas, floodplains, prime agricultural land, historic and archaeologic sites would be protected. These comparisons are

FIGURE I-6

Land Use/Water Quality Relationships

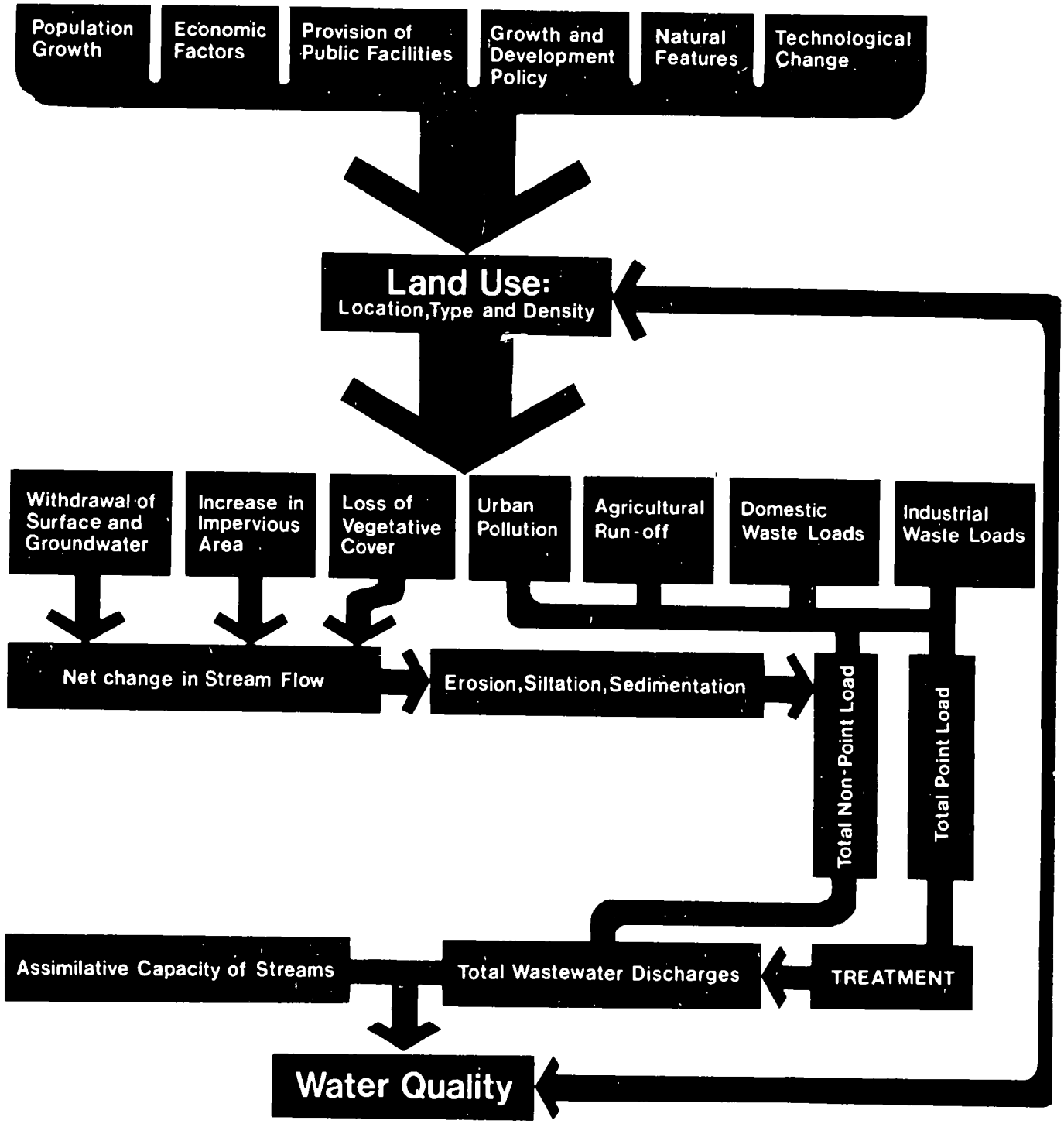


TABLE I-13

EXISTING LAND USE BY COMMUNITY, 1975
(In Acres)

Community	Residential	Commercial	Manufacturing & Warehousing	Agricultural	Utility	Public	Semi-Public	Vacant
Abington	1,667	214	98	157	429[a]	1,094	151	2,571
Avon	603	32	171	16	333[a]	249	36	1,350
Bridgewater	2,435	152	218	2,312[c]	918[a]	1,786	51	9,594
Brockton	7,180	862	519	136	52	1,574	967	2,582
East Bridgewater	1,748	184	123	1,579	19	614	150	6,688
Easton	2,120	99	91	512[d]	424	2,391	636	12,569
Hanson	1,796	80	28	1,733	231[b]	650	148	5,312
Pembroke	4,086	168	58	483[e]	0	939	602	8,704
West Bridgewater	1,149	205	103	2,047	443[b]	1,339	71	4,674
Whitman	1,197	95	66	293	207[b]	443	122	2,044
Total 208 Area	23,981	2,091	1,475	9,268	3,056	11,079	2,934	56,088

Notes: a. Includes streets and railroads
b. Includes streets
c. Excluding 501 acres of agricultural land in public ownership
d. Includes only agriculturally assessed land
e. Includes cranberry bogs only

Source: OCPC, Land Use/ Water Quality Issues in the OCPC 208 Area (1976)

TABLE I-14

EXISTING LAND USE BY COMMUNITY, 1975
(As a percent of the total 208 area land use)

Community	Residential	Commercial	Manufacturing & Warehousing	Agricultural	Utility	Public	Semi-Public	Vacant	Total Community Acreage
Abington	7.0%	10.2%	6.6%	1.7%	13.6%[a]	9.9%	5.2%	4.6%	5.8%
Avon	2.5%	1.5%	11.6%	0.2%	10.6%[a]	2.2%	1.2%	2.4%	2.5%
Bridgewater	10.2%	7.3%	14.8%	24.9%[c]	29.2%[a]	16.1%	1.7%	17.1%	15.9%
Brockton	29.9%	41.2%	35.2%	1.5%	1.7%	14.2%	33.0%	4.6%	12.6%
East Bridgewater	7.3%	8.8%	8.3%	17.0%	0.6%	5.5%	5.1%	11.9%	10.1%
Easton	8.8%	4.8%	6.2%	5.5%[d]	16.3%	21.6%	21.7%	22.4%	17.1%
Hanson	7.5%	3.8%	1.9%	18.7%	7.3%[b]	5.9%	5.0%	9.5%	9.1%
Pembroke	17.0%	8.0%	3.9%	5.2%[e]	0 %	8.5%	20.5%	15.5%	13.7%
West Bridgewater	4.8%	9.8%	7.0%	22.1%	14.1%[b]	12.1%	2.4%	8.3%	9.1%
Whitman	5.0%	4.6%	4.5%	3.2%	6.6%	4.0%	4.2%	3.7%	4.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Notes: a. Includes streets and railroads
b. Includes streets
c. Excluding 501 acres of agricultural land in public ownership
d. Includes only agriculturally assessed land
e. Includes cranberry bogs only

Source: OCPC, Land Use/ Water Quality Issues in the OCPC 208 Area (1976)

TABLE I-15

1975 SUMMARY OF THE ZONING BY-LAWS IN THE OCPC 208 AREA

COMMUNITY	RESIDENTIAL						BUSINESS	INDUSTRIAL	FLOOD PLAIN	OTHER DISTRICTS	CLUSTER PROVISIONS	
	Single Family	Multi-Family										
	Minimum Lot Size in Sq. Ft.	Minimum Lot Size in Sq. Ft.	Additional Lot Size in Sq. Ft./ Unit	District By Right	District By Special Permit	Other Requirements	Minimum Lot Size in Sq. Ft.	Minimum Lot Size in Sq. Ft.		Minimum Lot Size in Sq. Ft.	Minimum Size	District
Abington	R- 40 40,000 R- 30 30,000 R- 20 20,000	20,000	First 8: 6,000 each unit 9-15 5,000 each add: 4,000		R-2 Cl HC	600 sq. ft. first unit (interior) 400 sq. ft. each add. (interior)	HC: 20,000 GC: 8,000	I: 20,000	Yes	-	-	-
Avon	R-25: 25,000 R-15: 15,000	40,000	First 8: 10,000 Next 7: 5,000 each add: 3,000	-	R-15 R-25 B	-	B: 8,000	I: 40,000	Yes	-	CR: 15 acres PUD: 50 acres PBD: 5 acres PID: 15 acres	R-15 R-15, R-25 B I
Bridgewater	BA: 22,500 BB: 22,500 BC: 13,500 BD 18,500	-	-	-	-	-	BA: 10,000 BB: None	I-A: 40,000 I-B: 40,000	No	-	-	-
Brockton	R-1-A: 30,000 R-1-B: R-1-C:	7,000 5,200	R-2: 1,500 R-3: 700	R-2 R-3	C-3	-	C-1: None C-2: None C-3: None C-4: 2 acres C-5: 10,000	I-1: None I-2: None I-3: None	Yes	-	PRD: 5 acres	any R
East Bridgewater	R-A: 35,000 R-B: 15,000	15,000	3,000	RB B	-	-	B: None	LI: None I : None	Yes	-	-	-
Easton	R: 40,000 R-1: 40,000	40,000	1 bedrm: 8,000 2 bedrms: 16,000	B	F	Max. 8 bedrms. on 40,000 sq. ft. lots. Max. 24 bedrms. on larger lots.	B: 40,000 Bn: 40,000	I: 40,000	Yes	Eleemosynary (E): None Municipal, Open Space(M): none	CR: 15 acres PUD: 25 acres PBD: 5 acres PID: 15 acres	R-1 B Bn
Hanson	R-AA: 40,000 R-A : 30,000 R-B : 60,000	60,000	5,000 sq. ft. each unit after first 4 units.	-	R-B	Max. 8 units per building.	B: None	C-I: None	No	Agricultural-Recreation: 40,000	-	-
Pembroke	R-A: 40,000 R-B: 25,000 R-C: varies	120,000	-	R-C	-	Max. 12 units, site plan review, public hearing.	B-A: Conform to surrounding R B-B 80,000	I: 80,000	Yes	Historic District: None	-	-
West Bridgewater	GR&F: 30,000	-	-	-	-	-	B: 18,750	I: 2 acres	No	-	-	-
Whitman	A-1: 22,500 A-2: 18,000 GR : 10,000	83,000	4,000	-	GR HB,GB LI,I	Building in HB, GB, LI, and I require site plan approval.	HB: 10,000 GB: 10,000 except gas stations 25,000	LI: 10,000 I: 10,000 except office, research or ind. park: 5 acres.	Yes	-	-	-

TABLE I-16

RESIDENTIAL LAND USE PROJECTIONS

Number of Acres Projected for 1995

	Single Family			Multi-Family	Total Residential
	Low Density R	Medium R	High R		
Abington	187	336	79	40	642
Avon	97	51	-	6	154
Bridgewater	0	818	214	NA	1032
Brockton**	NA	NA	NA	NA	-
East Bridgewater	-	753	-	18	771
Easton	1492	-	-	50	1542
Hanson	458***	333	-	6	797
Pembroke	1418*	85	-	12	1515
West Bridgewater	465	-	-	-	465
Whitman	-	183	117	19	319
TOTAL	4117	2559	410	157	7237

Number of Units Projected for 1995

	Single Family			Multi-Family	Total Residential
	Low Density	Medium Density	High Density		
Abington	174	400	128	180	882
Avon	99	69	-	25	184
Bridgewater	-	1220	369	700	2289
Brockton**	NA	NA	NA	NA	-
East Bridgewater	-	787	-	99	886
Easton	1392	-	-	221	1613
Hanson	448***	374	-	122	944
Pembroke	1323*	117	-	43	1483
West Bridgewater	552	-	-	56	578
Whitman	-	273	210	93	576
TOTAL	3999	3240	707	1509	9435

* Includes R-C zone.

** Land use projections have not been made for Brockton as it is virtually completely sewered.

*** Includes Agricultural-Recreation zone.

Source: OCPC, Technical Memorandum: Residential Land Use Projections 1975-1995 in the OCPC 208 Area (1977)

detailed in the town by town sections of Volume 2.

SUMMARY

Under P.L. 92-500, the Federal Water Pollution Control Act, a goal of fishable/swimmable waters is set for the nation. Under Section 208 of that Act, the Old Colony Planning Council was funded to determine the extent of water quality problems, to determine their source, to outline alternative strategies for solving those problems and then in conjunction with public input, recommend solutions, both technical and management, for implementation.

The alternative strategies are discussed in this volume, Toward Clean Water: Alternatives for Action, Vol. 1, Environmental Impact Assessment. The draft recommendations will appear in the next volume, Toward Clean Water: Alternatives for Action, Vol. 2, Draft 208 Plan. The final 208 plan will be published after continued public input as Toward Clean Water: A Program For Action.

The communities that will be affected by this plan include Abington, Avon, Bridgewater, Brockton, East Bridgewater, Easton, Hanson, Pembroke, West Bridgewater, and Whitman. Table I-17 lists the chapters of the Alternatives document as they affect each community.

Table I-18 lists the completed outputs of the 208 study.

TABLE I-17

Chapters of the Alternatives Document as They Affect Each 208 Area Community

	Chapter 1 - Documentation of Water Quality Problems	Chapter 2 - Public Participation	Chapter 3 - Groundwater Protection	Chapter 4 - Municipal Wastewater Disposal	Chapter 5 - Industrial Wastewater Disposal	Chapter 6 - Urban Run-off/Construction and Development	Chapter 7 - Agriculture	Chapter 8 - Residuals Management	Chapter 9 - Local Environmental Management Programs	Chapter 10- Regional Water Quality Management Alternatives
Abington	X	X	X	X	X	X		X	X	X
Avon	X	X	X	X	X	X			X	X
Bridgewater	X	X	X	X	X	X	X		X	X
Brockton	X	X		X	X	X			X	X
East Bridgewater	X	X	X	X	X	X	X	X	X	X
Easton	X	X	X	X	X	X	X		X	X
Hanson	X	X	X	X		X	X		X	X
Pembroke	X	X	X	X		X	X	X	X	X
West Bridgewater	X	X	X	X	X	X	X	X	X	X
Whitman	X	X	X	X	X	X	X	X	X	X

TABLE I-18

Outputs of OCPC 208 Program July, 1977

Taunton River Basin Water Quality Report, 1975

Brockton Industrial Cost Recovery, 1976

Brockton Industrial Wastewater Survey, 1976

Citizen Involvement in OCPC 208 Planning, 1976

Conference Proceedings: Alternatives to Sewers, 1976

Ellis Brett Pond Section 314 Application, 1976

Land Use/Water Quality Issues in the OCPC 208 Area, 1976

Rainfall Analysis for the OCPC 208 Area, 1976

Technical Memorandum: Pembroke Landfill, 1976

Technical Memorandum: Pembroke Salt Pile, 1976

Technical Memorandum: Rockland Landfill, 1976

Water Supply and Water Use in the OCPC 208 Area, 1976

Water Quality Survey of the Old Colony 208 Planning Region, Non-point Sources(data only), 1976

Agricultural Land and Preservation Issues in the OCPC 208 Area, 1977

An Economic and Population Profile of the OCPC Region, 1977

Employment Projections for the Old Colony Region, 1977

Environmental Assessment Statement, Avon, Mass., 1977

Groundwater Resources in the Old Colony Planning Council 208 Area (plus maps), 1977

Industrial Wastewater Survey of the OCPC 208 Area, 1977

Opportunities for Water Conservation, 1977

Population Projections in the OCPC 208 Area, 1977

Technical Memorandum: Defining Groundwater Well Protection Areas, 1977

Technical Memorandum: Determining the Magnitude and Extent of a Need for a Public Sewerage System, 1977

Technical Memorandum: Residential Land Use Projections 1975-1995 in the OCPC 208 Area, 1977

CHAPTER 1

Documentation of Water Quality Problems

Table of Contents

	page
Background	1-1
-Water Quality Problems For Each 208 Area Community	
Abington	1-15
Avon	1-19
Bridgewater	1-13
Brockton	1-27
East Bridgewater	1-31
Easton	1-35
Hanson	1-39
Pembroke	1-43
West Bridgewater	1-47
Whitman	1-51

Water quality sampling has been done in the upper Taunton River Watershed and the North River Basin for the past several years. In the Taunton River Basin, sampling results performed in July 1970 were published (see Figures 1-1 and 1-2), in the Taunton River Basin Water Quality Management Plan (1973). Data for the North River Basin Plan published in 1975 was presented in the North River Water Quality Survey Data also published in 1975.

The Old Colony Planning Council's 208 sampling program was designed to give more up-to-date information, to cover a broader range of rivers than just the mainstem of the Taunton and North Rivers, to include lakes and ponds and to try to pin-point non-point sources of pollution; including urban run-off. OCPC contracted with the Division of Water Pollution Control, Bridgewater State College and Energy, Environmental Analysis (see Table 1-1) to do both wet weather and dry weather water quality sampling. The results of the Division's sampling on the Taunton and North Riversare given in Figures 1-3, 1-4, 1-5, and 1-6. In the five-year period, 1970-1975, it is clear from comparing figures 1-1 and 1-4 that coliform levels have dropped substantially although they do not meet the fishable/swimmable criteria of being less than 100 per 100 ml. A comparison of Fig. 1-2 with 1-5 shows that dissolved oxygen levels are approximately the same in 1975 as in 1970 for the portion of the upper Taunton in the OCPC 208 area.

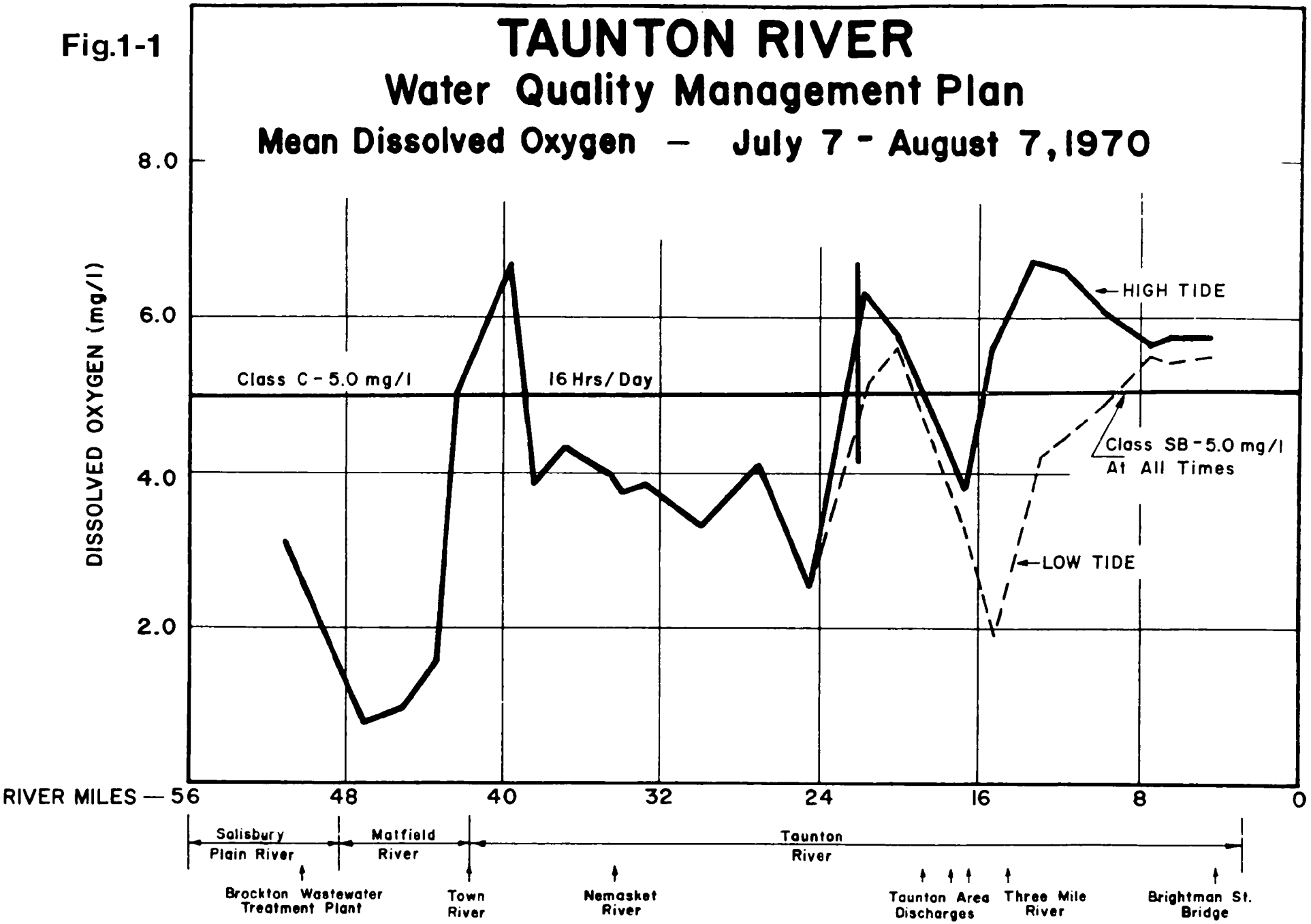
Water quality sampling, the results of which appear in the Appendix form the basis for the documentation of present water quality problems. However, a second level of information came to the study through the public participation process (see Chapter 2). At the Water Quality Workshops, in many of the communities citizens noted the existence of water quality problems for which the study either had no data or did not have data to pinpoint the suspected source. These locations and problems are discussed in the community characterizations as are the active sand and gravel removal operations. Data is insufficient to know whether they constitute water quality problems. Future water quality sampling efforts should be aimed at these sources.

A third level of water quality problems are those activities and locations which are not now a problem but which may result in future water quality problems. Such future sources include sludge from treatment plants (both sewage treatment plants and drinking water treatment plants) not presently built or being expanded, urban run-off from areas now not having extensive paved areas or storm drains, and new construction, either highway or residential.

In the Appendix is a listing by community of each sampling location which was deemed to presently have a water quality problem. Accompanying each table is a map of that community with all the sampling locations marked as well as the sampling locations showing a water quality problem. For some communities, every sampling location had a water quality problem while for other communities relatively few sampling locations showed problems.

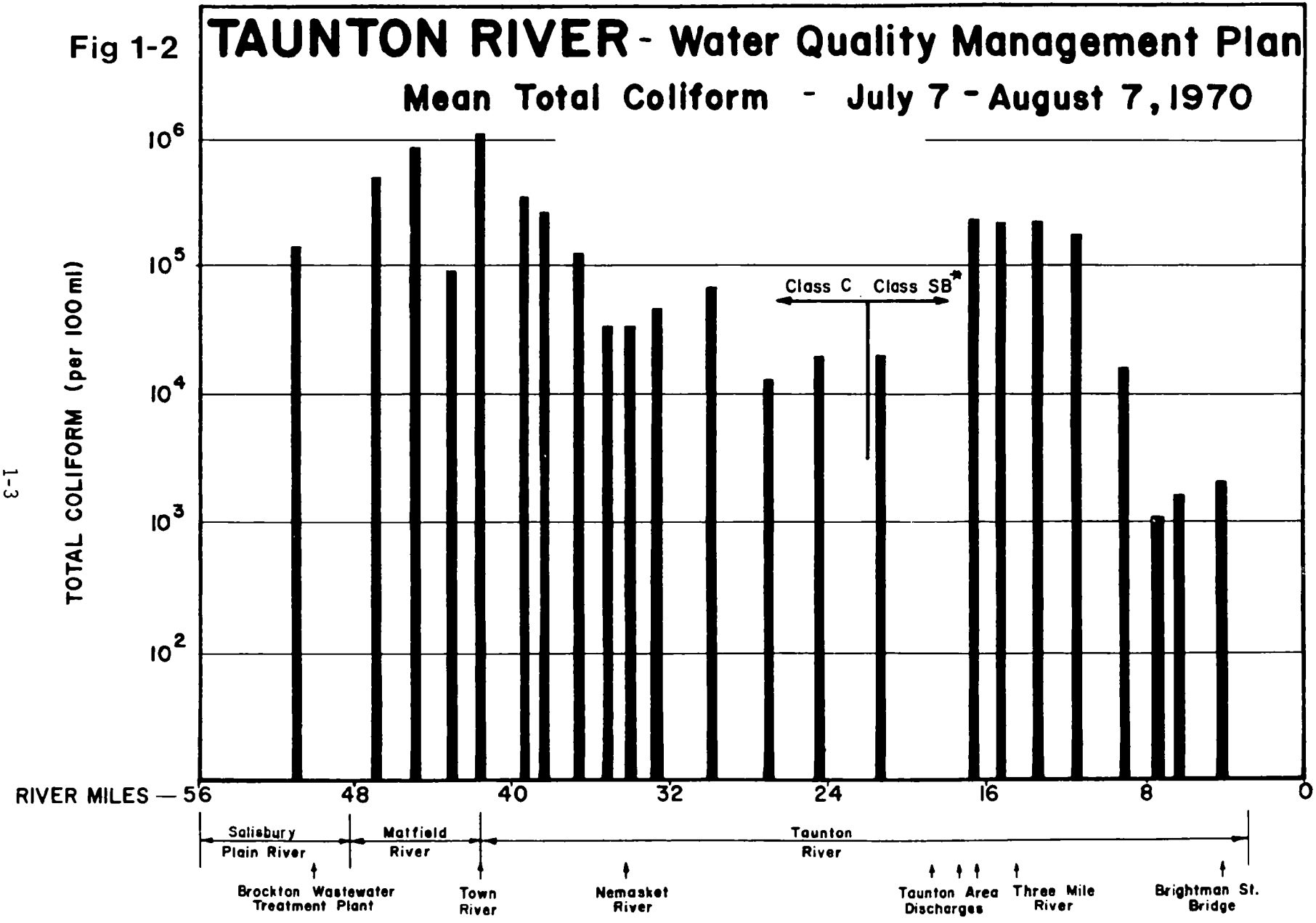
In order to determine what constituted a problem, it was necessary to look at the proposed uses of the streams (the stream classifications

Fig.1-1



SOURCE: Massachusetts Division of Water Pollution Control, Taunton River Basin Water Quality Management Plan. 1973.

Fig 1-2



* Tidal values are average of high and low tide data

SOURCE: Massachusetts Division of Water Pollution Control, Taunton River Basin Water Quality Management Plan. 1973.

TABLE 1-1

OCPC 208 SAMPLING PROGRAMS

Program	Period	# of Sites	Comments
Mass. Division of Water Pollution Control	6/75-7/75	41	To determine in-stream ambient water quality in major OCPC Taunton River Basin rivers and streams; to provide updated flow and water quality information for Taunton River Basin Model.
MDWPC - II	6/75-8/75	8	To determine in-stream ambient water quality in major OCPC North River Basin rivers and streams; to provide updated flow and water quality information for Taunton River Basin Model.
MDWPC - III	3/18/76	26	To determine in-stream ambient water quality in selected DWPC sites in the OCPC Taunton River Basin rivers and streams during high flow periods.
MDWPC - IV	4/3/75	33	Same as MDWPC - III
MDWPC - V	6/75-7/75	6 lakes	To determine ambient water quality in six selected OCPC lakes and ponds (Brockton Reservoir, Waldo Lake, Thirty-Acre Pond, Ellis Brett Pond, Robbins Pond, Lake Nippenicket); 1-3 sampling locations per lake/pond; selected biological data also collected.
Bridgewater State College	12/75-1/76	69	To determine locations of non-point sources; to verify suspected non-point sources.
Bridgewater State College	3/76-4/76	51	Same as Phase I; also to confirm or clarify BSC Phase I results.
EEA - I	6/16/76	10	Ellis Brett/Thirty-Acre Ponds and tributaries (dry weather).
EEA - II	7/1/76	10	Same as above (wet weather).
EEA - III	8/76	40 (8 lakes)	Summer lakes/ponds and tributaries survey (cleveland Pond, New Pond, Lake Nip, Robbins Pond, Oldham Pond, Furnace Pond, Wampatuck Pond, Monponsett Pond).

TABLE 1-1 (cont'd)

OCPC 208 SAMPLING PROGRAMS

Program	Period	# of Sites	Comments
EEA - IV	9/17/76	12	Brockton wet weather in-stream survey.
EEA - V	10/20/76	12	Same as above.
EEA - VI	Fall, 1976	3	Stormwater Emissions Survey - Westgate Mall, Reece's Circle, Tremont/Warren Street (additional samples in Lovett's Brook).
EEA - VII	Spring, 1976	23	Agricultural and landfill surveys, wet weather, in-stream

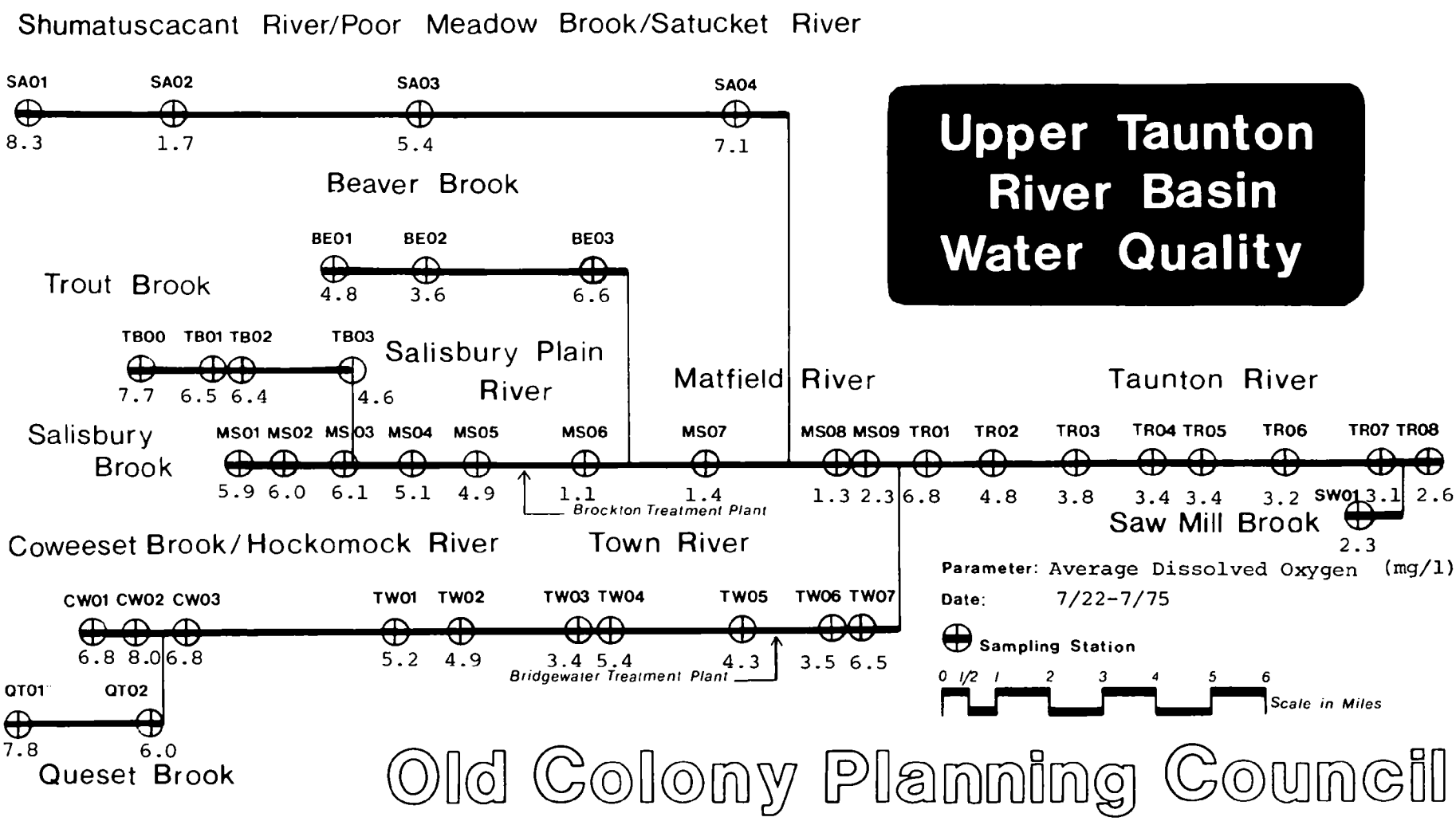

Shumatuscacant River/Poor Meadow Brook/Satucket River
SA01
SA02
SA03
SA04
8.3
1.7
5.4
7.1
Beaver Brook
Upper Taunton River Basin Water Quality
BE01
BE02
BE03
Trout Brook
4.8
3.6
6.6
TB00
TB01
TB02
TB03
Salisbury Plain River
7.7
6.5
6.4
4.6
Matfield River
Taunton River
Salisbury Brook
MS01
MS02
MS03
MS04
MS05
MS06
MS07
MS08
MS09
TR01
TR02
TR03
TR04
TR05
TR06
TR07
TR08
5.9
6.0
6.1
5.1
4.9
1.1
1.4
1.3
2.3
6.8
4.8
3.8
3.4
3.4
3.2
3.1
2.6
Brockton Treatment Plant
SW01
Saw Mill Brook
2.3
Coweeset Brook/Hockomock River
Town River
CW01
CW02
CW03
TW01
TW02
TW03
TW04
TW05
TW06
TW07
6.8
8.0
6.8
5.2
4.9
3.4
5.4
4.3
3.5
6.5
Bridgewater Treatment Plant
Parameter: Average Dissolved Oxygen (mg/l)
Date: 7/22-7/75
Sampling Station
0 1/2 1 2 3 4 5 6
Scale in Miles
QT01
QT02
7.8
6.0
Queset Brook
Old Colony Planning Council

Fig. 1-3

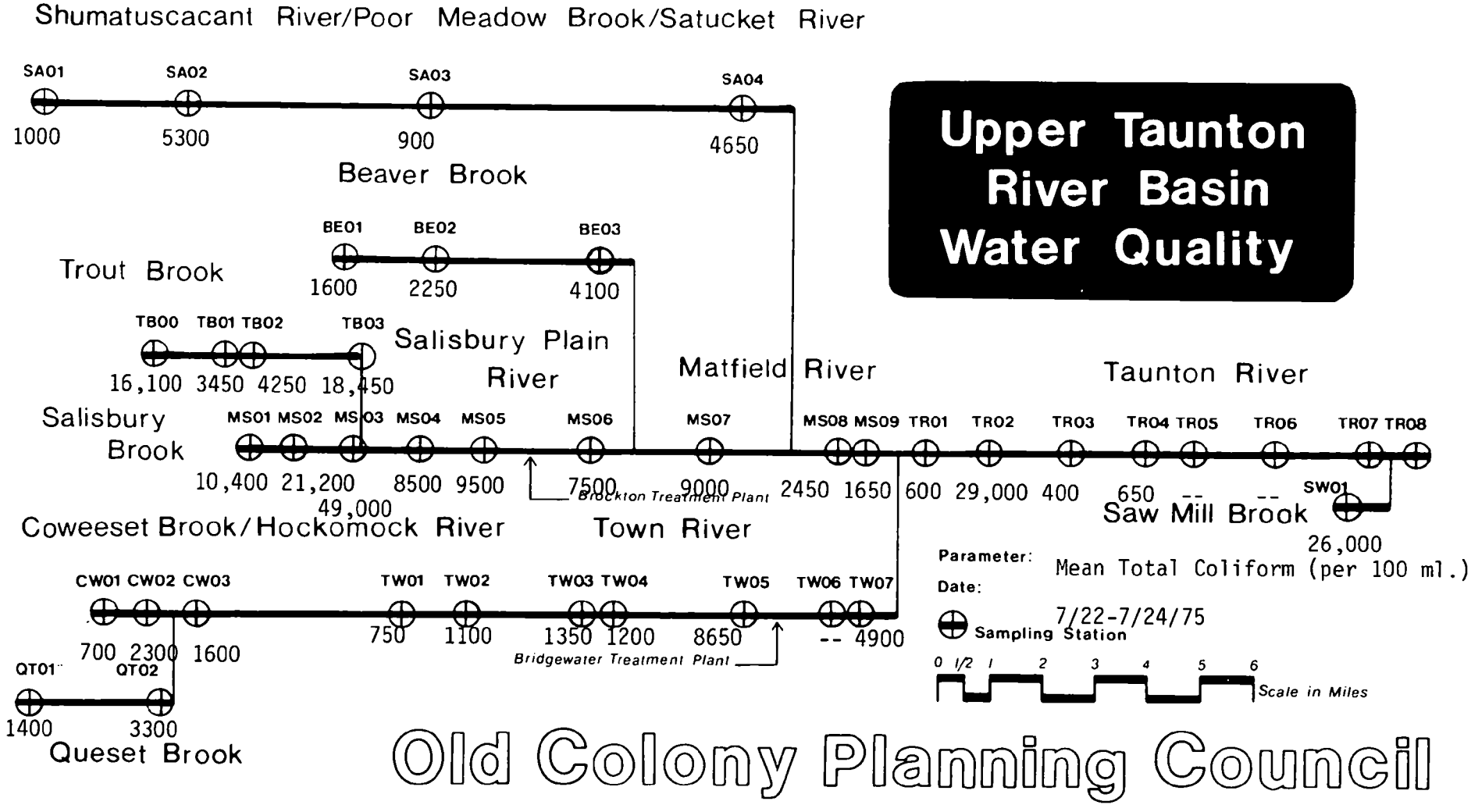
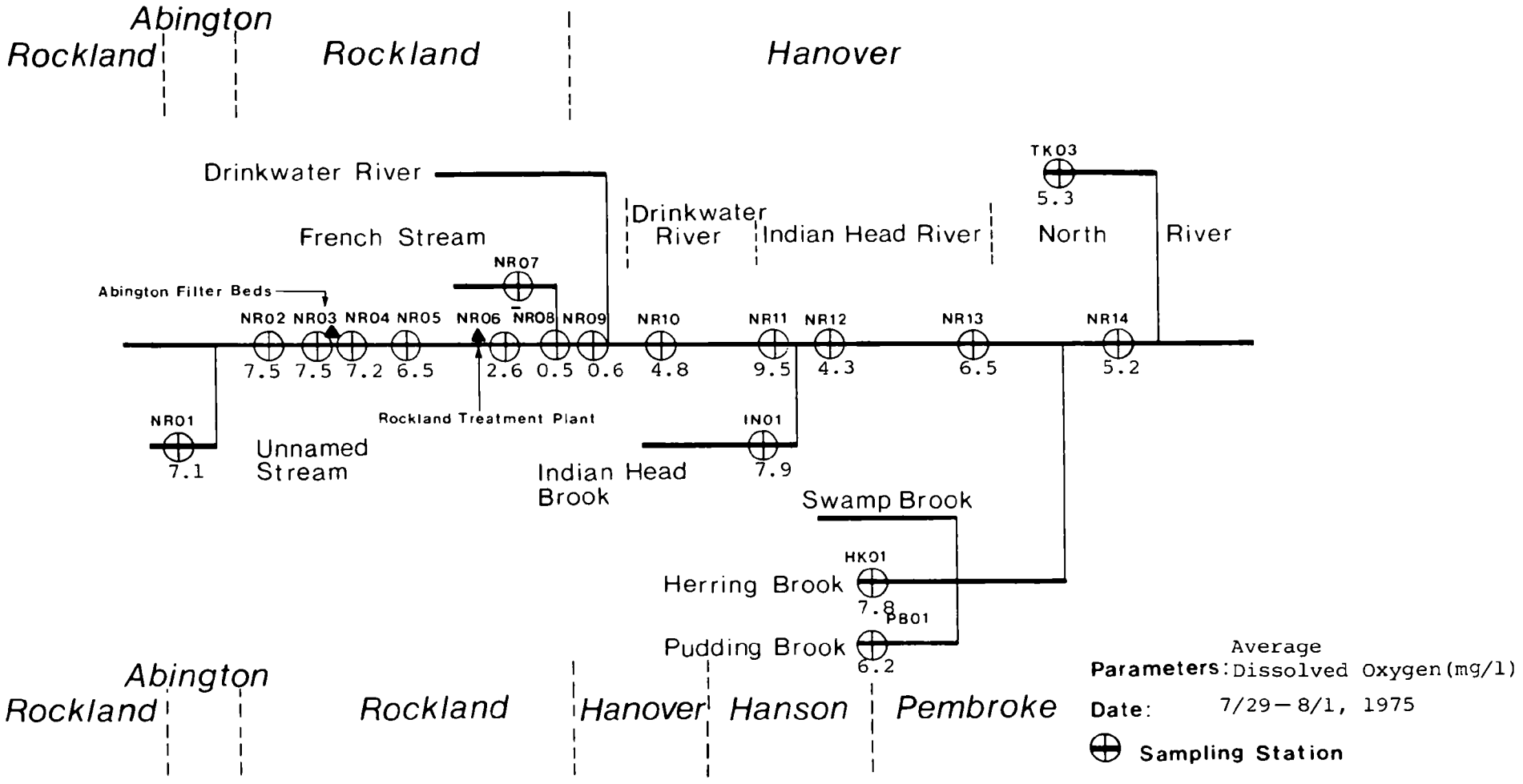

Shumatuscacant River/Poor Meadow Brook/Satucket River
SA01
SA02
SA03
SA04
1000
5300
900
4650
Beaver Brook
Upper Taunton River Basin Water Quality
BE01
BE02
BE03
Trout Brook
1600
2250
4100
TB00
TB01
TB02
TB03
Salisbury Plain River
16,100
3450
4250
18,450
Matfield River
Taunton River
Salisbury Brook
MS01
MS02
MS03
MS04
MS05
MS06
MS07
MS08
MS09
TR01
TR02
TR03
TR04
TR05
TR06
TR07
TR08
10,400
21,200
49,000
8500
9500
7500
9000
2450
1650
600
29,000
400
650
Brockton Treatment Plant
SW01
Saw Mill Brook
26,000
Coweeset Brook/Hockomock River
Town River
CW01
CW02
CW03
TW01
TW02
TW03
TW04
TW05
TW06
TW07
700
2300
1600
750
1100
1350
1200
8650
4900
Bridgewater Treatment Plant
QT01
QT02
1400
3300
Queset Brook
Parameter:
Mean Total Coliform (per 100 ml.)
Date:
7/22-7/24/75
Sampling Station
0
1/2
1
2
3
4
5
6
Scale in Miles
Old Colony Planning Council

Fig. 1-4

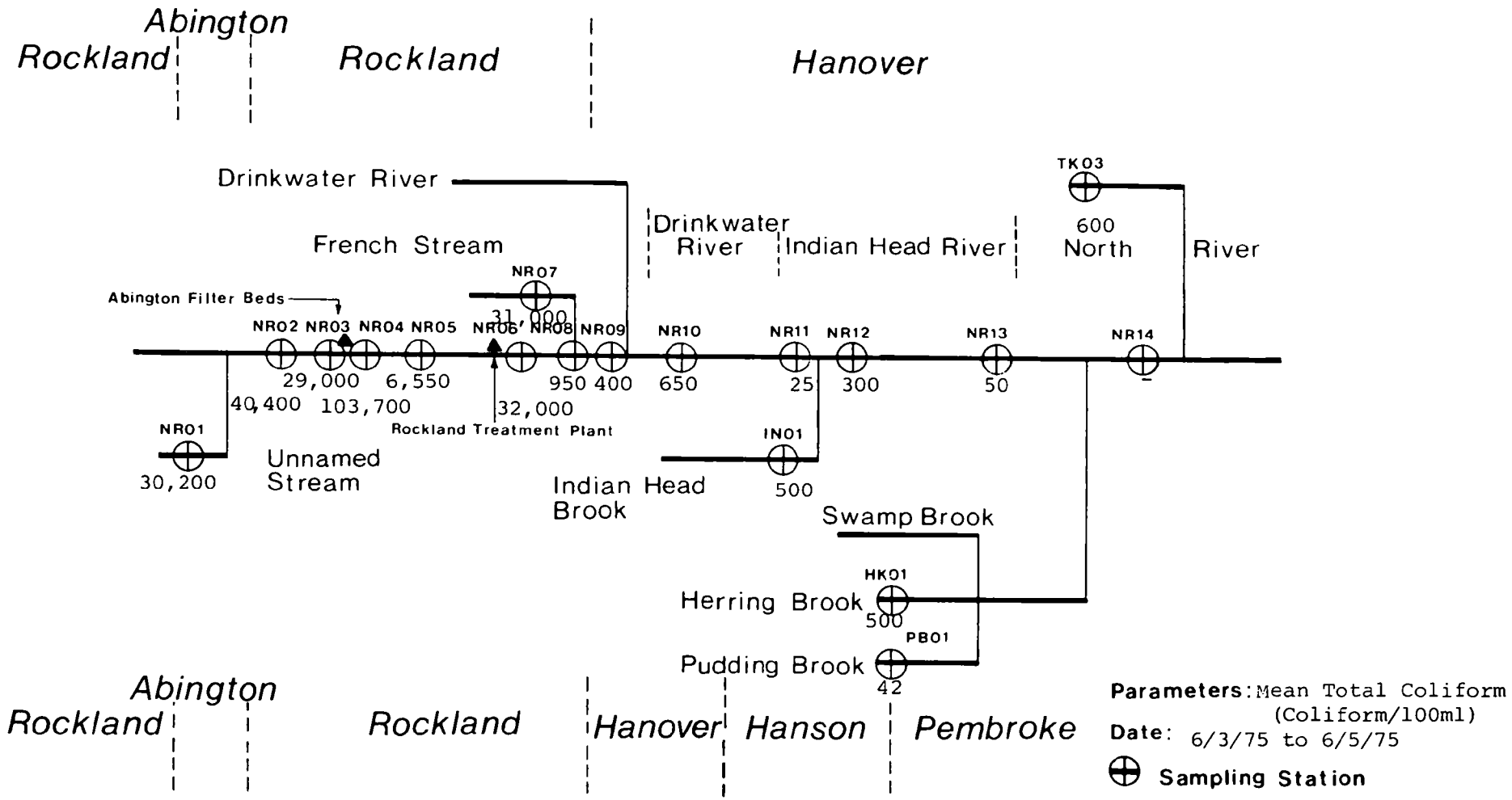
North River Basin Water Quality



Old Colony Planning Council

Fig. 1-5

North River Basin Water Quality



Old Colony Planning Council

Fig. 1-6

are discussed in the Introduction) and the levels of the parameters necessary to achieve these uses. The Appendix lists the measures of water pollution for different uses (flowing water, lakes and ponds, and groundwater) that the 208 study used to determine whether a site was a problem or not. For example, for fishable/swimmable streams there must be no less than 5 mg/l of dissolved oxygen and no more than 1000 coliform bacteria per 100 ml. of water. Thus, if a stream which is classified Class B (fishable/swimmable) showed a sampling result of 6 mg/l of dissolved oxygen and a coliform level of 850 per 100 ml. it was considered not to be a problem. However, if the site showed 2.5 mg/l of dissolved oxygen and a coliform level of 16,000 per 100 ml. or a dissolved oxygen level of 5.5 mg/l and a coliform level of 8600 per 100 ml. it was considered to be a water quality problem. In every case, the worst case was assumed, i.e., if even one parameter was exceeded, the location was considered a water quality problem site.

In general, the worst problems in the more suburbanized communities (Abington, Avon, Easton, Hanson, and Pembroke) stem from failing septic systems, landfill leachate, and road salt (or salt pile) run-off. In Brockton, the major problems stem from urban run-off and from the over-loaded, out-moded sewage treatment facility. In the more rural communities (West Bridgewater, East Bridgewater, and Bridgewater) a major problem stems from agricultural run-off.

In the following section, each community and its water quality problems are described in greater detail. Table 1-2 summarizes the sources of water pollution in each of the 208 communities. Figure 1-7 shows the sampling locations in the 208 area.

TABLE 1-2

IN-COMMUNITY SOURCE(s) OF WATER POLLUTION

	septage lagoon leachate	septic system leachate	sewage treatment plant effluent	industrial discharge(s)	agricultural run-off	urban run-off	salt pile run-off	highway run-off (salt)	landfill leachate	unknown
Abington		X	X			X		X	X	X
Avon		X					X	X		X
Bridgewater	X	X	X	dairy proc.	X					
Brockton		X	X	X		X		X		X
East Bridgewater		X			X	X		X		
Easton		X			X		X	X		X
Hanson		X					X	X		X
Pembroke		X			X		X	X		X
West Bridgewater		X			X			X		
Whitman	X	X		X		X	X		X	

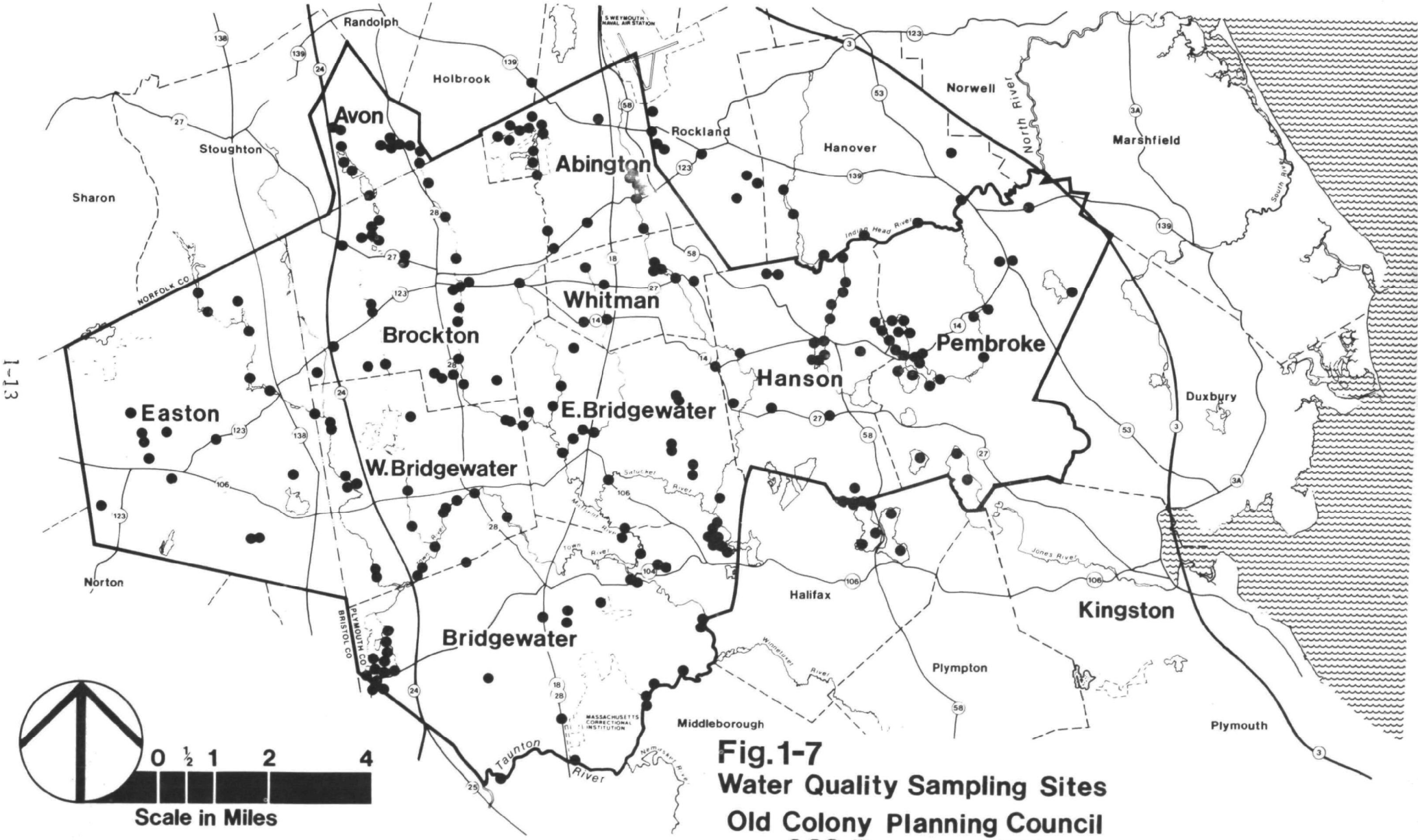
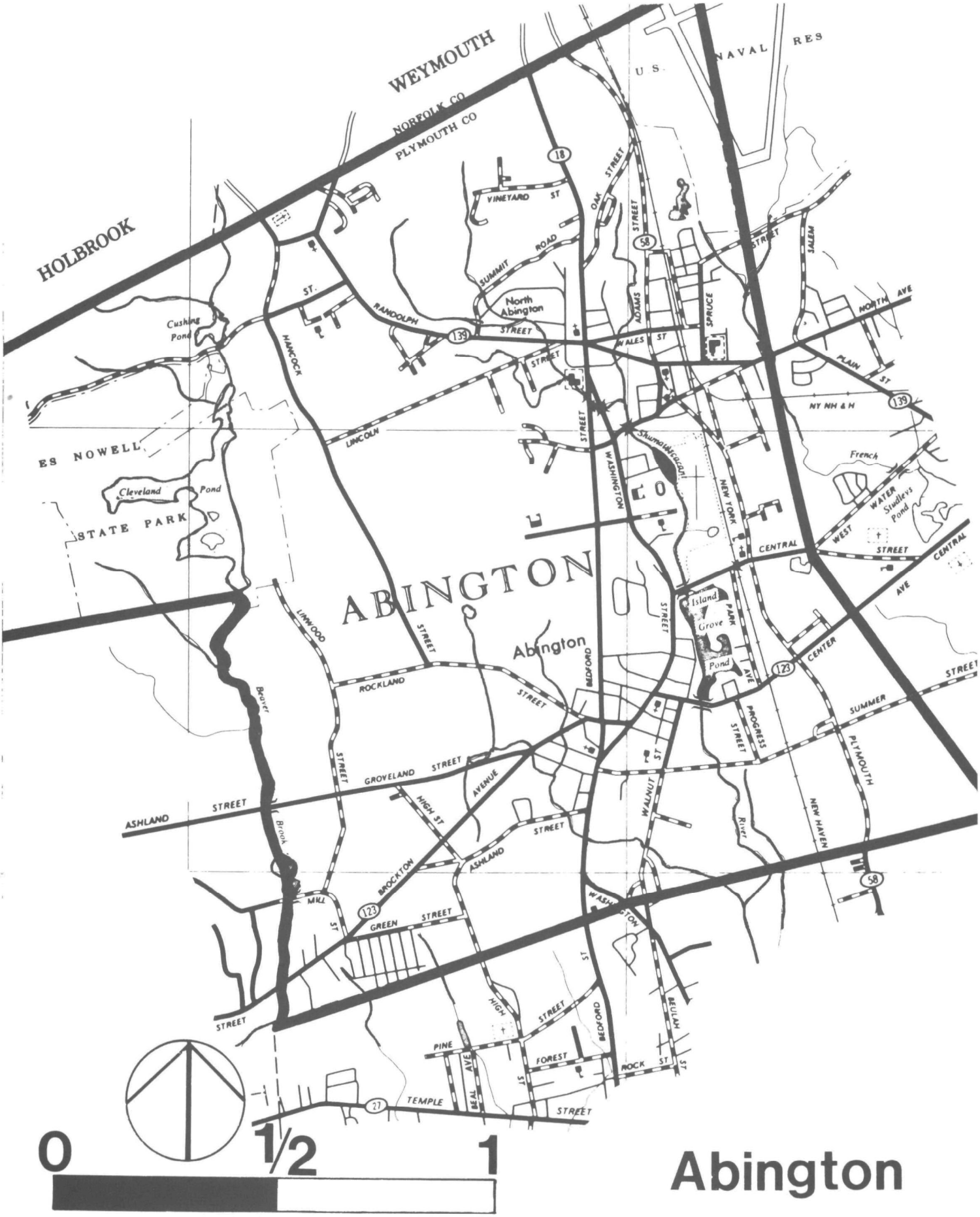


Fig. 1-7
Water Quality Sampling Sites
Old Colony Planning Council
208 Program, 1977

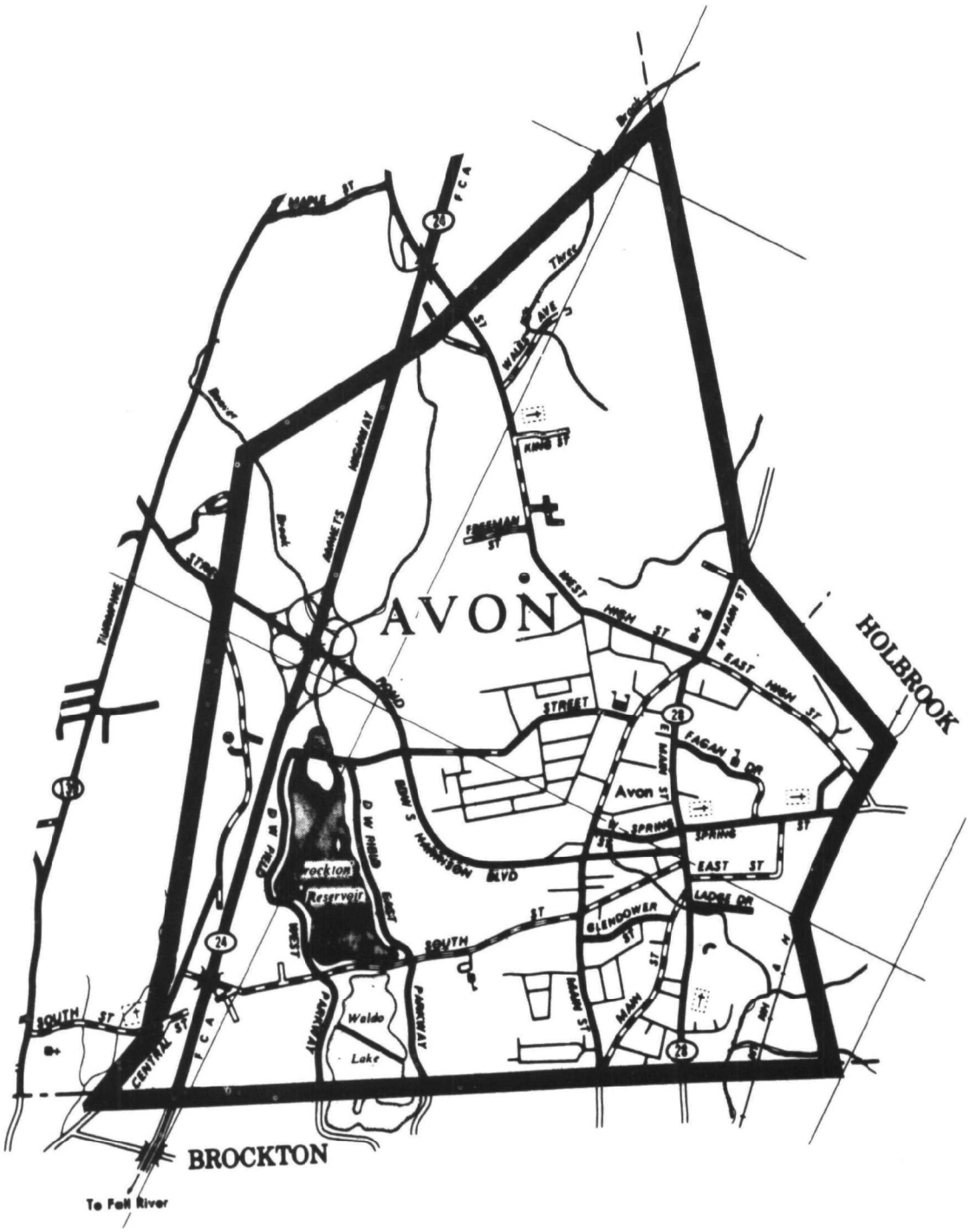

WEYMOUTH
NORFOLK CO
PLYMOUTH CO
HOLBROOK
U S NAVAL RES
ABINGTON
North Abington
Abington
Cushing Pond
Cleveland Pond
STATE PARK
ES NOWELL
Island Grove Park
Pond
French
Studleys Pond
Shumatuscacant
VINEYARD ST
SUMMIT ROAD
OAK STREET
ADAMS STREET
SPRUCE STREET
SALEM STREET
NORTH AVE
PLAIN ST
NY NH & H
RANDOLPH STREET
HANCOCK STREET
LINCOLN STREET
WALES ST
WASHINGTON STREET
NEW YORK CENTRAL
WEST CENTRAL AVE
WATER STREET
LINWOOD STREET
ROCKLAND STREET
BEDFORD STREET
CENTER STREET
SUMMER STREET
PROGRESS STREET
PLYMOUTH
NEW HAVEN
RIVER
WALNUT ST
GROVELAND STREET
ASHLAND STREET
HIGH ST
AVENUE
BROCKTON
MILL ST
GREEN STREET
PINE
FOREST
ROCK ST
BEULAH ST
BEAL AVE
TEMPLE STREET
Beaver Brook
18
58
139
123
27
0
1/2
1

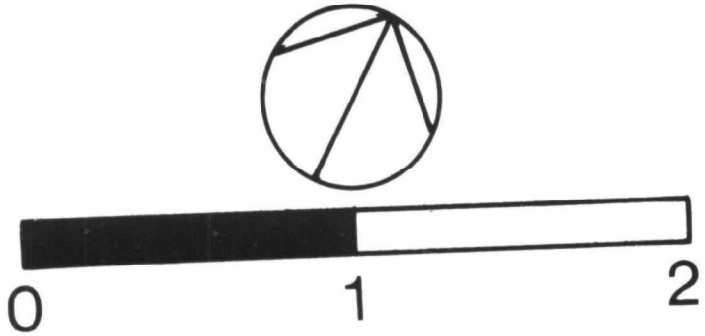
Abington

ABINGTON

Abington has a population of 13,000 and is expected to grow to 17,000 by 1995. It is a relatively small community, primarily suburban in character, but with a moderate amount of multi-family housing. It is close to Boston and Brockton. Development has been hindered by poor soils in the western half of town. Its major pollution sources are septic system leachate, effluent from the small Abington Charles Street filter beds and effluent from the closed landfill. Its major water quality issues are to what extent to build sewers and the decision as to whether to treat the sewage in Brockton, in Rockland and/or at the Old Colony Water Pollution Control District (OCWPCD) facility in Bridgewater. The only industry in the NPDES permit system in Abington is Rumford Litho, Inc. A suspected water quality problem is an industrial discharge at the intersection of Rte. 58 and Summer Street and a dental lab discharge on Oak Street.

Abington relies on wells in Pembroke and at Meyers Avenue in Abington for its drinking water. The Meyers Avenue well has shown elevated sodium levels.


AVON
HOLBROOK
BROCKTON
To Fall River
MAPLE ST
FCA
20
WABAN AVE
KING ST
FREEMAN ST
WEST HIGH ST
EAST HIGH ST
MAIN ST
STREET
FAGAN DR
Avon
SPRING ST
EAST ST
LADDIE DR
GLENDOWER ST
SOUTH ST
MAIN ST
Brockton Reservoir
Waldo Lake
PARKWAY
CENTRAL ST
SOUTH ST
24
28
138

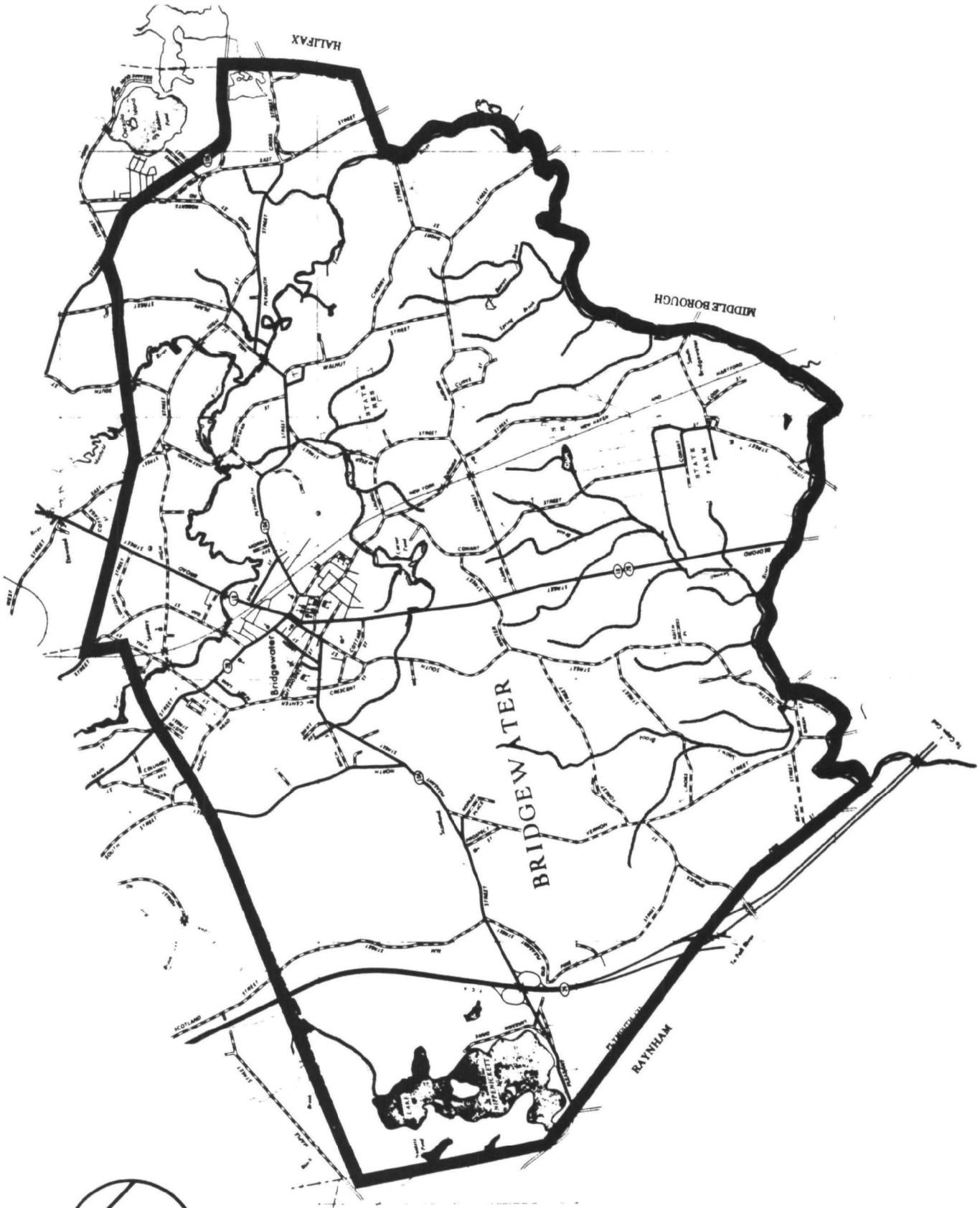

0
1
2

Avon

AVON

Avon is the smallest town in the Commonwealth. It has a population of 5,000 and is only expected to grow to 6,100 by 1995. It faces a severe water shortage, relying entirely on in-town groundwater, such that extensive growth even with sewering is not expected. The extensive growth of the Avon Industrial Park shows the importance of transportation access and the relatively little importance of the lack of public sewerage. The town completed a sewerage plan but voted down the funds to build the sewer twice at town meetings. Avon well illustrates the fact that water quality planning which does not include a mix of alternatives will probably not get implemented. Its major pollution sources are septic system leachate and highway runoff. Its major water quality issues and problems are protecting water supplies (both groundwater and surface water at the Brockton Reservoir) through aquifer protection and water conservation, the restoring of septic system operation and prevention of future problems, and instituting an Open Space Plan which includes water quality objectives. Hermetite in Avon is the only industry in the NPDES permit system. A possible water quality problem, not documented, is run-off from uncovered storage piles at the Industrial Park.

The wells on Harrison Boulevard and Route 28 (four) have shown excessive levels of sodium. This is a potentially serious problem for Avon, as Avon relies entirely on its own wells and the supply is currently limited.



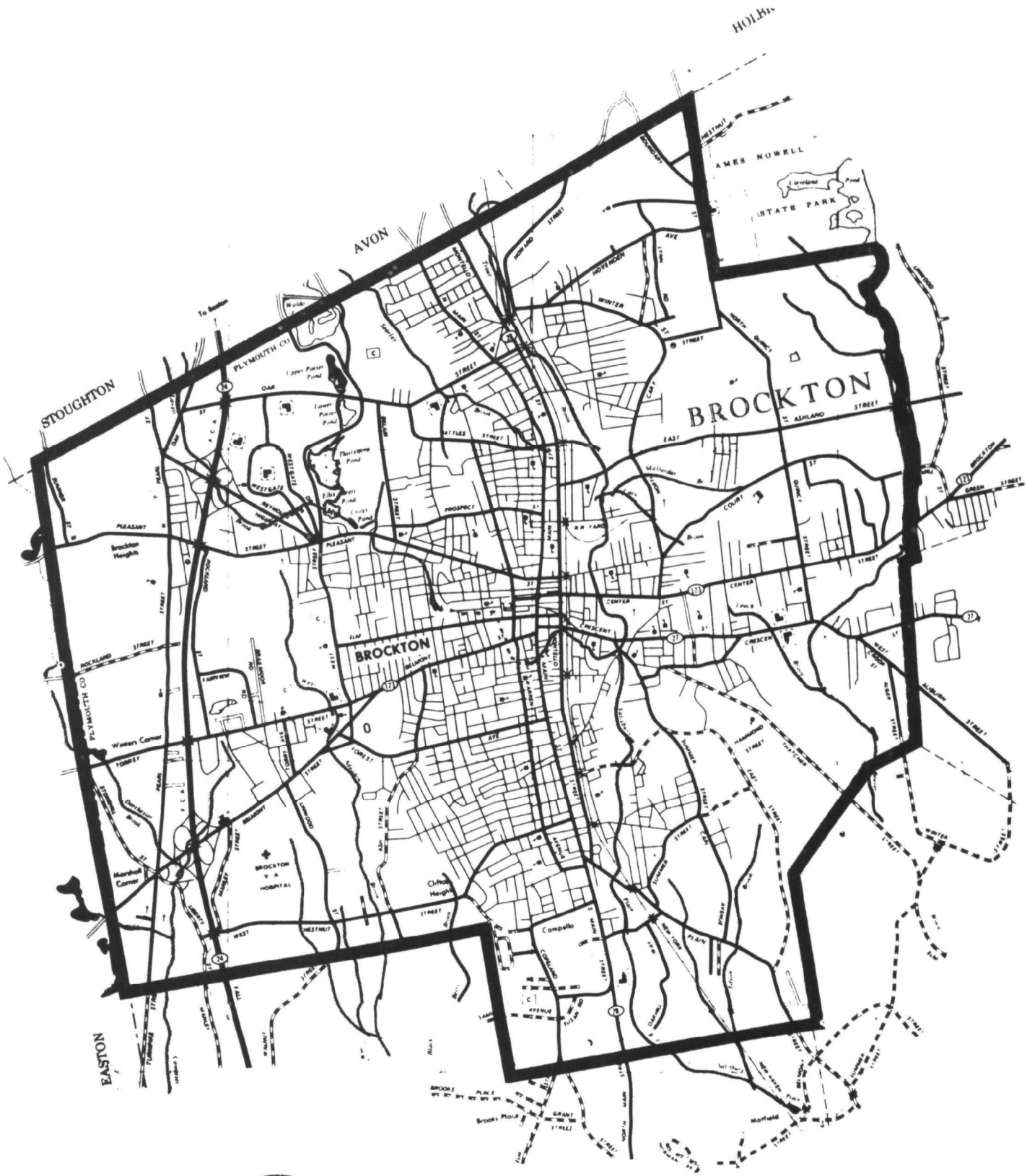
Bridgewater

BRIDGEWATER

Bridgewater is a large, relatively agricultural (mostly dairies and field corn) community with a developed town center. Its population is now 15,100 and is expected to be 24,100 by 1995. There have been large apartment complexes built in the downtown sewered portion of town. Bridgewater State College is also in the center of town. Bridgewater's major pollution sources are effluent from the Bridgewater and Massachusetts Correctional Institution sewage treatment facilities, agricultural runoff, especially along the Taunton River and septic system leachate. Its major water quality issues are controlling agricultural run-off, determining the extent of any need for expanded sewerage, up-grading or replacing of the sewage treatment facilities in town, water conservation and water supply protection, and protecting the recreational facilities at Lake Nippenicket. Bridgewater has many active sand and gravel removal sites. Both Cumberland Farms, Inc. and McIntires Dairy are in the NPDES permit system.

In addition to the above sources of water pollution, Bridgewater also has problems with septage lagoon leachate and effluent from dairy processing.

Bridgewater relies entirely on groundwater for its water supply. The well at High Street was recently closed due to high nitrate levels and Carver Pond well #2 has shown elevated sodium levels.


BROCKTON
STOUGHTON
AVON
EASTON
PLYMOUTH CO
AMES NOWELL
STATE PARK
BROCKTON
BROCKTON
BROCKTON
V A
HOSPITAL
Compello
Montfield
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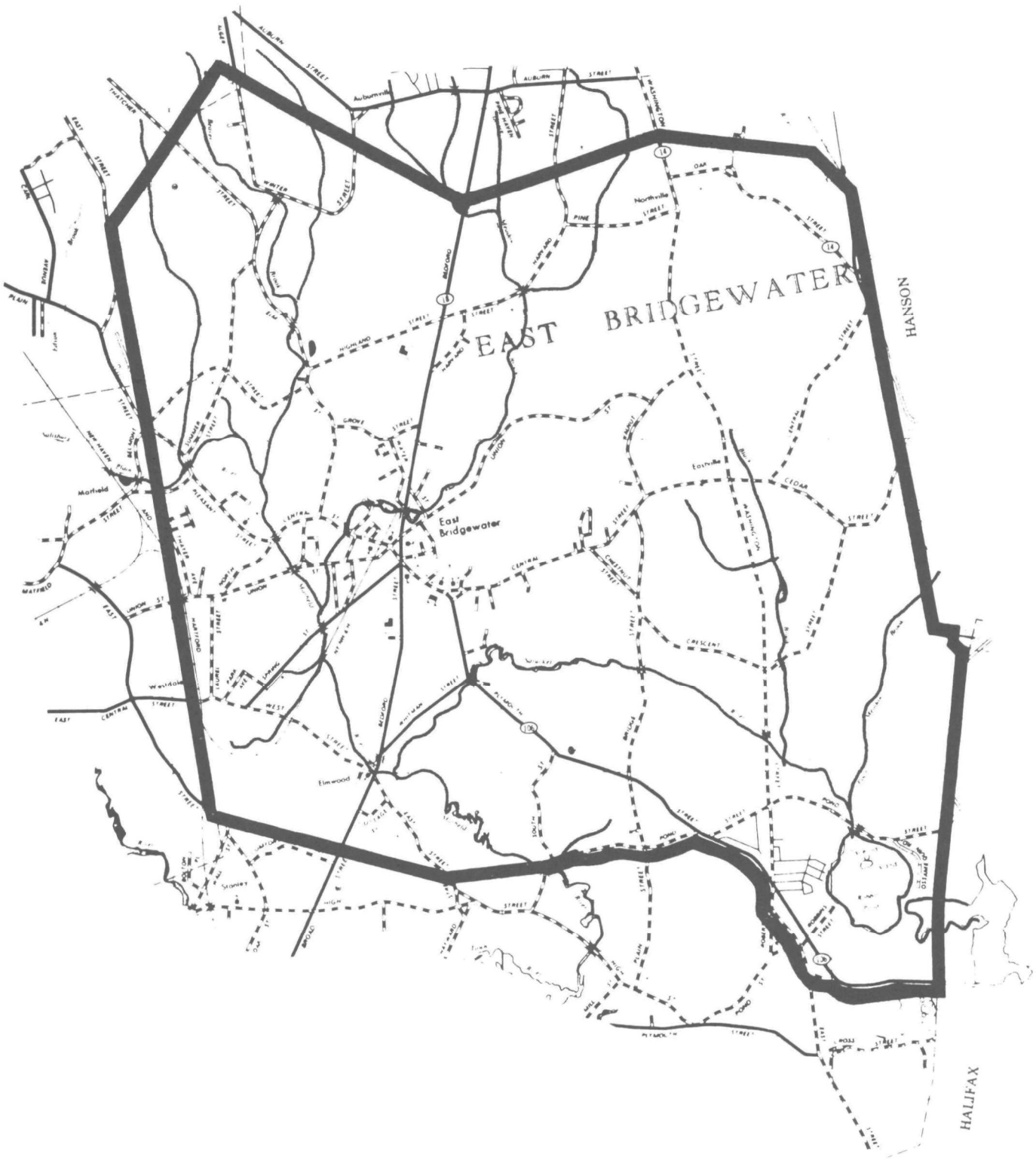
Brockton

BROCKTON

Brockton is the only city in the 208 area. It has a population of 95,700 and is expected to reach 111,000 people by 1995. Brockton is one of the few cities in the Commonwealth to continue to gain population during the last 20 years. This is partially because the availability of sewers and their lack in the rest of the region made extensive single family and multi-family as well as commercial growth possible. This growth has led to several of Brockton's water quality problems, notably the over-loading of the Brockton Sewage Treatment Plant and the closure of Ellis Brett Pond to swimming due in part to urban runoff from the nearby shopping mall. The major water quality issues for Brockton are the upgrading of the Brockton Sewage Treatment Plant, industrial wastewater issues, the control of urban runoff, and continued work on restoration of Ellis Brett Pond. In addition, Brockton has water quality problems from septic system leachate and highway runoff (primarily salt) from Rte. 24. Possible water quality problems are from its active sand and gravel removal operations and from illegal connections to storm drains. In Brockton Drew Tanning, E.L. LeBaron Foundry, and Brockton Sole and Plastics are in the NPDES permit system.

Brockton relies on other communities for its water supply. Its major source is Silver Lake in Pembroke, with diversions from Furnace Pond and Monponsett Ponds during the winter months.

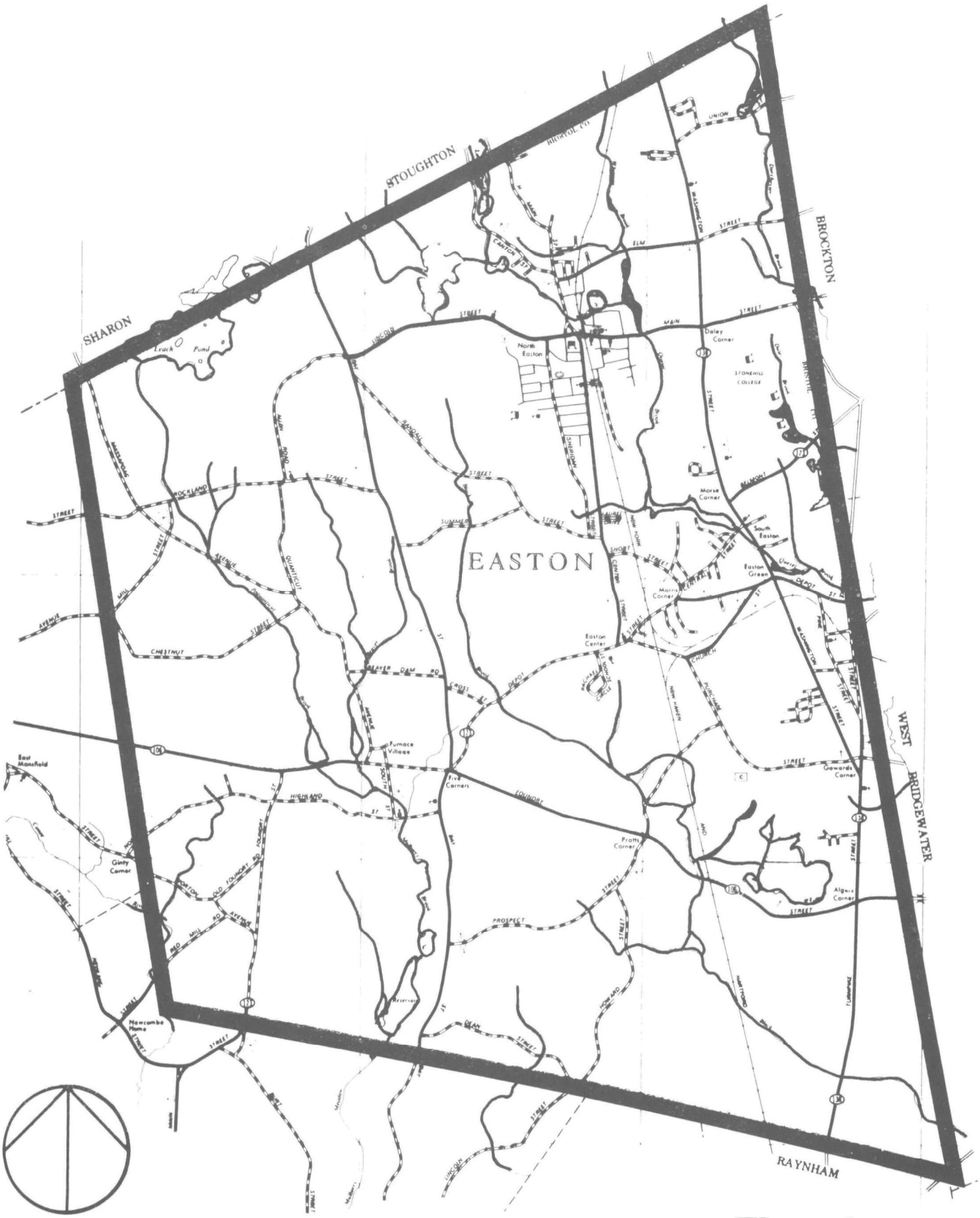


East Bridgewater

EAST BRIDGEWATER

East Bridgewater is a relatively small town with a defined town center, some outlying agricultural areas and summer home development around Robbins Pond. It originally was an industrial town with the development of bog iron. Its population is now 9500 and it is expected to grow to 13,300 by 1995. Its major pollution sources are septic system leachate, agricultural run-off and landfill leachate. Its major water quality issues are the decision as to whether to sewer a portion of the town and where to treat the sewage, to institute a septic system maintenance program, to correct the problems of landfill leachate and ground-water protection of its wells. It has active sand and gravel removal operations which pose a potential water quality problem. Siltation in Forge Pond from residential construction has been a problem in the past. The Foxboro Company is the only industry in East Bridgewater in the NPDES permit system.

East Bridgewater relies entirely on its own groundwater for water supply. The Crescent Street Well #2 showed an elevated sodium level in the past but it has returned to safe levels.


STOUGHTON
SHARON
BROCKTON
WEST BRIDGEWATER
RAYNHAM
EASTON
North Easton
Daley Corner
Morse Corner
South Easton
Easton Green
Morris Corner
Easton Center
Furnace Village
Five Corners
Pratts Corner
Gowards Corner
Algers Corner
Ginty Corner
Newcombe Plains
East Mansfield
Leach Pond
STONEHILL COLLEGE
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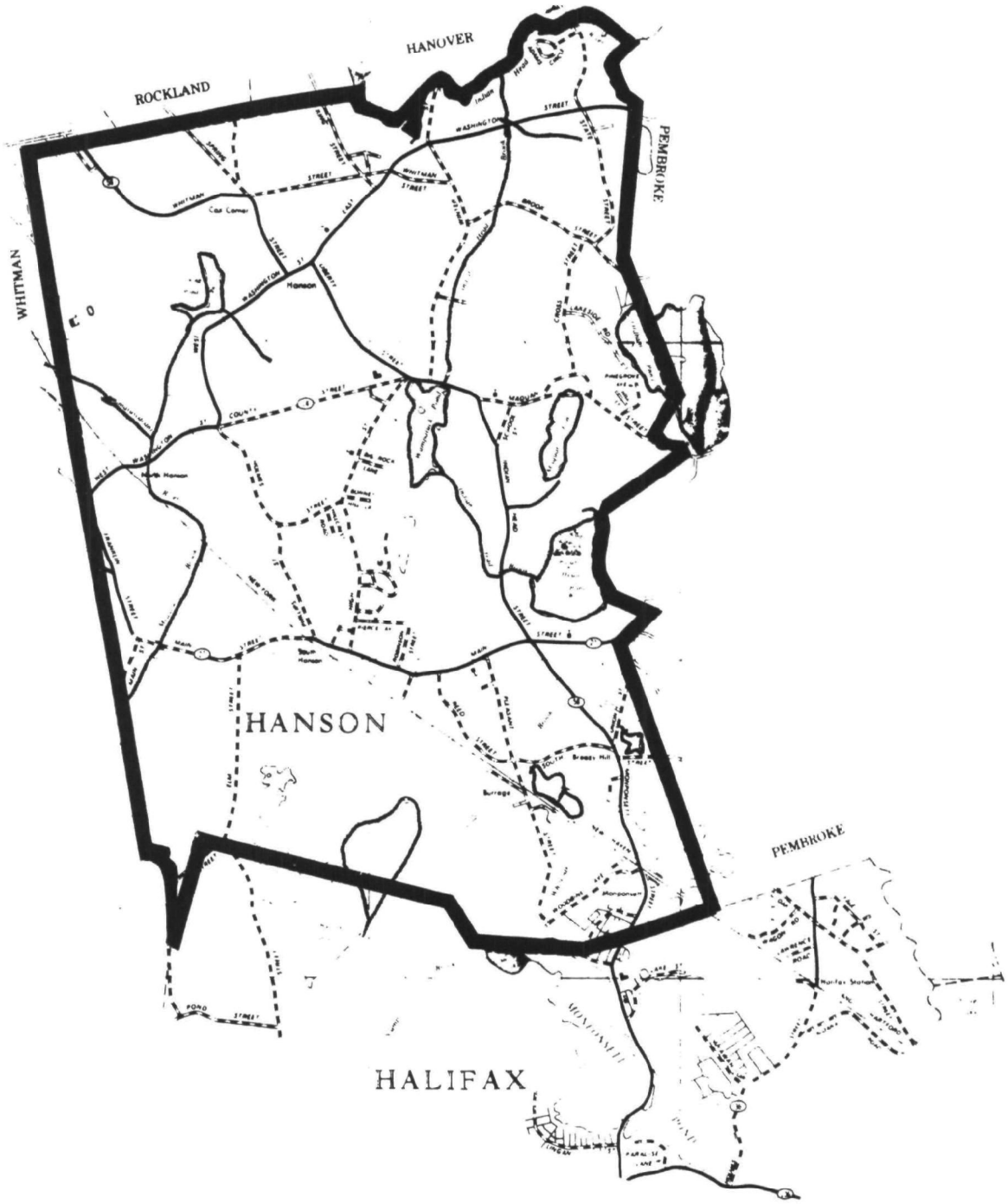
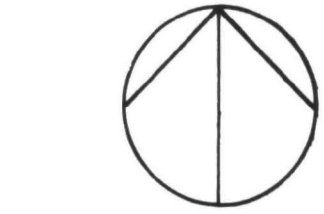
Easton

EASTON

Easton is a prosperous, large, suburban community with a fair amount of multi-family development. Land values are high and homes are relatively expensive. There are extensive areas of wetlands but large amounts of vacant buildable land. The population is currently 14,100 people and is expected to reach 20,000 by 1995. The major pollution source in Easton is isolated septic system leachate (Black Brook, Queset Brook, Morse's Pond). Its major water quality issues are the prevention of future septic system failures and protection of its groundwater supply, run-off from a dairy operation, increasing sodium levels in the Queset Brook well and potential problems from an unknown chemical off Highland Street above a town well.


HANOVER
ROCKLAND
PEMBROKE
WHITMAN
HANSON
PEMBROKE
HALIFAX



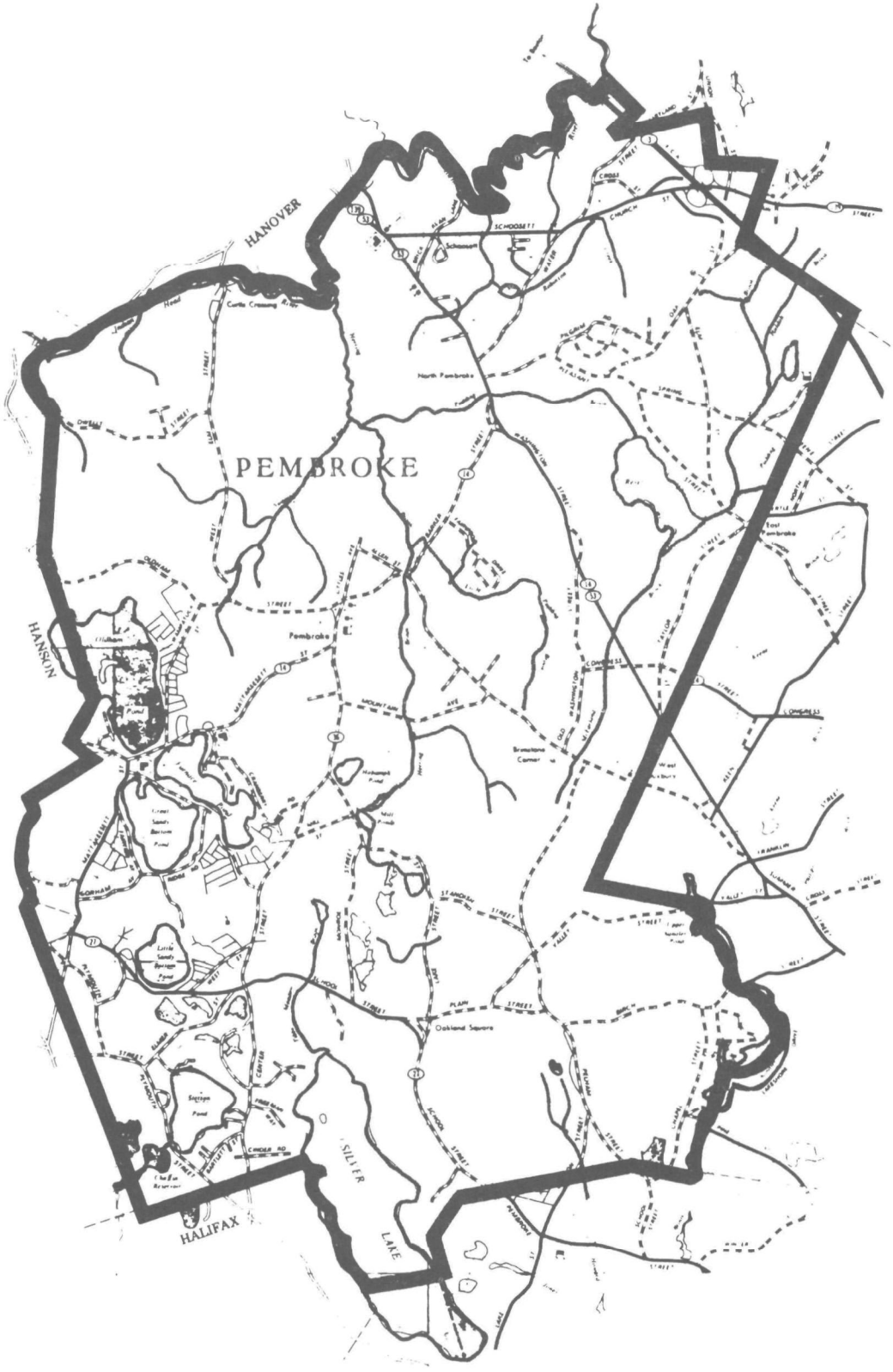
0 1 2

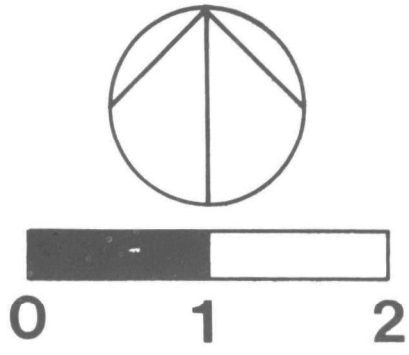
Hanson

HANSON

Hanson is a small community, primarily suburban in character but with some agricultural areas, mainly cranberries, in the southern portion of town. It has a population of 8,300 and is expected to be 12,100 by 1995. It is not near a major transportation route and does not now or expect to have sewers by 1995. Its major pollution sources are septic system leachate, leachate from the County Hospital lagoon, and agricultural runoff. Its major water quality issues are instituting a system of septic system maintenance, development of a groundwater source, and institution of wetlands and floodplain zoning. There are no industrial discharges in Hanson on the NPDES permit. There may be a problem with salt from the salt pile and road salting in the downstream surface waters. There are active sand and gravel removal operations in Hanson which pose potential problems. In addition, an unknown chemical, possibly a pesticide, was found in White Oak Brook.

Hanson is part of the Brockton water supply system and thus is dependent on Pembroke's Silver Lake and Furnace Pond and Monponsett Pond.





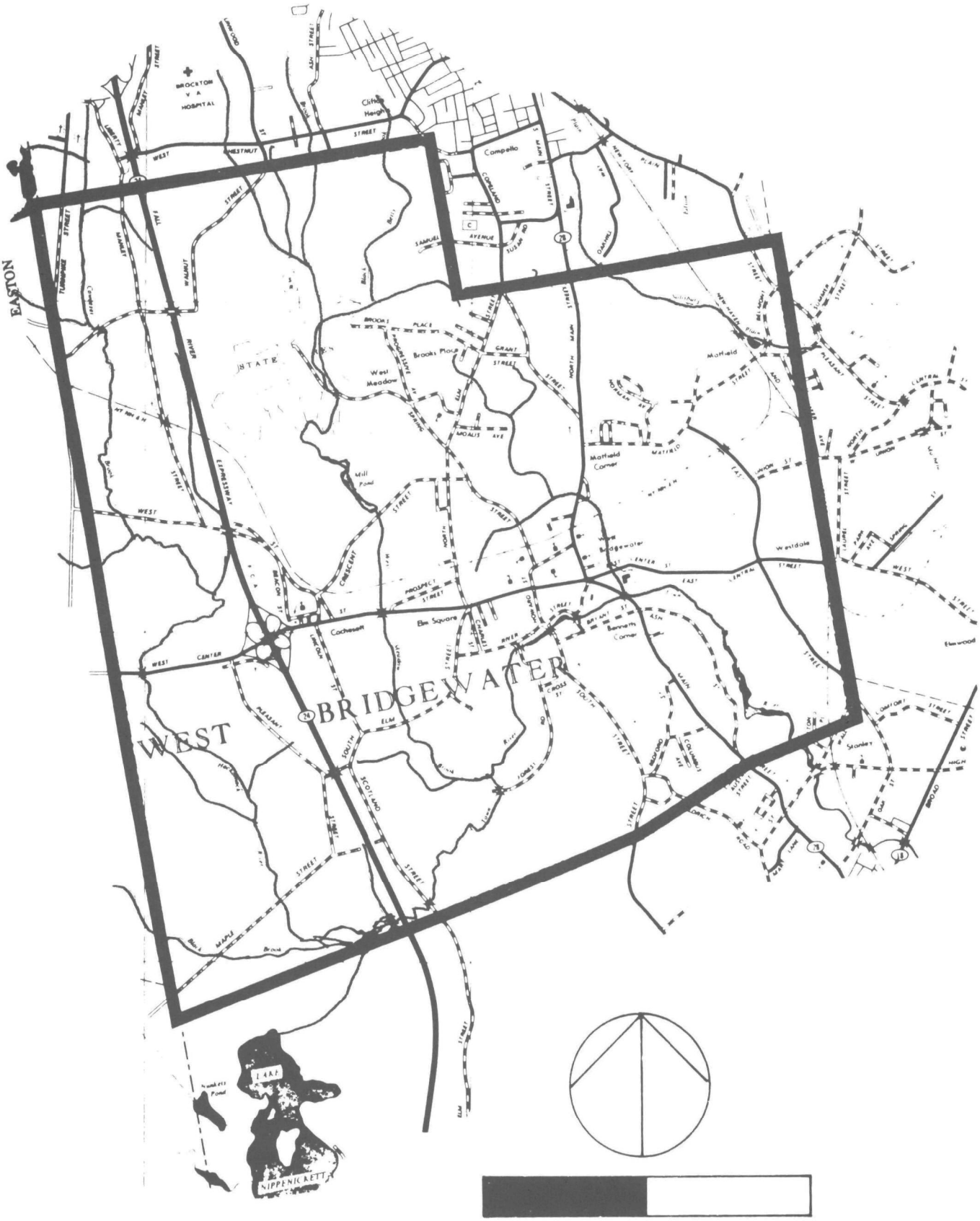
Pembroke

PEMBROKE

Pembroke has some remaining agricultural areas but it is primarily suburban in character. Its population is 12,400 and is expected to reach 19,000 by 1995. Pembroke is located at an interchange of Route 3, a major commuter highway to Boston. There are large areas of summer home developments around the major ponds -- Oldham, Furnace, Little Sandy Bottom, Stetson -- with many of these homes being converted to year-round use.

Pembroke's major pollution sources are septic system leachate, salt pile leachate and highway runoff. Its major water quality issues are protection of the many high quality rivers, ponds and aquifers in the town and institution of a septic system maintenance program. The North River has been chosen to be the first designated Scenic River in the state because of its current high quality water. There may be a problem with landfill leachate from the town landfill. An unknown chemical (most closely resembling malathion) was found off Mattakeeset Street on a tributary to Furnace Pond, in Herring Brook at Mountain Avenue and in Pudding Brook at Washington Street. There are no industries with discharges.

Pembroke is key in the water supply picture for the region as its aquifer is the sole source of water for the City of Brockton and the towns of Pembroke, Whitman and Hanson, and a partial supply for Abington and Rockland. The Abington/Rockland well beside Great Sandy Bottom Pond has shown elevated sodium levels due to a nearby Pembroke salt pile. Pembroke's own wells of Hobomock Street, Center Street and School Street have also shown elevated sodium levels.

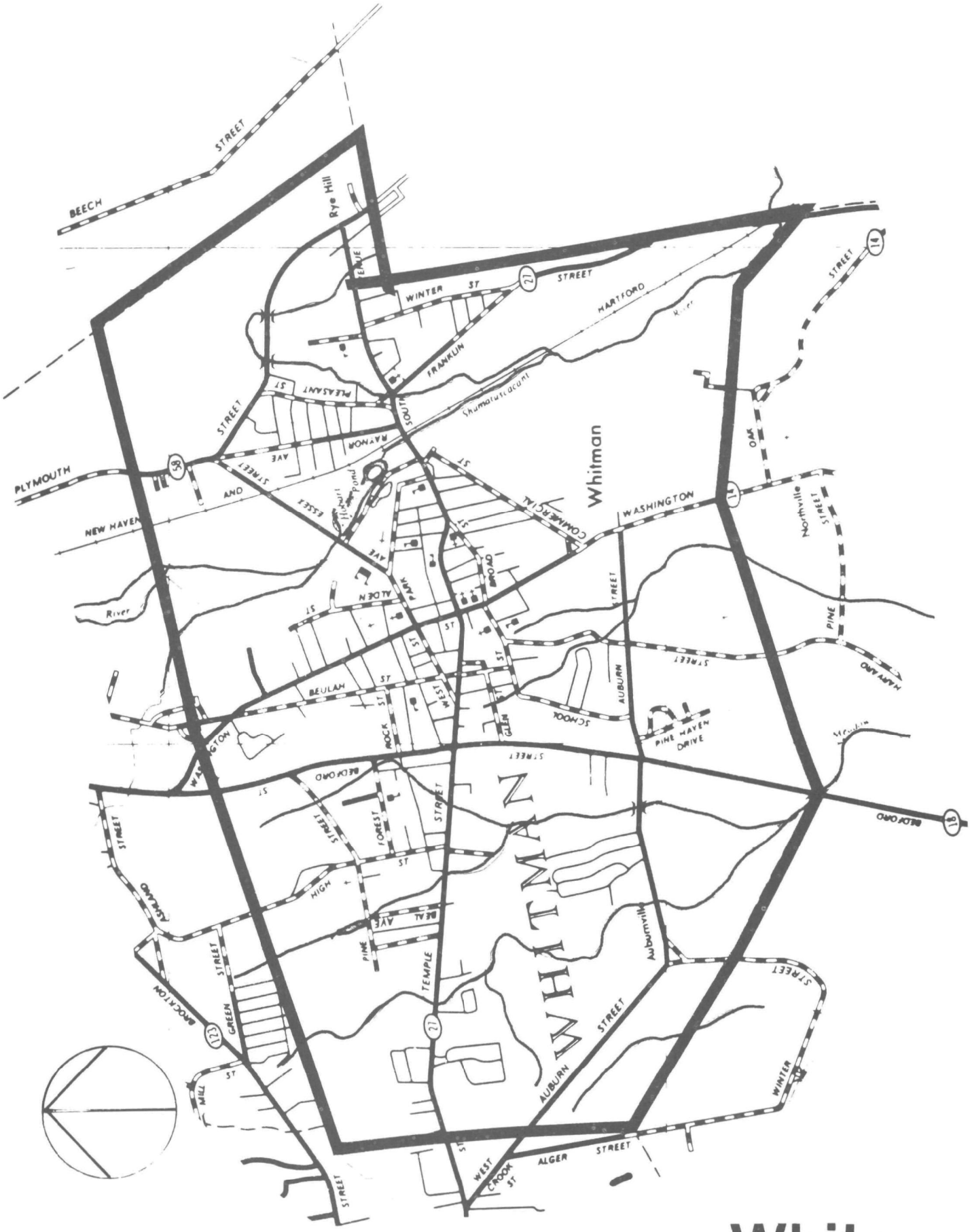


West Bridgewater

WEST BRIDGEWATER

West Bridgewater is a small, agricultural town with little development of any kind. It currently has 6400 people and is expected to have 9000 people by 1995. It has good access to Route 24, a major highway to Boston. A good portion of the Hockomock Swamp is in West Bridgewater. The major pollution sources are agricultural runoff, highway runoff and septic system leachate. The major water quality issues are prevention of septic system failures, determining if there is a need for public sewerage, controlling agricultural runoff and instituting floodplain zoning. West Bridgewater has no industries in the NPDES permit system.

West Bridgewater relies entirely on its own groundwater for its water supply. Its wells at both Norman Avenue and Manley Street show elevated sodium levels. The Manley Street well is directly beside an interchange of Route 24, a major highway into Boston.


Whitman
WHITMAN
BEECH STREET
Rye Hill
WINTER ST
HARTFORD
PLEASANT ST
FRANKLIN
SOUTH
Shumatuscacant
PLYMOUTH
NEW HAVEN
AND
ESSEX
RAYNOR AVE
COMMERCIAL
WASHINGTON
OAK
Northville
PINE
BEULAH
ALDEN PARK
ROCK
WEST
GLEN
SCHOOL
AUBURN
PINE HAVEN DRIVE
BLACK OAK
FOREST
HIGH
PINE
TEMPLE
Auburnville
ROCKLAND
GREEN
MILL
WEST CROOK
ALGER
WINTER
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Whitman

WHITMAN

Whitman is a fairly urbanized town with moderate amounts of industry and a clearly defined downtown. Its population is now 13,500 and only expected to reach 15,900 by 1995. Whitman has many areas with wet soils and has little vacant, developable land. It is a member of the Old Colony Water Pollution Control District and expects to be sewered when that facility is built. Its major pollution sources are septic system leachate and landfill leachate. Its major water quality issues are determining the extent of the need for public sewerage, instituting a septic system maintenance program and up-dating its zoning and subdivision regulations to incorporate water quality considerations. Whitman has several industries on the NPDES permit system, namely: USM-Corp., McCarthy Brothers Ice Cream and Whitman Plating. There are suspected industrial residuals and discharges entering Hobart Pond and suspected illegal connections to storm drains in the Alden Street to Washington Street area.

Whitman is a part of the Brockton water supply system and thus relies on Pembroke's groundwater. Whitman is considering developing an in-town well in the same aquifer that serves the Myers Avenue well in Abington.

CHAPTER 2

Public Participation

Table of Contents

	page
I. On-Going Public Participation Programs	2-1
A. Mechanisms for Citizen Input to Toward Clean Water: Alternatives for Action: Volume I; Draft Environmental Impact Assessment and Volume 2; Draft 208 Plan	2-1
II. Future Public Participation Alternative	2-6
A. Continue Public Participation Through the Policy Advisory Committee	2-7
B. Maintain On-going Public Participation Through Existing Watershed Association	2-10
C. Maintain On-going Participation Through Individual and/or Special Interest Group Action	2-12
D. Maintain On-going Participation by the Coordination of an On-going Policy Advisory Committee, Watershed Associations and Individual Action	2-13

I. On-Going Public Participation Programs

On-going public participation is one of the most critical aspects of present and future water quality programs in the OCPC 208 region. Public participation is an integral aspect of increasing public awareness, of promoting public education of existing and potential water resources, and of ensuring implementation of the 208 plan. Public education programs lead to a greater understanding and appreciation of local water bodies, streams, and wetlands. The streams and ponds in the OCPC 208 area provide many amenities for local residents including open space corridors, recreational land, water supply, and scenic value. Public involvement and concern is necessary for the protection of our valuable natural water resources.

A. Mechanisms for Citizen Input to Toward Clean Water: Alternatives for Action: Volume I; Draft Environmental Impact Assessment and Volume 2; Draft 208 Plan

Citizen review and comment on the Draft Environmental Impact Assessment is essential in order to assure that the Draft 208 Plan will address the needs of each town in the 208 region. Up to this stage of the 208 program, every effort has been made by the staff to incorporate as much citizen involvement as possible by a variety of mechanisms (see Citizen Involvement in OCPC 208 Planning). These include regular meetings of the Policy Advisory Committee (comprised of two subcommittees, the Citizens Committee on Clean Water and the Clean Water Task Force Technical Committee), two water quality workshops in each of the ten OCPC 208 area communities, frequent meetings with town/city officials and boards, public information through the bi-monthly 208 newsletter and the distribution of reports and technical memoranda, visits to problem areas with local citizens, and technical assistance to communities. Public involvement has assisted the 208 staff in the identification of water quality problem areas and potential solutions to be investigated.

The review of the Draft Environmental Impact Assessment will be accomplished by four mechanisms: Policy Advisory Committee meetings, meetings with community boards and committees who would be affected by the alternatives, responses from other interested citizens and special interest groups, workshops that will be held in each town, and areawide public hearings.

The Policy Advisory Committee (PAC) is comprised of two subcommittees: the Citizens Committee on Clean Water and the Clean Water Task Force Technical Committee (Table 2-1). The Citizens Subcommittee on Clean Water is comprised of selectmens'/mayor's designated representatives from each OCPC 208 area community. Other interested and concerned citizens regularly attend the meetings. Further, representatives from the Old Colony Planning Council attend meetings to serve as a liaison between the 208 Citizens Committee and the Planning Council. The Clean Water Task Force Technical Subcommittee is comprised of appointed representatives from the entire range of state and federal agencies concerned with water

TABLE 2-1

208 Policy Advisory Committee, 1977

Citizens Sub-Committee on Clean Water

Abington	Mr. Richard Colbert
	Ms. Jane Howell
	Mr. John Zipeto
Avon	Mr. Robert Cook
	Mr. Peter Crone
Bridgewater	Ms. Marilyn Furlong
Brockton	Mr. Irving Mendelson
East Bridgewater	Mr. Roland Veilleux
	Mr. Paul Tesson
Easton	Mr. Shepard Williams
Hanson	Ms. Margaret C. Kitchenham
Pembroke	Ms. Jean Foley
	Mr. William Jordan
West Bridgewater	Ms. Beth Surgens
Whitman	Mr. Elbert Clayton
OCPC Liaison	
East Bridgewater	Mr. Charles Benson
Easton	Mr. Richard Chase

Clean Water Task Force Technical Subcommittee

Coastal Zone Management	Mr. Dan Calano
Environmental Protection Agency	Mr. Roger Duwart
Mass. Department of Environmental Quality Engineering	Ms. Madeline Snow
Mass. Dept. of Environmental Management, Division of Plan.	Ms. Suzanne Kilner
Mass. Division of Water Pollution Control	Mr. Paul Anderson
	Mr. Al Cooperman
	Mr. William Marhoffer
	Mr. Clint Watson
	Mr. Richard Young
Mass. Dept. of Public Works	Mr. Mike Sharples
Mass. Division of Water Resources	Mr. Paul White
Metropolitan Area Planning Council	Mr. Andrew Patton
North & South Rivers Watershed Assn.	Mr. Jack Foley
Office of State Planning	Mr. Al McNiff
Pilgrim Resource, Conservation and Development	Mr. Bud Reese
Plymouth County Agricultural Stabilization & Conservation Service	Mr. Robert Leland
Plymouth County Extension Service	Mr. Michael Sikora
Project Quest	Mr. Gerry Beals
Southeastern Regional Planning & Economic District	Mr. Stephen Smith
Taunton River Watershed Assn.	-
U.S. Army Corps of Engineers	Mr. John Craig

quality management in the OCPC 208 area. Membership also includes representatives from the adjoining designated 208 regional planning agencies: Metropolitan Area Planning Council and Southeast Regional Planning and Economic Development District.

These two subcommittees meet separately for the convenience of their members; the Citizens Committee meets monthly in the evening and the Technical Committee meets less frequently during normal working hours. All Policy Advisory Committee (PAC) members (Citizens Subcommittee and Technical Subcommittee) are invited to all meetings. Recent meetings of the PAC have focused on specific issues which are the major chapters of Toward Clean Water: Alternatives for Action.

During the past two years, a series of Water Quality Workshops, sponsored by the Citizens Subcommittee and the OCPC 208 staff, were held in each of the ten OCPC 208 area communities. The purpose of the workshops was to introduce the 208 program, and to discuss the OCPC's water sampling results, probable pollution sources, and alternative control measures. These workshops were very useful to the 208 staff in the formulation of alternative solutions for each town and provided a forum for all community officials and other residents to discuss common water quality problems and to seek solutions.

The second mechanism to encourage review and comment of Toward Clean Water: Alternatives for Action are individual meetings of municipal boards and committees that will be affected by the alternatives with members of the OCPC 208 staff. The purpose of these meetings will be to answer any questions about the Draft Environmental Impact Assessment, to elaborate on alternative solutions, and to determine the municipalities' preferred alternatives.

The third mechanism for public review is to encourage responses from other interested and concerned citizens who may not be a part of a town board, committee, or any special interest groups that have not already been contacted. This mechanism allows all residents of the 208 area to participate. Other interested citizens will be informed from local newspaper press releases and articles written by 208 staff members summarizing the major issues (see Table 2-2). Another method to inform citizens who might not normally be contacted is the coverage by the Brockton Enterprise of each monthly Old Colony Planning Council meeting. Progress and review of the 208 program will be discussed at the next five monthly Old Colony Planning Council meetings. In addition, the newsletter of the OCPC 208 Program, will continue to be published bi-monthly and distributed to the current mailing list of over 800 local residents. Forthcoming issues will update 208 program progress as well as summarize the alternatives for each major issue.

The final mechanism for eliciting public involvement will be a series of community workshops to discuss and receive comment on the Draft Environmental Assessment and the Draft Plan. These workshops will be well publicized and held at a convenient location in each

TABLE 2-2

Newspapers in the OCPC 208 Area

	Weekly	Daily
Avon Messenger	X	
Bridgewater Independent	X	
Brockton Enterprise		X
East Bridgewater Star	X	
Easton Bulletin	X	
Lincoln News	X	
Silver Lake News	X	
Southshore News	X	
Quincy Patriot Ledger		X
Whitman Times	X	

town. At the workshops there will be a presentation by the 208 staff of the major alternatives and recommendations followed by discussion and comment.

Table 2-3 lists the agencies, organizations and boards the 208 program has contacted and consulted with during the course of the study.

II. Future Public Participation Alternatives

Each of the alternatives which will be discussed in the following section will be evaluated by five criteria which a successful citizens participation program should address: 1. education (information dis-seimnation), 2. citizen identification of problems and opportunities, 3. evaluation of alternatives, 4. coordination, and 5. implementation of recommendations.

1. Education is one of the most important aspects of a citizens participation program. Education can be achieved through information dissemination by a variety of mechanisms, including: public meetings, seminars, workshops, newsletters, brochures, newspaper articles, and depositories for reports and back-up information. Education is an essential aspect of a public participation program because it enables citizens to become aware and involved in the planning and management of town and regional water resources.

2. The second criterion of a public participation program is that it should enable the public to identify problem areas and opportunities for solutions. The public which is to use the water resources to be protected is the most appropriate source to define and rate problem severity as well as to suggest opportunities for solutions which might not be identified from other means.

3. The third criterion of a public participation program is that it should provide the public a mechanism to evaluate plan alternatives and to up-date the 208 plan. The public to be served is in the best position to be able to evaluate plan alternatives. In addition, proposed alternatives which are not feasible within the existing political environment may be eliminated at an early stage.

4. Another criterion to evaluate a public participation program is the adequacy with which it coordinates the many levels of planning and regulatory agencies, public organizations, and local neighborhood and lakes associations. The complexity of this task is illustrated by Table 2-3 which lists the agencies, organizations, and local boards, from all administrative levels (local, regional, state, and federal) which have some effect on land and water use in the OCPC 208 region.

5. The last criterion for evaluating a public participation program is its ability to facilitate the eventual implementation of recommendations. Public participation is essential for town action since most implementation mechanisms (town and zoning by-laws, approval of the 208 plan, and appropriation of town funds) require approval at town meeting. Support from local residents in the development of alternative recommendations will lead to a strong local base of support which will assist the adoption of recommendations.

There are three basic alternatives for achieving the necessary level of on-going public participation in the OCPC 208 region: 1. continue the Policy Advisory Committee; 2. maintain existing watershed associations; and 3. maintain individual citizen and special interest group action. A fourth alternative is the combination and coordination of the three basic alternatives.

A. Continue Public Participation Through the Policy Advisory Committee

Description: The Citizens Committee on Clean Water is presently comprised of appointed representatives from each town and city in the OCPC 208 region. Further, representatives from the Old Colony Planning Council attend meetings to serve as a liaison between the 208 Citizens Committee and the Planning Council. Other interested and concerned citizens regularly attend the meetings.

Presently, the purpose of the Citizens Committee is to determine on-going policy for the 208 program. The Committee advises the OCPC staff of the potential implications of proposed actions, of implementation feasibility of proposed actions, and of modifications that should be made of proposed actions.

A second important responsibility of the existing Citizens Committee is to assist OCPC in galvanizing more widespread public participation in each of the local communities, in addition to helping the staff organize the recommendations as to the use of information techniques in their communities, approaches to use, and people to contact.

A third primary role of the Citizens Committee is to address and help resolve conflicts that arise in the study period. Because of its inherent areawide nature, the Citizens Committee is a logical group to deal with conflicting water goals and issues among the local communities.

To continue on-going citizen participation through the Policy Advisory Committee would mean that the Citizens Committee and Technical Committee would become a water quality advisory committee to the Old Colony Planning Council. The Citizens Committee would continue its objectives of determining on-going policy, promoting public participation and resolving conflicts. The only change in the existing structure would be that rather than advise the 208 staff, the Citizens Committee would report directly to the Old Colony Planning Council. The continuation of the Policy Advisory Committee would require that the Policy Advisory Committee adopt by-laws and elect officers, including a chairperson. This

TABLE 2-3

AGENCIES, ORGANIZATIONS AND BOARDS CONTACTED FOR THE 208 STUDY

Organization	Major Activity
Town Groups	
Abington Heights Homeowners Association	Neighborhood improvement
Bridgewater Aware	Public information
Brockton Land Trust	Acquisition, conservation
East Bridgewater Groundwater Committee	Groundwater protection
Easton Natural Trust	Open space acquisition
Grossmans Swamp Association (Brockton)	Protection, conservation
Lake Nippenicket Association (B'water)	Protection, recreation
Pembroke Association for Conservation of the Environment	Protection, conservation
Project Quest	Education
Washburns Meadow Association (Brockton)	Protection, conservation
Town Boards	
Conservation Commissions	Acquisition via self help, wetlands protection
Planning Boards	Zoning and subdivision regulations
Boards of Appeal	Zoning appeals
Sewer Committees (Ab, Av, Bri, W.B.)	Define septic system problem areas
Boards of Water Commissioners	Provide water supply
Boards of Selectmen	Carry out provisions of town meeting decisions
Regional Groups	
Chambers of Commerce (Greater Brockton, Plymouth County)	Economic development
Cranberry Growers Association	Agriculture
League of Women Voters (Brockton, Easton)	Public information
Mass. Audubon Society	Wetlands project, conservation
Metropolitan Area Planning Commission	208 Program
Nature Conservancy	Acquisition
North & South Rivers Watershed Assn.	Conservation, protection, recreation
Old Colony Sportsmans Association	Recreation
Old Colony Planning Council	208 Program
Plymouth County Agricultural Stabilization & Conservation Service	Provide agricultural grants
Plymouth County Extension Service	Education
Rod & Gun Clubs	Recreation
Sierra Club	Conservation, recreation
Southeastern Chapter, Appalachian Mountain Club	Conservation, recreation
Southeastern Regional Planning & Economic Development District	208 Program

TABLE 2-3

AGENCIES, ORGANIZATIONS AND BOARDS CONTACTED FOR THE 208 STUDY (cont'd)

Regional Groups (cont'd)	
Taunton River Watershed Association	Conservation, recreation, protection
Trout Unlimited	Recreation
Trustees of Reservations	Conservation, acquisition (North River Protection Project)
State	
Executive Office of Environmental Affairs	Designation of environmentally critical areas
Coastal Zone Management Program	Estuaries and coastal protection
Department of Environmental Management	Coastal restrictions, inland restrictions, Scenic Rivers Designation
Department of Environmental Quality Engineering	Water pollution control, sanitary landfill and wetlands regulations, Sanitary Code enforcement
Department of Fisheries and Wildlife	Marine and inland fisheries
Division of Conservation Devices	Self Help and land and water conservation programs
Division of Water Pollution Control	Protect water quality
Office of State Planning	State planning
Department of Public Works	Transportation and highway planning
Division of Water Resources	Manage the State's water resources
Federal	
Department of the Interior	Federal Scenic River, Estuarine sanctuary
Bureau of Outdoor Recreation	Land and Water Conservation Fund
Environmental Protection Agency	Funding of sewage treatment facilities and 208 areawide water quality management natural
National Park Service	National Natural Landmark
Department of Housing and Urban Development	Flood Insurance Program
Soil Conservation Service-Pilgrim Resource Conservation and Development District	North River Environmental Corridor
U.S. Army Corps of Engineers	404(e) - Wetlands Permits

alternative would require on-going funding from the OCPC for staff assistance to the Policy Advisory Committee and acceptance by the OCPC as an advisory group.

Evaluation: The continuation of the Policy Advisory Committee to promote public participation has the advantage of representation from each community in the region as the selectmen/mayor from each town/ city appoints a representative. In addition, the jurisdiction of the Policy Advisory Committee conforms to political boundaries so that program implementation would include the entire portion of each community in the region.

However, an on-going Policy Advisory Committee has the possibility of being only an additional layer of government with similar responsibility as the Old Colony Planning Council. There could also be some duplication of effort since both the Policy Advisory Committee is partially and the Old Colony Planning Council is completely comprised of selectmen's/ mayor's appointees. However, the Policy Advisory Committee could pay full attention to water quality.

A third problem of the Policy Advisory Committee is that its region of influence conforms to political boundaries making the identification with streams and water bodies difficult.

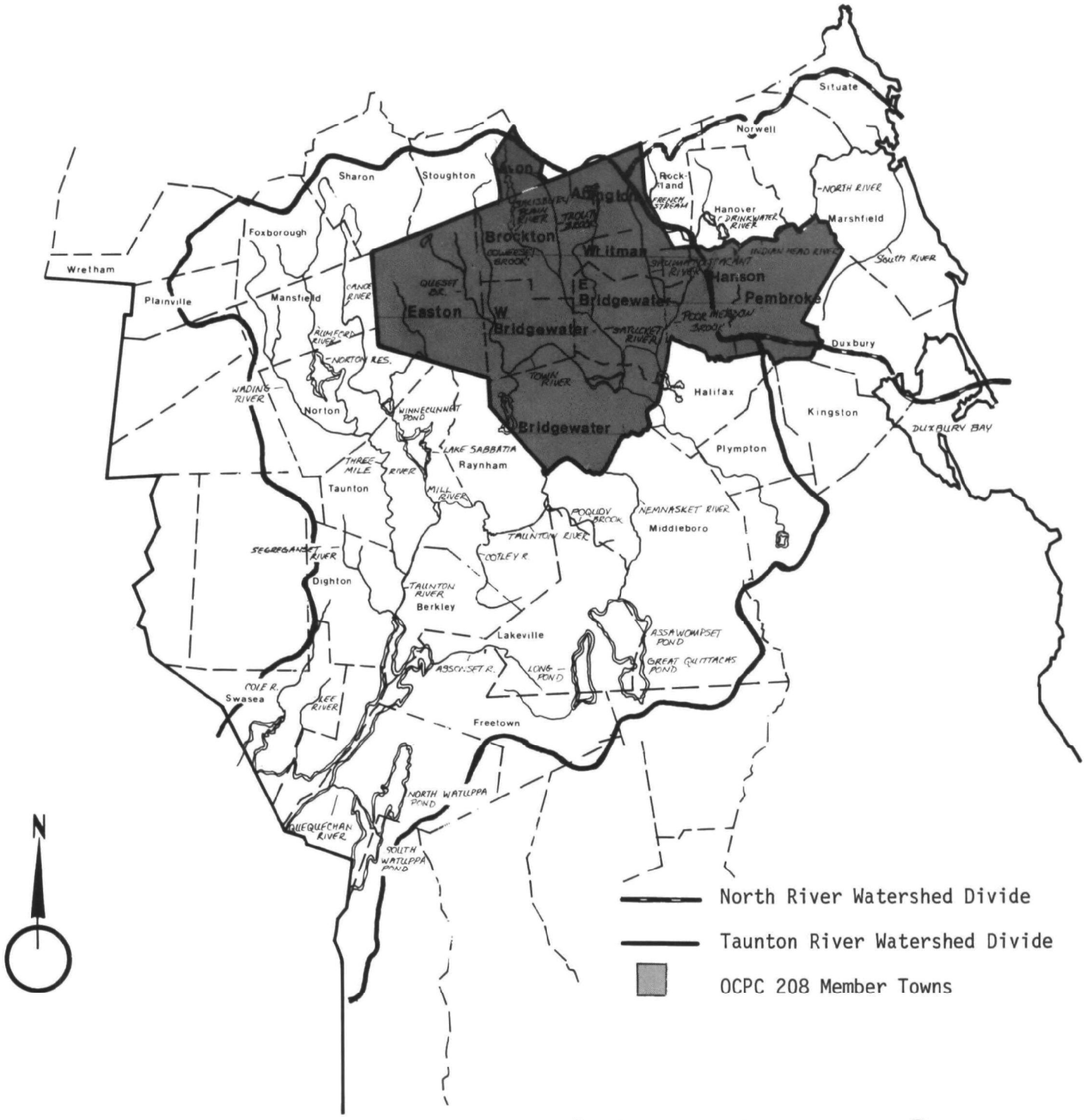
The continuation of the Policy Advisory Committee would adequately fulfill the evaluation criteria provided that there was support from the OCPC. The Policy Advisory Committee has already shown that it can be useful for public education, the identification of problems and opportunities, the evaluation of alternatives, coordination, and implementation.

B. Maintain On-going Public Participation Through Existing Watershed Associations

Description: Watershed associations in the OCPC 208 Region are volunteer organizations whose purpose is the preservation, protection, conservation, and enhancement of the natural resources of a major river basin. There are two active watershed associations in the OCPC area: the North and South Rivers Watershed Association, and the Taunton River Watershed Association (see Figure 2-1). Watershed associations have the potential for encouraging and maintaining on-going citizen participation.

Evaluation: Watershed associations are able to provide varied functions. One of the primary roles of watershed associations is to act as a spokesgroup for the watershed. As a river constituency, watershed associations are in an ideal position to monitor all activities which can affect the quality of the river basin for recreational, wildlife, and aesthetic uses. Thus, watershed associations are able to assume a watchdog role in the prevention of changes to the natural environment that could have a detrimental impact on water quality. Watershed

Major Watersheds in the OCPC 208 Area



Old Colony Planning Council
208 Program Area, 1977
Fig. 2-1

associations have the advantage of jurisdictional boundaries which encompass the resource or river system to be protected rather than being limited by municipal boundaries or lost among statewide or countywide interests.

In a position as spokesgroup for a river system, watershed associations are able to coordinate the actions of local, regional, state and federal agencies, organizations, and boards. As an autonomous, independent group, watershed associations are not under pressure to conform to state and federal policy requirements.

Because watershed associations encompass an entire natural physical feature, they are able to concentrate on providing public information and education on issues relevant to the river basin. In addition, the identification of problem areas, opportunities for solutions, and the evaluation and implementation of alternatives are all part of the normal watershed association functions.

However, there are several problems with the use of watershed associations as the means for on-going public participation. First, both the North and South Rivers Watershed Association and the Taunton River Watershed Association consist entirely of volunteer membership. No full-time or even part-time staff help is available. Consequently, volunteer officers are required to maintain watershed associations. A second problem is that the watershed association boundaries (the river basin boundaries) do not conform to political boundaries, creating implementation problems. There is no political entity or agency in the OCPC region which has regulatory authority over an area as large as these two major watersheds. Therefore, there can be an implementation problem. Another problem with watershed associations is the difficulty in generating interest and encouraging attendance and participation.

Finally, both the North and South and Taunton Rivers Watershed Association have funding problems due to their existing structure of being dependent on individual membership dues as the major source of income.

C. Maintain On-going Citizen Participation Through Individual and/or Special Interest Group Action

Description: This alternative would rely solely on the enthusiasm, interest, and persistence of individual citizens and special interest groups, such as the League of Women Voters or Chambers of Commerce, to maintain participation in water quality issues. Citizen participation through individual and special interest group action is an alternative which is always open to citizens at the local level. However, regional and state agencies and organizations may not be responsive to these requests. The OCPC 208 staff currently receives and responds to such requests for assistance on technical issues. These requests vary from site inspections of possible failing septic systems to alleged groundwater pollution from sanitary landfills and salt storage piles.

Evaluation: This alternative requires that the OCPC staff be available to respond to individual requests. The major advantage of maintaining on-going citizen participation through individual and special interest group action is that it becomes a source of information that is always open to citizens in need of assistance.

The major disadvantage of the maintenance of public participation through this alternative is that there is no areawide structure or organization with water quality as its major purpose to ensure its successful operation. In addition, individual and local organization requests often lack emphasis or "clout". Another problem of this alternative is that it requires citizens to be active and concerned for the protection of water quality on their own initiative. Other problems with this alternative are that opportunities for education and information dissemination become united. Also, there is no formal group to identify problem areas, opportunities for solutions, or to evaluate alternatives. Similarly, there are no mechanisms for coordination and implementation except for that which presently exists through the Old Colony Planning Council.

D. Maintain On-going Citizen Participation by the Coordination of an On-going Policy Advisory Committee, Watershed Associations and Individual Action

Description: This alternative by the combination of the previous three alternatives enables the most comprehensive citizen participation program.

The coordination would be made possible by joint membership of the Policy Advisory Committee and the executive committee members of the North and South Rivers Watershed Association (N&SRWA) and the Taunton River Watershed Association (TRWA). Citizens Subcommittee members from Abington, Avon, Bridgewater, Brockton, East Bridgewater, West Bridgewater, and Whitman would become part of the TRWA, the Pembroke Citizens Subcommittee member would become part of the N&SRWA, with the Hanson representative becoming part of both watershed associations. Thus, each town would have a selectmen's/mayor's appointee on the Citizens Subcommittee on Clean Water and the executive committees of the N&SRWA and the TRWA. Individual action by citizens not affiliated with an organization or special interest group would continue to receive assistance from the OCPC staff.

Evaluation: Through coordination, this alternative is able to eliminate many of the disadvantages of the three individual alternatives while combining many of the advantages. Maximum public participation may be achieved through the use of three mechanisms instead of just one.

combining many of the advantages. Maximum public participation may be achieved through the use of three mechanisms instead of just one.

The major difficulty with this final alternative is that it may be cumbersome to implement. It will require a great deal of coordination between the watershed associations and the Policy Advisory Committee. Another major problem is that this alternative may force the same committee members to attend several meetings per month. If committee members have too many meetings to attend, attendance and interest will decline.

The coordination of the three previous alternatives permits the maximum coverage of education and information dissemination programs. In addition, the alternative also is best suited to identify problem areas, opportunities for solutions, and to evaluate alternatives. Finally, this alternative provides the highest degree of coordination between local, regional, stage and federal organizations and the best chances of implementing proposed recommendations.

CHAPTER 3

Groundwater Protection

Table of Contents

page

Background

-Groundwater protection efforts under the 208 program 3-1

-Potential land use impacts on groundwater: residential development, commercial and industrial development, solid waste disposal, sand and gravel mining, agriculture, salt storage, salt application, pipeline construction

I. Rely Upon Existing Regulations and Programs for Groundwater Protection 3-5

II. Establish a Groundwater Protection District Around Existing and Potential Wells 3-8

III. Seek Special State and Federal Protection for the Pembroke Well Protection Area 3-12

A. Seek State "Critical Areas" Designation

B. Seek Federal "Sole Source Aquifers" Designation

Directly or indirectly, all communities in the Old Colony 208 Area are dependent on groundwater for public water supplies. Six communities (Avon, Easton, West Bridgewater, East Bridgewater, Bridgewater and Pembroke) have community water systems entirely supplied by groundwater; Abington, which has a joint water system with Rockland, uses a combination of ground and surface sources in Pembroke, Abington, and Rockland; and Brockton, Whitman and Hanson are supplied from surface water, principally from Silver Lake in Pembroke. Since the surface water bodies used are hydrologically connected to regional groundwater aquifers, all of the 208 Area communities share an interest in groundwater preservation.

Some groundwater sources in the region which could provide sufficient quantities to make their development economically feasible have iron or manganese levels above secondary (aesthetic) drinking water standards, due to the organic swamp-related deposits which are widespread, especially in the southern part of the 208 area. Some sources, then, are naturally unsuitable for water supply without treatment.

Under Section 208 (b) (2) (k) of the Federal Water Pollution Control Act, 208 plans must include "a process to control the disposal of pollutants on land or in subsurface excavations within such area to protect ground and surface water quality." The non-natural (i.e., human-related) pollutants which are of potential concern for groundwater quality in the Old Colony region include coliform bacteria, nitrates, sodium, heavy metals, and toxic chemicals. Nitrate pollution of unknown origin has caused the closing of the High Street well in Bridgewater. Sodium levels were, in 1975 or 1976, at or above 20 mg/l (the newly adopted state standard) in one or more groundwater supplies in Abington, Avon, Bridgewater, Easton, East Bridgewater, Pembroke and West Bridgewater as well as in the Avon Reservoir, the back-up surface water supply for Brockton (see Chapter 1). No known problems with coliform bacteria, metals, or toxic chemicals have been experienced with groundwater in the OCPC 208 Area.

Another area of concern for groundwater protection is the protection of groundwater quantity. By eliminating septic tank effluent as a source of recharge, public sewerage may have an impact on groundwater quantity. Also, development which creates large impermeable paved areas without provision for recharge of stormwater runoff may reduce infiltration to a point where groundwater supplies are affected.

Under the 208 program, OCPC has devoted considerable attention to the delineation of groundwater resources and identification of strategies for groundwater protection. A series of maps was prepared by the geological consultant to the 208 program, depicting location, thickness and transmissivity of sand and gravel deposits and directions of groundwater flow. A report, Groundwater Resources in the Old Colony Planning Council 208 Area, was prepared to accompany the maps.

Using this information, the 208 staff devised a method for identifying well protection areas. The method is described in an available OCPC publication, Technical Memorandum: Defining Groundwater Well Protection Areas.

As explained in that report, a distinction is drawn between an "aquifer recharge area", representing the entire sand and gravel deposit in which a well lies, and the land surface which, based on directions of ground and surface water flow, actually contributes recharge to a well. This latter area is referred to in the Technical Memorandum and in this chapter as a "well protection area".

At the request of the East Bridgewater Water Supply Protection Study Committee, the OCPC 208 staff prepared a map of the town's well protection areas, using the procedures outlined in the Technical Memorandum. The staff has now defined such areas for the towns of Easton, Avon, West Bridgewater, Bridgewater, East Bridgewater, Abington, and Pembroke, as well as for Whitman and Hanson, which have located potential wells. The areas are presented on Figure 3-1, "Protection Areas for Existing and Identified Potential Wells". The map relies upon existing data and as such does not necessarily include all areas with the potential to yield public supplies, but it does include all existing and identified potential wells and additional areas in Bridgewater and Pembroke considered most favorable for additional exploration. It should be noted that the map is not intended to be a favorability map for water supplies. It is based on studies of groundwater quantity, and as such makes no judgment as to the possibility that treatment (i.e., for iron/manganese removal) may be needed. Also, soil and rock conditions can be highly localized and thus there is no assurance that wells drilled within the most favorable areas will yield large supplies (or, that wells drilled outside those areas will not).

Three alternatives are presented below for groundwater protection. The alternatives consist of "packages" of controls, with the first alternative generally reflective of existing programs and the succeeding alternatives representing in turn increasing levels of public activity. The items within each package are not necessarily mutually dependent, but they are presented as a package to indicate the types of measures which would follow from a commitment to a particular objective.

An effective groundwater protection program would consider groundwater quality and quantity issues related to various land uses and monitoring procedures. Each of the three alternative packages discussed in the chapter may be evaluated according to its effectiveness in addressing these potential impacts on groundwater. The following is a summary of reasons for giving consideration to these various land uses and possibilities for avoiding adverse impacts:

Residential Development - Groundwater quality can be affected by the nitrates present in septic system leachate (even properly functioning systems will add nitrates to the groundwater). The greater the density of residential development in unsewered areas, the higher the nitrate levels which may be anticipated. The state and federal drinking water standard for nitrates is 10 mg/l. Groundwater quality would also be affected if bacteria from septic tank effluent reached the water table before being completely removed from the effluent by adhesion to the soil.

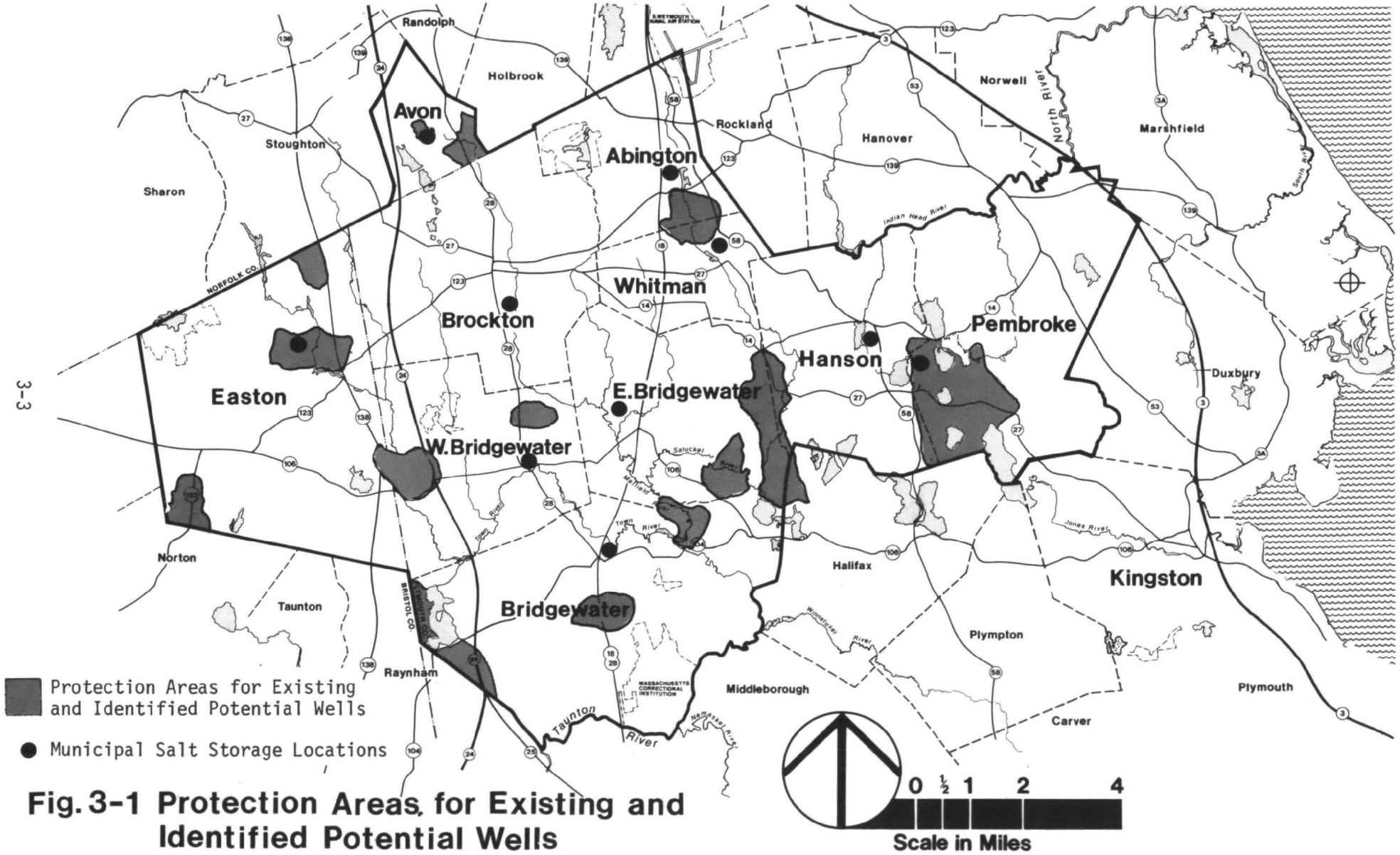


Fig. 3-1 Protection Areas for Existing and Identified Potential Wells

The Old Colony Planning Council/208 Program, 1977

Residential development can also have an impact on groundwater quantity by reducing surface permeability and thereby reducing infiltration to the groundwater from rainfall. The greater the amount of paved, impermeable surfaces, the less the amount of infiltration which is expected to occur.

Residential density can be regulated through local zoning by-laws. Impermeability can be considered in town by-laws or in subdivision regulations. Operation of septic systems is under the purview of the Board of Health.

·Commercial and Industrial Development - Potential threats to groundwater quality from commercial and industrial operations include discharge of toxic wastes, storage of toxic materials in an exposed location where rainfall may leach materials into the earth, and accidental spills. Also, groundwater quantity can be affected by reductions in surface permeability through extensive paving. Zoning can be used to regulate the location, type, and density of commercial and industrial development. Subsurface disposal systems are in this case under the jurisdiction of the Massachusetts Department of Environmental Quality Engineering (DEQE).

·Solid Waste Disposal - Leachate from landfills, junkyards, and dumps can contain several harmful materials, including nitrates from decomposing organic wastes, toxic metals present in the solid waste, and sodium from salt-laden snow dumped at solid waste sites. (Note: Solid waste disposal is discussed in Chapter 8.) Landfills and other solid waste disposal sites are under the jurisdiction of the local boards of health and DEQE.

·Sand and Gravel Mining - Sand and gravel mining, if it results in the exposure of the water table, may allow contaminants to enter groundwater more readily. Also, sand and gravel sites may be used for solid waste disposal (including dumping of snow) and be subject to similar groundwater impact risks as for other solid waste disposal areas. Sand and gravel mining is commonly regulated under local earth removal by-law or zoning provisions. (Regulation of sand and gravel mining is discussed in Chapter 9.)

·Agriculture - Improper or excessive use of manure or chemical fertilizers can contribute nitrates to groundwater. Chemicals used for pest control (including control of weeds and insects) may contain toxic materials, so that their use must be regulated to avoid groundwater impacts. (Agricultural sources of pollution and possible control measures are discussed in Chapter 7.)

·Salt Storage - Salt which is stored before being applied to winter roadways can, if exposed to precipitation, dissolve and leach into the ground, eventually reaching the water table and causing increased sodium levels in groundwater. The chances of this occurring can be minimized by storing the salt in an enclosed building. Salt storage is now the responsibility of local and stage highway department officials, but DEQE is empowered to establish regulations for salt storage and use under Chapter 85, Section 7A of the Massachusetts General Laws.

·Salt Application - Runoff from roads which have been salted can leach sodium into the groundwater. Reduction in loadings can be accomplished either by reducing the percentage of salt contained in the sand/salt mixture applied to roadways or by reducing the number of times that the mixture is applied to the roads. Use of salt on privately-maintained surfaces, such as shopping center parking areas, warrants attention.

·Pipeline Construction - Both groundwater quality and quantity can potentially be affected by pipelines (including those carrying fuel or sewage). Quality can be affected in the event of leakage from the pipe or breakage. Quantity can be affected if groundwater infiltrates into the pipe, or if the pipe changes the direction of flow by blocking flow perpendicular to the pipe or by creating a new path for flow along the pipe. An indirect impact of sewerage construction can be reduction of recharge where septic systems are replaced by sewerage and water which once entered groundwater now is carried by sewer mains outside of the watershed.

Controls to reduce risks of leakage or breakage from sewer lines would include use of ductile iron pipe and sealed joints, materials which are presently used when sewage is being pumped under pressure. Check dams and suitable backfill materials can be required to prevent the flow of groundwater along the direction of the pipe rather than perpendicular to it. Where a trench created during pipe installation would interrupt the flow of water to a well, water removed from the trench to keep it dry can be recharged through well points. Finally, an attempt can be made (as part of 201 facilities plans and/or EPA-ordered Environmental Impact Statements) to assess impacts on water levels and well yields from the removal of septic tank recharge.

The monitoring required under a groundwater protection program will include the regular sampling of public water supplies required under state and federal law, and may also include sampling of private and semi-public supplies and monitoring of suspected pollution sources through field checks and surface and groundwater sampling.

The three alternative packages presented below will be discussed in terms of their impact on the land uses and practices just described.

I. Rely Upon Existing Regulations and Programs for Groundwater Protection

Description: Existing regulations and programs include the following:

·Local zoning ordinances regulating the type and density of development, and local by-laws affecting sand and gravel mining.

·Local board of health regulations on septic system siting and installation.

·Massachusetts drinking water supply regulations which provide that a water supplier must "control" development within a 400-foot radius of each gravel-packed well (the most common type of public well). Outright ownership of this land area is considered as demonstrating such control.

·DEQE and local oversight of solid waste disposal site operations.

·DEQE powers to regulate salt storage.

·Encouragement of proper agricultural practices through the Cooperative Extension Service, the Conservation District, the Soil Conservation Service, and other agencies.

·Sampling of public water supplies for bacterial and chemical constituents by DEQE, in accordance with Massachusetts regulations and the federal Safe Drinking Water Act (P.L. 93-523).

Evaluation: This alternative does not involve the identification of protection areas for wells beyond the 400-foot radius specified under state regulations. The 400-foot radius is generally believed to be sufficient to protect against bacterial contamination, because bacteria tend to be filtered by the soil; however, the radius is insufficient to protect against contaminants which can travel greater distances, such as nitrates and sodium. The watershed of a well may extend thousands of feet from the well, not just 400 feet. Existing state regulations do not, therefore, necessarily prevent contamination which enters the groundwater within the watershed of a well from reaching that well.

Several towns have zoning by-law provisions specifying groundwater protection as a purpose of their "watershed protection district". In Pembroke, Whitman, and Brockton groundwater protection is an additional purpose of what is basically a floodplain and/or wetlands protection zone, and the boundaries of the districts are based on the location of wetlands and floodplains, and not with reference to the identification of well recharge areas. In Avon, a separate Watershed Protection District has been established encompassing the southeastern corner of the town where four wells are located near Trout Brook. This district includes a portion, but not all, of the area which contributes recharge to the wells. Consequently, no community in the OCPC 208 Area now has a groundwater protection by-law which applies fully to the actual recharge area for its wells.

Under existing regulations, land uses which may impact groundwater quality are as follows:

·Residential Development - One-acre zoning generally prevails in the areas identified on Figure 3-1 as well protection areas. This is judged by the 208 staff to be adequate to keep nitrate levels below 10 mg/l. This judgment is based both on computations of estimated loadings and on review of present well records. One-acre zoning is not judged to have a serious impact on quantity available to groundwater supplies, although this is a

difficult issue to resolve without detailed information on site-specific conditions, including aquifer thickness and permeability, proximity of streams and acceptability of increased induced recharge from them, and design of the specific project under consideration.

·Commercial and Industrial Development - Several of the well protection areas shown in Figure 3-1 lie in sections zoned for commercial or industrial uses; the areas include western West Bridgewater and the portion of Easton adjoining it, western Hanson, and western Bridgewater. Commercial and industrial development can occur in these areas and under present conditions special attention would not necessarily be given to impacts on groundwater.

·Solid Waste Disposal - No active landfills presently exist within the well recharge areas. Present regulations provide for oversight of the siting of new landfills, but if a well protection area is not defined, there is the possibility that impacts on groundwater might not be anticipated. Absolute prevention of landfill leachate is difficult to accomplish. The closed Bridgewater landfill is on the edge of the Carver Pond well protection area. No impacts have been noted, but some residents and officials in Bridgewater are concerned that the landfill may at a future date affect the wells.

·Sand and Gravel Mining - All towns now have earth removal by-laws or zoning by-law provisions, but only Easton's by-law contains any regulations pertaining to groundwater protection (see Chapter 9).

·Agriculture - Agricultural operations do occur in well protection areas or along streams draining into and through them, especially in West Bridgewater, East Bridgewater, and Bridgewater. No special controls are imposed, and pollution control is in practice largely voluntary.

·Salt Storage - In three towns -- Pembroke, Easton, and Avon -- salt is stored within well protection areas. In Pembroke, the storage pile has been shown by geophysical testing (with electrical resistivity techniques) conducted under the 208 program to be polluting the well at Great Sandy Bottom Pond owned by Abington. In Easton and Avon, sodium levels above 20 mg/l may be due in part to salt storage practices. Existing regulations do not prevent such siting practices.

·Salt Application - The existence of sodium levels above 20 mg/l in nearly all communities suggests that salt application is a serious problem. In West Bridgewater and Avon, salting of state highways by the state DPW is a factor; in all towns (including those two), municipal salting practices would also be significant. As presently occurring, the impact on groundwater is not considered when salt/sand ratios are established or when a decision is made to send out the sander.

·Pipeline Construction - At present, this is principally an issue which involves the town of Avon, which is proposed for a sewer connection to Brockton, and the towns of Abington, Whitman, East Bridgewater, and Bridgewater, through which an interceptor would pass en route to the proposed Old Colony Water Pollution Control District (OCWPCD) facility in Bridgewater.

Concern over potential groundwater impacts contributed to the defeat of funding for sewerage construction in Avon at town meeting and has led to requests for environmental impact statements on the OCWPCD facility from OCPC and East Bridgewater officials. (The OCWPCD Board has voted to alter the East Bridgewater route, but the revision has not yet appeared in a revised Facilities Plan.) The controversies suggest that existing procedures are not sufficient to settle to the satisfaction of all parties what the actual impacts of sewerage construction will be.

·Monitoring - Regular sampling of public water supplies is required under state law and the Safe Drinking Water Act. A wider range of parameters will be tested under the new federal act (effective June, 1977) than under previous regulations. Landfill sites are checked periodically by state DEQE personnel, but there is no regular program for on-site groundwater and surface water sampling. Consequently, a problem may only be noted when it affects samples collected from a public well.

To summarize then: existing regulations have not been sufficient to prevent all groundwater pollution problems, most notably those associated with salt storage and use. The past success of current regulations in dealing with other types of pollution sources is no assurance that problems will not arise in the future, since defined well protection areas (beyond the mandatory 400-foot radius) have not actually been used as the basis for local planning. Without such defined areas, it is possible for uses to be allowed which would have unintentional or unforeseen adverse impacts on groundwater quality or quantity.

II. Establish a Groundwater Protection District Around Existing and Potential Wells

Description: The well protection areas shown in Figure 3-1 would be incorporated into groundwater protection districts, and regulations would be established to prevent groundwater contamination or significant loss of recharge. Regulations adopted for these districts would supplement existing local and state regulations. Hence, any development within a 400-foot radius of a well would still be prohibited, while the following regulations would apply in the rest of the protection district:

·Residential Development - Allow an average density of no more than one unit per acre (i.e., cluster development would be allowed if this average density criterion was met). To minimize impacts on groundwater infiltration, require that runoff from roofs, gutters, and paved surfaces be directed as much as possible to pervious surfaces rather than to storm drains. To minimize future problems with septic systems, require that the "reserve area" (required on a lot under the State Environmental Code as a backup for the leaching field) be tested with an observation pit and a percolation test before the original system is approved for installation.

·Commercial/Industrial Development - Exclude all new industrial development from the well protection area. Allow commercial and service firms only if there will be no risk of pollutant spills or accidental discharges. For existing operations, require that industrial materials be safely stored and that non-corroding tanks, such as fiberglass, be used for underground fuel storage (as at gasoline stations). For any non-residential uses allowed, limit amount of impervious surface (including both the portion of the lot occupied by a structure and parking and driveway areas) to 35 percent of the total lot area, as a way of reducing recharge loss. Also, require that surface runoff from paved areas be directed towards pervious surfaces, for the same purpose.

·Solid Waste Disposal - Prohibit any new solid waste disposal within the groundwater protection district. At existing sites, install observation wells and collect both surface and groundwater samples and close down any sites found to be causing contamination. Prohibit disposal of particularly undesirable materials, such as toxic industrial wastes and salt-laden snow removed in winter from roads and parking areas.

·Sand and Gravel Mining - Require that a buffer zone of five feet be maintained between the bottom of a sand and gravel excavation and the water table. Prohibit snow dumping at sand and gravel sites.

·Agriculture - Require farmers in groundwater protection districts to adopt and implement a conservation plan, in conjunction with the county Conservation District and the Soil Conservation Service.

·Salt Storage - Prohibit any new salt storage sites within the groundwater protection district. For any existing sites, construct an enclosed structure for salt storage to minimize the leaching of salt into the soil.

·Salt Application - Reduce salt use within the groundwater protection district by reducing the proportion of salt in the sand-salt mixture, reducing the frequency of application, and establishing no-salt zones on secondary roads. Limit salt use on privately-maintained areas and impose reporting requirements.

·Pipeline Construction - Minimize risks to groundwater by choosing routes entirely outside the groundwater protection district. Where this is not feasible (for example, where land within the district is itself to be sewered), require that special safeguards be followed to minimize risks (see above, under "Rely Upon Existing Regulations...", for a description of these special measures).

·Groundwater Monitoring - In addition to the sampling of public ("community") supplies presently required under the Safe Drinking Water Act, perform sampling at no charge for "semi-public" supplies, such as those at campgrounds and summer camps, which will have to undergo sampling beginning in 1979 under the same law. (The regulations apply to systems serving at least 25 persons or 15 service connections for at least 60 days a year.) Also, provide

sampling facilities for homeowners with private supplies who would like to have their wells tested. (No such sampling program now exists, nor is any mandated under the Safe Drinking Water Act.)

Evaluation: Overall, this alternative provides a greater degree of protection than the first alternative, results in some increases in administrative costs, and involves some changes in zoning and other land use requirements. To evaluate each of the suggested items in turn:

·Residential Development - Most of the well protection areas are presently zoned for one-acre development, so this requirement would not involve much change, except insofar as it might limit the granting of variances by establishing an additional purpose for the allowed density. Imposition of a design standard on runoff drainage would impose some costs on a developer, but allows more flexibility than an arbitrary standard for allowable imperviousness and is more workable for both the developer and the review agency than a requirement that the developer demonstrate that his project will not affect well yields. The requirements for testing of the reserve area would add about $50 to the original cost of a new house.

·Commercial/Industrial Development - Some changes in zoning would be required, particularly in a portion of Easton and West Bridgewater north of Route 106 and in western Bridgewater. Some inspection of existing firms would be necessary, but it appears that existing firms in these areas would not have difficulty in meeting operational standards. Installation of new non-corrosive gasoline storage tanks would impose an additional expense.

·Solid Waste Disposal - Since there are no landfills presently in the well protection areas proposed for incorporation into groundwater protection districts, costs for monitoring would be minimal (the closed Bridgewater landfill would be one site to be checked). The requirement would limit potential future land use for this purpose, but would safeguard groundwater from a particularly dangerous source.

·Sand and Gravel Mining - Imposition of a buffer-zone requirement would limit somewhat the amount of material which could be extracted, but would allow for subsequent re-use of the land and avoid the safety hazard of exposed water areas. Easton already has language in its earth removal by-law implying this as a standard. Snow dumping is not known to occur at existing sand and gravel sites, so this would be a preventive requirement.

·Agriculture - Conservation District officials estimate that about 80 percent of farmers in the region presently have conservation plans, so that requiring one for those within protection districts should not impose a significant additional workload on SCS or the conservation district. Non-structural "best management practices" would generally be all that would be suggested within a conservation plan.

·Salt Storage - Requiring coverage of existing piles in well protection areas would affect Pembroke, Easton, and Avon. The Massachusetts legislature

recently passed a highway bond issue which included $1,000,000 for grants to municipalities for salt storage sheds. OCPC recommends that these three towns seek state grants under this program. The Massachusetts Department of Public Works estimates the cost of a 40' by 60' shed able to hold 650 tons at $23,000. Avon would have to purchase land for a storage site, since its pile is presently located on leased land, and the grants may only be made for sheds on public land.

·Salt Application - A reduction in salt use on state highways which affect public wells was ordered by Executive Office of Environmental Affairs Secretary Evelyn Murphy on October 29, 1976. The extent of this reduction (which was to be above and beyond a general salt reduction on all state roads) has not yet been defined. A reduction in salt use could mean a reduction in travel speed; there are conflicts of opinion as to what impact this would have on accident rates. There would be some additional expenses for publicity and notification of reduced and no-salt policies. Offsetting this would be savings from the reduced purchase of salt. Regulating salt use on private property has a legal basis (under Chapter 85, Section 7A of the General Laws) but may be administratively difficult. Inspection could concentrate on large shopping centers or other paved areas.

Advantages of reducing salt use, besides considerations of groundwater quality, include reduced corrosion damage to automobile bodies and reduced damage to roadside vegetation.

·Pipeline Construction - Based on current facilities planning (and assuming that a westerly route is followed in East Bridgewater), these requirements would affect interceptor construction in Avon, Abington, Whitman, and Bridgewater. Added costs of choosing a route outside the well protection area would have to be determined within the facilities planning process but offsetting additional costs would be the reduced political and legal resistance to a less-risky route.

·Monitoring - Some additional public costs would result from a decision to perform sampling of semi-public supplies. However, administrative and enforcement costs would be minimized and voluntary compliance would be increased by performing sample analysis at Lakeville, and incremental costs of sampling would be small for an existing laboratory. There are only a handful of summer camps and campgrounds located in the OCPC 208 area communities. These are in Easton, Hanson, Pembroke, and East Bridgewater.

Sampling of private (domestic) supplies would have the benefit of providing more information on groundwater quality adjacent to lakes and ponds, particularly in Hanson and Pembroke. Also, data could be collected on the impact of septic systems on private water supplies. Only about one percent of the OCPC 208 area's residents are not served by public water. Sampling and administrative costs could be minimized by collecting and analyzing all the samples at one time. By arranging ahead of time for a slack period at the Lakeville laboratory, the impact of such sampling on the facilities there could be minimized. Public health would be better protected by the protection of individual health under such a sampling program.

III. Seek Special State and Federal Protection for the Pembroke Well Protection Area

Description: In addition to the measures described under the second alternative, special status would be sought for the Pembroke well protection area outlined in Figure 3-1. The reasons for such status would include the unusual thickness of the sand and gravel deposits present there and the current use of the area by several communities: directly by Abington, Rockland, and Pembroke, and indirectly by Brockton, Hanson, and Whitman, which obtain surface supplies from Silver Lake. Two possibilities exist for such special status, either or both of which could be pursued:

A. Seek State "Critical Areas" Designation

Description: The Secretary of the Executive Office of Environmental Affairs would be asked to designate the protection district as a "critical environmental area".

Evaluation: This designation would expand EOEA's review powers under the Massachusetts Environmental Policy Act (MEPA). Presently, state actions are subject to review except where exemptions are provided for in the MEPA statute or where agencies have established "categorical exemptions" in applying MEPA to their own activities. Critical area designation would eliminate the categorical exemptions, and make all state activities in the area (except as exempted by statute) subject to full MEPA review. Since any "significant" action is already subject to review, designation would only reduce the risk of a project with unforeseen impacts escaping review; it would not mean that stricter standards would be applied in reviewing projects. The effectiveness of designation is therefore questionable.

Because the removal of all categorical exemptions would result in impact statements being required for every activity no matter how minor, EOEA is presently reluctant to designate critical areas. (To date, only one designation has occurred, that of Great Cedar Swamp in Westboro.) Designation might have a psychological impact on both private developers and public agencies and thereby give added priority to groundwater protection, whatever the actual importance of designation itself.

B. Seek Federal "Sole Source Aquifer" Designation

Description: Under Section 1424(e) of the Safe Drinking Water Act, if EPA determines that "an area has an aquifer which is the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health," it may so designate such an aquifer. Thereafter, no "commitment for federal financial assistance" may be made for any project which would contaminate the aquifer "so as to create a significant hazard to public health". Under this alternative, OCPC would, in 1978, apply for designation of the Pembroke well protection area as a "sole source" aquifer.

Evaluation: An obstacle to this alternative is the set of proposed guidelines for the implementation of Section 1424(e). The draft guidelines (issued by EPA in June 1976) present criteria for size of area affected and immediacy of threat to the aquifer which would eliminate the Pembroke area, as well as any other part of the OCPC 208 Area, from consideration. Under the draft guidelines, only large aquifers (serving, for instance, more than one county) could be designated and designation could only be made where the area was immediately threatened by federally-assisted projects. Smaller groundwater supply areas, which predominate in New England, would therefore be ineligible for designation, and designation would have to be applied for at a time of crisis, rather than as a preventive planning measure.

Evaluation of "Seek Special State and Federal Protection": Either of these two possibilities should be viewed only as a supplement to local regulations and not as a replacement for them, since only a limited range of projects would be covered under the state and/or federal designations. However, the projects which would be covered are potentially those with great impacts, or ones for which detailed assessment is warranted. Since the resource is in this case one of regional importance, there is reason for designating this area as a critical resource and providing a higher level of protection than that accorded other well protection areas.

Impacts on land uses would be largely the same as under the second alternative, with additional review for those projects subject to the state and federal provisions described. As mentioned in the evaluation of the state critical areas designation possibility, environmental benefits might result from the psychological impacts of such designation on developers, officials, and the public at large.

CHAPTER 4

Municipal Wastewater Disposal

Table of Contents

	page
I. Municipal Wastewater Disposal Options Requiring Installation of a Local Collection System	4-3
A. Regional Wastewater Treatment Facilities	
1. Treat Municipal Wastewater at the OCWPCD Facility	4-4
a. Alternative Configurations of the OCWPCD	
1) OCWPCD Initially Servicing Abington, Bridgewater, West Bridgewater and Whitman	
2) OCWPCD Initially Servicing Abington, Whitman, East Bridgewater and Bridgewater	
b. Service Areas Within District Communities	4-11
1) Provide Service Areas as Recommended by the OCWPCD Facilities Plan	
2) Provide Service Areas Based on Need for Sewerage	
c. Treatment Process	4-22
1) Wastewater Treatment Process Recommended in Existing Facilities Plan	
2) Alternative Treatment Process With Surface Water Discharges	
3) Land Application of Effluent From Secondary Treatment	
d. Sludge Disposal	4-26
1) Sludge Disposal Recommended in Existing Facilities Plan	
2) Regional Sludge Disposal with Joint Brockton/OCWPCD Incineration	
e. Siting of the Treatment Plant	4-29
1) Locate OCWPCD Treatment Facility at the Site Recommended in the Regional 201 Facilities Plan	
2) Locate the OCWPCD Treatment Facility at Alternative Sites Considered in the Facilities Plan	

page

3) Locate the OCWPCD Treatment Facility at a New Location Delineated on the Basis of Reassessed Wastewater Flows, Treatment Schemes and Sludge Disposal Options 4-29

2. Treat Municipal Wastewater at the Brockton Wastewater Treatment Plant 4-35

a. Service Areas 4-36

1) Service the Area Recommended in the Local 201 Facilities

a) Abington

a) Avon

2) Only Service the Areas in Abington and Avon which Need Sewers

B. Municipal Wastewater Disposal at Publicly-Owned In-town Disposal Facilities 4-40

1. Install Community Septic Tanks 4-41

a. Collection System 4-43

1) Community Septic Tanks Fed by Gravity Flow System

2) Community Septic Tanks Fed By Pressure Flow System

b. Service Areas 4-44

II. Restoration and Maintenance of Septic System Operation 4-47

A. Restoration of Septic System Operation 4-49

1. Correction of Failing Septic Systems by Non-Structural Methods 4-51

a. Pump the System 4-51

1) Fund the Pumping of Septic Systems by a Municipally-Owned and Operated Septage Hauling Truck

2) Continue to Use Private Contractors to Pump Septic Systems

page

b. Fix Leaky Plumbing Fixtures 4-51

2. Correction of Failing Septic Systems by Structural Methods 4-56

a. Expand and/or Redesign the Septic System 4-56

b. Rebuild the Septic System 4-57

c. Dispose of Effluent on a Nearby Lot that has adequate soils 4-57

3. Fund Repair of Septic Systems from HUD Community Block Grants 4-58

4. Institution of a Program to Locate and Repair Failing Septic Systems 4-58

a. Conduct Additional Water Quality Sampling

b. Conduct Dye Tests

c. Inspect Septic Tanks and Cesspools

B. Maintenance of Septic System Operation 4-60

1. Increase the Enforcement Capability of the Board of Health 4-60

a. Adjust the Pay Structure of the Board of Health 4-60

1) Pay Health Agent on an Hourly Rate Rather Than Per Inspection

2) Make Position of the Health Agent Full-time

b. Require Licensing of Health Agents 4-61

1) Have the State Department of Public Health License Health Agents

2) Require All Health Agents to be Certified by the Existing Board of Certification

c. Require Pumpers to Notify the Board of Health of Every Home That is Pumped 4-62

d. Provide Technical Assistance Through a Regional Health District 4-63

page

2. Adopt More Stringent Local Board of Health Regulations than the Minimum State Code 4-63

a. Define the Period of the Year For Testing Groundwater Elevation 4-63

1) Limit Groundwater Elevation Testing to the Period from September 15 to June 15

2) Require Groundwater Elevation Tests from March 1 to June 1

3) Determine Period of Year of High Groundwater Levels From Test Wells Throughout the Town

b. Require Expansion and Upgrading of Septic Systems When Homes are Converted from Seasonal to Year Round Use 4-67

c. Prohibit the Use of Garbage Grinders (Disposals) With On-Site Systems 4-68

d. Prohibit the Use of Acid Treatments on Enzymes 4-68

e. Require that Septic Tank Manholes be Installed at Finished Grade 4-69

f. Require As-Built Plans with Professional Engineer's Certification 4-69

3. Increase Public Awareness of the Need for Septic System Maintenance Through Education 4-69

a. Organize Annual Workshop to be Sponsored and Organized by the OCPC and the Plymouth County Extension Service 4-70

b. Distribute Booklets and Brochures 4-70

c. Notification by the Board of Health of Voluntary Annual Inspection and Pumping 4-71

4. Institute a Mandatory Maintenance Program 4-71

a. Inspect all Systems Annually and Require Pumping When Necessary 4-71

b. Inspect all Homes Annually and Pump on a Specified Schedule 4-73

1) Require Annual Pumping

2) Require Bi-annual or Less Frequent Pumping

page

c. Town owns and Operates Pumper to Pump All Homes at Adjusted Interval 4-75

d. Town Contracts with Pumper 4-75

e. Require Permits for Septic System 4-76

III. Septage Treatment and Disposal 4-76

A. Selection of Treatment Disposal Sites 4-78

1. Private Selection of Treatment/Disposal Sites 4-78

2. Community Selection or Designation of Treatment Sites

B. Treatment at Wastewater Disposal Facilities 4-79

1. Treat Septage at the Old Colony Water Pollution Control District 4-79

a. Membership in the District

1) OCWPCD Required Membership

2) OCWPCD Membership Not Required

b. Operation and Maintenance Cost Appointment 4-81

1) Assessment Though Fee of Hauler Charged to Homeowner

2) Assessment Through Fee From Regional Facility Directly to the Community

2. Treat Septage at the Brockton Wastewater Treatment Plant

IV. Reducing Wastewater Disposal Problems Through Water Conservation 4-83

A. Promote Water Conservation in Existing Residential Structures 4-85

1. Distribute Information on Water Conservation Methods 4-87

2. Sponsor Community-Wide Retrofitting with Public Funds 4-87

B. Promote Water Conservation in Future Residential Structures 4-88

page

1. Rely on Private Market Forces to Achieve Water Conservation 4-88

2. Provide Incentives for the Use of Water-Saving Devices 4-89

a. Reduce Leaching Field Size Requirements for Homes With Water-Saving Fixtures 4-89

b. Impose System Development Charges Based on Projected Flow 4-89

3. Require that Water-saving Devices be Used in New Residential Sturctures 4-90

C. Promote Water Conservation in Commercial/Industrial Structures 4-90

1. Require New Firms to Estimate Future Flows 4-91

2. Impose a System Development Charge 4-91

3. Impose Charges on Large Flows Under the Industrial Cost Recovery Program 4-91

4. Adopt Flat Rate Pricing for Water 4-91

D. Promote Water Conservation in Public and Semi-Public Buildings 4-92

1. Bill Public Users 4-92

2. Install Water-Saving Devices 4-92

Within the OCPC 208 region with the exception of three communities, municipal wastewater disposal is accomplished exclusively by means of on-site disposal systems. Those OCPC communities where municipal wastewater collection and treatment facilities are available include Brockton where 85 percent of the city is serviced; Bridgewater, where the downtown area is serviced and Abington, where a limited two block area is serviced by collection and treatment facilities.

Although several municipal wastewater disposal reports have been written for the OCPC area and for several of the individual communities themselves, the need for nor the advisibility of providing such facilities previously had been thoroughly assessed. Those studies performed prior to the 208 study have primarily addressed the provision of sewerage collection and treatment systems in terms of economic feasibility.

The OCPC 208 efforts in terms of identifying treatment work alternatives capable of solving existing wastewater quality problems and capable of meeting anticipated municipal and industrial waste treatment needs of the area over a twenty-year period have incorporated the expressed desires of local communities, in addition to incorporating alternatives discussed in the 303(e) Taunton River Basin Plan. The "treatment works" identification process was further influenced at the outset by prior community actions taken to initiate the construction of municipal wastewater disposal systems through 201 facilities construction grants.

In the OCPC 208 area, eight communities are eligible to be members of the Old Colony Water Pollution Control District (OCWPCD) and of these eight, four had elected to join the District. These were Abington, Bridgewater, West Bridgewater and Whitman. In having opted for membership in the OCWPCD prior to the initiation of the 208 study, it was assumed, for the purposes of the 208 programs consideration of alternatives, that these communities were committed to the construction of local collection systems and participation in the regional collection and treatment system. On the basis of this assumption and in order to eliminate the potential for duplication of effort in the 208/201 scope of study, it was determined by EPA that evaluation of alternatives for these member communities would be left to the local 201 facilities studies. As a result, the information generated by the 208 study in regards to municipal wastewater disposal in these district communities was limited to:

- -in-stream water quality sampling data
- -preliminary screening of on-site disposal problem areas
- -comparison of land use maps with wetlands and soils information
- -informal contacts with the Boards of Health

Although eligible for membership in the Old Colony Water Pollution Control District, East Bridgewater, Easton, Hanson and Pembroke have not opted to join the District. It was in these communities that had not made a commitment to a particular alternative that the 208 program delineated

"problem areas" and assessed alternative systems for the correction and elimination of these same problems. The methodology applied in each of these communities to delineate problem areas is detailed in the OCPC Technical Memorandum: Determining the Magnitude and Extent of a Need for a Public Sewerage System. Briefly, the methodology applied entailed the following steps:

- -Develop accurate and up-to-date land use maps for each community;
- -Examine "informal" reports of septic system problem areas and note on town maps (citizen contacts, preliminary indications from Board of Health);
- -Review soils information (SCS, Goldberg-Zoino groundwater elevation maps);
- -Distribute questionnaires (Board of Health, septage haulers);
- -Review surface water quality sampling data
- -Examine above indicators of on-site disposal failures and delineate suspected failure areas;
- -Questionnaire on a home-by-home basis in suspected failure areas delineated;
- -Field survey of these suspected failure areas;
- -Compile questionnaire and survey results and establish percent failure rates on a street-by-street basis in these problem areas.

Upon determining problem areas in the communities, OCPC's sewerage consultant Anderson-Nichols, Inc. developed several alternative systems for correcting the problems. These alternatives are discussed below.

The City of Brockton, prior to the start of the 208 study had begun a 201 facilities study for upgrading and expanding the City's municipal wastewater treatment facility. The City's municipal wastewater disposal problems are essentially related to the operational integrity of the existing treatment plant and the integrity of the wastewater collection system.

In light of the fact that the discharge from the Brockton facility has negatively impacted the quality of the receiving waters, it was OCPC's opinion that whatever measures could be taken to identify extraneous and incompatible wastes being introduced into the collection and treatment systems and their eventual elimination would have a positive impact on the operation of the treatment plant and improve the quality of the plant's effluent.

OCPC opted to provide assistance during Step I of the facilities planning study by funding the required Industrial Cost Recovery report and the contingent study of several residual wastes (i.e., oil and grease).

The treatment works alternatives process conducted in Avon was similar to that done in non-OCWPCD communities. There were, however, several differences in that unlike the non-OCWPCD communities, the delineation of community problem areas in Avon and the evaluation of alternatives was done

as part of a local 201 facilities study funded in part by the 208 program. In addition, the questionnaire distributed for non-OCWPCD communities solely in failure areas was instead distributed throughout the entire town of Avon.

I. Municipal Wastewater Disposal Options Requiring Installation of a Local Collection System

In those areas of the OCPC 208 region where on-site disposal systems are determined to be inadequate for the treatment and disposal of municipal wastewater it will be necessary to collect flows previously discharged to these systems and transport them to a site where adequate treatment can be provided.

A. Regional Wastewater Treatment Facilities

Description: Two regional wastewater treatment facilities in the OCPC 208 region are capable of servicing the ten study communities. Abington (west) and Avon are eligible for treatment and disposal of their wastewater flows at the City of Brockton's treatment facility and Abington (entire town), Bridgewater, East Bridgewater, Easton, Hanson, Pembroke, West Bridgewater and Whitman are eligible for disposal at the Old Colony Water Pollution Control District facility.

Evaluation: On the basis of the OCPC area's water quality and the potential for economic benefits, regional wastewater treatment facilities are the most efficient for wastewater treatment facilities (if collection is required). The communities which make up the 208 region serve in part as the headwaters of both the Taunton and North Rivers. As such, the area's rivers and streams are characterized by low flows and the assimilative capacity of these rivers and streams is extremely low in many cases. In order to meet water quality standards set for the area's streams, effluents discharged into them will require extremely high levels of treatment. In addition to the stringent treatment requirements on allowable discharges, the anti-degradation policy enacted by the state precludes the introduction of any new discharges up-stream of existing municipal wastewater treatment plant discharges in all but a few of the area's streams. In addition, now that the North River has been designated as a National Natural Landmark it is unlikely that new discharges would be allowed as in the Federal Register, November 28, 1975 130.17 (e) (2) it states that "no degradation shall be allowed in high quality waters which constitute an outstanding National resource..."

The concept of regional use of municipal wastewater treatment facilities in the OCPC 208 region provides for:

- -Economies of scale in treatment cost (particularly for tertiary treatment)
- -Compliance with the State's anti-degradation policy

Although treatment of wastewater at a regional facility provides for economies of scale with larger flows and cost savings for participating communities, the costs incurred for providing facilities to transport wastewater flows from the community to the facility can be staggering.

1. Treat Municipal Wastewater at the Old Colony Water Pollution Control District Facility (Abington, Bridgewater, East Bridgewater, Easton, Hanson, Pembroke, West Bridgewater, and Whitman)

The OCWPCD is a regional water pollution abatement district which was formed in 1974 based on the recommendation of a regional water and sewerage study completed for OCPC by Metcalf and Eddy consultants (1971). The District has recently completed a Step I Facilities Planning Report (April, 1977) on which discussions on the OCWPCD alternative will be based.

As mandated in the OCWPCD enabling legislation, planning for the construction of a regional wastewater collection and treatment system proceeded with the intent of providing service for each of the eight communities eligible for membership (Abington, Bridgewater, East Bridgewater, Easton, Hanson, Pembroke, West Bridgewater, and Whitman). On the basis of sewerage need information developed in those eligible communities which have not opted for membership, and on the expressed desires of these same non-member communities not to enter into the regional wastewater system, several alternative OCWPCD services configurations are more likely than one servicing all eight communities. These will be discussed below.

a. Alternative Configurations of the OCWPCD

1) OCWPCD Initially Servicing Abington, Bridgewater, West Bridgewater and Whitman (with East Bridgewater, Easton, Hanson, and Pembroke in a delayed construction phase)

Description: As per the draft Step I facilities planning report, Abington, Bridgewater, West Bridgewater and Whitman were recommended as the immediate service configuration for the OCWPCD.

For the purposes of laying out alternative interceptor routes, the District was considered in an east (Ab, W, EB, H, P, B) and west (E, WB, B) configuration (see Figure 4-1). The main interceptor for the eastern portion of the District is the so called "Abington Interceptor". This interceptor is designed to serve Abington and Whitman at present and could serve Pembroke and Hanson if they were to join the District in the future. The main branch of the interceptor continues south from Abington into Whitman where a small extension (servicing west Abington and Whitman) joins the Abington interceptor. The interceptor parallels the Shumatuscacant River. The "Abington" interceptor continues south to the Whitman-East Bridgewater town boundary,

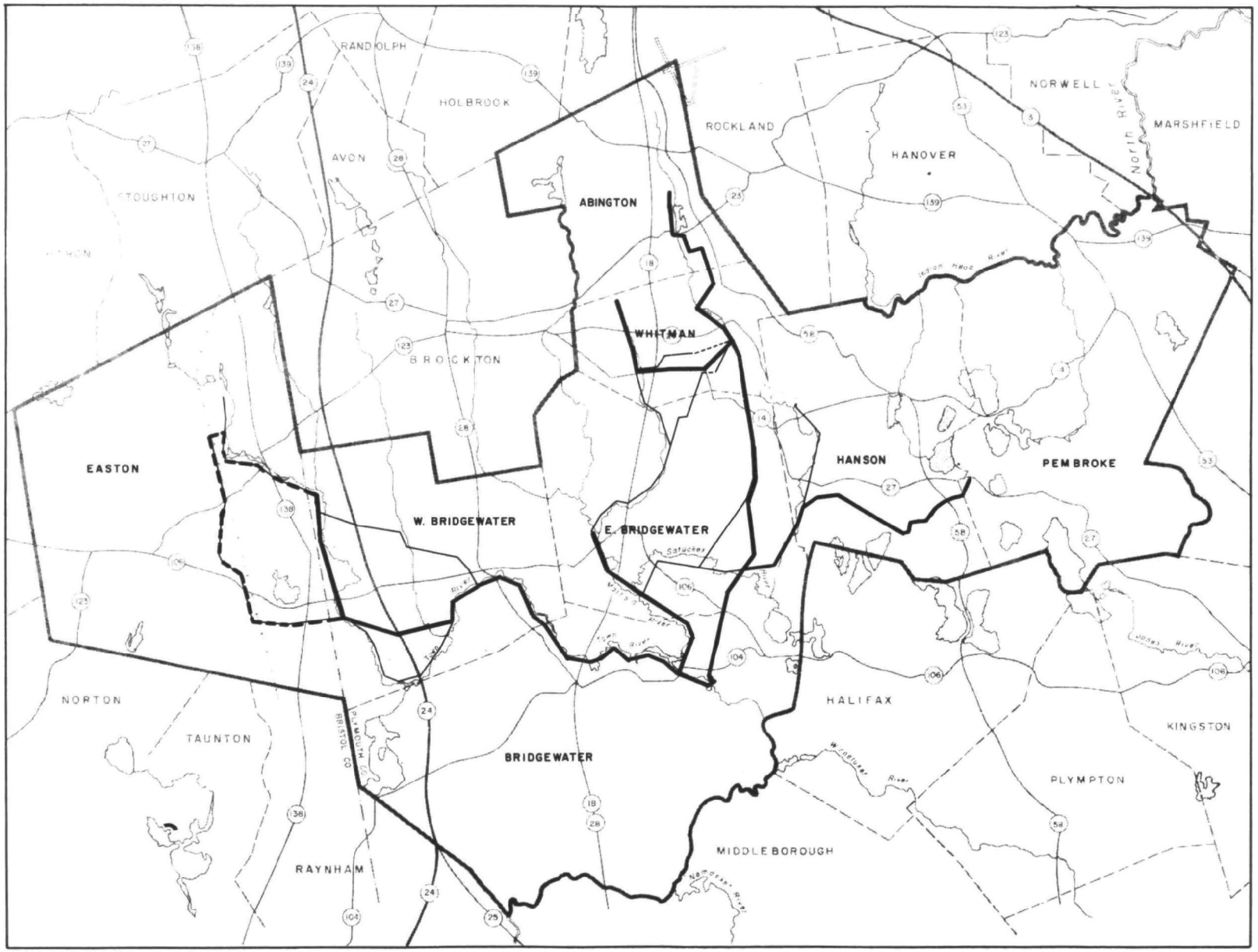


Fig. 4-1 Recommended OCWPCD Interceptor Routes

Source: OCWPCD 201 Facilies Plan 1977

---- Either Route Available to Easton.

where pumping is required. The wastewater would be lifted to Washington Street where the interceptor continues south through East Bridgewater to the Satucket River where the wastewater would be pumped to Bridge Street. From Bridge Street, flows would continue by gravity into Bridgewater.

In the delayed construction phase, this alternative would require East Bridgewater to construct an additional interceptor to service its downtown population center. The East Bridgewater interceptor would carry wastewater from the town's center paralleling the Matfield River to the Town River and join the interceptor servicing West Bridgewater and Bridgewater. If Hanson and Pembroke were to join the District at some later date, the interceptor would start at Route 27 in Pembroke, run southwesterly into Hanson/Poor Meadow Brook and then along the Satucket River to join the "Abington" interceptor in East Bridgewater.

The immediate construction phase of the west interceptor would continue as far west as the West Bridgewater town center. Provisions are included for potential expansion of this interceptor to provide collection service to Easton. From the West Bridgewater town center, the interceptor would pass along the Taunton River to below the Paper Mill Dam and then cross the river to the influent pumping facility on the treatment plant site.

Evaluation: The routes as discussed and presented on Figure 4-1 were presented in a series of public hearings conducted by the District during the Fall of 1976.

In the OCWPCD's Environmental Assessment Statement report prepared on the proposed project, the following were cited as beneficial environmental effects and advantages of the proposed interceptor system:

- -Removes construction from immediate Black Brook watershed;
- -Minimizes disturbance of wetlands;
- -Minimizes required access roads;
- -Increased flow velocities, minimizing maintenance requirements;
- -Allows for minimim immediate phase construction;
- -Minimizes total pipe length and infiltration.

Disadvantages of the system and adverse environmental impacts cited in the Environmental Assessment Statement were that it:

- -Requires three pumping stations;
- -Requires extensive construction in existing roadways;
- -Results in increased operation and maintenance costs;

-Results in immediate construction crossing the Satucket River approximately 1500 feet downstream of a potential East Bridgewater well;
-Requires construction in East Bridgewater's well supply basin.

In addition to the issues cited in the report, this particular interceptor route alternative would have several additional environmental impacts as well as raise considerable public controversey. For this reason, the 208 staff has requested the Environmental Protection Agency to prepare a full Environmental Impact Statement. Among the significant impacts potentially associated with the project are the following:

-Changes in Land Use Patterns - Several of the areas which would be served by public sewers under this proposal contain extensive amounts of undeveloped land. Marginal soils presently limit the location, type, and density of development. The availability of sewers would allow development on these soils, creating the potential for higher rates of growth and changes in the character of the communities. This statement holds true for all communities in the sewer district's planning area, but is especially relevant to western Abington, Bridgewater, West Bridgewater, and East Bridgewater. In East Bridgewater, the recommended interceptor route would pass through substantial tracts of agricultural land. If East Bridgewater joined the District or was forced to join the District, growth could be redistributed to the area by the interceptor which could lead to residential development and a reduction in agricultural activity. In Bridgewater, large-scale growth could strain already-tight water supplies.

-Changes in Groundwater Quantity and Quality - The easterly interceptor, located along Washington, Walnut, and Bridge Streets in East Bridgewater, would pass through the recharge area for a potential well near the Satucket River. According to East Bridgewater officials, other potential well fields have also been identified in that section of town. Town officials and citizens fear that the interceptor could disrupt recharge patterns and/or cause groundwater contamination. The aquifer through which the interceptor would pass is East Bridgewater's sole source of water supply.

-Community Control and House Rule - Town officials in the area have expressed concern over the potential enfringement on home rule powers upon the installation of regional interceptors. Officials fear that once an interceptor is in place in a non-member community (i.e., East Bridgewater)

state authorities could mandate that such a community join the District and construct public sewers.

-Economic Impacts of Regional Interceptor Construction - As can be expected, costs associated with the construction of wastewater pollution facilities capable of carrying projected wastewater volumes over the required distances to the treatment facility are extremely high. Costs for the recommended interceptor route are presented below:

Total Estimated Cost for Recommended Facilities (1977)

Facility	Total Capital Cost	Federal & State Grant	Local Share (10%)
Abington Interceptor	$11,670,000	$10,503,000	$1,167,000
Green St. Interceptor	$ 1,730,000	$ 1,557,000	$ 173,000
W. Bridgewater Interceptor	$ 9,150,000	$ 8,235,000	$ 915,000
Subtotal Interceptors	$22,550,000	$20,295,000	$2,255,000

Several other routes were presented in the Facilities Plan (see Figure 4-2). Table 4-1 presents the effects, advantages and disadvantages associated with these alternative routes as presented in the OCWPCD's Environmental Assessment Statement.

Although not included in the present facilities plan, as a result of the opposition to the route recommended in the plan by East Bridgewater officials, an alternative interceptor route through East Bridgewater is slated as a revised proposal. The alternative route would pass through the westerly portion of town outside of the community's well recharge area. Estimated costs for this route indicate an increased expenditure of two-three million dollars.

2) OCWPCD Initially Servicing Abington, Whitman, East Bridgewater, Bridgewater

Description: This alternative would provide no municipal wastewater connection to the regional system for West Bridgewater and includes East Bridgewater as a District member community.

Evaluation: As a result of opinions expressed at the OCWPCD's facilities plan hearings and community reaction to the views expressed, several significant revisions are not unlikely to the Districts proposal. In response to the proposed plan, this

TABLE 4-1
COMPARISON OF ALTERNATIVE CONVEYANCE SYSTEMS
Towns of Abington, East Bridgewater, Hanson, Pembroke and Whitman

Alternative	Present Worth Costs			Adverse Environmental Effects	Beneficial Environmental Effects	Advantages of Alternative	Disadvantages of Alternative
	Capital	O & M	Total				
A	$13,230,000	$30,000	$13,260,000	Extensive wetland construction Extensive construction within East Bridgewater water supply drainage basin Might require several stream crossings	Extends maximum of service to five communities (i.e., might represent a maximum on secondary growth impacts)	Minimum of required pumping facilities (one facility) Majority of construction is in cross-country areas. Minimum disturbance of traffic and utilities Moderate additional resources required to extend to East Bridgewater center	Susceptible to larger quantities of infiltration Flatter pipe slopes might require additional pipe maintenance during initial flow periods Requires a majority of interceptor construction to be completed in the initial construction phase Requires extensive access roads
B	10,570,000	310,000	10,880,000	Immediate construction crosses the Satucket River approximately 1,500 ft. downstream of proposed East Bridgewater well Construction removed but still within East Bridgewater drainage well supply basin	Removes construction from immediate Black Brook watershed Minimizes disturbance of wetlands Minimizes required access roads	Increased flow velocities should minimize maintenance requirements. Permits minimum immediate phase construction Minimizes total pipe length and infiltration	Requires three pumping facilities Requires extensive construction in existing roadways Increased operations and maintenance costs
C	12,900,000	170,000	13,070,000	Moderate disturbance of Satucket River watershed Construction removed but still within East Bridgewater drainage well supply basin	Relocates proposed immediate construction, approximately 1 mile downstream of proposed East Bridgewater well	Requires two pumping facilities Moderate additional resources required to extend service to East Bridgewater center	Requires more extensive immediate phase construction Moderate infiltration anticipated
D	12,830,000	190,000	13,020,000	Considerable construction on wetlands and along stream beds Extensive construction along Satucket River	Removes immediate phase construction from total Black Brook watershed	Minimizes pumping facilities required (one) Offers maximum service potential to East Bridgewater Offers service to West Whitman without requiring pumping	Difficult construction problems in East Bridgewater center Requires considerable length of access roads
E	13,320,000	190,000	13,510,000	Considerable construction on wetlands along stream beds Extensive construction along Satucket River	Removes immediate phase construction from total Black Brook watershed	Minimizes total length of pipe Offers maximum service potential to East Bridgewater Offers service to West Whitman without requiring pumping	Minimizes total service extended to Whitman and East Bridgewater
				Towns of Bridgewater, Easton, and West Bridgewater			
F	Not Costed			Construction in close proximity to Morse Pond and the town of Easton well supply Extensive construction along the Town River	Reduces construction on wetlands	Minimized total length of pipe required Provides extensive service to West Bridgewater's industrially zoned lands Offers maximum initial service to development in Easton along Route 138	Does not offer gravity service to southwest corner of Easton Minimum pipe slopes and initial flows might increase maintenance requirements Difficult construction in western sector of West Bridgewater
G-1	11,500,000	-	11,500,000	Construction in close proximity to Morse Pond and town of Easton well supply Extensive construction along the Town River	Minimizes construction within Hockomock Swamp Provides immediate service to potential problem areas along Route 138	Provides maximum service to industrially zoned land in West Bridgewater Permits extension of sewer service to industrially zoned land in town of Bridgewater	Extensive cross-country construction requiring considerable length of access road Requiring pumping to service many sections of town of Easton Offers minimum service to town of Easton
G-2	12,000,000	30,000	12,030,000	Construction in close proximity to Morse Pond and town of Easton well supply Extensive construction along the Town River Construction required within outer fringe of Hockomock Swamp	Minimizes impact on land use by parallelling existing railroad bed Provides immediate service to several present problem areas in southern sectors of the town of Easton	Provides access to industrially zoned land in West Bridgewater Permits extension of service to industrially zoned land in the town of Bridgewater Offers maximum service to the town of Easton	Extensive cross-country construction requiring considerable length of access road Might require several crossings of railroad property to extend lateral services to the town of Easton Extensive cross-country construction requiring considerable length of access road
H-1	12,920,000	-0-	13,920,000	Construction in close proximity to Morse Pond and town of Easton well supply Maximum construction along the Town River	Provides immediate service to potential problems along Route 138 Minimizes energy consumption by eliminating pumping facilities	Provides marginal service to industrially zoned land in West Bridgewater Provides optimum service to industrially zoned land in Bridgewater	Requires pumping to service many sections of the town of Easton Offers minimum service to the town of Easton Longest considered interceptor route to service the town of Easton
H-2	12,990,000	30,000	13,020,000	Construction in close proximity to Morse Pond and town of Easton well supply Construction required within outer fringe of Hockomock Swamp	Minimizes impact on land use by parallelling existing railroad bed Offers immediate service to problem areas within southern sectors of the town of Easton	Provides marginal service to industrially zoned land in West Bridgewater Provides optimum service to industrially zoned land in Bridgewater Offers maximum service to the town of Easton	Extensive cross-country construction requiring considerable length of access road Might require several crossings of railroad to extned lateral sewers to the town of Easton Longest considered interceptor route to service the town of Easton

Source: OCWPCD 201 Facilities Plan, 1977

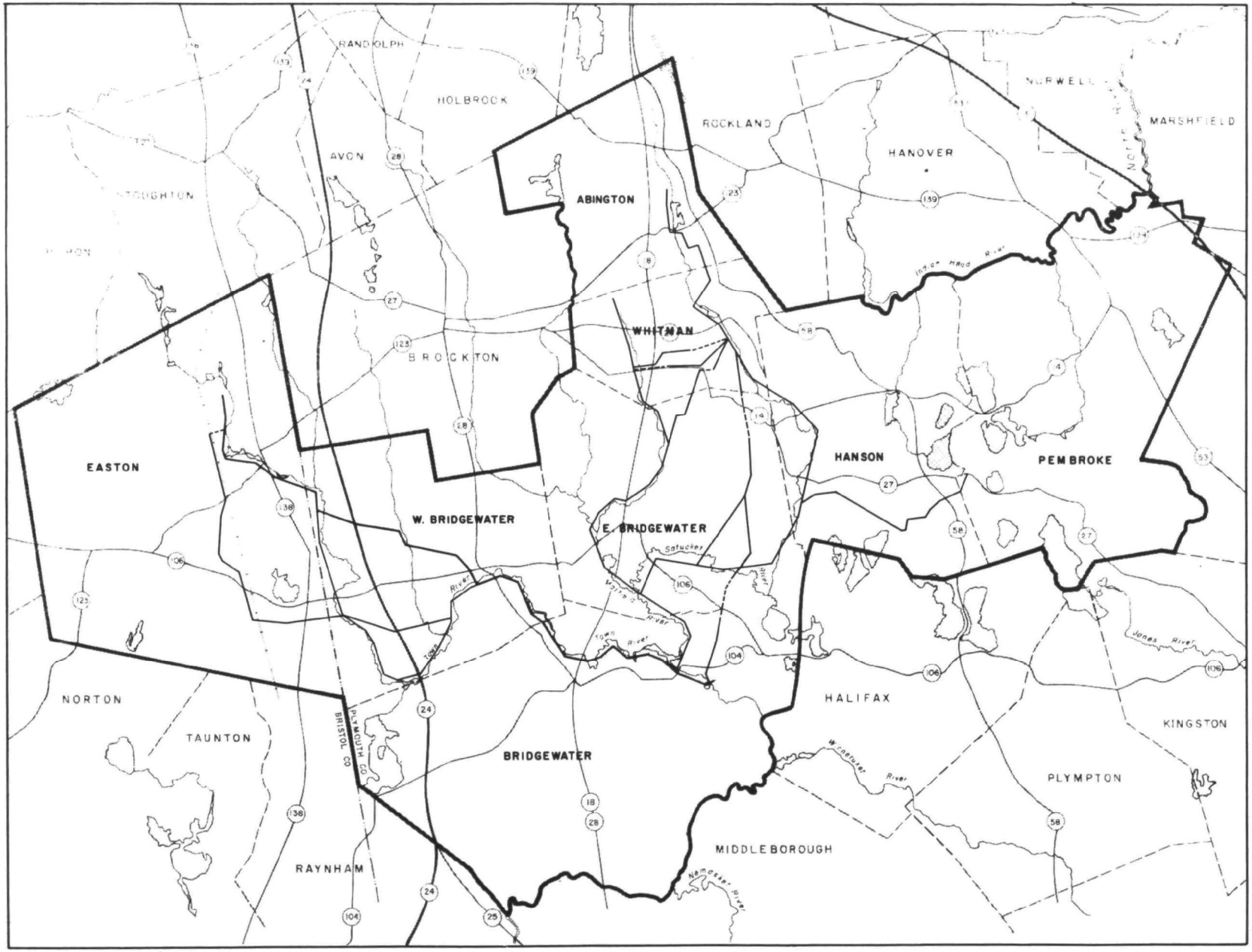


Fig. 4-2 Alternative OCWPCD Interceptor Routes

Source: OCWPCD 201 Facilities Plan 1977

The above configurations represent all the routes considered in the Facilities Plan Report.

alternative becomes a reasonable configuration of the OCWPCD in a revised facilities plan.

West Brigewater having initiated the effort to withdraw from the OCWPCD due to community concern over the need for West Bridgewater's participation in the program is expected to continue to the point of complete withdrawal from the District. East Bridgewater, on the other hand, having been shown to have in-stream water quality problems in the downtown area, plus being located such that the "Abington" interceptor must pass through East Bridgewater to reach the treatment facility and given that this same interceptor will likely pass through or near the town center (upon which local officials indicated District membership likely), East Bridgewater can now be reasonably considered for District membership.

No interceptor routes to service the revised District configuration have been proposed by the District's consultant to date. It is reasonable to assume, however, that the revised routes will no longer call for the extension of interceptors to West Bridgewater as part of the immediate construction phase of the project. The interceptor route passing through East Bridgewater will pass through or in close proximity to the towns center along its route to the treatment facility in Bridgewater.

Elimination of the "west" interceptor which would have serviced West Bridgewater and potentially Easton will eliminate the potential for growth impacts associated with installation of a large regional collection pipe in West Bridgewater and Easton. Moving the "Abington" interceptor to the western portion of East Bridgewater will also eliminate the potential for immediate and significant growth in the relatively open area of East Bridgewater through which it was originally proposed to pass. In addition, the potential for the interceptor impacting the quantity or quality of East Bridgewater's water supply will be eliminated.

Economically, such an alternative will impact both positively and negatively in that construction costs for the "west" interceptor will be eliminated from the total project cost. The rerouting of the "Abington" interceptor in East Bridgewater is likely to increase project costs by two-three million dollars.

b. Service Areas Within District Communities

1) Provice Service Areas As Recommended by the OCWPCD Facilities Plan

Description: As part of the wastewater volume projection methodology applied by the OCWPCD for the purposes of sizing

collection and treatment facilities, flows from local communities were estimated based on expected service areas. According to the OCWPCD's Facilities Plan, recent aerial photographs for each town were used to delineate areas which most probably would be initially sewered. These areas consist of densely populated town centers and/or significant areas of subdivision development and are termed "immediate service areas". Secondary areas of anticipated growth were delineated from the photographs as areas which would become sufficiently developed to economically justify wastewater facilities over the next 15 to 30 years. The procedure above was modified as felt necessary for each town after conducting a series of local workshops. This resulted in the following service areas:

Abington: Recommended service areas in the regional facilities plan included roughly the eastern half of town and the Green Street housing development. The future service area would expand the wastewater treatment system as far west as Hancock and Linwood Streets and would include the extreme southeast corner of Abington. The local 201 facilities plan completed for Abington expanded the service area on the basis of a recommendation of the Board of Selectmen to provide sewer service to approximately 60 percent of the town's population by servicing the following areas (see Figure 4-3A):

-Green Street Subdivision,
-Abington Heights,
-Charles Street Sewage Disposal Beds,
-Senior High School/Elderly Housing,
-Dianne Circle/Jennings Drive area,
-Ekstrom Circle, Tricket Street area

Bridgewater: Flows currently collected by Bridgewater's existing system were expected to be immediately serviced by the District facility. An initial sewer expansion program was assumed to consist of extension of service to the highly developed areas located concentrically about the existing service area. Future sewer expansion as far south as Flagg and Winter Streets and west to Route 24 and the industrially zoned areas adjacent to the highway were indicated as possible for inclusion. (Figure 4-3B)

East Bridgewater: The regional facility plan projected an initial sewer construction phase to include the developed center of town. Areas surrounding the initial sewer service area were expected to require sewerage within fifteen years. The future service area was indicated as potentially extending north to Highland Street, west to the town boundary and east along Central, Plymouth and Whitman Streets. Also, portions of Cedar and Washington Streets and the Robbins Pond section were suggested for sewers. (Figure 4-3C)

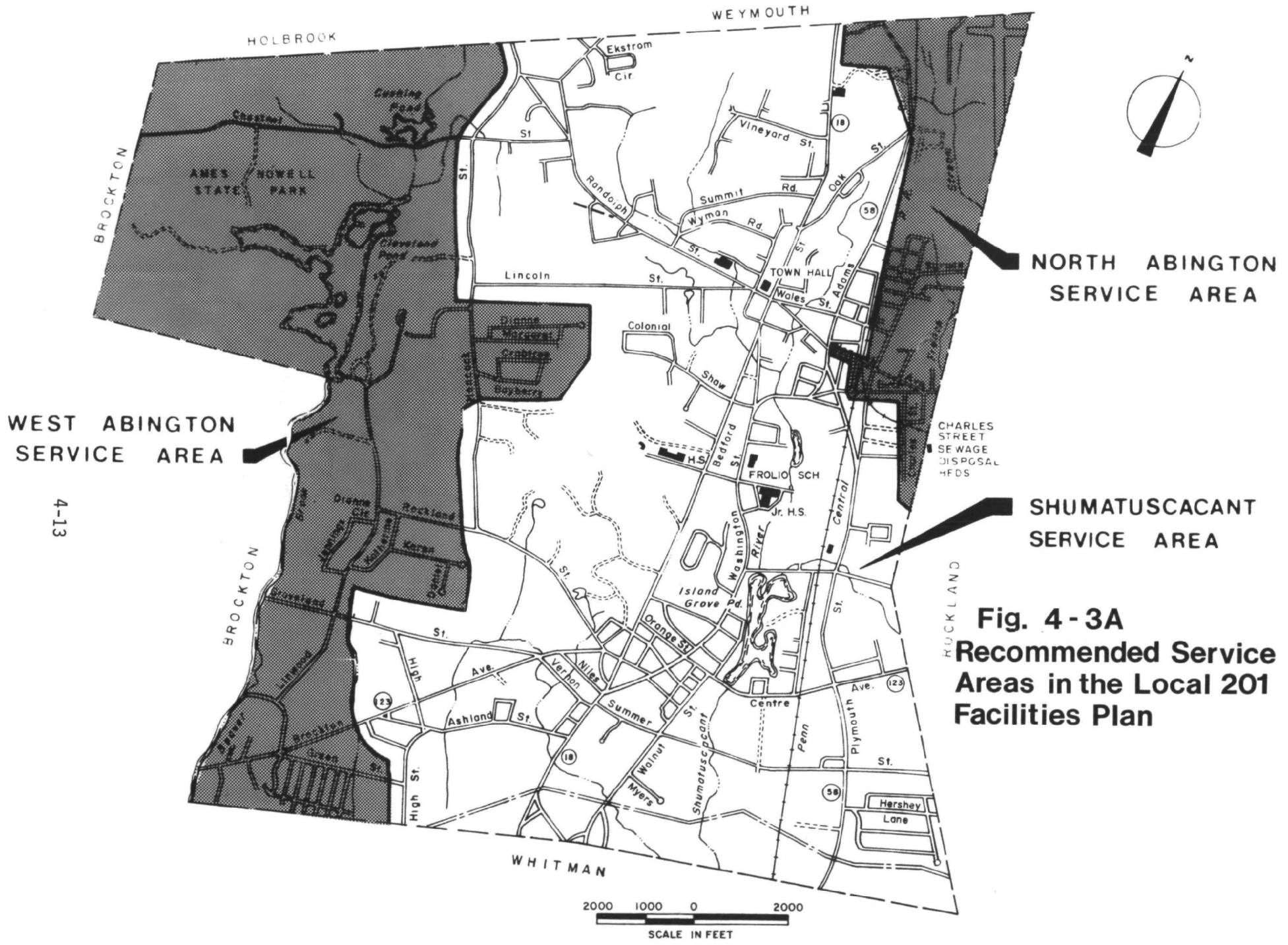
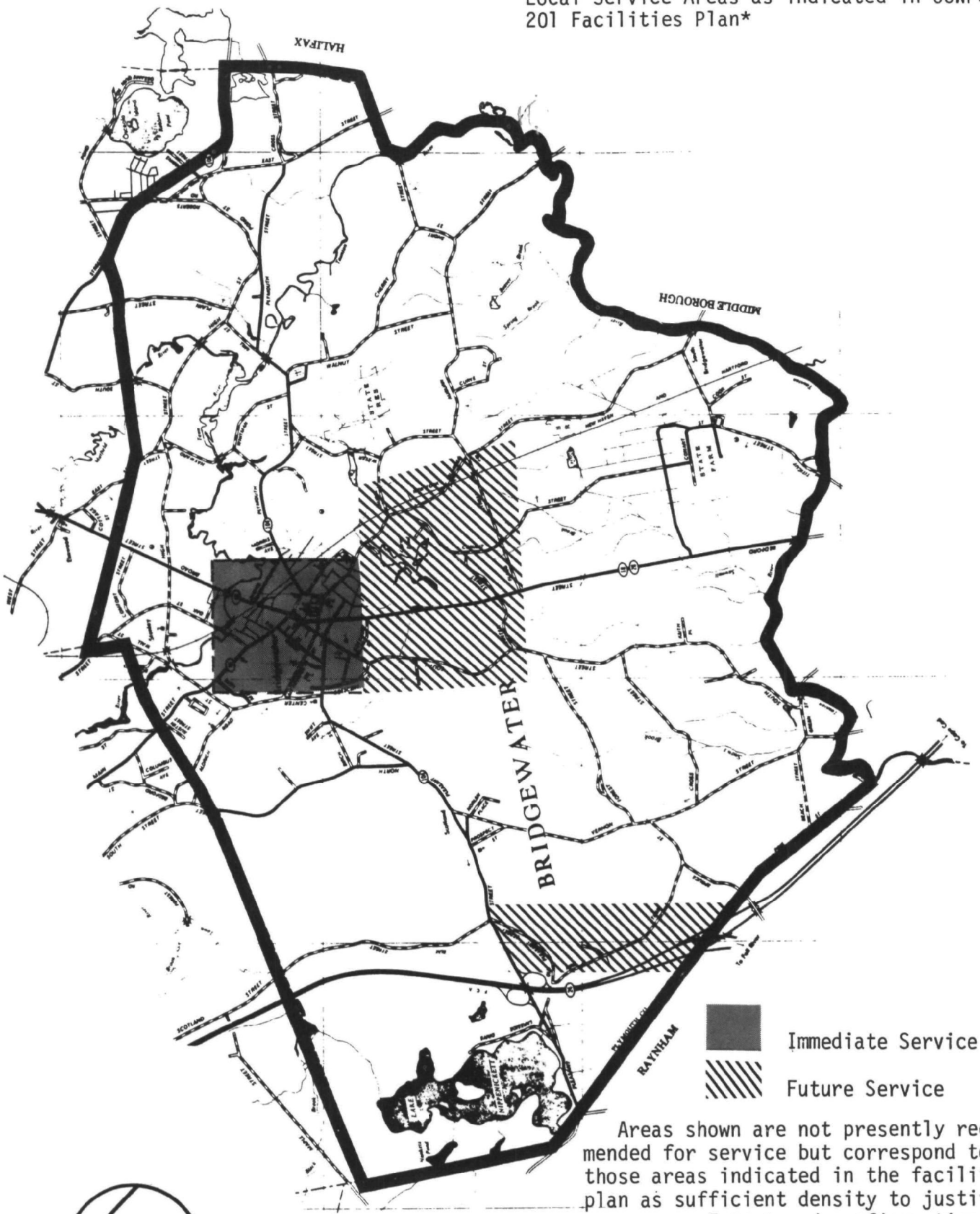


Fig. 4-3A
Recommended Service Areas in the Local 201 Facilities Plan

Local Service Areas as indicated in OCWPCD 201 Facilities Plan*



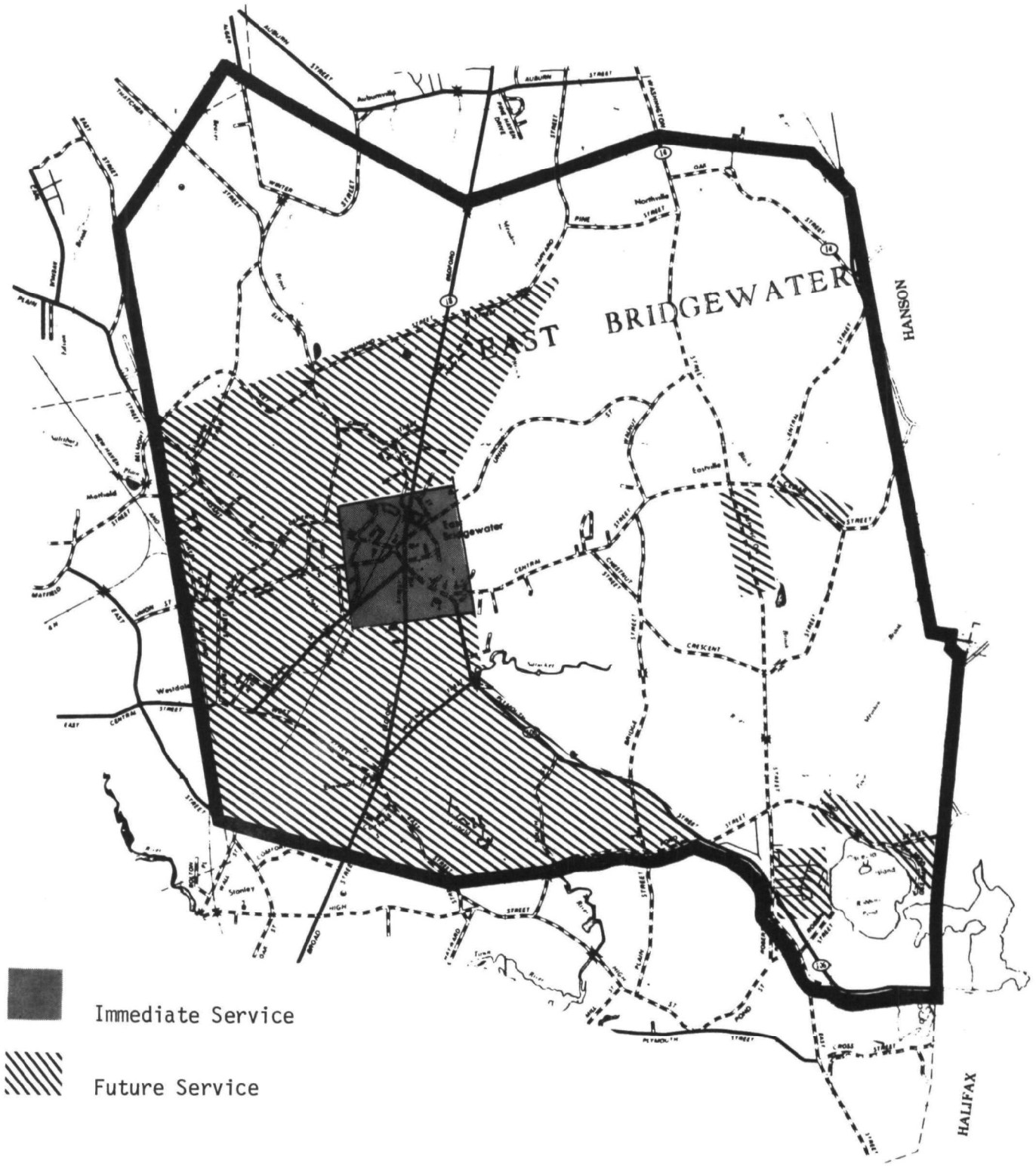
Areas shown are not presently recommended for service but correspond to those areas indicated in the facilities plan as sufficient density to justify sewerage. Extent and configuration of areas shown is not exact but indicative of areas mentioned in OCWPCD Step I Report.

FIG.4-3B

Bridgewater

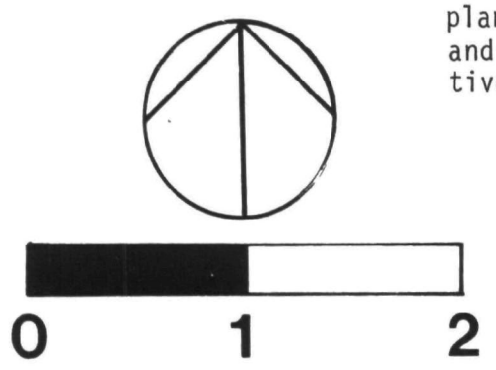
0 1 2

Local service areas as indicated in OCWPCD 201 Facilities Plan*



Areas shown are not presently recommended for service but correspond to those areas indicated in the facilities plan as sufficient density to justify sewerage. Extent and configuration of areas shown is not exact but indicative of areas mentioned in OCWPCD Step I Report.

FIG.4-3C



East Bridgewater

Easton: If Easton were to initiate a sewer construction program, No. Easton and the Washington Street section from Morris Corner to Howards Corner were indicated as possible areas for initial sewer service. Future construction, perhaps after 1990 to 1995, might include residential areas abutting the immediate service area, the remainder of Washington St. and satellite housing projects. (Figure 4-3D)

Hanson: The facilities plan designated the Bonney Hill section, plus Main and Pleasant Streets as the only possible immediate service areas in Hanson. (Figure 4-3E)

Pembroke: The regional facilities plan indicated that growth areas surrounding Oldham, Furnace, Great Sandy Bottom and Little Sandy Bottom Ponds might economically justify sewer construction. (Figure 4-3F)

West Bridgewater: Satellite service areas such as the Matfield Street area and Elm Square were considered as initial service areas in the regional Facilities Plan. At the time of the completion of the regional facilities plan, it was expected that service areas in West Bridgewater would be more fully delineated in the local 201 facilities study. (Figure 4-3G)

Whitman: The regional facilities plan considered a wastewater collection system servicing essentially the entire town within a twenty-year period justifiable. (Figure 4-3H)

Evaluation: Construction of wastewater collection systems to service these areas would require extension of interceptor distances beyond that currently acceptable to designated communities. Cost figures for the local systems to service these areas are not available at this writing. Need for servicing these areas has not been established.

2) Provide Service Areas Based on Need for Sewerage

Description: Under this alternative, the "sewerage need" methodology would be applied in each community designated as eligible for District membership. The methodology required is discussed in the introduction of this Chapter (see above) and in the Technical Memorandum: Determining the Nature and Extent of a Need for Public Sewerage.

Evaluation: Determining service areas on the basis of existing need as demonstrated by failure of on-site systems and the fact that these same systems cannot be rejuvenated to the desired level of operational efficiency constitutes the most reasonable method for identifying service areas. Such a determination performed in each community associated with the regional 201 facilities plan (whether done as part of local

Areas shown are not presently recommended for service but correspond to those areas indicated in the facilities plan as sufficient density to justify sewerage. Extent and configuration of areas shown is not exact but indicative of areas mentioned in OCWPCD Step I Report.

Local service areas as indicated in OCWPCD 201 Facilities Plan*

Immediate Service

Future Service

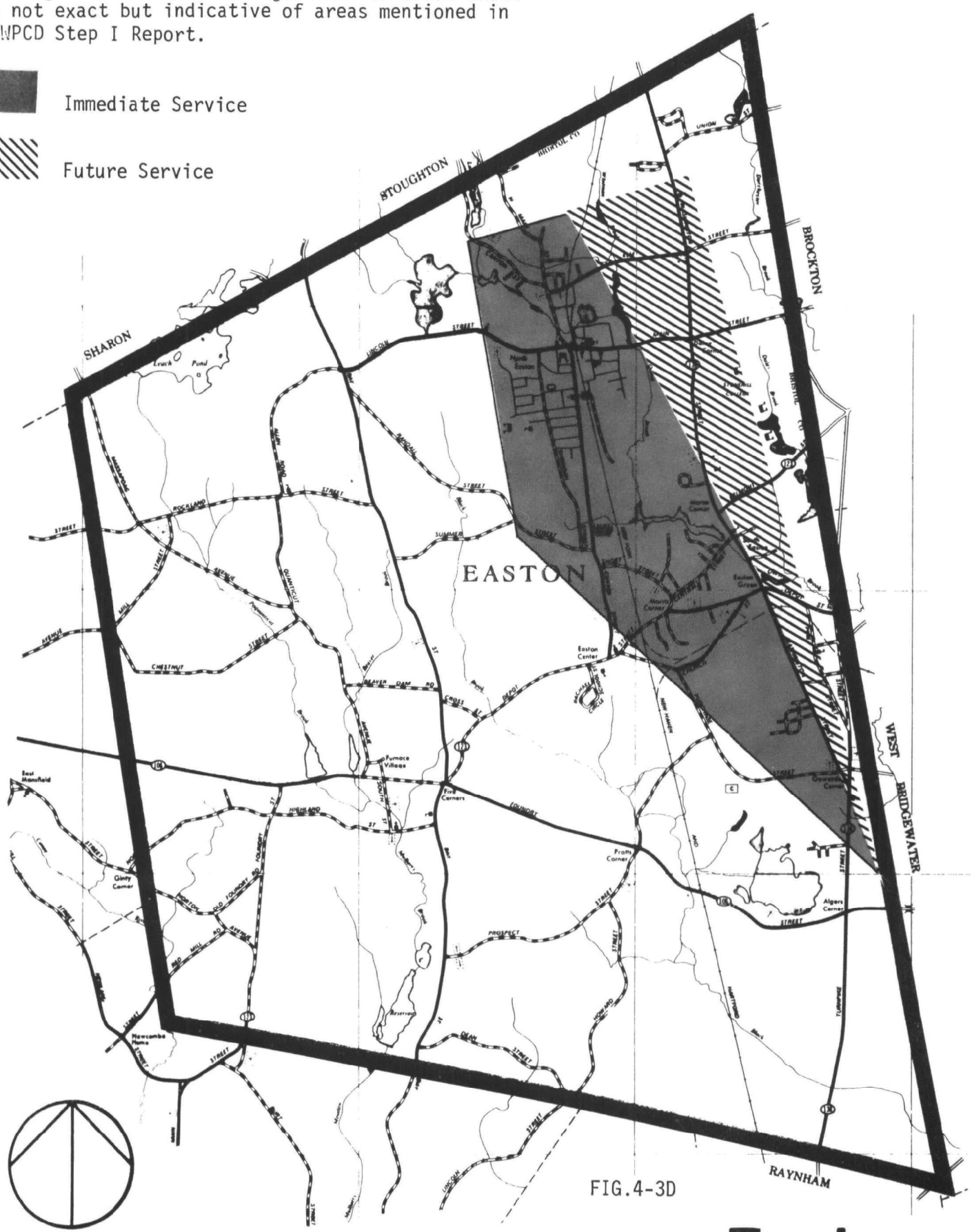
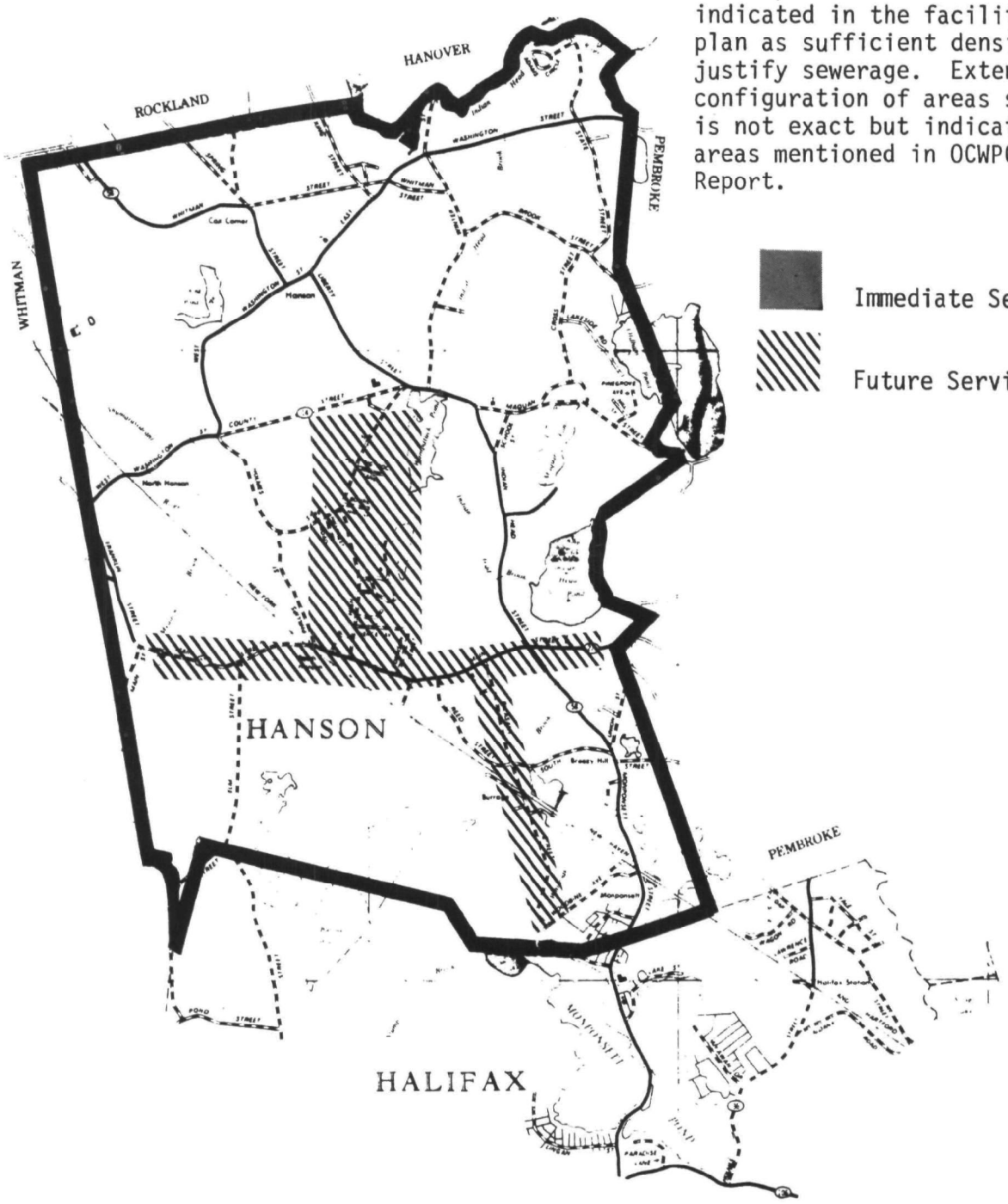


FIG.4-3D

Easton

Local service areas as indicated in OCWPCD 201 Facilities Plan*

Areas shown are not presently recommended for service but correspond to those areas indicated in the facilities plan as sufficient density to justify sewerage. Extent and configuration of areas shown is not exact but indicative of areas mentioned in OCWPCD Step I Report.



Immediate Service

Future Service

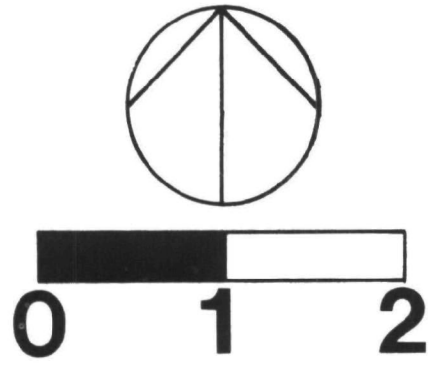


FIG.4-3E

Hanson

Local service areas as indicated in OCWPCD 201 Facilities Plan*

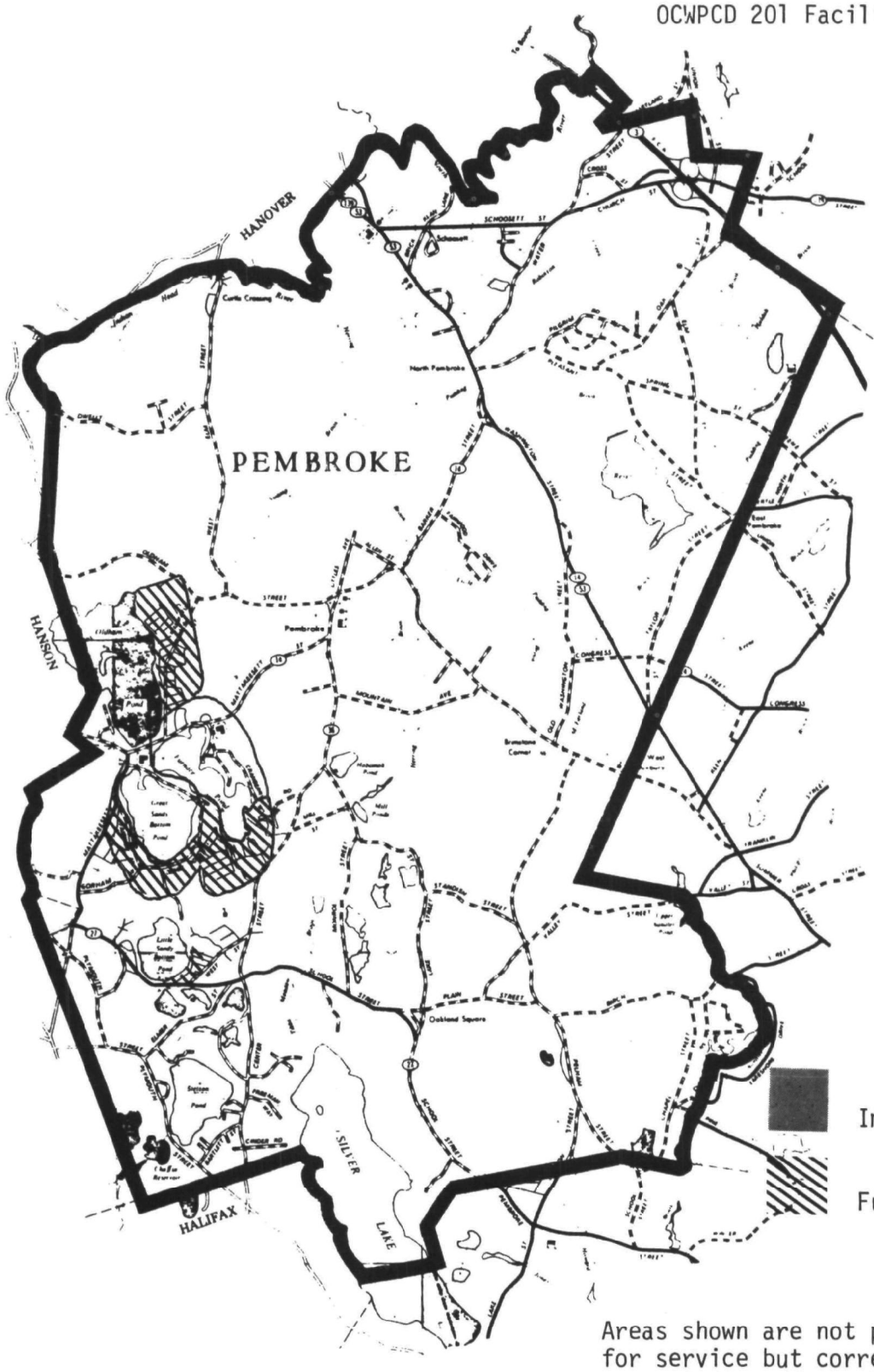


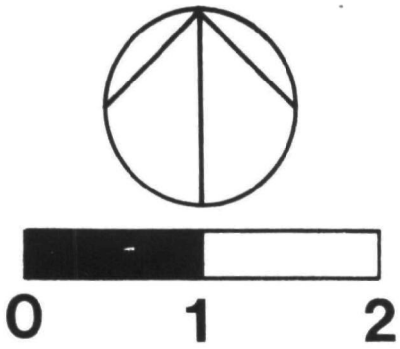
FIG.4-3F

Immediate Service

Future Service

Areas shown are not presently recommended for service but correspond to those areas indicated in the facilities plan as sufficient density to justify sewerage. Extent and configuration of areas shown is not exact but indicative of areas mentioned in OCWPCD Step I Report.

Pembroke



Local service areas as indicated in OCWPCD 201 Facilities Plan*

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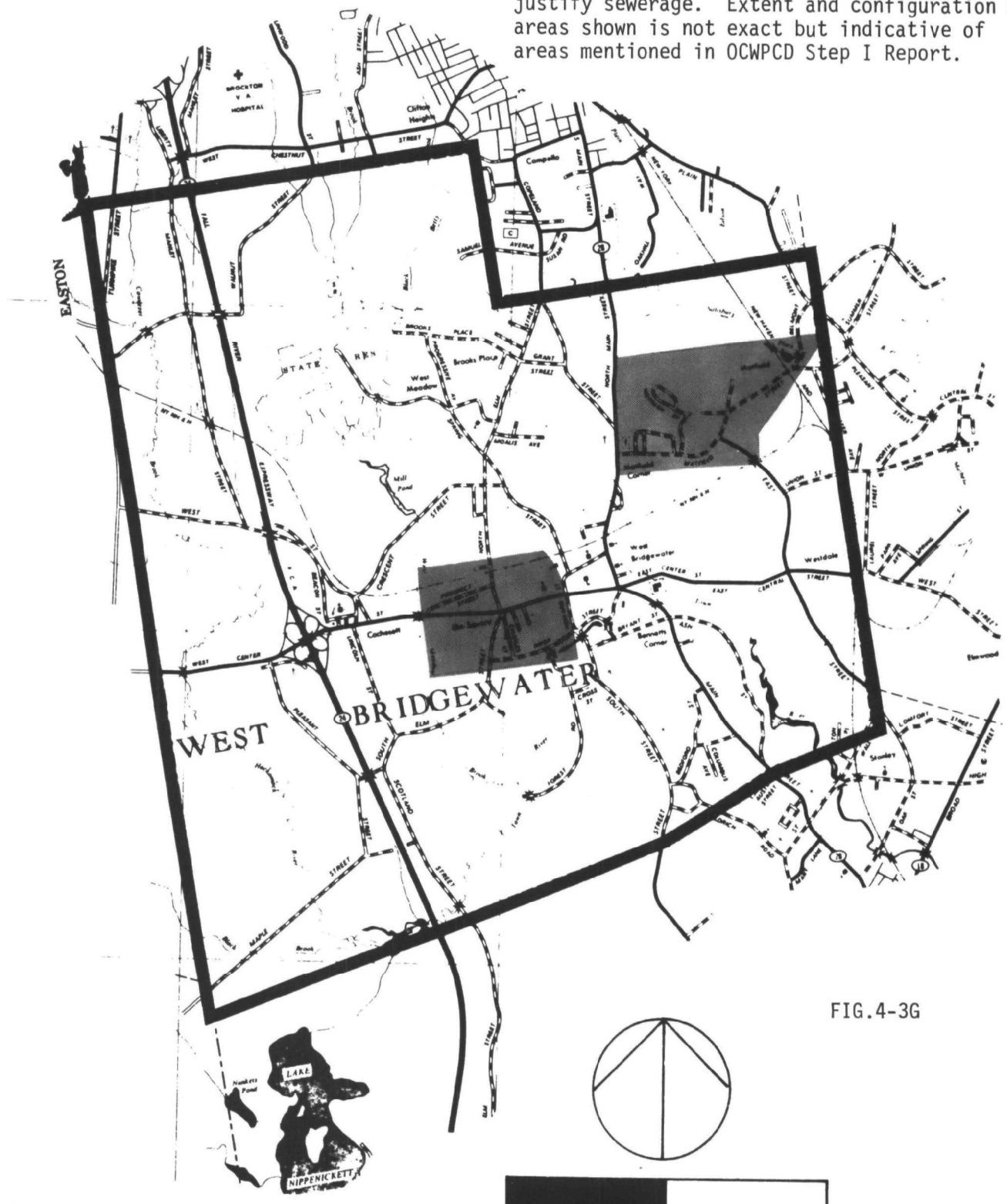


FIG.4-3G

Immediate Service

Future Service

West Bridgewater

Local service areas as indicated in OCWPCD 201 Facilities Plan*

Areas shown are not presently recommended for service but correspond to those areas indicated in the facilities plan as sufficient density to justify sewerage. Extent and configuration of areas shown is not exact but indicative of areas mentioned in OCWPCD Step I Report.

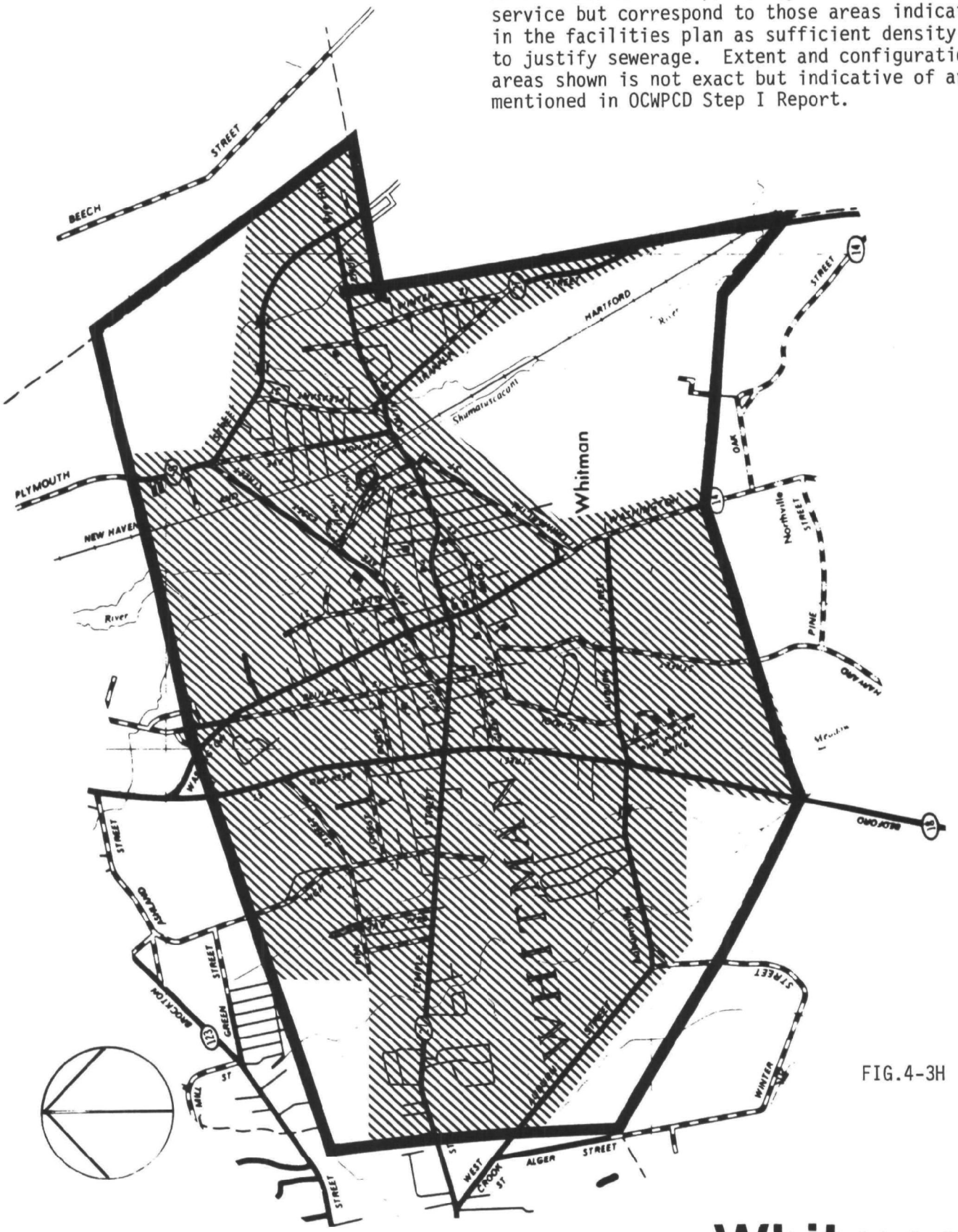


FIG.4-3H

Whitman

201's or as part of the 208 study) provide for specific documentation of on-site disposal or discharge problems. In addition, such a study would document the nature, number and location of existing disposal systems which are malfunctioning. Homeowner questionnaires will aid in the evaluation of the nature of the causes of existing failures of on-site systems and differentiation between failure caused by lack of maintenance and failure related to poor percolation or high groundwater is possible.

In a recent Program Requirements Memorandum sent out by the Environmental Protection Agency (EPA) it is stated that "the facility plan must also document the nature, number and location of existing disposal systems (e.g. septic tanks) which are malfunctioning" and that "Specific documentation of the nature and extent of health, groundwater and discharge problems must be provided in the facility plan." Thus, new EPA policy clearly supports determining sewer service areas on the basis of need.

c. Treatment Processes

On the basis of projected wastewater flows, estimated wastewater constituents and effluent criterion established by the Massachusetts Division of Water Pollution Control, the OCWPCD evaluated as part of its facilities plan various wastewater treatment and disposal options. The results of that evaluation are discussed below. The overriding factor in the evaluation of each alternative conducted by the OCWPCD is the fact that no local 201 facilities plans had been completed by any member community at the time of the evaluation of treatment processes. More importantly, no decisions have been made at the local level to construct collection systems (at town meeting) which will be the final determinant of flows requiring treatment at the regional facility. The reason that this is important is that the treatment process (such as land application versus tertiary treatment is highly dependent on the volume of flows and without local 201's being completed, no hard data on flows is available.

Any discharge from the wastewater treatment facility to a surface receiving water body will require that the wastewater receive an advanced level of treatment. For a discharge to a surface water (i.e., Taunton River) the OCWPCD wastewater treatment facilities effluent will have to meet the following criteria:

Class B Waters

MGD	BOD	NH	P	DO
12.9	5.0 mg/l	2.0 mg/l	1.0 mg/l	7.0 mg/l
6.0	9.0 mg/l	2.0 mg/l	1.0 mg/l	7.0 mg/l

1) Wastewater Treatment Process Recommended in Existing Facilities Plan

Description: An estimated wastewater flow of 12.7 mgd was used in evaluating wastewater treatment alternatives. The 12.7 mgd figure used represents the anticipated flow from seven communities (four member and three non-member).

To treat the projected wastewater flows, an advanced single stage aeration treatment process using lime to precipitate phosphorus is recommended in the facilities plan.

Evaluation: The lime precipitation process is preferable to an alum precipitation system because of its inherent odor control, the ease with which solid residues can be dewatered, minimization of the number of chemicals to be handled, and the possibility that, in future years, significant quantities of lime can be recovered. This process would produce considerably more sludge than a similar alum process. However, the ease with which lime sludge could be dewatered would facilitate dewatering and, thus, minimize the land requirements if land-filling is required for ultimate disposal. The significantly large quantities of lime sludge could be further reduced, if the OCWPCD facility should be expanded to a size at which it might be economical to separate and recalcinate the lime.

The single-stage aeration process, is equivalent in cost with the mixed growth system, but it offers a minimum number of unit processes and would minimize total energy demands of the treatment facility by making optimum use of required chemical additions. The single-stage process could readily be expanded to meet future requirements by duplicating existing process units. The use of lime precipitation is compatible with the biological nitrification process conducted in the second stage. This process would require a slightly larger expenditure of energy and other resources when compared with on-land disposal of secondary effluent.

2) Alternative Treatment Processes with Surface Water Discharges

Description: Seven alternative liquid treatment schemes were considered in the Facilities Plan for which surface water discharge would be the means of disposal. Those six schemes considered in addition to the one recommended above include:

- -Two-stage activated sludge with initial salt addition in the first stage aeration tanks;
- -Single-stage activated sludge with metal salt addition to the primary clarifiers;

-Two-stage biological treatment (first stage biological oxidation, however, second stage activated sludge) with metal salt addition to the intermediate clarifier;
-Two-stage biological treatment with lime addition to the intermediate clarifier;
-Mixed growth biological system with metal salt addition to primary clarifier;
-Mixed growth biological system with lime addition to the primary clarifier.

Evaluation: Evaluation of the alternative liquid treatment processes can be found in Table 4-1A.

3) Land Application of Effluent from Secondary Treatment

Description: Although discussed in the existing OCWPCD's facilities plan, an alternative employing land application as part of its treatment process should be given renewed consideration. Of the seven sites presented as potential land application areas, one site in Bridgewater was listed. The "Bridgewater site", although its location was not mentioned in the report, was listed as being a 190 acre tract west of the Taunton River, south of Paper Mill Village. The site is currently zoned residentially and soils were indicated as having potential for use of irrigation, overland flow, infiltration basins and sludge disposal.

An additional reason for considering land application are the revised flow estimates. The flow of 12.7 mgd used by the District represents flows from seven communities with service areas delineated by density. At this time, four communities are members with one community withdrawing and one community sending a portion of its flows elsewhere. This would substantially reduce the land required.

Evaluation: At a site meeting the requirements for land application, secondary treatment followed by land application is an attractive alternative for the OCWPCD. In order for the effluent of the District to be eligible for discharge to the Taunton River tertiary treatment of the effluent will be required and the costs associated with these processes is very high. In addition to the capital costs for the removal equipment required to meet tertiary treatment requirements, yearly operation and maintenance costs for treating of the OCWPCD's municipal wastewater are heavily weighted by the volume of flows reaching the treatment facility. Ideally, the most economical method of running a treatment facility is at or near its design maximum in order to achieve economies of scale. To treat very low flows to the required level will not offer economies of scale. Current design wastewater flow projections are not based on service areas selected at town meeting. It

TABLE 4-1A
LIQUID PROCESSING

Process Alternative	Present Worth Costs				Adverse Environmental Effects	Beneficial Environmental Effects	Reasons Why Alternative is Desirable	Reasons Why Alternative is Undesirable
	Total	Capital	O&M	Sludge Disposal				
Two-Stage Aeration with Alum	$16,680,000	$8,100,000	$7,750,000	$830,000	1. Larger land requirements 2. Little potential for chemical recovery 3. Sludge has high aluminum concentrations	1. High degree of treatment	1. Less susceptable to cold weather 2. Extensive operating experience 3. Greatest flexibility for variant lands and flows 4. Can easily remove variable amounts of phosphorus	1. High power consumption 2. High capital and labor costs 3. Process is more susceptable to toxic upsets
Single-Stage Aeration with Alum	14,390,000	6,310,000	7,290,000	790,000	1. Little potential for chemical recovery 2. Sludge has high aluminum concentrations	1. High degree of treatment	1. Less susceptable to cold weather 2. Low O&M costs 3. Low capital costs 4. Can remove variable amounts of phosphorus 5. Extensive operating experience	1. Process probably cannot nitrify without chemical ppt. 2. Requires a three-chemical system
Single-Stage Aeration with Alum	14,390,000	6,310,000	7,290,000	790,000	1. Little potential for chemical recovery 2. Sludge has high aluminum concentrations	1. High degree of treatment	1. Less susceptable to cold weather 2. Low O&M costs 3. Low capital costs 4. Can remove variable amounts of phosphorus 5. Extensive operating experience	1. Process probably cannot nitrify without chemical ppt. 2. Requires a three-chemical system
Single-State Aeration with Alum	14,380,000	5,970,000	7,330,000	1,080,000	1. Larger quantities of sludge produced	1. High degree of treatment 2. More positive odor control 3. Potential for chemical recovery	1. Less susceptable to cold weather 2. Lowest capital costs 3. Low O&M costs 4. Extensive operating experience 5. More resistent to toxic upsets 6. Multi-use of lime	1. Process probably cannot nitrify without chemical ppt. 2. Cannot vary level of phosphorus removal
Attached Growth and Suspended Growth with Alum	16,610,000	8,230,000	7,660,000	720,000	1. Possible odor problem 2. Large land requirements 3. Higher physical profile 4. Little potential for chemical recovery 5. Sludge has high aluminum concentrations	1. High degree of treatment	1. Good flexibility for variant lands and flows 2. Resistant to toxic upsets 3. Can remove variable amounts of phosphorus 4. Least sludge to handle	1. High capital and labor costs 2. Operating parameters are empirical for first stage 3. Requires a three-chemical system
Attached Growth and Suspended Growth with lime	17,790,000	8,630,000	7,980,000	1,180,000	1. Possible odor problems 2. Large land requirements 3. Higher physical profile 4. Larger quantity of sludge produced	1. High degree of treatment 2. Potential for chemical recovery	1. Good flexibility for variant lands and flows 2. Resistant to toxic upsets	1. Phosphorus removal "all or nothing" 2. High overall costs 3. Operating parameters are empirical for first stage
Mixed Growth System with Alum	14,650,000	6,490,000	7,380,000	780,000	1. Higher physical profile 2. Little potential for chemical recovery 3. Sludge has high aluminum concentrations	1. High degree of treatment	1. Good flexibility for variant lands and flows 2. Less susceptable to cold weather 3. Low capital costs 4. Low O&M costs 5. Can remove variable amounts of phosphorus	1. Operating parameters are empirical 2. Requires three-chemical system.

Source: OCWPCD 201 Facilities Plan, 1977

may in fact be that service areas selected by OCWPCD communities generate flows far below that currently projected. The ability for the users of such a facility to pay for the O&M of a low flow tertiary treatment facility may be limited which alters the cost effectiveness of the tertiary facility and enhances the cost effectiveness of the secondary facility followed by land application.

Secondary treatment followed by land application is expected to be significantly lower in yearly operational costs than tertiary. In addition, land purchased in order to provide acreage for land application is grant eligible.

Environmentally, land application complies most closely with the intent of P.L. 92-500 by completely eliminating the need for a surface water discharge. On-land disposal would utilize plants, soils, surface and subsurface bacteria to removal organics and minerals passing through the secondary treatment facility. As discussed in the Environmental Assessment Statement there are potential negative impacts associated with the use of a land application process. Many safeguards are required, these however, have not as yet been costed for use in a comparative analysis of treatment alternatives.

On-Land Disposal

Adverse Environmental Impacts	Beneficial Environmental Impacts	Reason Why Alternative is Desirable	Reason Why Alternative is Not Desirable
1. very land intensive	1. minimizes chemical requirements	1. reduces required degree of treatment	1. limited sites available
2. potential groundwater contamination	2. minimizes sludge disposal requirements	2. reduces energy and environmental costs	
3. potential aerosal conveyance	3. eliminates surface water discharge		

d. Sludge Disposal

Alternatives for sludge handling and disposal operations available to the OCWPCD are dependent on the wastewater treatment scheme selected for the liquid train of the facility. The currently recommended wastewater treatment scheme (single-stage activated sludge with lime) is projected to produce 74,760 lb/day of sludge.

The process recommended for sludge handling at the OCWPCD facility entails:

Thickening: It is recommended that the settled primary solids be thickened in the primary clarifiers. Dissolved air floatation thickeners are recommended for the thickening of waste biological solids.

Sludge Holding: Sludge holding facilities, with a minimum detention time of three days, are recommended. Aeration to mix the solids and to avoid septicity is also recommended. Mechanical mixers are also recommended to ensure continuous mixing.

Sludge Stabilization: Chemical conditioning with lime and ferric chloride is recommended with ultimate disposal of the conditioned and dewatered sludge in a landfill. Sufficient lime should be added to assume that the sludge is stabilized.

Sludge Dewatering: Filter pressure is recommended for the dewatering of wastewater sludge. Although little difference is observed in the total present worth costs of filter presses and centrifuges for the recommended liquid treatment alternative, the simplicity of operation and drier cake offered by the filter pressure are factors which encourage selection of this process.

As in the case of selecting a reasonable liquid treatment scheme for the OCWPCD, projected wastewater flows impact the selection of sludge handling processes as well as the selection of a method of ultimate disposal. If the flow of wastewater reaching the District facility is lower than projected, due to member communities not constructing collection systems to the extent expected, so too will the solids generated from the treatment facility be reduced proportionately. In light of the fact that only one local Step I 201 facilities study has been completed (which has resulted in reduced flows) and no formal sewer service areas have been adopted in any community, alternatives examined in the regional Facilities Plan should be given renewed consideration in any additional regional 201 work (Step I). (The OCWPCD is expected to conduct additional Step I study work in order to perform the extensive revisions required due to actions taken by East and West Bridgewater and Abington.) Although solids handling procedures may be altered by changes in wastewater flow projections, it is expected that such changes would have their primary impact on the ultimate means of sludge disposal selected.

1) Sludge Disposal Recommended in Existing Facilities Plan

Description: Sanitary landfilling of dewatered and stabilized sludge was recommended in the OCWPCD facilities plan because it is most cost effective given the large land requirements for lime stabilized sludge.

Evaluation: All the alternatives evaluated for the ultimate disposal of sludge were considered to be satisfactory methods of sludge disposal. Sanitary landfilling, however, is expected to have an operational cost of one-third that of the other technically feasible alternatives. The major costs associated with landfilling of the stabilized sludge are related to site preparation and fill operation. A total of 35 to 200 acres was projected as being required for landfilling by the year (2025). To insure a minimum potential of pollution of groundwater, it was recommended that a leachate collection system be installed.

Based on revised flows from more accurate service areas (determined by local 201 studies and approved by town meeting as areas to be sewered), the cost-effectiveness of sludge recycling, on-land disposal of sludge, incineration and landfilling may be altered. In light of the fact that of primary concern in the siting of the proposed treatment facility (which is a very controversial issue and which will be discussed in a later section) is the availability of adequate acreage for landfilling, the treatment plant selection process would receive valuable information from a re-evaluation of disposal practices. If landfilling were not to be used, acreage requirements of the treatment plant site would be reduced which would increase the number of potential treatment plant sites.

2) Regional Sludge Disposal With Joint Brockton/OCWPCD Incineration

Description: Sludge generated at the OCWPCD wastewater treatment facility would be transported to and incinerated at the sludge incinerator proposed in the City of Brockton's facilities plan.

Evaluation: This alternative was not given serious consideration in the original Facilities Plan completed for the OCWPCD. The Facilities Plan stated that the engineer for the City of Brockton cited capacity and other potential problems with such an alternative and that the engineers reported that "at present, the City officials of Brockton are not looking with favor upon a joint use incinerator at Brockton". Re-evaluation of this alternative is required in order that cost figures can be developed. Incineration jointly with Brockton would eliminate OCWPCD's need for purchasing a site adequate for landfilling. Also eliminated would be the need for preventive measures associated with leachate that will be required with a landfill alternative.

A check with DEQE indicated that joint incineration would not significantly impact air quality.

e. Siting of the Treatment Plant

As expected, the siting of the regional wastewater treatment facility in Bridgewaer has proved to be a particularly sensitive issue as strong opposition to the currently recommended site has been voiced by Bridgewater residents. Continued opposition to the recommended site may prove to be an obstacle to the implementability of the existing OCWPCD Facilities Plan.

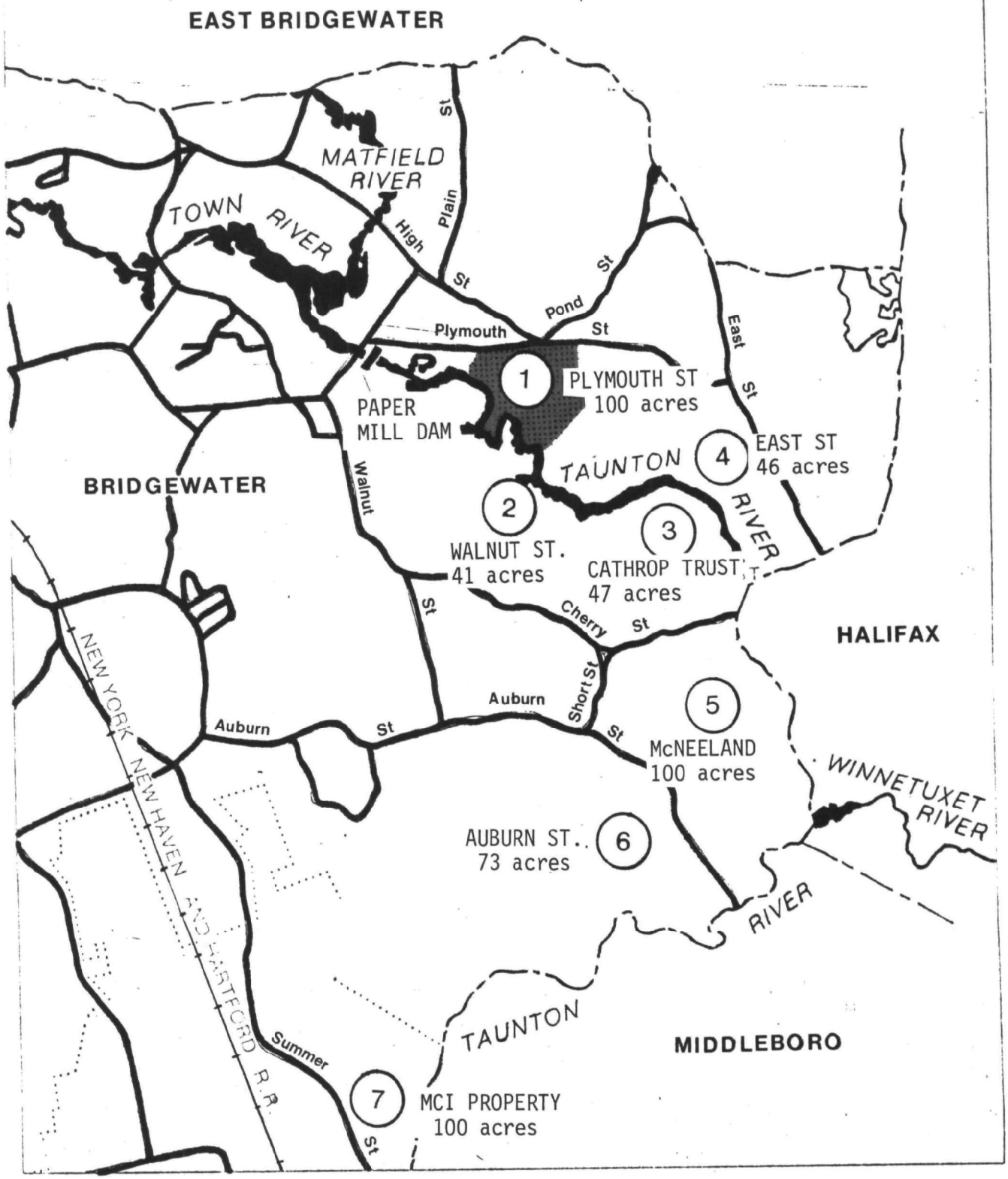
The presently recommended treatment plant site was predicated in part on the chosen treatment and disposal option: stream discharge of effluent with landfilling of sludge. Under this treatment option, the plant needs to be located near the Taunton River on a site large enough for a long-term landfill operation with suitable soils and groundwater conditions to allow landfilling.

An additional factor influencing the treatment plant siting is the projected wastewater flow. The impact of wastewater flows on the selection of a site for the treatment plant is due primarily to the role flow projections play in the selection of a wastewater treatment process. As discussed above, wastewater flow projections used in the evaluation of treatment schemes may be subject to considerable change. Initially flows were projected on a District comprised of four member communities, which is expected to be reduced to three, and service areas within these communities determined without performing a sewerage needs study to establish percent failures, etc. as part of a local 201 facilities study. In addition, no sewer service areas have been adopted by town meeting. Should, on the basis of re-evaluating flow and treatment process, other treatment alternatives become feasible or preferable, a wider range of sites could be considered for the location of the OCWPCD treatment plant.

1) Locate the OCWPCD Treatment Facility at the Site Recommended in the Regional 201 Facilities Plan

Description: Site #1 (see Figure 4-4) adjacent to Plymouth Street in the town of Bridgewater is recommended for the construction of the OCWPCD regional treatment facility.

Evaluation: The site as described in the Facilities Plan has 100 acres of land under a single ownership and would provide approximately 45 acres for on-site disposal of solids materials (the area's groundwater table is estimated to be approximately 20 to 30 feet below the existing surface in most areas.) The site would permit buffer zones to be developed on all sides of the treatment facility and might enable the District to develop a recreational facility. The recommended site would require extensive renovation of abandoned mining operations, to permit construction. However, the high cost of site preparation is



Source: OCWPCD 201 Facilities Plan

OLD COLONY WATER POLLUTION CONTROL DISTRICT

ALTERNATIVE WASTEWATER TREATMENT PLANT SITE LOCATIONS

Plant Site Recommended in Facilities Plan

Plant Sites Evaluated by Facilities Plan

FIG. 4-4

somewhat mitigated by being able to minimize the construction costs of the influent sewer at this site. The very permeable soils expected would require that a positive means of collection and, if necessary, treatment of sanitary landfill leachate, be provided.

Costs associated with the Plymouth Street property as the site of the OCWPCD facility are presented in Table 4-2.

2) Locate the OCWPCD Treatment Facility at Alternative Sites Considered in the Facilities Plan

Description: On the basis of the recommended treatment and disposal processes, a total of seven sites were considered which provided for a discharge to the Taunton River.

Evaluation: The following table (Table 4-2A) was presented in the OCWPCD 201 facilities plan.

The economic considerations for the wastewater treatment plant site selection as presented in the facilities plans are presented in Table 4-3.

3) Locate the OCWPCD Facility at a New Location Delineated on the Basis of Re-assessed Wastewater Flows, Treatment Schemes and Sludge Disposal Options

Description: Due to the facts that: 1. the OCWPCD is expecting to revise its existing facilities plan based on the results of the Abington local 201 Facilities Plan (reduced flows to OCWPCD and not proceeding with Step II application for District service areas); 2. West Bridgewater intends to withdraw from the OCWPCD; and 3. changes to the recommended interceptor routes are being made, the treatment plant siting process is recommended for reassessment. This alternative is recommended to begin upon completion of local 201 Step I facilities studies in member communities.

Evaluation: Initiating a wastewater treatment plant site evaluation with the determination of probable service areas and wastewater flows from areas (on sewerage) will provide the evaluation process with reasonable wastewater flow volumes on which wastewater treatment process alternatives can be weighed.

Communities who wish to provide collection systems as a public service will be eligible to do so and those who wish to provide collection sewers as a means of solving water quality problems will also be able to do so. However, the wishes of the communities can only be known after initiation of local 201 facilities studies through which service areas will be delineated.

TABLE 4-2

THE SITE RECOMMENDED IN THE OCWPCD REGIONAL 201 FACILITIES PLAN

Source: OCWPCD
201 Facilities Plan

Economic Parameters	Site #1 Plymouth Street
1. Cost of influent sewer from Paper Mill Dam	$2,480,000
2. Cost of outfall	$ 44,000
3. Cost of clearing	$ 5,000
4. Cost of grading	$1,332,000
5. Cost of constructing access road	-
6. Cost of supplying water utilities	-
7. Total cost	$3,861,000

The evaluation of the site's physical parameters included in the Facilities Plan are as follows:

Physical Parameters	Site #1 Plymouth Street
1. Land area available	Up to 100 acres
2. Width of buffer	350 feet
3. Acres of wetland on site	-
4. Additional marginal land to be purchased	8 acres
5. Ownership	Conn. Aggregates
6. Present land use	Mining
7. Existing vegetation	Open areas
8. Soils expected	Gravel, loamy sand, and sandy loam
9. Groundwater table (feet below surface)	20 to 30 ft.
10. Flooding resistance	Good
11. Proximity to water supply	2,800 ft.
12. Onsite area available for landfilling	45 acres

TABLE 4-2A
COMPARISON OF THE PHYSICAL PARAMETERS
OF THE
TREATMENT PLANT SITES

Physical Parameters	Site #2 Walnut Street	Site #3 Cathrop Trust	Site #4 East Street	Site #5 McNealand	Site #6 Auburn Street	Site #7 MCI Property
1. Land area available	41 acres	47 acres	46 acres	up to 100 acres	73 acres	100+ acres
2. Width of buffer	200 feet	350 feet	300 feet	500+ feet	450 feet	500+ feet
3. Acres of wetland on site	13 acres	-	15 acres	10 acres	38 acres	30 acres
4. Additional marginal land to be purchased	12 acres	13 acres	-	26 acres	-	-
5. Ownership	5 or 6 owners	Cathrop Trust	Martino	McLealand	Lehtola	MCI
6. Present land use	Extensive agriculture	Extensive agriculture	Extensive agriculture	Extensive agriculture	Extensive agriculture	Intensive & extensive agriculture
7. Existing vegetation	Mixed woods	Softwoods	Mixed woods	Mixed woods	Softwoods	Mixed woods, intensive agriculture
8. Soils expected	Silty loam & fine, sandy loam	Sandy loam & fine, sandy loam	Sandy & silty loam	Silty loam, deep & shallow muck	Sandy loam & shallow muck	Sandy loam
9. Groundwater table (feet below surface)	10 feet	5 to 10 feet	5 to 10 feet	5 to 10 feet	0 to 10 ft.	0 to 10 feet
10. Flooding resistance	Fair	Good	Good	Good	Fair	Good
11. Proximity to water supply	4,300 feet	Over 1 mile	Over 1 mile	Over 1 mile	Over 1 mile	5,000 feet
12. Onsite area available for landfilling	-	-	6 acres	-	-	-

Source: OCWPCD 201 Facilities Plan

TABLE 4-3
COMPARISON OF THE ECONOMIC PARAMETERS
OF THE
TREATMENT PLANT SITES

Economic Parameters	Site #2 Walnut Street	Site #3 Cathrop Trust	Site #4 East Street	Site #5 McNeeland	Site #6 Auburn Street	Site #7 MCI Property
1. Cost of influent sewer from Paper Mill Dam	$2,025,000	$3,510,000	$4,050,000	$5,445,000	$7,245,000	$10,400,000
2. Cost of outfall	70,000	122,000	40,000	78,000	226,000	-
3. Cost of clearing	31,000	32,000	32,000	32,000	28,000	-
4. Cost of grading	722,000	640,000	444,000	975,000	1,828,000	-
5. Cost of constructing access road	158,000	68,000	-	70,000	-	-
6. Cost of supplying water utilities	80,000	85,000	-	118,000	38,000	-
7. Total cost	$3,086,000	$4,457,000	$4,566,000	$6,718,000	$9,365,000	($10,400,000)

Source: OCWPCD 201 Facilities Plan

2. Treat Municipal Wastewater at the Brockton Wastewater Treatment Plant (Abington, Avon, Brockton)

Description: The existing wastewater treatment facility in the City of Brockton is expected to serve, on a limited basis, as a regional wastewater treatment facility in the OCPC 208 study area. The Brockton wastewater treatment facility is an alternative treatment site for Abington and Avon should they construct local collection systems.

Evaluation: The city's existing wastewater treatment facility is located in the southeastern corner of Brockton near the West Bridgewater border. The facility services wastewater flows from approximately 85 percent of the city and provides a secondary level of treatment prior to discharging its effluent into the Salisbury Plain River.

Expansion Program - The current 201 Facilities Construction Program in which Brockton is engaged calls for the upgrading and expansion of the existing facility. As mentioned previously, approximately 85 percent of the city is now sewered and it is expected that by 1995 the entire city will be sewered. The existing wastewater treatment facility was designed in 1964 to treat an average daily capacity of 12 million gallons. An average daily flow of 18 mgd was adopted for the 1995 design year with a maximum flow rate of 36 mgd. The treatment facility will be designed to provide tertiary treatment for the average daily flow rate of 18 mgd with 36 mgd as the tertiary treatment capacity for the facility. The facility will also be capable of providing primary settling and chlorination of flow up to 64 mgd. This additional primary treatment capacity will be included in the design recommendation for the system until such time as an evaluation survey of the collection system indicates that rehabilitation of the system will eliminate the need for the added capacity.

Average Daily Flow Rates (mgd)

	Brockton	
	Existing	Planned
Domestic	5.7	9.4
Industrial (including hospitals)	1.0	1.5
Infiltration/Inflow	4.4	5.5
Town of Avon	-	1.0
Abington, westerly section	-	0.5
	11.1	17.9

Upgrading Program - The upgrading portion of the construction project is intended to bring the current secondary level of treatment to tertiary treatment. The requirement for tertiary treatment is based on the allowable effluent loading developed by the Massachusetts Division of Water Pollution Control (Westboro) for the Salisbury Plain River.

For Discharge to Class B Waters

MGD	BOD_5	NH	P	DO
18.0	3.0 mg/l.	1.0 mg/l.	1.0 mg/l.	7.0 mg/l.

Service Areas of the Brockton Facility - As part of the expansion of the Brockton Sewage Treatment Facility, allowances for wastewater flows from Abington and Avon have been included in the design capacity of the facility. Inclusion of capacity for flows from these two additional communities is in accord with the 3030e) Basin Plan completed for the Taunton River Basin by the Division of Water Pollution Control. Wastewater collected from the entire town of Avon is eligible for treatment at the Brockton facility and in Abington wastewater flows collected in a 1080 acre tract of "west" Abington which naturally drains into the Beaver Brook watershed are eligible for treatment. Treatment capacity of 0.5 mgd and 1 mgd have been allocated to Abington and Avon respectively.

Construction of the proposed improvements to the Brockton Treatment Facility is expected to bring marked improvements to the quality of the municipal wastewater effluent discharged by Brockton into the Salisbury Plain River. Effluent data was gathered for 1975 and when compared with the required parameter levels for the facilities discharge (BOD and DO) were found to differ significantly.

Parameter	Effluent Levels, 1975	Design Requirements
BOD	44 mg/l.	3.0 mg/l.
DO	4.7 mg/l.	7.0 mg/l.

The negative impact of the facilities present discharge is evident in the downstream communities of West Bridgewater, East Bridgewater and Bridgewater. Reduction of this impact is expected to be extensive upon completion of the proposed improvements.

In addition to the improvement to the quality of the facility's discharge as a result of increased treatment capability, the improvement program is addressing the problem of the wet weather operational integrity of the facility. The existing treatment facility has long been plagued by severe infiltration/inflow (I/I) problems which have reduced the treatment capability of the plant during wet weather to virtually zero. Wet weather flows of over 30 mgd have reduced detention times to the point where virtually raw sewage is discharged to the Salisbury Plain River.

In order to formalize the community configuration as a service area for the Brockton facility, Abington has engaged in a long-term intermunicipal agreements with the City of Brockton while Avon sought revision to the proposed agreement. In opting for these intermunicipal agreements, Abington and Avon will agree to pay a portion of the capital costs (past and present

in Abington's case) for construction of the required improvements to the facility. In addition, O&M costs per the agreements will be apportioned on the basis of a metered flow figure. The Abington agreement has been ratified at town meeting and by the Brockton City Council whereas in Avon the agreement has only been ratified by the City Council. Avon is seeking to make several revisions to the agreement prior to its being formally adopted at town meeting.

Costs associated with the project, excluding work required to rehabilitate the City's collection system were estimated to be $19,616,000. The costs for operation and maintenance for the first year was estimated to be $1,068,000 and the cost for the twentieth year of operation was estimated to be $1,418,000. The cost is approximately $243/mgd for the first year operation and $215/mgd for the twentieth year.

a. Service Areas (Abington and Avon)

1) Service the Area Recommended in the Local 201 Facilities Plan

a) Abington

Description: The "west" Abington section eligible for discharging its wastewater to the Brockton facility is the 1080 acre area draining into the Beaver Brook watershed. The service area recommended in the Facilities Plan for tie-in to the Brockton facility is the entire eligible section and can be seen in Figure 4-3A.

Evaluation: Servicing the entire west Abington section as recommended in the Facilities Plan would provide for the elimination of several on-site disposal problems. As can be seen in the surface water quality sampling data (Appendix) for the Beaver Brook watershed, septic system leachate is a problem in the area. The areas in which sewers would be installed as presently recommended is, however, not based on the sewerage need methodology.

Participation in the Brockton wastewater disposal option was projected to incur the costs presented on Table 4-4 as described in the Abington 201 Facilities Plan.

The provision of a 500,000 gallons/day wastewater allotment for "west" Abington in conjunction with the vacant land available in "west" Abington allows for maximum growth in the area. Assuming a flow of 80 gallons per capita and an average household size of 3.79 persons per household (1970 U.S. Census), there would be enough capacity for 1,650 single family households.

TABLE 4-4

COSTS TO ABINGTON OF TIEING IN TO BROCKTON

Item Description	Quanitity	Unit Cost	Amount
Capital cost share - Brockton STP	lump sum	$772,400	$ 772,400
Brockton interceptor	550 ft. - 18-inch gravity sewer	$70/lin ft	38,500
Flow metering	lump sum	$15,000	15,000
4-inch force main	2,900 lin ft	$20/lin ft	58,000
Pumping stations	2	$125,000	250,000
8-inch lateral sewer	34,000 lin ft	$40/lin ft	1,360,000
10-inch lateral sewer	8,950 lin ft	$45/lin ft	402,750
10-inch lateral sewer*	3,900 lin ft	$40/lin ft	156,000
15-inch lateral sewer	850 lin ft	$55/lin ft	46,750
15-inch lateral sewer*	3,200 lin ft	$50/lin ft	160,000
		Total Construction Cost	$3,259,400
		Engineering & Contingencies (25%)	814,850
		Project Cost Sub-total	$4,074,250
Connection charge for existing collection facilities	lump sum	$16,319.80	16,319.80
		TOTAL PROJECT COST	$4,090,569.80

*denotes sewers constructed in unpaved areas

SOURCE: SEA, Abington Local Facilities Plan (1977)

In western Abington (BAZ numbers 111, 113, 114, 119 and 120), there are 66 acres of available, vacant land zoned for 20,000 square foot lots, 168 acres for 30,000 square foot lots and 231 acres of 40,000 square foot lots. Assuming that 20 percent of the available land would be taken by roads, schools, public buildings, etc., there would be a total of 114 households in the R-30 and 200 households in the R-40 for a total of 508 households.

Therefore, with the sewers there is capacity for three times more households than are currently planned for in the zoning. There may be great pressure to down zone or to change the zoning to allow for multi-family housing.

b) Avon

Description: The entire (94%) town of Avon was recommended for eventual sewering. The service area recommended for immediate construction in Avon's local 201 facilities study is in the southeast corner of Avon at the Brockton border. Streets to be serviced include:

- -Nichols Ave.
- -Howard Lane
- -Lawson St.
- -Johnson Road
- -Main St. (from Oak St. south)
- -McDonald St.
- -Crane St.
- -Maguire Ave.
- -Bows Lane
- -East Main (between Connelly & Fletcher St.)
- -Connelly Rd.
- -Fletcher St.
- -Clove St.
- -Overlook Rd.
- -Kempton Ave.
- -Argyle Ave. (southern half)

Flows collected from these streets would then pass via an interceptor to the Brockton/Avon town boundary.

Costs of sewering the recommended immediate construction area were projected by Anderson-Nichols, Inc. to be as follows:

Construction Costs	100% Total	90% Federal/ State Share	10% Local Share
Local collection system* (N.B.)	$5,600,000	$5,066,000*	$ 534,000
Avon share of Brockton treatment plant	658,000	593,100	65,900
Interceptor	1,305,000	1,181,000	124,000
Pump station/ force main (Bodwell St.)	275,000	249,000	26,000
	$7,839,000	$7,055,000	$ 749,000
Design/Engineering			$ 350,000
			$1,099,900

*N.B. - The cost presented represents that for installing a collection system in the 5 service areas. Service area 1 is presently the only area recommended for immediate installation. Costs for servicing only this area are expected to be $2,477,900.

In addition to the one-time capital costs outlined above, Avon will also have to pay annual operation and maintenance (O&M) costs. These have been estimated by Anderson-Nichols for the initial years of the project as follows:

$44,800 - Avon share of Brockton Treatment Plant O&M costs
$25,000 - Local Avon O&M costs
$69,800 - Total

The coordination of 208/201 work in Avon was very close and as part of this joint effort, sewerage need methodology was applied in Avon as part of the local facilities study. Percent failure rates were established on a street-by-street basis through which the Avon Sewer Commissioners established an immediate construction area and allowed for projecting a phased expansion program for the collection system. The environmental impacts associated with the installation of the recommended alternative are discussed in detail in the Environmental Assessment Proposed Sewerage Facilities, Town of Avon, written by the OCPC 208 staff.

Evaluation: The area of Avon most in need of servicing, taking water quality data alone would be proposed Service Area 2 (Brentwood Avenue, Gill Street, part of East Main Street, part of West Spring Street, East Spreet, Rock Street, School Street and Langley Road). Sewering these two areas (Service Area 1 and Service Area 2) would provide the most effective water quality protection. Sewering the entire town would allow for extensive secondary impacts such as impacts on growth and water supply.

2) Only Service the Areas in Abington and Avon Which Need Sewers

Description: A sewerage need study would be done in Abington and the results of the study done in Avon would be used. Only those areas experiencing failures which cannot be restored to operational efficiency would be serviced.

Evaluation: Sewering only those areas requiring sewerage reduces the costs, obviates extensive growth impacts and provides an adequate water quality solution. When limited sewering is combined with an extensive public education program to maintain septic system operation, the goal of clean water will be achieved.

B. Municipal Wastewater Disposal at Publicly-owned In-town Disposal Facilities

As part of the 208 program's evaluation of municipal wastewater disposal options in non-OCWPCD communities, community septic tanks were considered

in Easton and Hanson, in the category of alternatives requiring the installation of a collection system. The community septic tank alternatives discussed in the following sections are municipally-owned and operated systems servicing special sewerage "Districts" under the jurisdiction of a local board of sewer commissioners. As such, the alternatives discussed are governed under the provision of Chapters 40 and 83 of the Massachusetts General Laws and are subject to DEQE approval.

Also considered were in-town facilities with a surface discharge but as most of the communities are on anti-degradation streams, it was considered that such alternatives would not be fundable and therefore would not be feasible.

1. Install Community Septic Tanks (Hanson, Easton)

Description: Installation of community septic tanks calls for the construction of a very limited collection system servicing those homes in the problem areas for which reapir of the problem subsurface on-lot system is impossible. Treatment and disposal would be accomplished by transporting the wastewater collected from these problem homes to a site, within reasonable distance, with soils suitable for on-lot subsurface disposal.

Evaluation: Use of community septic tanks in isolated areas of on-site disposal system failure provides for a reasonable low cost alternative means of municipal wastewater disposal. (See Table 4-4A for a comparison of sewers, community septic systems and restoration of septic system operation.) The primary advantages associated with a community septic tank alternative are its low cost (in comparison to tertiary treatment) and eliminating the need for installing interceptors or mains to transport the wastewater great distances to a regional treatment facility. As can be expected, secondary impacts often associated with installation of great lengths of collection piping through areas of relatively low development are also eliminated (i.e., rapid growth). Installation of community septic tanks which require the installation of a collection system may result in an increase in water consumption at those homes serviced by the system.

In order for such a system to be fundable, it is state policy (Division of Water Pollution Control) that the system must be shown to have adequate capacity for 20 years. Thus for isolated pockets of a community where it could be shown that due to other constraints, such as lack of vacant land, the population could not exceed the capacity of the system, state policy would be amenable to a community septic system. As discussed under C. Design Criteria (to follow), this policy, however, would preclude funding for either Hanson or Easton. Should such a policy change, then this becomes a reasonable alternative. This alternative has been included because clearly

TABLE 4-4 A
Comparison of Sewers, Community Septic Systems and Restoration of Septic System Operation

CRITERIA	SEWER SYSTEM	COMMUNITY SEPTIC TANKS	RESTORATION OF SEPTIC SYSTEM OPERATION
Water Supply:			
1) Quality of Supply (groundwater)	Reduced nitrate levels	No Change	No Change
2) Quantity of supply	Lower water table, but no change on well capacity	No Change	No Change
3)Quantity of demand	Increased to 65 gpd by 1995	Less Marked Increase	Less Marked Increase
Drainage	None	None	Adverse in isolated instances
Surface Water: 1) Quality	Improved	Improved	Improved
2) Quantity	Slightly reduced	Equal to present value	Equal to present value
Aesthetic Changes	None	None	None (possibly adverse if mounds used)
Stimulus to Growth	Yes	No	No
Real Estate Market Land Values	Increased	Presently undeterminable	No Change
Admin. Difficulty & Expense	Low	Moderate	Moderate
Implementing Agency	Sewer commission	Sewer commission	Board of Health
Continued Responsibility	Sewer commission	Sewer commission	Home Owner and Board of Health
Control of Problems & Correction	Good	Good, Takes care of worst care problems	Good, Takes care of worst problems
Land Acquisition	Easement, right-of-way	Eastment, rights of way, out right purchase of treatment site	None, except in particularly difficult cases
Federal Grants	Eligible	Eligible	Eligible for HUD grants
Allocation of Costs	Relatively Uniform	Applied only to users	Uneven
Application of Alternative	Straightforward	Reasonably straight forward	Sometimes difficult
Disposition of homes which cannot be rehabilitated	Does not apply	Does not apply	1) Town may purchase house 2) Interim system 3) Remote leaching field
Duration of Solution	25-50	20-50	20-50
Construction Dislocation	Severe on Public ways, house connections	Severe on public ways, house connection septic tank site buffer	Severe on private land

such a requirement (i.e., requiring an additional constraint beyond projected population) is not asked of a municipally-owned wastewater treatment plant. Many such facilities are over-loaded long before they have been in operation 20 years -- Brockton is such an example. There the state accepts population projections routinely as implying adequate capacity.

a. Collection System

The collection system servicing the homeowners on the community septic tank system may be either a gravity or a pressure flow system.

1) Community Septic Tanks Fed by Gravity Flow System

Description: This alternative as a means of transporting wastewater flows to the community septic tank system will require sewage to flow by natural grade or as a result of cuts from the on-site disposal problem to the septic tanks.

Evaluation: Installation of a gravity flowing feeder system requires installation of jointed pipe. Such piping results in infiltration which will use valuable treatment capacity. In addition, exfiltration from the system is also possible. Costs associated with the installation of gravity sewer are generally very high (costs will be presented below).

2) Community Septic Tanks Fed by Pressure Flow System

Description: A pressurized feeder system transporting sewage to the septic tanks requires the installation at the effluent end of each septic tank of a grinder pump system. The grinder pump would then feed the flows from the septic tank into small diameter plastic pipes buried just below the frost penetration depth.

Evaluation: Experience with the use of pressure systems is limited in both number of installation and duration of service. It is immediately apparent however, that there are several benefits of pressure sewers primarily related to costs and inherent system characteristics. Installation of pressure sewers is of a lower cost than gravity sewers, particularly in low density outlying problem areas. Cost savings are due to the shallow depth for installation and the width of the associated excavation. The sealed piping associated with the use of pressure sewers prevents treatment capacity from being taken up by infiltration.

Due to the pumping requirements of a pressure system, installation of a grinder pump will be required on the property of each connected home. In general, operation and maintenance

costs related to the use of mechanical equipment at each point of entry to the system is expected to be higher than O&M associated with a gravity sewer. Wastewater reaching the septic tank system is expected to be more concentrated than wastewater collected in gravity sewers. The pressure sewer system alternative does not require any modification of household plumbing.

Transportation Costs as a Function of Distance[3]

Distance	Gravity Sewer ($45/lf)	Pressure Sewer[1] ($30/lf)	Pressure Sewer[2] ($10/lf)
500 ft.	$ 22,500	$ 15,000	$ 5,000
1000 ft.	$ 45,000	$ 30,000	$ 10,000
.5 mile	$118,000	$ 79,000	$ 26,000
1 mile	$237,000	$158,000	$ 53,000
2 miles	$475,000	$317,000	$106,000
connection cost (includes grinder pump)	$ 750	$ 2,000	$ 2,000
annual O&M per dwelling unit	negligible	$ 60	$ 60
annual O&M per mile of sewer	$ 400[2]	$ 100[2]	$ 100[2]

1. Large diameter force main
2. Small diameter force main (less than 4")
3. Krissle, James F. "Status of Pressure Sewer Technology"

b. Service Areas

Those areas for which community septic tanks are considered as an alternative means of wastewater disposal are within the towns of Easton and Hanson. As discussed in an earlier section of this chapter, evaluation of alternative treatment and disposal systems by the 208 study was limited to the non-District communities. The sewerage need methodology when applied in these communities delineated on-site disposal problem areas which warranted investigation of alternatives requiring the installation of a collection system. These alternatives were then presented to local officials and at a series of workshops held in each 208 community. On the basis of reaction to these alternatives, community septic tanks were considered reasonable alternatives in Easton and Hanson.

Included in the cost evaluation table (Table 4-5) are the following costs for the septic system:

Service Area Name:	N. Easton	Kingsbrook Estate	Camelot Estate	Kennedy Circle	Total
Number of septic tanks:	2	1	1	1	5
capacity of tanks:	20,000 gpd	7000 gpd	2500 gpd	3500 gpd	33,000 gpd
cost:	$22,000	$4500	$1500	$2500	$30,000
Leaching area:					
size of leaching area (sq ft):	(2)23,000	(1)7400	(1)2700	(1)4200	0.86 acres
cost:	$103,000	$16,700	$6100	$9500	$135,800
Total land area required:					
areas:	8	2.5	2	2	14.5
cost:	$40,000	$12,700	$10,000	$10,000	$72,700

Community Septic Tank Installation in Hanson

Service Area	Gorwin Drive Area
Number of Homes to be served	
(1975)	9
(1995)	14
Length of collector in streets	6,800 feet
Infiltration	
(1975)	3,000 gpd
(1995)	5,000 gpd
Sanitary Flow	
(1975)	3,000 gpd
(1995)	4,000 gpd
Project Construction Costs	
Gravity Sewer	$611,000
Pressure Sewer 1	$441,000
Pressure Sewer 2	$199,000
Total Annual Costs	
Gravity Sewer	$ 6,500
Pressure Sewer 1	$ 6,800
Pressure Sewer 2	$ 6,800
Salvage Value	
Gravity Sewer	$362,000
Pressure Sewer 1	$251,000
Pressure Sewer 2	$362,000
Present Worth (6-3/8 percent for 20 years)	
Gravity Sewer	$578,000
Pressure Sewer 1	$444,000
Pressure Sewer 2	$245,000

TABLE 4-5

Community Septic Tank Installation Costs in Easton[3]

Service Area	North Easton	Kingsbrook Estate	Camelot Estates	Kennedy Circle	Total
Number of Homes to be Served					
(1975)	56	9	3	5	70
(1995)	85	14	5	8	112
Length of Collector in Streets	10,000	4,800	2,500	3,500	20,800
Infiltration (1975)	4,500	2,200	1,100	1,600	9,400
(1995)	7,600	3,600	1,900	2,700	15,800
Sanitary Flow (1975)	16,400	2,600	900	1,500	21,400
(1995)	24,900	4,100	1,500	2,300	32,800
Project Construction Costs					
Gravity Sewer	$776,000	$375,000	$250,000	$301,000	$1,702,000
Pressure Sewer 1	667,000	275,000	178,000	216,000	1,336,000
Pressure Sewer 2	414,000	126,000	25,000	93,000	708,000
Total Annual Costs					
Gravity Sewer	9,300	6,200	5,700	5,800	27,000
Pressure Sewer 1 & 2	14,500	6,700	5,700	6,000	32,900
Salvage Value					
Gravity Sewer	458,000	228,000	153,000	183,000	1,020,000
Pressure Sewer 1	330,000	158,000	107,000	113,000	708,000
Pressure Sewer 2	178,000	69,000	48,000	39,000	331,000
Present Worth (6-3/8 percent for 20 years)					
Gravity Sewer	747,000	379,000	269,000	313,000	1,727,000
Pressure Sewer 1	733,000	304,000	211,000	250,000	1,497,000
Pressure Sewer 2	524,000	81,000	126,000	149,000	980,000

1. Large diameter force main
2. Small diameter force main (less than 4")
3. Projected costs based on costs per foot times length of collector in street (Anderson-Nichols, Inc.)

Costs associated with the required community septic system (included on the previous page) are as follows:

Service Area	Gorwin Drive
Number of septic tanks:	1
Capacity of tank:	15,000 gpd
Cost:	$ 5,000
Leaching Area:	
Size of leaching area (square feet):	16,750
Cost:	$37,700
Total land area required:	
Acres:	3.5
Cost:	$17,500

Wastewater flows were calculated on 65 gpd. In north Easton, future flows are projected to be too great to be accommodated even in two larger septic tanks. Therefore, it is probable that the community septic tanks in North Easton would eventually have to be supplemented by a small wastewater treatment plant which would also discharge to the augmented leaching field. The leaching field area was calculated on the basis of a percolation rate of 15 minutes/inch and a depth to limiting layer of four feet. A reserve area of equal size for field replacement and a buffer of 100 feet were also used in the calculations.

The same design criteria were used for Hanson. However, there the projected flows can be accommodated in the single septic tank.

II. Restoration and Maintenance of Septic System Operation

Description: On-site disposal systems, which include septic systems and cesspools provide for the treatment and disposal of household sewage from most households, single and multi-family in non-sewered areas. This includes limited sections of Brockton, most of Abington and Bridgewater, and all of the remaining communities in the OCPC 208 region (Avon, Easton, East Bridgewater, Hanson, Pembroke, West Bridgewater, and Whitman). Properly installed and maintained, septic systems will continue to function from 20 up to 75 years.

There are two types of on-site systems which are predominantly used in the OCPC region: cesspools and septic tanks. Cesspools also called dry-wells, are common in older homes throughout the 208 area; but, they are no longer permitted to be installed for new homes.

A cesspool is a large diameter (6 feet) concrete or brick pit with open-jointed lining in the bottom portions to allow sewage to seep into the

soil. Septic systems consist of two major components, the septic tank and the soil absorption (leaching) system. The septic tank is a water tight box (the State requires a minimum capacity of 1000 gallons) in which all household sewage is stored for one to three days. During this period, the solid components of the sewage, septage, have time to separate from the liquid portion. The liquid effluent then flows to the leaching system which could be a larger concrete pit with holes or a series of perforated pipes in trenches or in "beds" of washed stone.

Septic systems require regular maintenance to prevent system failure. Maintenance of a septic system would include annual inspection, and pumping when necessary; care not to put unnecessary solids down the drain (garbage, grease, paint thinner, hair, and cigarettebutts); fixing leaks promptly; conservation of water; and care not to compact the leach area.

Current local regulations in the ten towns of the OCPC 208 region range from adoption of the minimum state code as required by law (Whitman), to more stringent regulations based on the then proposed revisions to Title 5 (Pembroke).

There are several specific areas which are critical to the operation of new septic systems, including: minimum leaching area, minimum distance to a water body, provisions for garbage grinders, period of year when deep observation pit tests may be taken, number of inspections during installation, the requirement for as built plans, and the requirement for a registered surveyor's or professional engineer's stamp on the as built plans.

Minimum leaching area may be measured by two basic techniques: the bottom area (the pervious horizontal interface of the leaching area) and the sidewall area (the pervious vertical interface of the leaching facility below the lowest elevation of the distribution pipe). The sidewall area of a trench is the major infiltrative surface, and the bottom area is of less significance. Thus, deep, narrow trenches are the most effective leaching facility.* It is for this reason that the Title 5 requirements are much less for sidewall than bottom area. Large minimum areas for leaching trenches will reduce the possibility of system failures for the present homeowner and future families, who may have different rates of water consumption. The second parameter, minimum distance to a water body indicates the likelihood of septic tank leachate reaching the water body. Third, provisions for garbage grinders are critical because of the large volume of organic material that garbage grinders will add to the septic system. The added organic material will increase the frequency that septic tanks must be pumped along with putting an added strain on the leaching area. Fourth, the period of year when deep observation pit tests may be taken is very important because the purpose of the test is to determine the groundwater elevation. The test must be made when the groundwater elevation is at its highest point to assure that the lowest point of the leaching

*McGauhey, P.H., Menur, A.B., and Winnebeger, J.H. "Summary Report on Causes and Prevention of Failure of Septic Tank Percolation Systems". Report by FHA by Sanitary Engineering Research Labaratories, University of California, Berkley, California, 1963.

area is above the groundwater table at all times of the year. Fifth, the number of site inspections that are made during the installation of a system is significant because it is one of the methods to assure proper installation of septic systems. Two inspections are commonly made, after the excavation is made and after the septic tank and pipes have been set, prior to back-filling. More frequent inspections are additional checks that the septic system is properly installed. The sixth and seventh criteria, the requirement for as built plans and the requirement for a registered surveyor's or professional engineer's stamp on the as built plans are further assurances that the system is installed at the proper elevations and that the Board of Health has an accurate set of plans of the septic system location.

For each of these categories, Table 4-6, Current Septic System Regulations, indicates what the local board of health regulation states for each of the communities in the OCPC 208 region. Also included are the existing minimum state regulations, i.e., Title 5, which became effective July 1, 1977.

As a long term solution, septic systems can provide a realistic alternative for the disposal of wastewater. However, it is essential that existing systems be maintained and repaired when necessary and that new systems be designed, located, and installed properly. The adequacy of septic systems as a long term solution is dependent upon the adoption of appropriate regulations to ensure the correct installation and operation of septic systems. These regulations which will be discussed in the alternatives to follow, include mandatory maintenance of septic systems, enforcement of existing installation requirements, and adoption of additional more stringent regulations for the installation of new systems.

A. Restoration of Septic System Operation

Any program which recommends the continuation of on-site systems for the disposal of wastewater must provide mechanisms for the correction of failing septic systems.

Septic tank and cesspool failures are characterized by the discharge of raw sewage either at the soil surface directly above the septic system or after flowing under the ground level to a storm drain, stream or other surface location. The effluent from failing septic systems becomes a public health hazard, increases eutrophication rates (aquatic plant and algae growth) of ponds, as well as degrading the quality of water bodies and streams. The major components of wastewater that degrade water quality are pathogenic bacteria and viruses (indicated by fecal coliform bacteria), nitrate-nitrogen, phosphorus, and chlorides.

Septic tank and cesspool failures may be caused from a variety of factors including: lack of maintenance (pumping or leaking faucets), poor design, careless installation procedures, and poor location (wet soils and/or high groundwater table). Once the cause of failure has been determined by a "professional engineer or other professional authorized by law" (Title 5, page 10) and/or the board of health agent, actions are recommended.

TABLE 4-6

CURRENT SEPTIC SYSTEM REGULATIONS

	MINIMUM LEACHING AREA	MINIMUM DIST. TO WATER BODY	GARBAGE GRINDERS	TIME OF YEAR FOR OBSERVATION PITS	NO. OF INSPECTIONS OF NEW SYSTEMS	AS BUILT PLANS REQUIRED	REGISTERED SURVEYER OR PROFESSIONAL ENGINEER STAMP REQUIRED
TITLE 5: State Environmental Code (Effective July 1, 1977)	Varies with Perc. Rate	50'	Increase Leaching Area by 50%	"Wet Season"	Any time during Instal-lation	Certifi-cate of Compli-ance	No
ABINGTON	Bed and Pit: 1000 ft.^{2}	Same as State Code	Same as State Code	Sept. 15 to June 15	Several	Same as State Code	Same as State Code
AVON	Same as State Code	Same as State Code	Same as State Code	Mar, Apr with Excep-tions	Same as State Code	Same as State Code	Same as State Code
BRIDGEWATER	Field: 1000 ft.^{2} Trench or Pit:300'^{2}	50'	None Permit-ted	9/15-6/30 Question-able Site 3/1-6/1	2	Same as State Code	Same as State Code
BROCKTON	DOES NOT ENCOURAGE ANY NEW ON-SITE SYSTEM INSTALLATIONS						
EAST BRIDGEWATER	1000 ft.^{2}	Recommend 100 ft.	Not Recom-mended	Oct 1 to Nov 1	3-4	Same as State Code	Same as State Code
EASTON	Bed 1200 ft.^{2} Pit 600 ft.^{2}	50'	Same as State Code	Year-round	2	Same as State Code	Same as State Code
HANSON	1000ft.^{2}	Same as State Code	Same as State Code	Wet sea-son deter mined by wells	2-3	Same as State Code	Same as State Code
PEMBROKE	1000 ft.^{2}	Same as State Code	Not with Cesspool	Sept 15 to June 15	2	Same as State Code	No, but must be designed by PE.
WEST BRIDGEWATER	Same as State Code	Same as State Code	Same as State Code	Sept.15 to June 15	2	Same as State Code	Same as State Code
WHITMAN	Same as State Code	Same as State Code	Same as State Code	Same as State Code	Same as State Code	Same as State Code	Same as State Code

The repair of failing septic systems has been proven to be a realistic solution to water quality problems, according to interviews with the Board of Health agents in four OCPC 208 area communities (Abington, Avon, Easton and West Bridgewaer). The most common repair that has been needed is the expansion of the leaching area for homes that had previously utilized cesspools for wastewater disposal. Properly designed and installed septic systems have been shown to operate with few failures.

1. Correction of Failing Septic Systems by Non-structural Methods

The correction of failing septic systems by non-structural methods is the first alternative that should be investigated as a potential solution. By "non-structural,"it is meant that the system does not need rebuilding.

The major limitation of the nonstructural alternatives is that they are only able to correct systems that are in good soils and have failed from lack of pumping or from leaking fixtures.

a. Pump the System

Description: In some cases, septic tank and cesspool failures are caused by the buildup of solids in the tank to the point where the inlet or outlet pipes become blocked.

As solids build up in the septic tank, the chances of solids flowing to the leaching area increases, contributing to the blockage of soils and the prevention of safe effluent disposal. This condition results from the lack of regular pumping to remove the normal accumulation of solids in the septic tank or cesspool. It is common to find failing septic systems that have not been pumped for the previous five to fifteen years. The pumping of a septic tank will restore normal operation for systems that are in suitable soil and where the overflow of solids has not caused a blockage of the leaching area pipes or soils. Septic tank and cesspool pumpers are privately owned and haulers are licensed by each Board of Health (Title 5, Regulation 2.3).

Evaluation: This is one of the least costly measures to restore septic tank operation. In the OCPC region, the cost to pump a septic tank ranges from $20 to $35. The costs to the homeowner increase if there is difficulty in locating the septic tank or cesspool. If the soil conditions do not permit the restoration of normal operation, then more extensive structural repairs will be necessary.

1) Fund the Pumping of Septic Systems by a Municipally-Owned and Operated Septage Hauling Truck

Description: A municipally-owned and operated septage hauling truck is eligible for 75 percent federal and 25 percent

state funding in accordance with Section 201 of P.L. 92-500. A requirement for eligibility under this program is that the vehicles be used for the sole purpose of transporting septage. With a town-owned septage truck, the costs of pumping would be significantly reduced. The annual cost of one municipal septage truck; including initial capital, manpower, and operation and maintenance costs, to a town is $32,132. This amount includes both Federal and State funding for the capital costs. Table 4-7, Costs of a Town-owned Septage Truck, provides the detailed cost data including estimated costs for the disposal of the septage. The present worth cost or actual cost to society (without Federal or State funding) is enumerated in Table 4-8. Each town in the OCPC 208 region will require various levels of septage pumping services depending on the number of septic systems in the town. Table 4-9, Costs of Septage Pumping Trucks Required to Service Each Town, includes 1970 census data of the number of on-site disposal systems in each city and town. The number of septage pumping trucks needed was calculated by assuming that one septage pumping truck would service four systems per day with 260 pumping days per year. The number of trucks needed was then rounded up to the nearest whole, which will compensate for lost pumping time for truck maintenance and repair.

Evaluation: A town-owned truck is a very effective method for the collection and disposal of septage. The major difficulty of implementing this alternative would be the initial administration of the program. But, once the program is operating, it will be a self perpetuating program, taking in revenue to equal expenses. With a town-owned septage truck, the town would be able to maintain records of each home that is pumped and to be assured that all septage will be disposed of at an approved facility. Town-owned septage trucks will provide a greater level of service to homeowners at less cost, because of the federal and state subsidies for the purchase of the septage trucks.

2) Continue to Use Private Contractors to Pump Septic Systems

Description: The continued use of private contractors to pump septic systems would perpetuate the current practice of several private contractors obtaining permits from the Board of Health to pump septic tanks and cesspools.

Evaluation: To continue the present method of septic tank pumping, would not necessarily mean any improvement in pumping and maintenance practices. If chosen, this alternative should be combined with more stringent Board of Health regulations to require pumpers to identify each home that is pumped and to not utilize acid treatments or enzymes. In addition, the provision of easily accessible, approved dumping locations must be included with this alternative to help prevent illegal dumping.

TABLE 4-7

COSTS OF A TOWN-OWNED SEPTAGE TRUCK

Capital Cost		
One Truck	$30,000	
75% Federal + 15% State Funding	$27,000	
Town share	$ 3,000	
Compounded annually at 7%		$732
Manpower		
One Man at 40 hr/wk + 4 hours overtime - $4/hr.		$9,500
Fringe Benefits at 20%		$1,900
One Man as 1/3 mechanic, 1/3 administrative, and 1/3 driver - $5/hr		$10,400
Fringe Benefits at 20%		$2,100
Operation and Maintenance		
$.25/mile x 20,000 miles (115 mi/ day)		$7,500
COST FOR TOWN-OWNED SEPTAGE TRUCK		$32,132
Actual local cost to treat one load of septage (2,000 gallons)		$25
Assume 4 loads per day per truck (260 working days + 52 emergency pumps)		1,092 loads/yr
TREATMENT COST TO TOWN FOR ONE SEPTAGE TRUCK		$27,300/yr
TOTAL COST TO TOWN (Including Treatment of Septage)		$59,432/yr

TABLE 4-8

PRESENT WORTH COSTS OF A TOWN-OWNED SEPTAGE TRUCK

Capital Equipment		
One Truck		$30,000
Manpower		
One Man at 40 hr/wk + 4 hours overtime - $4/hr	$9,500	
Fringe Benefits at 20%	$1,900	
One man as 1/3 mechanic, 1/3 administrative, and 1/3 driver - $5/hr	$10,400	
Fringe Benefits	$2,100	
Operation and Maintenance		
$.25/mile x 30,000 miles (115 mi/day)	$7,500	$31,400
Salvage Value		
Resale of truck after 5 years	$5,000	

Present Worth = capital cost + P/A (annual manpower + operation + maintenance) - P/F (Salvage value)

Present Worth = 30,000 + 4.169 (31,000) - .734 (5000) (6 3/8% for 5 years)

Present Worth = $157,237

Present worth septage treatment costs = $40/truck load - assume 4 loads per day per truck = 1,092 loads/year
260 working days + 52 emergency pumps

Present Worth of Treatment Costs = $43,680

TOTAL PRESENT WORTH COSTS (5 Years) = $200,917

TABLE 4-9

COSTS OF SEPTAGE PUMPING TRUCKS REQUIRED TO SERVICE EACH TOWN

	1970 [1] Number of On-Site Disposal Systems	2 Septage Pumping Truck - Days	3 Number of Trucks Needed	4 Cost of Septage Pumping Trucks
Abington	3,243	811	3	$99,396
Avon	1,397	349	1.3	66,264
Bridgewater	2,313	578	2.2	99,396
Brockton	2,881	720	2.8	99,396
East Bridgewater	2,299	575	2.2	99,396
Easton	3,075	769	3.0	99,396
Hanson	1,917	479	1.8	66,264
Pembroke	3,046	761	2.9	99,396
West Bridgewater	1,677	419	1.6	66,264
Whitman	3,543	886	3.4	132,528

1 U.S. Bureau of the Census, Census of Housing: 1970 Detailed Housing Characteristics, Final Report HC (1)-B23 Massachusetts,U.S.G.P.O., Washington, D.C., 1972

2 Septage Pumping Truck - Days assumes 4 pumps per day.

3 Number of Trucks needed assumes 260 days per year.

4 Fractions are rounded up to the nearest whole. These costs do not include treatment of septage.

b. Fix Leaky Plumbing Fixtures

Description: The constant leak of a faucet or toilet can contribute a considerable amount of water to a leaching area. The constant soaking of a leach area will eventually fill the soil to capacity so that the leach area will no longer be able to properly treat the wastewater. This overloading of a leach area can usually be corrected by fixing the leaky faucet or toilet. In many cases, leaks from plumbing fixtures such as toilets may not be able to be identified by the homeowner until it is too late. Regular inspection of the septic tank or cesspool inlet pipe will indicate any leaking plumbing fixtures. (See Mandatory Maintenance Program). Another indicator of leaking fixtures is an abnormally high water bill.

Evaluation: The fixing of a leaking fixture is the most inexpensive method to correct a failing leaching area, but, leaking fixtures comprise a small percentage of the total number of failing systems.

2. Correction of Failing Septic Systems by Structural Methods

Structural solutions (expansion, redesign or rebuilding) for the correction of on-site failing septic systems provide for the continued use of on-site systems. All of the following alternatives for on-site waste disposal are far less costly than a public sewerage system, but collection and treatment alternatives will be necessary to correct failing systems in severe soil conditions, high groundwater table, or when sufficient land is not available for the expansion of a leaching area.

a. Expand and/or Redesign the Septic System

Description: The correction of failing septic systems by expansion and redesign is a commonly used solution for older systems. This alternative is most applicable to older homes, built prior to the adoption of the State Sanitary Code (then Article XI) in 1962, which prohibited the installation of cesspools. Cesspools continued to be installed until adequate enforcement mechanisms were established. Since cesspools are a less efficient means of treating wastewater than septic tanks with a leaching area, homes with failing cesspools can often remain with on-site systems by the installation of a septic tank with a leaching area.

Another cause of failure, undersized septic tanks and leaching areas may have been caused from a general increase in water use, which could be a result of the increased use of water-using appliances (especially garbage grinders), increased family size, or a new family with different water use characteristics, thus

putting additional stress on the septic system. Undersized septic tanks and leaching fields are likely to occur in older homes because the minimum required capacity of septic tanks and leaching fields in earlier state sanitary codes was less than the requirements of the more recent codes.

Other causes of septic system failure which can sometimes be alleviated by expansion and redesign are seasonally wet soils and high groundwater tables. In some instances these conditions can be overcome by sophisticated designs such as mound systems to elevate the leaching area above a high groundwater table and curtain drains which lower the groundwater table in the vicinity of the leaching area.

Evaluation: For failures which have been caused by the above reasons, redesign and system expansion are realistic alternatives. The approximate cost for expansion and redesign of a system is $2,000.

b. Rebuild the Septic System

Description: The correction of failing septic systems by the rebuilding of the system can alleviate failure due to incorrect and careless installation, blockage of leaching area pipes from tree roots, the buildup of organic material in the leaching area resulting in the blockage of flow, and the blockage of leaching area pipes due to crusting from heavy vehicles.

Evaluation: For failures which are caused by the above factors, rebuilding the system will restore normal operation. Repair costs range from $750 to $7,500 depending on the quality of the soil and the size of the leaching area.

c. Dispose of Effluent on a Nearby Lot that has Adequate Soils

Description: For systems that have failed due to poor soil conditions and high groundwater table that cannot be repaired by redesign and reconstruction, another alternative to correct the failing system is to relocate the leaching field on a nearby lot that has adequate soils.

Evaluation: This alternative is only possible when suitable soils may be found near the failing system. Also for the operation of this alternative it is essential that the entire septic system be owned by one person. This means that the homeowner must buy an easement or full title to the property for the leaching area. The costs of this alternative are dependent on the cost of the disposal area easement, and the distance and graident to the disposal area. If the disposal area is at a higher elevation than the septic tank, it will be necessary to pump wastewater to the leaching

area, thus increasing costs.

Evaluation: This alternative has been used successfully in the OCPC 208 communities in the past. The additional costs to the homeowner may be worth not losing the use of his/her lot.

3. Fund Repair of Septic Systems from HUD Community Development Block Grants

Description: The U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant Program has generally been known for funding community development projects such as schools, fire stations, playgrounds and housing rehabilitation. Housing rehabilitation is traditionally considered to be renovating, rebuilding and restoring of roofs, porches, and other exterior and interior structural features but it could include the repair and restoration of normal septic tank operation with other types of housing rehabilitation. HUD regulations for eligible activities for community development block grants (CDBG) include rehabilitation of buildings and improvements, including financing rehabilitation of privately owned properties through the direct use of funds in the provision of grants, loans, loan guarantees, and interest supplements. To be eligible for funding, housing rehabilitation would be connected with other community development programs such as improved street lighting, road paving, and playgrounds. Another requirement for houses to be eligible for these grants is that individual home rehabilitation grants may only be made for low income families. The HUD definition of low income varies for each town, ranging from $13,000 to $16,000. These CDBG grants may be written so that outright grants can be made for an entire repair project, a fixed amount, loan subsidies and loan guarantees depending on the town or upon the individual income.

Evaluation: This alternative will eliminate one of the major obstacles to the repair of failing septic systems, lack of sufficient funds. Health agents in each of the OCPC towns have expressed the problem of homeowners having failing septic systems but having no funds available for repair. HUD CBDG grants may contribute signifcantly to the repair of failing septic systems. However, there remains a question of the eligibility of septic tank repair for these grants and more importantly whether these grants would be made even if they were eligible. These questions are being investigated further.

4. Institution of a Program to Locate and Repair Failing Septic Systems

There are several limited areas of the OCPC 208 region where septic system failures and illegal storm drain connections are suspected based on water quality sampling results (see the Appendix), neighborhood complaints, and known poor soil conditions. The current practice,

with existing Board of Health budgets and manpower, is to require public health problems to be abated. Failing systems can only be issued abatement notices when they more readily identified either by an obvious surface discharge or a pipe to storm drain. This alternative would actively seek to identify individual failing septic systems and recommend repair measures. One difficulty with this alternative is that the homeowner with a suspected failure may refuse the health agent access to the system. In this event, the health agent must document his suspicions for failure and ultimately request a search warrant. One possibility short of requesting a search warrant is to request that a police officer accompany the health agent to the house. In some cases, the presence of a uniformed officer will cause the homeowner to allow access. To obtain a search warrant, the health agent must document his evidence for suspecting a failing septic system. The procedure to obtain a search warrant is involved and would not be practical to obtain for every home that warranted inspection. The expenditure of town funds for the inspection of suspected failing septic systems must be evaluated with the potential public health hazards of the failing systems. For the inspection program to be effective, it must have the cooperation of the public.

There are three methods which would be utilized for the identification of failing systems: additional sampling, dye testing, and inspection of septic tanks and cesspools.

a. Conduct Additional Water Quality Sampling

Description: Additional water quality samples would be taken at progressively upstream to pinpoint the source of pollution. These sampling sites would be determined by the health agent who would be most familiar with drainage and suspected failing systems. The water samples would be tested for coliform bacteria, a major component of septic tank and cesspool effluent.

Evaluation: Water quality sampling is one of the most reliable methods to identify areas of failing septic systems. However, it is not specific enough to identify an individual failing septic system. The cost for the analysis of water samples ranges from $30 to $50. A large portion of this fee is for the field collection of the samples. If the health agent or an assistant were able to collect the samples the cost per sample would be reduced.

b. Conduct Dye Tests

Description: Dye tests are performed by putting different colored dyes into the septic system, usually be flushing the dye down the toilet. Conclusive evidence of a failing system would be the immediate appearance of the dye in a nearby stream, pond, or storm drain. However, if the dye appeared in water bodies after

a period of days, it would not be possible to determine whether it was from a failing or a normally operating system.

Evaluation: Dye testing is an excellant method for identifying a failing septic system that is discharging directly into a nearby waterbody. However, if the failing system is discharging to the groundwater and not entering surface waters for some distance, dye testing will not be very effective. Dye testing becomes questionable when the dye is retained in the leaching field and later, released. In such a situation, the appearance of dye must be checked further by water sampling and inspection.

c. Inspect Septic Tanks and Cesspools

Description: A third method for the identification of a failing system is to inspect the system. The septic tank inspector would look for plugged inlet or outlet pipes, broken or inoperative sanitary tees, and any evidence of surface effluent discharge. Access to the septic system is permitted when there is a suspicion of failure or a public health hazard.

Evaluation: The inspection of potentially failing septic systems would enable a health agent or his assistant to identify most septic tank failures. However, in some cases, other tests such as dye testing and water quality sampling will be necessary.

B. Maintenance of Septic System Operation

The continued use of on-site disposal systems requires that measures be taken to ensure the safe operation of the on-site system and to ensure that future systems will not fail. The communities in the OCPC 208 region currently have varying degrees of management, regulation, and enforcement of septic tank installation, operation, and maintenance. However, each town is in need of more stringent management of septic tanks and cesspools to guarantee proper installation and maintenance.

1. Increase the Enforcement Capability of the Board of Health

Many Boards of Health in the OCPC 208 region are hindered in the performance of their responsibilities because of inadequate institutional and administrative arrangements. The following alternatives will improve the enforcement capability of the Board of Health by adjusting the pay structure and qualifications of the health agent, enhancing administrative capabilities, providing technical assistance, and adopting more stringent local Board of Health regulations.

a. Adjust the Pay Structure of the Board of Health

The pay structure of the Board of Health agent directly affects the performance of the necessary functions of the Board

of Health by allowing for more thorough enforcement of Board of Health regulations which will reduce the number of failing septic systems due to incorrect location or careless installation.

1) Pay Health Agent on an Hourly Rate Rather Than Per Inspection

Description: Two towns, Easton and Whitman, in the OCPC 208 region pay the health agents according to the number of inspections rather than the time that each inspection requires.

Evaluation: Payment on an hourly basis provides a more accurate system for accounting for a health agent's time. When payments are made on an hourly basis the health agent is more likely to remain for the inspection of the performance of the required percolation tests or to make the necessary number of site inspections of new installations. An hourly pay structure also assures that the health agent is compensated for all inspection time.

2) Make Position of the Health Agent Full-Time

Description: Seven communities in the OCPC region currently have part-time health agents (Avon, East Bridgewater, Easton, Hanson, Pembroke, Whitman, and West Bridgewater). With the constantly increasing responsibilities of the Board of Health and the health agent, it becomes more and more important that funding be appropriated to support a full-time health agent.

Evaluation: With a full-time health agent, one person is charged with the responsibility of observing soil and groundwater tests and inspecting new installations rather than distributing the responsibility among the Board of Health members along with other town officials, such as the building inspector or zoning officer. A full-time health agent also assures that one person will be available to respond to questions and provide assistance.

b. Require Licensing of Health Agents

Currently there are no requirements for the licensing of health agents. The absence of a licensing program in the past has led to the varying qualifications of health agents and thus variation in the capabilities of the health agents. A licensing program would establish minimum requirements of experience and educational background. A licensing program may lead to an increase in the salary demands of health agents, but this would be offset by the improved capabilities of the health agents. Another element of a licensing program would be a course or seminar given at regular intervals on the various aspects of Board of Health and health agent jurisdiction.

1) Have the State Department of Public Health License Health Agents

Description: This alternative would designate the Mass. Department of Public Health with the responsibility of establishing minimum requirements for the position of a local health agent and to examine or test applicants.

Evaluation: Most of the Board of Health responsibilities are administered through the Department of Public Health, making them the appropriate agency to administer such a program. One very significant aspect of health agent responsibility (on-site disposal systems) is administered by the Department of Environmental Quality Engineering (DEQE). The DPH would work with DEQE in assuring the competence of health agents in this area.

2) Require All Health Agents to be Certified by the Existing Board of Certification

Description: "An Act Establishing the Board of Certification of Health Officers" (Chapter 521 of the Acts of 1970) provides for the certification of health officers. Chapter 521 expressly states that "No employee of a local board of health shall be required to be a certified health officer as a condition precedent to employment". This alternative would amend Chapter 521 to require that health officers be certified as a precedent to employment.

Evaluation: Amending Chapter 521 of the Acts of 1970 utilizes an existing institution (the Board of Certification) to implement a mandatory licensing of health agents. The Board of Certification would continue to administer examinations for the testing of health officers. This alternative would significantly increase the workload of the Board of Certification especially during the first few years after such an amendment was passed.

c. Require Pumpers to Notify Board of Health of Every Home that is Pumped

Description: Another technique to increase the enforcement capability of Boards of Health is to require septage pumpers to notify the Board of Health of every home that is pumped.

Evaluation: If the Board of Health was informed when each septic tank in the community was pumped, the Board would be able to determine (by the frequency of pumping) homes that were in need of system repair and sections of town that had poor soils and a high groundwater table. Quick action by the Board of Health to require the repair of failing septic tanks will reduce the

possibilities for public health hazards and the pollution of water bodies and streams.

Another benefit of this alternative is that the volumes of septage being pumped in the town can be estimated and correlated with volumes being disposed of at approved disposal facilities. Thus, any illegal dumping activity may be quickly identified. However, this system will increase the administrative workload of the Board of Health. A part-time bookkeeper or inspector could be assigned those responsiblities or an existing part-time clerk could become full-time. Septage pumpers might be opposed to this system because it would closely monitor their activity, but if coordinated with septage management programs (Section III) which provided convenient disposal sites, the septage pumpers might be more agreeable to such a system.

d. Provide Technical Assistance Through a Regional Health District

Description: A regional helath district consisting of several towns, but smaller than the existing Southeastern Association of Boards of Health, could provide technical assistance to local Boards of Health.

Evaluation: A regional health district has become increasingly important with the adoption of the new Title 5 (July 1, 1977) which increases the size of septic tanks are regulated by local Boards of Health from 2000 gallons to 15,000 gallons. Local Boards of Health will be in need of technical assistance to review and regulate these large septic systems. However, there is a strong feeling against most efforts to regionalize local authority. The towns in the 208 region do not want to lose their identities in a regional regulatory agency. Therefore, this alternative probably would not be expanded to include regulatory functions in the future. The regional health district could also be of assistance by providing laboratory services for water analysis to be used by several towns, thus greatly reducing the cost to individual towns. The regional health district could be funded through an assessment to the member towns.

2. Adopt More Stringent Local Board of Health Regulations than the Minimum State Code

The State Sanitary Code, Title 5, regulating the on-site disposal of wastewater is the minimum standard. Local Boards of Health are authorized to enact more stringent health regulations (G.L. Chapter 11, Section 31).

a. Define the Period of the Year for Testing Groundwater Elevation

Groundwater elevation is tested by the digging of a deep observation pit (at least 10 feet deep). To assure the proper operation of the leaching system, it is essential that the groundwater be at least 4 feet below the bottom elevation of the

leaching area at all times of the year. Therefore, it is necessary to dig the deep observation pit during the period of year when the groundwater is highest. The State Sanitary Code, Title 5, states that "The groundwater elevation should be determined when the groundwater is at its maximum elevation". This general definition is used rather than a more specific period of months because the months of highest groundwater will change depending on amounts of precipitation. The definition of a period of the year for testing groundwater elevations allows for a more accurate evalution of individual lots for on-site disposal as well as giving the Board of Health definite criteria on when groundwater testing should be allowed. However, becuase of the yearly variation in the amount and period of rainfall, problems are encountered in documenting that period of the year when the groundwater is highest. In addition, limiting the period of the year when groundwater tests are made, limits the time that building permits may be issued, since the site must be approved for on-site disposal before a building permit may be issued. Thus, builders, developers, and home-buyers may be opposed to these restrictions. However, by careful preparation builders and developers can work within these limitations. These regulations will protect the future homeowner from costly repairs and prevent future public health and water quality problems.

1) Limit Groundwater Elevation Testing to the Period from September 15 to June 15

Description: This is a conservative estimate of the wet season of the year that has been adopted by three OCPC 208 Area towns. Abington, Avon, Pembroke, and West Bridgewater have adopted this interval as the period when groundwater tests should be made.

Evaluation: Groundwater testing during these nine months eliminates tests in the driest months of the year. This limitation should not be a severe hardship on the building industry. But according to Table 4-10, groundwater elevations in September through December can be as much as ten feet below high groundwater elevation. Health agents should not permit groundwater elevation tests during these months unless the groundwater table is high.

2) Require Groundwater Elevation Tests from March 1 to June 1

Description: Analysis of available groundwater elevation data indicates that this three month period of the year has the greatest probability of having the highest groundwater elevations. Table 4-10 indicates the months of highest groundwater from 1959 to 1974. The months of March, April, and May are most frequently the months of highest groundwater. Table 4-10 is

TABLE 4-10

MONTHS OF HIGHEST GROUNDWATER IN MASSACHUSETTS

Year	Month and day of Measurement						
1959			Mar. 31	Apr. 30	May. 31	June 30	July 31
1960		Jan.31 Feb.29	Mar. 31	Apr. 30	May 31		
1961				Apr. 3	May 2	June 1	
1962		Jan. 8	Mar. 3		May 2		
1963					May 3, May 29		
1964			Mar. 30	Apr. 18	May 27		
1965		Feb.26	Mar. 26	Apr. 26			
1966			Mar. 28	Apr. 26	May 26		
1967			Mar. 31	Apr. 26	May 31		
1968			Mar. 26	Apr. 25	May 23	June 25	
1969		Feb.27	Mar. 26	Apr. 25	May 27		
1970	Dec. 29(69)	Jan. 28 Feb.25	Mar. 24	Apr. 23	May 22		
1971			Mar. 29	Apr. 26	May 24		
1972			Mar. 29	Apr. 27	May 26	June 28	
1973	Dec. 28(72)	Jan. 29 Feb.27	Mar. 28	Apr. 28			
1974		Jan. 30 Feb.27	Mar. 29	Apr. 26			

Based on: Maevsky, Anthony. Groundwater Levels in Massachusetts, 1936-74, Massachusetts Hydrologic - Data Report No. 17. U.S. Departmnet of the Interior, Geological Survey, Prepared in Cooperation with the Massachusetts Department of Public Works. Boston, Massachusetts 1976.

TABLE 4-11

GROUNDWATER LEVELS IN EAST BRIDGEWATER

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JULY 31, 1958	9.84	SEP. 1, 1962	14.75	MAY 31, 1967	3.60	MAR. 29, 1971	5.17
AUG. 31	10.72	SEP. 28	15.45	JUNE 28	5.04	APR. 26	6.21
SEP. 30	10.77	OCT. 30	9.85	JULY 27	7.09	MAY 24	5.88
OCT. 31	9.63	DEC. 1	6.75	AUG. 23	9.20	JUNE 24	9.40
NOV. 30	8.79	DEC. 31	7.03	SEP. 29	11.30	JULY 26	11.77
DEC. 31	8.99	JAN. 31, 1963	7.03	OCT. 24	11.45	AUG. 25	13.45
JAN. 29, 1959	9.78	FEB. 28	9.40	NOV. 28	11.71	SEP. 27	15.13
FEB. 28	9.13	MAY 3	7.86	DEC. 27	8.14	OCT. 26	16.20
MAR. 31	5.43	MAY 29	8.75	JAN. 26, 1968	6.20	NOV. 29	16.14
APR. 30	5.08	MAR. 30, 1964	4.42	FEB. 27	7.00	DEC. 28	12.55
MAY 31	7.95	APR. 28	4.30	MAR. 26	3.01	JAN. 28, 1972	9.26
JUNE 30	8.09	MAY 27	6.52	APR. 25	5.15	FEB. 27	9.05
JULY 31	8.15	JUNE 25	10.83	MAY 23	6.48	MAR. 29	3.28
AUG. 31	11.28	JULY 24	12.50	JUNE 25	7.06	APR. 27	3.98
SEP. 30	12.92	AUG. 26	13.68	JULY 25	8.90	MAY 26	4.40
OCT. 31	13.93	SEP. 25	15.63	AUG. 27	11.79	JUNE 28	4.88
NOV. 30	13.11	OCT. 28	16.24	SEP. 24	13.54	JULY 28	8.45
DEC. 31	8.53	NOV. 27	16.34	OCT. 28	15.20	AUG. 30	10.57
JAN. 31, 1960	7.25	DEC. 28	14.04	NOV. 26	13.64	SEP. 28	9.89
FEB. 29	4.19	JAN. 27, 1965	10.82	DEC. 28	8.97	OCT. 30	10.69
MAR. 31	4.11	FEB. 26	8.12	JAN. 28, 1969	9.27	NOV. 29	5.08
APR. 30	5.39	MAR. 26	7.42	FEB. 27	7.36	DEC. 28	3.27
MAY 31	7.66	APR. 26	7.31	MAR. 26	2.40	JAN. 29, 1973	4.63
JUNE 30	10.17	MAY 23	8.58	APR. 25	2.99	FEB. 27	5.20
JULY 31	12.11	JUNE 24	10.90	MAY 27	6.36	MAR. 28	5.72
AUG. 31	13.87	JULY 26	13.28	JUNE 25	9.32	APR. 28	4.99
SEP. 30	14.00	AUG. 24	15.06	JULY 24	11.52	MAY 30	6.00
OCT. 25	13.92	SEP. 27	16.98	AUG. 26	12.91	JUNE 28	8.85
NOV. 21	13.25	OCT. 28	17.52	SEP. 24	14.20	JULY 30	7.18
DEC. 27	12.51	NOV. 22	17.67	OCT. 29	15.20	AUG. 29	8.69
JAN. 30, 1961	9.96	DEC. 28	17.83	NOV. 28	11.41	SEP. 28	9.00
FEB. 27	7.33	JAN. 28, 1966	15.94	DEC. 29	3.28	OCT. 30	10.80
APR. 3	3.91	FEB. 25	11.67	JAN. 28, 1970	7.09	NOV. 29	11.75
MAY 2	4.32	MAR. 28	8.18	FEB. 25	4.38	DEC. 21	5.69
JUNE 1	5.05	APR. 26	9.22	MAR. 24	5.30	JAN. 30, 1974	3.90
JULY 7	9.18	MAY 26	9.60	APR. 23	4.88	FEB. 27	4.47
AUG. 3	11.20	JUNE 29	10.28	MAY 22	6.39	MAR. 29	5.00
SEP. 7	13.2	JULY 25	11.80	JUNE 29	9.18	APR. 26	4.58
OCT. 3	11.80	AUG. 23	13.59	JULY 27	11.14	MAY 30	7.33
NOV. 1	10.80	SEP. 28	15.15	AUG. 26	13.05	JUNE 28	9.64
DEC. 2	10.44	OCT. 26	15.77	SEP. 24	14.51	JULY 31	11.68
JAN. 8, 1962	5.82	NOV. 22	13.02	OCT. 28	16.01	AUG. 27	13.75
MAR. 3	8.33	DEC. 20	12.37	NOV. 23	14.03	SEP. 27	14.40
MAY 2	6.51	JAN. 26, 1967	10.05	DEC. 29	10.84	OCT. 24	13.21
MAY 28	8.71	FEB. 23	8.36	JAN. 28, 1971	9.84	NOV. 22	12.34
JULY 1	11.38	MAR. 31	4.72	FEB. 25	7.78	DEC. 30	10.35
JULY 30	12.61	APR. 26	3.77				

Note: This well is located on the site of the East Bridgewater Medical Center. It is a dug, unused water-table well in glacial till of the pleistocene age, with a diameter of 36 inches (91 cm), depth of 24 feet (7.3 m), and cased with stone. The elevation of the land surface datum is 85 feet (25.9 m) above mean sea level with the measuring point 2.6 feet (0.8 m) above the land surface datum.

Source: Maevsky, Anthony. Groundwater Levels in Massachusetts, 1936-1974. Massachusetts Hydrologic Data Report No. 17. U.S. Department of the Interior, Geological Survey, Prepared in cooperation with the Massachusetts Department of Public Works. Boston, Massachusetts. 1976.

is based on Table 4-11, Groundwater Levels in East Bridgewater, which was compiled by U.S. Geological Survey. This three-month period has been incorporated into the Bridgewater Board of Health Regulations to limit groundwater tests for questionable areas only. However, this leaves open the definition of which sites are "questionable".

Evaluation: This alternative is the most reliable method to conduct groundwater test even though groundwater elevation in these three months can vary up to 3 feet from year to year depending on the amount of precipitation in a given year. This three month limitation may impose planning constraints on developers, home builders, and home buyers. However, such impacts may be mitigated by careful preparation and planning.

3) Determine Period of Year of High Groundwater Levels from Test Wells Throughout the Town

Description: Periods of high groundwater may be determined by monitoring test wells at several locations throughout a town. Prior to groundwater elevation tests, the general groundwater levels may be checked in the test wells in the vicinity of the proposed construction. If the test well groundwater elevation is more than a few feet from the maximum elevation, then the groundwater test would be postponed. This method is used by the Town of Hanson.

Evaluation: For this alternative to be effective, there must be several wells located throughout the town. This can be a costly procedure unless there are existing wells which may be utilized. Existing unused, private or town water supply wells are ideally suited for this purpose.

b. Require Expansion and Upgrading of Septic Systems When Homes are Converted from Seasonal to Year Round Use

Description: Prior to the adoption of the new State Environmental Code, Title 5 (July 1, 1977) the State Environmental Code permitted leaching facilities, which were to be used only during the summer to be reduced by 20 percent (Title 5, February, 1975, Regulation 7.11). When those homes are converted to year-round use, the conversion rarely includes the upgrading of the septic system. The conversion will result in increased flows of wastewater which are likely to cause septic system failures because of the undersized disposal area.

This alternative would be administered by coordination between the building inspector and the health agent. When a request is made to the building inspector, he would refer the

applicant to the Board of Health to assure that the septic system meets the current standards. After the Board of Health approves the disposal system, the applicant would apply for a building permit. The two towns in the OCPC 208 region in which this alternative is most applicable are Hanson and Pembroke with 75 and 77 summer connections to town water supply respectively. Summer water-supply connections are indicators of seasonal homes, with the actual number being much larger since most seasonal homes utilize private water supplies.

Evaluation: This alternative is addressed to a small percentage of the total number of homes in a community. But this small percentage of homes can account for a large percentage of septic system failures. This alternative will result in little added administrative costs to the town while it prevents potential septic system failure.

c. Prohibit the Use of Garbage Grinders (Disposals) With On-site Systems

Description: Garbage grinders are one of the biggest contributors of organic materials in wastewater. Garbage grinders add large amounts of organic material to septic tanks and cesspools which accumulate, increasing the frequency that pumping is needed. Garbage grinders also put an added strain on the leaching area as evidenced by the Title 5 requirement that leaching areas be increased by 50 percent when garbage grinders are installed. Title 5 specifically states that "Garbage grinders are not recommended where they discharge to subsurface disposal facilities" (Title 5, July 1, 1977, Regulation 6.2).

Garbage grinders would be regulated by the coordination of the plumbing inspector and the Board of Health. Permits for the installation of garbage grinders are required by the State Plumbing Code. Before approving a permit for the installation of a garbage grinder the plumbing inspector would check with the Board of Health to assure that it was in compliance with the Board's regulations.

Evaluation: This regulation would be incorporated into the Board of Health Regulations. The town of Bridgewaterhas adopted a regulation prohibiting garbage grinders with all on-site systems and Pembroke prohibits them with cesspools. This is a low cost alternative which would lead to the more efficient and economical operation of septic systems. However, homeowners may be opposed to prohibiting garbage grinders because of their own convenience.

d. Prohibit Use of Acid Treatments or Enzymes

Description: Acid treatments are commonly used by septage haulers to attempt to alleviate clogged drain fields. However,

acid treatments and enzymes have not been shown to have any long-term beneficial effects on the operation of septic systems.

Homeowners are frequently advised by septage haulers to use acid treatments and enzymes. This regulation would be implemented by including it in a provision in the Septage Handler's Permit which is issued by the Board of Health (Title 5, July 1, 1977, Regulation 2.3).

Evaluation: This regulation would contribute to proper operation of septic tanks. There may be opposition to this restriction from homeowners who sincerely believe that acid treatment and enzymes are improving the operation of their septic systems, but this opposition has no evidence for support of its point of view.

e. Require that Septic Tank Manholes be Installed at Finished Grade

Description: The installation of septic tank manholes at finished grade would allow for the convenient location and access to septic tanks for inspection and pumping.

Evaluation: There are few additional expenses incurred with such a regulation. In fact, the inspection and pumping costs may be reduced because of easy access. Some homeowners may be displeased with such a regulation because manholes are not considered aesthetic in appearance. However, manholes at grade will facilitate the maintenance of the septic system.

f. Require As-built Plans with Professional Engineer's Certification

Description: The requirement of as built plans with professional engineers certification is the most reliable method to assure that septic systems are properly located and installed. This provision, by necessitating that a professional engineer certify as-built plans, would require that all elevations be measured with a transit, thus ensuring their precise location.

Evaluation: The recording of the precise location of septic systems by the requirement of an as-built plan assures that any changes made from the proposed plan will be recorded. This alternative will impose an additional expense on the homeowner of approximately $60 for the preparation of the as-built plans and the professional engineer's certification.

3. Increase Public Awareness of the Need for Septic System Maintenance Through Education

One of the major causes of septic system failure is a lack of knowledge of how the system operates and how it should

be maintained. Increasing public awareness will reduce septic system failures without commiting the town to large expenditures of money, but the major shortcoming is that it does not guarantee septic system maintenance.

a. Organize Annual Workshop to be Sponsored and Organized by the OCPC and the Plymouth County Extension Service

Description: Annual workshops would increase public awareness by concentrating on various aspects of septic system installation, operation, and maintenance. These workshops would be directed to health agents and Board of Health members as well as the general public. Topics which would be discussed include soils testing and soil characteristics; septic system design, operation and maintenance; and septic system regulation. The OCPC and Plymouth County Extension Service would be responsible for organizing the workshop. Speakers and panel members could be local health agents, Board of Health members, septage pumpers, septic system designers and installers, Department of Environmental Quality Engineering engineers, and soils specialists from the Soil Conservation Service. The workshops would be held at a location that would be easily accessible to all the towns of the OCPC region.

Evaluation: Workshops are mechanisms to develop public awareness that enable in depth discussions and the dissemination of detailed information. A sucsessful workshop requires careful planning and organization, which would be supplied by the OCPC and the Plymouth County Extension Service.

b. Distribute Booklets and Brochures

Description: The distribution of booklets and brochures is an ideal format to provide information to homeowners about the operation and maintenance of their septic systems. These brochures could be written by the OCPC. It is also possible that the brochures could be purchased from the U.S. Public Health Service or other state and planning agencies. The printing could be funded either by the OCPC or by the towns.

The booklets and brochures could be distributed by a variety of mechanisms. A small one page leaflet could be sent with the water bills or annually with the tax bills. Larger, more detailed brochures could be given to homeowners by banks as new homeowners take out mortgages and by the Board of Health to all homeowners with septic systems.

Evaluation: Booklets and brochures are an excellent mechanism to inform every homeowner in a town or the region of the proper maintenance required by septic systems. The major disadvantage of this alternative is that not every homeowner will read the brochure and maintain his septic system as the brochure recommends.

c. Notification by the Board of Health of Voluntary Annual Inspection and Pumping

Description: Since a major cause of septic tank and cesspool failure is not pumping the system out, the Board of Health can eliminate this problem by notifying homeowners annually that their systems should be inspected and pumped if necessary. These notices could be easily mailed with the town water bills at staggered intervals to each home. The only added cost would be the administration of the program, which would be carried out by a part-time employee.

Evaluation: The voluntary notification of when systems should be inspected and pumped will fulfill the education and awareness aspects of septic tank management but it does not provide any assurance that the systems will be maintained.

4. Institute a Mandatory Maintenance Program

A mandatory maintenance program would require homeowners to inspect and/or pump septic systems at regular intervals. A mandatory maintenance program is an essential aspect of the 208 planning program. Mandatory maintenance is the only way to guarantee that the major cause of system failure, lack of maintenance, will no longer be a problem.

There are two major obstacles to the implementation of any type of mandatory maintenance program: cost and social acceptance. The cost of operating a mandatory maintenance program, especially the initial start up costs for bookkeeping and administration will be substantial. Furthermore any mandatory maintenance program might encounter public opposition. It can be veiwed as "an infringement upon the rights of the individual, and a homeowner has a right to maintain his own house as he chooses" (comment from Water Quality Workshop). But, these difficulties must be balanced with the benefits that mandatory maintenance will provide. First, septic system failure will be greatly reduced; thus, improving water quality and neighborhood environments. In addition, homeowners will be far less likely to be forced into major repairs to their septic systems which could cost up to $7,500. Finally, a regular maintenance program will enable use of on-site disposal to continue where without such regulations a public sewerage system would be the only feasible alternative.

a. Inspect all Systems Annually and Require Pumping When Necessary

Description: This alternative would require a two to three year start-up period before the system could operate on a regular basis. The two to three year lag time is necessary to carry out

the first inspections on each home which will take longer than subsequent inspections because many homeowners have never had their systems pumped nor do they know where the systems are located. It will require a considerably longer period of time to locate and dig out these systems to inspect them. Once all systems have been located and inspected once, the septic systems will be more easily inspected.

The town could hire special septic system inspectors, use highway department personnel or combine septic system inspections with other inspections. The inspector would have the inspection of septic tanks as his/her sole responsibility. The position would be full time during the seasons of the year when inspections are possible.

Town highway departments could assume the responsibility of septic tank inspections but additional full-time personnel would be needed to carry out the increased responsibility. Using the highway department has the advantage of hiring full-time personnel and having the flexibility of having other town-related work for the inspector(s) when weather does not permit inspections.

Septic system inspection could also be combined with other regular town inspection. One possibility is to combine water meter reading with septic tank inspection. Since both tasks require street-by-street house inspections combining these functions would eliminate non-productive travel time.

Evaluation: Mandatory inspection with required pumping when necessary guarantees that all septic systems will be inspected and pumped when necessary. This alternative is the most economical method to assure that septic systems will be maintained without adding unnecessary expenditures to the homeowner or town. Since the town will be responsible for conducting the inspections, there will be fewer problems with quality control, and homes will be able to be inspected on a street-by-street basis, which will be the most efficient use of manpower. Travel time between inspections will be greatly reduced. There might be public opposition to this alternative, since homeowners might not want to be forced to pump their septic tanks nor to have their septic tanks inspected by the town. However, this alternative would assure the maintenance of septic systems and thus eliminate a major cause of failure and the associated public health hazards. In addition, homeowners will be protected from major septic system repairs which are necessitated from a lack of maintenance. For homes that have been pumped within a year of the scheduled inspection, the inspection would not be necessary.

There are various mechanisms which may be adopted to fulfill the task of septic system inspection. Inspections would be made

in three seasons of the year, spring, summer, and fall where manholes are not at grade, since frozen ground would prevent winter inspections. For the number of inspectors which would be required for each town see Table 4-12.

The implementation of this alternative may require the passage of a town by-law to give the health agent the authority to inspect all septic systems. There is no question that the health agent has the authority to inspect a septic system that is suspected of failure. However a blanket inspection program may not be authorized under existing State enabling legislation. As long as there is no specific State statute prohibiting such inspections, the town may adopt such a by-law to formally recognize the health agent's authority. The courts would be generally favorable to approving access to a septic tank since it does not isolate the privacy of a homeowner by entering his house. Most homeowners would have no objection to the inspection of their septic systems.

b. Inspect all Homes Annually and Pump on a Specified Schedule

Mandatory pumping, like mandatory inspection will ensure the proper maintenance of septic systems. There are a variety of programs and pumping intervals that could be adopted.

Mandatory pumping has the major advantage of assuming that all septic tanks will be pumped regularly with the disadvantage that some homes will be pumped prematurely. The tradeoff is added periodic cost to the homeowner to prevent the major costs of system failure and public health hazards.

1) Require Annual Pumping

Description: Annual pumping of each home is the most reliable system of mandatory maintenance.

Evaluation: However this alternative does mean that some homes will be pumped prematurely.

There is no research to document the appropriate time interval to pump out septic tanks and cesspools. The solids that accumulate in septic tanks and cesspools accumulate at varying rates, even with identical volumes of wastewater. This is partially due to varying types and rates of activity of bacteria which can reduce approximately 40 percent of the solids.

Annual pumping will eliminate septic tank failures resulting from a buildup of solids and the clogging of the leaching area. Annual pumping will reduce the concentration of septage and thus enable easier treatment of the septage. But this reduction in cost will not be reflected in reduced costs for several years.

TABLE 4-12

NUMBER OF SEPTIC SYSTEM INSPECTORS REQUIRED
FOR A MANDATORY INSPECTION PROGRAM

	1970 Homes with On-Site Disposal Systems	No. of Man days[2] for Inspection	No. of[3] Inspectors Needed
ABINGTON	3,243	463	2 1/4
AVON	1,397	200	1
BRIDGEWATER	2,313	330	1 3/4
BROCKTON	2,881	412	2
EAST BRIDGEWATER	2,299	328	1 3/4
EASTON	3,075	439	2 1/4
HANSON	1,917	274	1 1/4
PEMBROKE	3,046	435	2 1/4
WEST BRIDGEWATER	1,677	240	1 1/4
WHITMAN	3,543	506	2 1/2

1. U.S. Bureau of the Census, Census of Housing: 1970 Detailed Housing Characteristics Final Report HC (1)-B23, Massachusetts. U.S.G.P.O., Washington D.C. 1972.

2. It is expected that one man will inspect seven septic tanks or cess pools per day.

3. Fractions of inspectors indicate part-time inspectors (rounded to the nearest 1/4)

2) Require Biannual or Less Frequent Pumping

Description and Evaluation: Biannual or less frequent pumping will reduce the pumping costs but increase the possibility of failing systems because of a buildup of solids.

c. Town Owns and Operates Pumper to Pump All Homes at Adopted Interval

Description: Any town can purchase and operate a septage truck (honey wagon). The truck would be operated and maintained by the town Department of Public Works. Each home would be pumped at the designated interval. The costs would be paid for as part of the towns general operating expenses.

Evaluation: The major advantage of a town-owned pumping truck is that the purchase cost of the truck is eligible for Federal funding under Section 201 of P.L. 92-500.

The town would be eligible for 75 percent federal and 15 percent state funding for the purchase of a septage pumping truck. Another advantage of this system if the town also does the operating, is that it would eliminate any illegal dumping by septage haulers and assure that acid treatments and enzymes, which have not been shown to have any beneficial effect on septic systems would not be used. The major problem with the town buying a septage pumper is that the town must incur the additional administration costs. Negative impacts of the town purchasing and operating the septage truck is that it eliminates the free competition and free enterprise among septage pumpers. A town could purchase the septage truck and then lease it to private haulers. (Tables 4-7, 4-8, 4-9)

d. Town Contracts with Pumper

Description: A second mechanism to achieve mandatory periodic pumping is for the town to contract with a private pumper to pump each house at a regular interval. The town would administer the program, and would tell the pumper when to pump the homes of each section of town.

Evaluation: This alternative is very similar to the one above except that it maintains the free enterprise system by allowing the pumpers to bid for the contract to pump all homes in town. The town is still able to monitor the haulers operations to assure that there is no illegal dumping of septage. The per pump costs would be high, since the town would still be responsible for the administrative aspects of septic tank management but the town would not have the advantage of a town-owned pumping truck to reduce operating expenses.

e. Require Permits for Septic Systems

Description: This alternative would require the homeowner to obtain a permit for the operation of a septic system. This would have the effect of an occupancy permit. The septic tanks permits would be issued periodically when the homeowner produced proof (a pumping receipt) that his septic tank had been pumped. If a homeowner was tardy in pumping his septic tank or in renewing his permit, the town would initially send reminders, then issue a fine, and finally put a lien on the property, similar to the procedure for failure to pay a water bill.

Evaluation: Requiring a permit for septic tank operation is a maintenance system which puts a great deal of responsibility on the homeowner. The costs to the Board of Health to enforce such a permit system if the public was not conscientious could be prohibitive. The permit system would necessitate a tax or fee of approximately $5 - $10 for administrative and clerical expenses. This alternative provides an adequate maintenance program without putting too -reat a burden on a town to hire new personnel. If homeowners were not conscientious about maintaining their septic systems or renewing their permits then more intensive mandatory maintenance programs, such as periodic inspection and pumping would be required.

III. Septage Treatment and Disposal

The Old Colony Planning Council 208 study area, except for the City of Brockton, the downtown area of Bridgewater and a small section of Abington, is unsewered and currently relies on on-site systems for the disposal of wastewater. Although 201 facilities planning studies are currently on-going in the area at both the regional and local level, it is safe to assume that some portion of the OCPC 208 study area will continue to make use of on-site disposal systems for many years to come.

Associated septage volumes will continue to be generated by these systems and provision for the effective disposal of the septage will be required. Present disposal practices vary in the area and the level of awareness as to how and where septage is presently disposed of varies greatly from community to community. It is, however, clearly evident that the issue of septage disposal has historically been handled very casually by most communities which has increased the potential for illegal dumping and has led to the current lack of refined septage management programs. In addition, the state-of-the-art of septage treatment has as yet not reached a level at which state regulatory agencies feel it would be reliable for use as a local in-town disposal and treatment option. As a result, state requirements have limited the ability of communities to address septage disposal locally. For the most part, the only disposal practice which meets with general acceptance with state agencies is disposal and treatment at a municipal wastewater treatment facility. In many cases, a direct

result has been for a community to rely entirely on the discretion of a septage hauler to select a reasonable site for septage treatment and disposal.

Within the OCPC 208 area, legal septage disposal is currently limited to the City of Brockton's wastewater treatment facility. Several communities which had previously relied on in-town septage disposal are no longer able to do so as a result of the failure of these same disposal areas to comply with state regulations. Presently, there are several sites outside of the 208 boundary which accept septage loads from OCPC community haulers; however, long-term reliance on these facilities is not a reasonable assumption, nor is it reasonable to expect the City of Brockton to serve the entire region as the sole septage treatment and disposal facility.

In the OCPC 208 study area, it is expected that two regional wastewater treatment facilities will be available as alternatives for the treatment and disposal of septage. Currently, the existing Brockton facility accepts septage from outside of the Brockton area and the proposed OCWPCD facility is also expected to institute a septage acceptance policy. In general, wastewater treatment facilities are presently considered the best alternative means of treating and disposing of septage. Within the area under the jurisdiction of the Southeastern Regional office of the Department of Environmental Quality Engineering in Lakeville, those septage treatment and disposal options other than wastewater treatment facilities are currently experiencing operational problems in one form or another. Although current operational problems at these alternative facilities do not preclude their use in the future, it does lend support to the use of wastewater treatment facilities until such time as alternative systems reach a satisfactory level of operational integrity.

Use of a regional wastewater treatment facility for the treatment and disposal of septage will allow for disposal at a facility with an approved effluent discharge based on the Division of Water Pollution Control's modelling studies. Such discharges, if within the desired levels are not expected to negatively impact in-stream water quality. Disposal at a regional facility will be in accordance with the state's anti-degradation policy which aims to reduce the number of surface discharges in the area. Although each regional facility will operate an advanced wastewater treatment scheme, it is expected that these facilities will afford some economy of scale in the overall treatment costs at the facility.

Within the realm of a regional option, communities in addition to selecting between the available wastewater treatment plant options for treatment and disposal of septage, will also be required to select and engage in long-term management policies. Often times, the transition from local management (i.e., regular pumpout programs, etc. discussed in previous section) to regional management (haul to disposal at out-of-town site) has been awkward and ineffective due to the failure of management systems to define the role of communities versus private haulers in the program. Communities in the OCPC area have, for the most part, not actively engaged themselves in septage management at the regional level and in many instances the role of the hauler vs. the community in the assignment or selection of treatment/disposal options have gone undefined.

A. Selection of Treatment/Disposal Sites

1. Private Selection of Treatment/Disposal Site

Description: The availability of such an option is highly dependent on the policies to be established for the acceptance of septage by the regional wastewater treatment facilities (Brockton, OCWPCD). In order for selection of a treatment site to be left to the discretion of a private hauler, the regional facilities must not require membership and/or cost assessment beyond the charge to dump. As part of such an option, private haulers would seek out and engage in long-term disposal agreements with the regional treatment facilities. Costs charged to the haulers as part of their dumping fees would reflect the O&M costs of treating a septage load as well as a portion of the capital costs for the construction of the facility. Community participation in this alternative would be minimal, requiring only that local haulers have designated a treatment/disposal site and have engaged in the necessary agreements guaranteeing disposal. Registration would be required through the Board of Health.

Evaluation: Such an alternative, in conjunction with the permit system discussed above with periodic checking by the Board of Health will reasonably guarantee the safe and reliable disposal of septage. Costs incurred as a result of instituting such a program would be borne entirely by the residents having their systems pumped. Remaining at the private level will preclude the application of the overall capital cost assessment to the general tax rate requiring that it be applied on an individual basis via a pump by pump assessment. Opting for private selection and designation of a treatment or disposal site is essentially continuing the existing system with several stricter guidelines.

2. Community Selection or Designation of Treatment Sites

Description: The availability of this alternative is predicated on a significant level of community participation in selected regional treatment/disposal options. Communities would be required to select and designate a facility as its disposal site in any instance where eligibility for septage disposal is dependent on either membership in the facility or engagement in a long-term intermunicipal agreement. This would require participating communities to engage in all the necessary legal agreements in order to become eligible for disposal of septage at the facility and the community would inform all local pumpers that the selected facility is the single disposal site available to the community. If the town owned and operated the septage trucks, then it would dispose of septage at the designated site.

Evaluation: Community participation in a regional facility as part of this alternative will require the selectmen to engage in

the necessary agreements and will require the program to be overseen by the Board of Health. If the community designates a facility requiring membership, then a town meeting vote will be required to ratify the agreement. Costs of such a program would be applied on a town-wide basis. A charge to pump a resident's system would be assessed on an individual basis by the pumper. This may reflect O&M costs at the treatment facility or may reflect just the cost of hauling to the facility. The cost applied on a town-wide basis would reflect the capital cost of the treatment facility for that portion of the facility which treatment of a community's septage is expected to require.

B. Treatment at Wastewater Disposal Facilities

1. Treat Septage at the Old Colony Water Pollution Control District (OCWPCD)

Description: The OCWPCD is currently planning for a regional wastewater treatment facility to be constructed in Bridgewater with a discharge to the Town River which would initially serve Abington, Whitman, West Bridgewter, and Bridgewater and which would be capable of expanding to service the additional communities of East Bridgewater, Easton, Hanson and Pembroke. In addition to planning for the collection and treatment of municipal wastewater, the OCWPCD's facilities plan proposes that the treatment of municipal wastewater, the OCWPCD's facilities plan proposes that the treatment plant can "reasonably be expected to receive essentially all of the septage produced in the eight-community study area". Accordingly, the OCWPCD facility is an alternative for septage treatment and disposal for a service area comprised of Abington, Bridgewater, East Bridgewater, Easton, Hanson, Pembroke, West Bridgewater, and Whitman.

Evaluation: Access to a septage treatment and disposal at the OCWPCD wastewater treatment plant in conjunction with new septage collection programs should reduce the potential for illegal septage dumping. Such a result will have a positive impact on the areas surface waters.

Although the organic and nutrient strength of septage is often exponentially stronger than that of sewage, it is not expected that treatment of septage at the OCWPCD facility will have a negative impact on the operational integrity of the facility which would prevent the facilities discharge from meeting its present effluent levels.

a. Membership in the District

Currently only four of the eight communities in the OCWPCD "septage service area" are members of the District. Although no

policy has been set by the OCWPCD Board, it may be that prior to eligibility being extended to a community for disposal of its septage at the treatment facility, membership in the OCWPCD may be required. Such a requirement may be regarded warily by several of the presently non-member communities. If membership were to be optional, long-term agreements between each community and the OCWPCD would be drafted. These agreements would set the period for which a community would be eligible for disposal at the facility as well as detailing the apportionment of treatment facility costs. In either case, (i.e., membership vs. agreement) communities will be required to share in the treatment plant's capital cost which would be applied on a town-wide basis. Operation and maintenance costs could be apportioned in several ways for the District as discussed in the following alternatives.

1) OCWPCD Required Membership (Abington, Bridgewater, East Bridgewater, Easton, Hanson, Pembroke, West Bridgewater, Whitman)

Description: In order to be eligible to dispose of septage at the District facility, membership would be required in the District.

Evaluation: District membership will result in each community being assessed on a yearly basis for its portion of the capital costs incurred in constructing the plant in addition to its portion of the yearly operation and maintenance of the system. Non-sewered District communities would be assessed solely on the septage costs of the treatment plant. For the first three years of operation of the facility, O&M costs are to be apportioned to member communities on the basis of population. It is expected that a similar arrangement would be expanded to include non-sewered District communities. After the initial three-year period, non-sewered communities would likely be assessed on septage volumes dumped at the facility at a cost which would be determined by the District based on the treatment requirements for the septage. It is expected that costs to haul septage to the regional facility will increase for several communities due to increased distances of travel.

2) OCWPCD (same towns -- District members; same towns -- inter-municipal agreements)

Description: This alternative would not require membership in the District for septage disposal.

Evaluation: This alternative would probably be considered more desirable by those communities having serious reservations concerning the impacts of membership in the OCWPCD. Non-membership in the District would eliminate those communities

so inclined from the policy decision making process conducted by the District Board. Non-member communities participating in the septage disposal program would be subject to those decisions made by the Board without benefit of representation on the Board.

Communities would be required to draft and engage themselves in long-term arrangements mututally agreeable to the District. These agreements would detail the requirements for septage disposal at the facility.

Non-membership in the District would still require participating communities to share in a portion of the capital cost with such cost apportionments and payment being determined by the District and included in the drafted agreement between the District and the community.

b. Operation and Maintenance Cost Apportionment

1) Assessment Through Fee of Hauler Charged to Homeowner

Description: Operation and maintenance (O&M) costs at the treatment facility will be increased by the additional burden on the facility of treating septage. O&M costs can be reflected in the fee charged to a hauler at the facility and thus passed directly onto the homeowner whose system is being pumped. The O&M cost would be in addition to the fee ordinarily charged by the hauler to cover his/her time and equipment costs.

Evaluation: Such a system would likely greatly increase present fees for septage pumping to the homeowner. There may be problems in establishing a reasonable fee to cover the operation and maintenance costs for a single pumpout of a system.

2) Assessment Through Fee From Regional Facility Directly to the Community

Description: This alternative would entail the facility establishing a reasonable cost for treating a standardized septage load. The facility would record the number of loads per year and assess the community on the basis of the total loads times standardized O&M cost per load. The assessment, when received by the community, can be apportioned on a town-wide basis in a general fee such as a sewer or water bill. The hauler pumping the system would not be charged for dumping at the facility; he would in turn charge residents only for his time and vehicle expenses.

Evaluation: The obvious problem with a town-wide assessment of O&M fees is that problem homes which require several pumpings

would be assessed the same rate as a home pumped once every one or two years. Regulations should be prepared whereby such chronic or severe problem homes are assessed additional monies after a reasonable number of pumpouts have occurred (such a number should be set by the Board of Health). The cost to the homeowner on a per pump basis charged by the hauler should decrease or remain fairly low. There will be added municipal costs for billing and fee collecting. It is expected that the cost for hauling septage to the OCWPCD treatment facility will increase from that presently incurred for several communities due to increased hauling distances.

2. Treat Septage at the Brockton Wastewater Treatment Plant

It is currently the policy of the City of Brockton to accept septage from all communities within the OCPC 208 study area as well as accepting septage from several neighboring non-OCPC communities. It is expected that Brockton's current septage policy will continue as facilities for septage handling have been included in the provisions of the recommended facilities plan.

As a regional septage treatment and disposal facility, Brockton will be considered in two service area configurations. The City of Brockton has engaged itself in inter-municipal agreements with the towns of Abington and Avon as part of their 201 facilities construction program. The areas serviced on the basis of these agreements can be considered a long-term finalized alternative. However, those communities not engaged in inter-municipal agreements with the City, but disposing of septage at the treatment facility have no such long-term guarantees. These communities are Abington, Avon, Bridgewater, East Bridgewater, Easton, Hanson, Pembroke, West Bridgewater and Whitman.

The operational efficiency of the upgraded and expanded Brockton STP is not expected to be negatively impacted by continued acceptance and treatment of septage. Accordingly, the quality of the effluent discharged by the facility is anticipated to be within the limits set by the Division of Water Pollution Control (DWPC) Westboro.

Brockton's wastewater treatment facility is being considered as a long-term alternative for septage disposal for the 1,000 acre portion of Abington naturally draining into the Beaver Brook watershed, and the entire town of Avon in addition to those small areas of Brockton itself which remain on on-site disposal systems. Such a septage service area is considered a reliable long-term alternative. Both Abington and Avon are presently engaged in long-range intermunicipal agreements with the City of Brockton which provide for the treatment and disposal of municipal wastewater. The existing agreements could be expanded to provide for septage disposal during the same long-term program arrangement.

The length of time for which the Brockton facility will remain accessible is subject to several variables. It seems likely that with the construction of the OCWPCD treatment facility, for which eight of the communities are designated for membership, Brockton officials will reassess the need and advisability of their facility providing septage treatment and disposal for these communities. The communities themselves or haulers servicing the community will have to evaluate the costs of treatment at each facility as well as time and travel costs incurred by hauling to the facility. Costs of hauling and treatment will be presented by community in the draft 208 Plan.

Disposal of septage at the Brockton STP currently requires each load to pass a sampling evaluation at the treatment plant. Costs for dumping at the facility are currently $10/load for a standard sized hauler and $25/load for larger trailer type haulers which several pumpers have begun to use. In addition, disposal at the facility requires the hauler to register at the plant stating which community the septage load was pumped from.

IV. Reducing Wastewater Disposal Problems Through Water Conservation

Water conservation to reduce sewage flows can be an option for reducing water quality problems from wastewater disposal and for reducing the costs of treatment. This possibility holds true whether on-site systems or collection systems are relied on for wastewater disposal. To offer some examples of the relationships between water conservation and wastewater disposal:

·Limiting water use can reduce the burden on a septic system leaching field and reduce the possibility of septic system failures in cases where a system is undersized for the amount of flow to which it is subjected.

·Where existing sewage lines or treatment plants are near or above capacity, water conservation may be a partial alternative to the construction of new facilities and may prevent overflows that degrade water quality.

·Water conservation can reduce the needed size of new sewage lines and treatment facilities now being planned and result in cost savings.

·Reduction of flows to a sewage treatment plant could reduce plant operating costs to some extent by allowing longer detention times and reducing chemical costs of advanced treatment. (Note: In some cases, treatment costs are largely dependent on the quantity of pollutant loadings and independent, within limits, of the volume of flow.)

·Where a community belongs to a regional treatment system and is assessed a share of the system's operational costs based on the volume of the town's flow, water conservation in the town could reduce the town's assessment.

·Where individual homeowners are charged for sewage on the basis of the flow, water conservation can result in a cost savings to them beyond the savings on water and energy costs.

·Any reduction in the costs of sewerage which could be achieved through water conservation would reduce the financial impacts of sewerage installation and make it more acceptable politically.

·For industries, water conservation is a means of reducing those industrial cost recovery charges imposed for reasons of high flow volumes. For firms which treat wastes prior to stream discharge or which pretreat wastes before discharging to a sewer system, water conservation can reduce the size of necessary treatment facilities and resulting costs.

The significance of water conservation to water quality management is reflected in at least two sections of the 1972 Federal Water Pollution Control Act (P.L. 92-500). Section 104(o)(1) states that the Administrator of EPA "shall conduct research and investigations on devices, systems, incentives, pricing policy, and other methods of reducing the total flow of sewage, including, but not limited to, unnecessary water consumption in order to reduce the requirements for and the costs of sewage and waste treatment services. Such research and investigations shall be directed to develop devices, systems, policies, and methods capable of achieving the maximum reduction of unnecessary water consumption."

Paragraph 2 of the same section directs that an annual report be made to Congress on this subject and recommendations made "for any legislation that may be required to provide for the adoption and use of devices, systems, policies, or other methods of reducing water consumption and reducing the total flow of sewage."

Also, Section 212(2)(B) defines "treatment works" eligible for federal assistance as including methods or systems for "preventing" or "reducing" municipal waste. The EPA publication Guidance for Preparing a Facilities Plan directs that 201 plans consider water conservation measures, including flow reduction measures for households.

A community will have other reasons for conserving water beyond those related to wastewater disposal. Reductions in water consumption can save a community and its residents the considerable expenses of locating, obtaining, and (possibly) treating new supplies, as well as the costs of building new and larger water mains, storage towers, and pumping stations. The need for additional facilities may result from that part of water consumption which does not enter wastewater disposal systems -- namely, outdoor water use for gardens, lawns, car washing, etc. These uses create a peak demand in the summer which places a special burden on water supply systems and which will often be the reason why new facilities are needed. In this report, water conservation will be discussed only as it relates to wastewater disposal. Water conservation is discussed more fully in an OCPC publication, Opportunities for Water Conservation (1977).

Approximately 75 percent of the water used in an average home is used either by showers and baths or by toilets. Consequently, reducing the water consumption in bath and toilet fixtures would result in a noticeable decrease in wastewater flow from the individual home. Water conservation can also be applied to other household appliances and fixtures (such as washing machines, dishwashers, garbage disposals, and bathroom and kitchen sink faucets), but since these account for less of the total flow, savings in these areas will usually mean smaller reductions overall, though the impact will vary from home to home. Also, leaks from faucets or toilets can waste up to hundreds of gallons per day and quickly overload a septic system. In the case of industrial and commercial establishments and such public buildings as schools, recycling of cooling water or changes in processes may be ways of reducing the bulk of water consumption.

The following discussion of alternatives for water conservation is presented under four headings, depending on the type of structure: existing residential buildings, new residential buildings, commercial/industrial buildings, and public/semi-public buildings. The relative significance of these topics to a community will depend on its present types of use and the degree to which the community is expected to grow in population: for example, a community whose population is projected to increase substantially will have more reason to stress alternatives for water conservation in new structures than one which is expected to grow slowly. Table 4-13 offers a guide to the relative importance of each topic to each of the OCPC 208 communities. Because existing structures will account for most of the water consumed in each community over the next twenty years, "existing residential" is listed as the most important topic for each community. However, as will be pointed out below, it may be easier administratively and less costly to stress conservation by some other class of users, such as future residential or commercial/industrial. Also, priorities may depend on the system of wastewater disposal and the type of problems being encountered in a community. For example, were Whitman seeking to minimize its total wastewater flow to a regional treatment plant, reducing commercial and industrial flows would be a significant step; however, if it were seeking to lessen the failures of existing septic systems, then water conservation in existing homes would rate priority.

A. Promote Water Conservation in Existing Residential Structures

Description: Concentration would be placed on encouraging replacement and modification of showerheads and toilets (often called "retrofitting") to make them use less water, and on detecting leaks. Two approaches are outlined: one involving an educational campaign only; the second, a more active publicly-sponsored effort to make retrofitting widespread.

Evaluation: This alternative would reach most users in the town at one time; the impact and effectiveness would be greater because of the focusing of public attention in this way. Where septic system problems are being experienced because systems are undersized for current flows (either because they were built too small originally or because year-round conversion of seasonal homes has occurred), water conservation may be a means of improving septic system operation.

TABLE 4-13

ALTERNATIVES FOR WATER CONSERVATION: RELATIVE SIGNIFICANCE BY COMMUNITY

The four topics discussed in the text are existing residential (abbreviated here to Exist. Res.); future residential (Fut. Res.); commercial/industrial (Comm/Ind.), which includes hospitals; and public/semi-public (Pub.), including schools and colleges. For each community, the topics are listed according to their relative importance for a community-wide program of water conservation.

	Most Important	<-------->		Least Important
Abington	Exist. Res.	Fut. Res.	Comm./Ind.	Pub.
Avon	Exist. Res.	Comm./Ind.	Fut. Res.	Pub.
Bridgewater	Exist. Res.	Fut. Res.	Pub.	Comm./Ind.
Brockton	Exist. Res.	Comm./Ind.	Fut. Res.	Pub.
East Bridgewater	Exist. Res.	Fut. Res.	Comm./Ind.	Pub.
Easton	Exist. Res.	Fut. Res.	Pub.	Comm./Ind.
Hanson	Exist. Res.	Fut. Res.	Comm./Ind.	Pub.
Pembroke	Exist. Res.	Fut. Res.	Pub.	Comm./Ind.
West Bridgewater	Exist. Res.	Fut. Res.	Comm./Ind.	Pub.
Whitman	Exist. Res.	Comm./Ind.	Fut. Res.	Pub.

1. Distribute Information on Water Conservation Methods

Description: Information would be distributed to homeowners on the availability and advantages of such devices as inserts to reduce toilet water use and low-flow showerheads, methods for detecting leaks, and general tips on reducing water usage. Another inducement to water conservation would be to print on individual water bills the total consumption during the billing period and also the average per-day consumption by the household, so that people could more easily follow their usage patterns. Flyers and leaflets would be prepared by the OCPC staff or purchased in bulk from an outside group (such as the American Water Works Association) and included in regular bill mailings.

Evaluation: By using existing mailings, costs could be kept down to those for preparation of the flyers and printing of them. If one flyer were prepared and used throughout the OCPC 208 Area, costs would probably be under $100 per 10,000 people. Changing billing information would be more costly and would be most feasible for communities on computerized billing systems (including Brockton and, shortly, Whitman).

The effectiveness of this alternative would rest on individual initiative. It would probably not result in a sizable decrease in total community consumption, but it might furnish helpful ideas to those people who have problems with septic systems. This alternative could allow individuals to reduce their own water, energy, and (in several areas) sewer costs, if they so chose. Individuals might, however, find it difficult to obtain water-saving devices readily at retail outlets, and this could lessen the impact of an educational effort.

2. Sponsor Community-Wide Retrofitting with Public Funds

Description: Water-saving devices (low-flow showerheads, toilet inserts) would be purchased in bulk by the community and distributed to every homeowner. The purchase could be financed either by town funds or under a Section 201 facilities construction grant. Technical assistance would be furnished to homeowners upon request.

Evaluation: This alternative would have the potential for reducing community consumption more than the first option, since the homeowner would not have to go to the effort of personally obtaining the devices. Individual costs would be lowered by purchasing in quantity. This alternative would be particularly appropriate where the community was seeking to reduce total sewage flow, whether to save on allocated operational costs or to reduce flows in overloaded lines.

Use of 201 funds appears possible under the statute language. It is unclear whether grants under Section 201 would in fact be

given. (Where water conservation was felt to be a means of reducing septic system failures, water conservation could seemingly be the subject of a 201 grant application which did not involve sewerage construction.)

Administrative costs of ordering and distributing the devices could be minimal, particularly if volunteer help were obtained from local service groups. Providing assistance on request could be difficult unless a person were hired for a short-term position and trained to offer the help (perhaps by the commercial distributor of the devices).

B. Promote Water Conservation in Future Residential Structures

Description: Steps would be taken to encourage or require installation of water-saving models of toilets and showerheads as original equipment in new houses, apartments, and condominiums. Three alternatives are presented: one, leaving the use of water-saving models to the operation of private economic forces; the second, providing positive or negative incentives to individuals to achieve water conservation; and the third, requiring water-saving devices in all new residential buildings.

Evaluation: Encouraging water conservation in new residences is feasible and cost-effective. Water-saving models can be purchased at no additional cost compared to standard models, and offer savings on water, energy, and sewage treatment costs. Inertia is more of a present obstacle than is outright resistance. It is simpler to promote such devices in new buildings than to encourage replacement of existing fixtures by homeowners. This alternative, however, would not affect a community's septic system problems if those problems are associated with older pre-Code homes or if they result from faulty installation or inspection of new home systems.

1. Rely on Private Market Forces to Achieve Water Conservation

Description: Public authorities would leave decisions on use of water-saving models to the discretion of builders and developers.

Evaluation: The rationale for such an approach would be that, in an era of rising energy costs, homebuyers will be more conscious of a home's energy consumption, and developers will adopt water-saving models as a selling point with buyers. (One condominium development in Bridgewater has in fact mentioned this in recent newspaper adverstisements.) Also, developers of apartment complexes who will be paying for water, sewer, and in some instances heating bills will have their own reasons to use water-saving models. Plumbing suppliers interviewed by the OCPC staff said that the larger residential developers were aware of water-saving models and were using them more frequently. In short, since water-saving models of toilets and showerheads have economic advantages, it may not be necessary for public authorities

to actively promote their use. On the other hand, this approach requires that both developers and buyers be knowledgeable about water conservation, and this may not yet be the case.

2. Provide Incentives for the Use of Water-Saving Devices

Public authorities would encourage conservation by providing indirect financial incentives. Two are suggested here.

a. Reduce Leaching Field Size Requirements for Homes with Water-Saving Fixtures

Description: The size of leaching fields required under the State Environmental Code is based on anticipated flows, which are now computed on the basis of 110 gallons per bedroom. Under this alternative, variances would be granted allowing field areas based on smaller flows in cases where water-saving fixtures were to be used.

Evaluation: The potential savings on the construction of the leaching field would be an incentive for the use of water-saving devices. However, several reasons can be presented for not allowing reductions in field size for this purpose. There would have to be additional supervision to ensure that water-saving models were used as promised, and the Board of Health would need information on the model to be used to be sure that flows would be as projected. Allowing variances for this cause opens up the potential of negotiated decisions on leaching area, which is contrary to the spirit of the State Code as a set of minimum requirements. Low-flow showerheads could be replaced by regular models at some future date without the Board of Health's knowledge (and with probably little awareness on the homeowner's part as to the potential impact on his septic system). The informational requirements which the board of health would have to impose, to make a proper decision, might be more than a developer would wish to bother with.

In cases where systems were to be replaced or repaired, this alternative might merit consideration, particularly for small (10,000 square foot or less) lots. For example, in considering an application for system repair on a small lot, a board of health might allow a smaller leaching area on the condition that water-saving devices be used, in order to leave room on the lot for the reserve area now required under the State Code for new systems.

b. Impose System Development Charges, Based on Projected Flow

Description: To provide a fund for future water system expansion, a fee would be levied on new users and set aside for this purpose. The fee would be based on projected flow, and so would be less where water-saving devices were to be used.

Evaluation: The only OCPC 208 Area community with such a charge now is Abington. The fees would be more significant to the decisions of commercial and industrial users than to residential users. However, the imposition of such a charge would serve to remind the developers of the possibility of using water-saving models.

3. Require that Water-saving Devices be Used in New Residential Structures

All new structures would be required to use low-flow showerheads and low-flush toilets. Requiring water-saving devices would actually save homeowners money, but would remove the freedom to choose. (This would be little problem for toilets, where there would be no impact on performance, but would make a difference with showerheads, since the change is noticeable.) The impact on costs and requirements for future public facilities (i.e., water system expansion) would be a reason for imposing such a requirement, since the burden of non-use of water-saving models may eventually be borne by the public at large. As long as an adequate period were allowed for using up stocks of old models, such a requirement would not be disruptive to the plumbing industry, since water-saving models are already being made.

The requirement that water-saving devices be used in new residential buildings would be implemented through the State Plumbing Code. The State Plumbing Code would be amended by the State Board of Examiners of Plumbers to specify maximum allowable rates of flow. This would create uniformity, which is stated as a purpose of the Code, while promoting water conservation, also stated as a purpose:

> "Plumbing must be designed and adjusted to use the minimum quantity of water consistent with proper performance and cleaning."

A community would then through its by-laws rely on the state Plumbing Code principle of water conservation and adopt maximum flow standards for new construction.

Local regulations would be an alternative if the State Board were reluctant to impose a general requirement at this time. A town-by-town approach would allow for local options but would create a lack of statewide uniformity. That, however, should not be a serious objection, since there is a lack of uniformity now, with some structures using water-saving devices and others not.

C. Promote Water Conservation in Commercial/Industrial Structures

Description: Water conservation would be encouraged for firms which use water for other than common sanitary purposes. These would include

processing industries (leather, metals, electrical equipment, and others), carwashes, restaurants, and supermarkets (which may use large quantities for cooling water). Three of the suggested measures rely on economic incentives to promote water conservation, another on persuasion. Business firms offer the potential for significant reduction on a "one-shot" basis -- i.e., one firm can make more difference for total consumption than many individual homes. However, the connection to wastewater disposal planning may be hard to make. For instance, if the OCWPCD sewer system is sized to serve present flows and firms adopt water conservation practices after the system is installed in order to reduce their sewer use and ICR charges, the system may operate inefficiently because of the reduced flows and operational costs will not be reduced by much.

1. Require New Firms to Estimate Future Flows

Description: Before being allowed to connect to the public water system, new users in this category would be required to file with the water department an estimate of the firm's water needs.

Evaluation: This would give the water department an opportunity to suggest water conservation practices to a firm and even refuse connections altogether where the burden on the water system would be too great. This practice is currently followed in Avon.

2. Impose a System Development Charge

Description: To provide a fund for future water system expansion, a fee would be levied on new users. The fee would be based on projected flow and so would be less where water-saving systems were used.

Evaluation: Imposing such a charge could be a strong incentive; the effectiveness would depend on the alternatives available to a firm. Where the firm was able to recycle water or use an alternative process, the charge would promote conservation; where such a choice was unavailable, the charge would merely make the business pay its fair share of future system expansion costs without actually causing conservation.

3. Impose Charges on Large Flows Under the Industrial Cost Recovery Program

Description: Under the Industrial Cost Recovery Program, the capital cost of the sewage treatment facility attributable to industry is apportioned on the basis of flow and pollutant load. Where a firm is able to reduce its flow, it would be able to reduce its costs under the Industrial Cost Recovery Program.

Evaluation: This is, in effect, a system development charge for sewers. A firm can reduce its charges by reducing its flow (and pollutant loadings), so this is an incentive for conservation. The ICR program applies to existing firms as well as new ones, and so is

more extensive than a water system development charge imposed only on new users. Of course, where sewers are not and will not be installed, a water system development charge is the only way of affecting water consumption.

4. Adopt Flat Rate Pricing for Water

Description: The same price would be charged for each gallon of water used, regardless of quantity. There would be no discount for large users. Presently, the following OCPC 208 Area communities have flat-rate pricing (above a certain minimum which even most residential users exceed): Abington, Avon, Bridgewater, and Easton. The others -- Brockton, East Bridgewater, Hanson, Pembroke, West Bridgewater, and Whitman -- have "sliding scale" pricing, in which the rate per gallon drops as the quantity used increases.

Evaluation: Sliding scale pricing makes water cheaper for large users, and so discourages water conservation. Flat rate pricing would have its greatest impact on firms which must view water as a raw material and make decisions accordingly as to how much of it to use.

D. Promote Water Conservation in Public and Semi-Public Buildings

This category includes schools, colleges, and public housing. Elementary and secondary schools use water principally for cafeterias, toilets, and gymnasiums; colleges have residential dormitory use as well. In the OCPC 208 Area, Bridgewater State College in Bridgewater and Stonehill College in Easton are substantial water users. (Stonehill obtains its water from Easton but is connected to the Brockton sewer system.) As with businesses, water conservation could be accomplished at less administrative costs for a single large user than for many smaller ones. If government units are to promote water conservation on the part of others, they must, to be credible, do so themselves.

1. Bill Public Users

Description: The water departments would meter and bill all users, including the school departments. (Fire departments, which draw from unmetered hydrants, would not be billed.)

Evaluation: Such a practice would force public users to be conscious of the cost of water and encourage conservation. A school department superintendent would be able to compare usage in similar schools and see where savings could be made.

2. Install Water-Saving Devices

Description: Gymnasiums, dormitories, and apartments in public housing units would be retrofitted with water-saving devices, and new structures would be required to use such models.

Evaluation: The same economic savings would apply as for private units; retrofitting costs would be lower, since it would be possible to purchase in bulk and install using existing maintenance personnel. There would be beneficial impacts in terms of publicity for water conservation, and manufacturers and distributors would be more aware of the market for water-saving devices.

The Department of Community Affairs now requires water-saving models in new state-assisted housing units.

CHAPTER 5

Industrial Wastewater Disposal

Table of Contents

	page
Types of Industrial Discharges In The OCPC 208 Area	5-1
NPDES Permits In The OCPC 208 Area	5-2
Municipal Waste Water Dischargers	5-3
Industrial Wastewater Discharge Alternatives	
I. Wastewater Treatment and Disposal by On-Site Subsurface Systems	5-7
II. Continued Discharge Under The NPDES Permit System	5-8
III. Wastewater Treatment and Disposal by Tieing into a Municipal Wastewater Collection and Treatment System	5-10
IV. Discharge to a Surface Water Body for New Industries With Installation of Facilities Capable of Tertiary Treatment of Effluent	5-12

Within the OCPC 208 study area, the impact of industrial wastewater on surface and groundwater quality has not been shown to be a serious problem. Industrial development which has taken place in the region is located primarily in the City of Brockton and the downtown area of Bridgewater which are the two major sewer service areas in the region, and in the Avon Industrial Park which is unsewered.

While not a serious water quality problem, the means by which industrial wastewater is disposed of varies in the area making the issue relatively complex. Generally the industries when grouped according to wastewater disposal practices, fall into five categories.

Type I - Sanitary wastewater only (or insignificant industrial wastewater) discharged to subsurface system

Type II - Same as Type I except discharged to municipal sewage treatment plant

Type III - Sanitary and industrial wastewater discharged to municipal sewage treatment plant

Type IV - Sanitary and industrial wastewater; sanitary discharged to subsurface disposal system; industrial discharged directly to stream and regulated by Environmental Protection Agency/ Massachusetts Division of Water Pollution Control discharge permit system (NPDES).

Type V - Same as Type IV but discharges to stream without NPDES permit

Most of the Type II and III industries are in the City of Brockton, although there are a few type IV industries. In the non-Brockton communities, the industries fall primarily into Type I, IV, and V categories with a majority of them being Type I industrial discharges.

In approaching the issue of industrial wastewater disposal, OCPC conducted a regional industrial wastewater survey in two parts: Brockton and non-Brockton industries. This was deemed the most efficient approach based on the number of industries in the City of Brockton. The results of the survey and evaluation of existing National Pollution Discharge Elimination System Permits (NPDES permits) are available in Industrial Wastewater Survey of the OCPC 208 Area.

Work related to industrial wastewater in the City of Brockton was done in conjunction with the firm of Fay, Spofford & Thorndike (FST) and was related to the development of the Industrial Cost Recovery program for the city. In Avon, OCPC has worked with its 208 consultant Anderson-Nichols, Inc. (ANCo). In the other eight 208 communities, results from an industrial wastewater survey conducted by Camp Dresser and McKee as part of the regional 201 facilities study were used.

The ability of an industry to treat its wastewater or to arrange for the treatment of its wastewater at a site other than the industrial plant itself is influenced by several factors. Historically, it has been least costly for industry to dispose of its water by discharging untreated waste directly into a neighboring water body. Certainly the nation's initial efforts to eliminate such discharges have been the impetus for treatment and efficient disposal of industrial wastewaters. The fact, however, that industry will seek the least costly alternative meeting the mandated discharge improvement /elimination establishes cost as the bottom line criteria. Evaluation of an industry' s wastewater disposal options includes assessing a receiving water's ability to assimilate the industrial effluent or the ability of a firm's wastewater to be disposed of in an on-site treatment system. Of particular importance to determining treatment options is the establishment of the toxicity of a firm's waste, which if of sufficient degree will preclude the use of "standard" treatment and disposal practices.

NPDES permits are the primary means of regulating industrial discharges. NPDES permits in Massachusetts are currently issued jointly by the Environmental Protection Agency and the Massachusetts Division of Water Pollution COntrol, under the mandates of Section 402 of P.L. 92-500. They allow for the discharge of effluents from municipalities and industries if the discharge is meeting limits established for specific parameters contained in the effluent. The permit system also contains provisions for those industries and municipalities whose discharges are not meeting established effluent quality levels. To bring these discharges up to acceptable levels, permits for non-complying firms prescribe various corrective measures and a schedule by which the corrective steps are to be completed.

Currently a total of approximately 20 discharges in the OCPC 208 Region have either applied for a permit to discharge or have been issued a permit. Among these twenty are permits for municipal sewage treatment facility discharges, municipal water treatment facility discharges and industrial discharges. Those area industries currently under the jurisdiction of the permit system are listed below. (See Table 5-1)

Abington
- Rumford Litho, Inc.

Avon
- Hermetite

Bridgewater
- Cumberland Farms, Inc.
- McIntires Dairy

Brockton
- Brockton Sole & Plastics
- Drew Tanning
- E. L. LeBaron Foundry

East Bridgewater
- Foxboro Company

Easton
    Steadfast Rubber

Hanson
    Ocean Spray Cranberry, Inc.

Pembroke
    None

West Bridgewater
    None

Whitman
    USM-Corp.
    McCarthy Brothers Ice Cream
    Whitman Plating

In addition to the industries on the NPDES permit system are the four existing wastewater treatment facilities - Abington, Bridgewater (Town and MCI), and Brockton. The Abington permit and Town of Bridgewater are discussed below. OCPC comments on the MCI and Town of Bridgewater and Brockton facilities permits are as follows:

1. MCI, Bridgewater/MA 0102237 - There are several pieces of information OCPC requires before any changes to MCI's permit can be recommended. OCPC will need to discuss with both EPA and DWPC the following issues:

-The availability of DWPC sampling information for the discharge
-Current compliance status with permit construction requirements
-Reduced treatment requirements as opposed to those set for the OCWPCD Treatment Facility
-Potential for land application

EPA's response to these issues was as follows: "The treatment plant has been under construction throughout most of the permit's life and the minimal communication indicates that it will be completed on schedule. No monitoring reports have been received due to lack of testing facilities and failure to obtain testing elsewhere. EPA relied on MDWPC for enforcement."

Division of Water Pollution Control response was as follows: "The DWPC cannot sample the discharge until the construction of the facilities. The discharge is now a primary treated effluent 50 percent of which bypasses the sand filters during construction."

2. Bridgewater STP/MA 0100061 - As in the case of the MCI facility, there are several issues related to the Bridgewater facility which must be resolved prior to OCPC's recommending permit revisions. Such issues include:

-The facilities waste load allocation
-The basis of the waste load allocation (i.e., secondary plus water quality limitations)

TABLE 5-1
INDUSTRIAL DISCHARGES IN THE OCPC 208 AREA
ON THE NPDES PERMIT PROGRAM

	DISCHARGER	ADDRESS	PERMIT NUMBER	CITY OR TOWN/RECEIVING WATERS
1.	Hermetite Corp.	100 Ladge Dr., Avon	MA0004022	Avon/Trout Brook
2.	Cumberland Farms*	143 Curve St., Bridgewater	MA0110001	Bridgewater/Taunton and the Winnetuxet Rivers
3.	McIntire's Dairy	792 Plymouth St., Bridgewater	MA0025755	Bridgewater/South Brook
4.	Brockton Sole & Plastics	53 Spark St., Brockton	MA0003212	Brockton/Salisbury Plain River
5.	Drew Tanning, Inc.**	62 Watson St., Brockton	MA0005380	Brockton/Salisbury Palin River
6.	E. L. LeBaron Foundry	14 E. Union St., Brockton	MA0005945	Brockton/Salisbury Plain River
7.	U.S.M. Corp.	98 Myrtle Ave., Whitman	MA0001171	Whitman/Meadow Brook
8.	McCarthy Bros. Ice Cream	205 Commercial St., Whitman	MA0023922	Whitman/Shaumatuscacant River
9.	Whitman Plating	256 South Ave., Whitman	MA0021741	Whitman/Hobart's Pond
10.	Foxboro Co.	200 Highland St., E.Bridgewater	MA0004103	E. Bridgewater/Meadow Brook
11.	Rumford Litho Inc.	380 North Ave., Abington	MA0023299	Abington

*(Cumberland Farms) There is no issued permit
**Tied into Brockton's STP

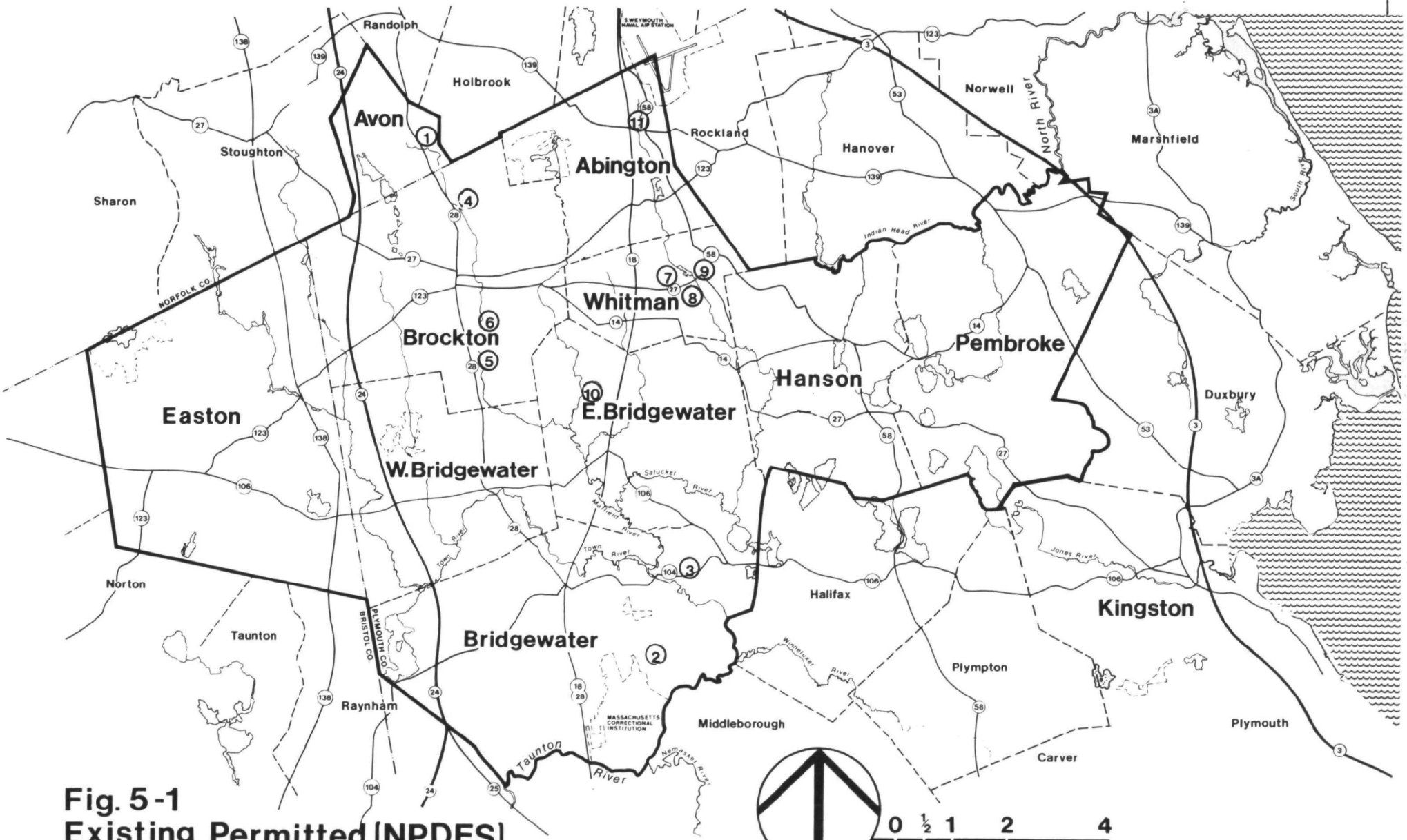


Fig. 5-1
Existing Permitted (NPDES) Industrial Discharges

Old Colony Planning Council/208 Pr gram, 1977

-The ability of new solids handling equipment to rectify existing treatment problems

-The impact of I/I rehabilitation on wet weather flows

Information obtained from EPA relative to the permit indicates that an Enforcement Compliance Schedule level (ECSL) has been issued for the discharge. The ECSL provides for extending the schedule for completion of sludge dewatering facilities and sludge disposal.

OCPC proposes no revisions to the existing revised permit.

3. Brockton STP/MA 0101010 - The City of Brockton has recently completed its Step I Facilities Planning Study and is currently beginning its Step II Design Phase for the system. Preliminary planning and design work have been based on DWPC effluent locads which will have to be reflected in the facilities new permit which will be effective upon the expiration of the existing permit on July 1, 1977.

Information obtained from EPA indicates requirements of the new permit to be written for the facility had originally been used on the Water Quality Management Plan which recommended a Biochemical Oxygen Demand (BOD_5) load of 322 lb/day. At a monthly average flow of 15 mgd the final BOD_5 effluent concentration would have to be 2.6 mg/l which represents a 98-99 percent BOD_5 removal. EPA has indicated that BOD_5 and TSS (Total Suspended Solids) effluent requirements levels will be set at a more relaxed level of 95 percent removal. In response to this recommendation, OCPC has several questions.

-In light of the fact that flows of the receiving waters for Brockton's discharge are extremely low with limited assimilative capacity should Brockton's removal requirements be as stringent as possible?
-What will the cost difference be to the operation and maintenance budget for 99 percent vs. 95 percent removal rates?
-How reasonable, on a purely operational basis, is the expectation of a 98-99% removal requirement?

OCPC recommends implementing the following recommendations as part of the City's municipal wastewater disposal program.

On the basis of existing pretreatment guidelines (1973) OCPC recommends that the City of Brockton consider implementing EPA pretreatment requirements for incompatible pollutants on the following firms:

Alden Products
Barbour Welding Company
Churchill Linen
Columbia Tanning
Garland Corporation
Hesse-Eastern
Rifor Precision Plating Corp.
Stone-Tarlow Sole Corp.

-That existing pretreatment guidelines be expanded to include BOD and SS, for all industries.

-That water saving devices and techniques be mandated in large water users of .050 mgd or more.

-That a waste oil residual management program be established. The program should require licensing of waste oil collection firms; reporting procedures for service stations with tie-ins to the municipal sewer system, and an inspection system by the city to insure oil trap maintenance.

-That rules be established regulating sizing and frequency of cleaning for restaurant grease traps.

-That an industrial wastewater monitoring program be established to implement the Industrial Cost Recovery and pretreatment programs.

-That the pretreatment requirements for industries, service stations and restaurants be included in the City's Sewer Use Ordinance.

OCPC recommends adopting the following changes in the overall permit program:

-For the purposes of issuing, revising or renewing permits for any given area, the affiliated 208 agency should be notified and involved in the process.

-Follow up on monitoring and reporting information mandated by permits should be given increased priority by regulatory agencies. Such information should be sent to the 208 agency.

-All permits should indicate the basis for their effluent limitations.

-All permit applications past and future should be referred to the 208 agency.

I. Wastewater Treatment and Disposal by On-site Subsurface Systems

Description: This alternative requires industries to provide for treatment and disposal of wastewater at or within close proximity of their plant's location at a site suitable for subsurface disposal.

Evaluation: Use of subsurface disposal and treatment for industrial wastewater will be available only to those industries for which site characteristics are suitable for on-lot disposal. Volume of flow will be particularly influential in the evaluation of the suitability of such a system. Effluent containing toxic parameters should be precluded from the discharge in areas where groundwater quality may be impacted. (See groundwater protection for siting criteria).

II. Continued Discharge to Surface Water Body

Description: On the basis of existing facilities planning in the area and previously expressed community sentiment towards installation of municipal sewage collection and treatment systems, it is assumed that several existing discharges will continue to discharge relying on individual treatment systems. See page 5-12, 13 for evaluation.

Such permittees in the OCPC area are:

1. Abington-Rockland Joint Water Works, Abington
2. Hermetite Corporation, Avon
3. Cumberland Farms, Bridgewater
4. Brockton Sole and Plastics, Brockton
5. E. L. LeBaron Foundry, Brockton
6. East Bridgewater Schools, East Bridgewater
7. Steadfast Rubber Company, Easton
8. Foxboro Company, East Bridgewater
9. Ocean Spray Cranberry, Inc. Hanson
10. Howard School, West Bridgewater
11. USM Corp., Whitman
12. Whitman Plating, Whitman
13. Town of Whitman

1. Abington/Rockland Joint Water Works/MA 0025658 - Monitoring reports information provided by EPA indicate that the Myers Ave. plant is meeting the effluent limits in its permit.

2. Hermetite Corp./MA 0004022 - The Hermetite Corporation has recently completed installation of treatment facilities required by their current permit. Limitations established for the firm appear to be a combination of BPT (Best Practicable Treatment) and drinking water standrads, (DWPC information indicates effluent guidelines stricter than those generally applied to electroplating industries were used), which on the basis of the firm's proximity to Avon's wells was originally requested by OCPC and the town of Avon. After operational levels for the newly installed system have been achieved, OCPC recommends the following:

-Based upon the results of the discharge monitoring and water quality samples taken from the well waters in Avon's downstream wells, the Regional Administrator and the Director should make a determination by December 31, 1978 if a tie-in to a municipal sewage system is necessary.

-The Hermetite Corp. shall notify the Avon Water Department immediately if the treatment facilities malfunction and cause untreated process wastes to be discharged to Trout Brook. Should the discharge of untreated waste result from a system malfunction, it shall cease as soon as practicable.

3. Cumberland Farms/MA 0110001: Considerable confusion exists in regards to the necessity of permitting the existing agricultural operation at the site. OCPC recommends on the basis of the OCPC wet weather surface water sampling data which indicates periodic discharge from the site, that a permit be required for Cumberland under the NPDES regulations related to confined animal feedlot operations (Refer to Chapter 7).

4. Brockton Sole and Plastics/MA 003212 - OCPC proposed no revisions to the existing permit. OCPC had suggested as part of our interim outputs that process related information contained in the permit be up-dated. In response to the comments EPA indicated that there had been no quarterly monitoring report since August 1976 and that enforcement proceedings would be initiated.

5. E. L. LeBaron Foundry/MA 0005945 - Information provided by EPA indicates that the firm has eliminated its process discharge while a second storm drain system discharge is continuing. DWPC states that the remaining discharge consists of storm drainage and compresser cooling water only and that no need to eliminate this discharge exists. OCPC recommends no changes to this permit.

6. East Bridgewater Schools/MA 0022446 - EPA has stated that effluent monitoring results at the facility indicate that the facility is in compliance with discharge requirements. As discussed in OCPC's interim outputs the permit currently calls for the tie-in of the discharge to the OCWPCD collection facility when it becomes available. OCPC proposes no revisions to this permit (EPA indicated that BOD loadings from the school are very low requiring allocation of very few pounds of load to the flow).

7. Steadfast Rubber - OCPC has not received this permit and will comment upon receipt of this permit.

8. Foxboro Company/MA 0004103 - The Foxboro Company currently has two existing discharges, one industrial and one sanitary. The permit requires submission of a report on how the firm intends to attain effluent levels capable of meeting waste load allocations. It is unclear whether such limits have been developed. If the Foxboro Company is incapable of meeting waste load allocations, the permit requires a tie-in to an East Bridgewater system. OCPC does not recommend any changes to this permit.

EPA comments on the permit are as follows:

"The (1973) Taunton River Basin Water Quality Management Plan designates no target effluent load for this permit. However, it is meeting secondary limits for treating its sanitary discharge. At 21,500 GPD (from 1000 employees) and 30 mg/l average BOD_5 the total oxygen demand load would be only 7.9 lb/day. More comprehensive waste load allocations in the Upper Taunton River Basin are truly needed."

9. Ocean Spray Cranberries/MA 0110019 - Having moved their processing operation out of the region, OCPC felt that comments on the permit were not necessary. EPA comments on the permit were very informative and are below.

"This is a bog and may require a general permit. A general permit is to cover situations such as irrigation, where there are very many contaminated, dispersed discharges."

10. Howard School/MA 0101753 - EPA reported that as stated by OCPC previous reporting information showed the treatment facility meeting effluent limits. No monitoring reports have been received during the past (76) school year. The file has been referred to the EPA water compliance section for enforcement. The new permit will not require any treatment improvements but will require tie-in to any sewer system when an interceptor is accessible to the school.

11. USM Corp., Whitman Metal Stamping Division (MA 0001171) - On the basis of OCPC interim output recommendations relative to this permit, EPA has proposed the following:

- -Information on additional, significant parameters for effluent limitations will be sought
- -Permit modification will be prepared for these and higher average flow reported
- -If any discharged parameters are detrimental to water quality, tie-in to an available sewer interceptor will be required

OCPC recommends no further changes to the permit.

12. Whitman Plating Company, Inc., (MA 0021741) - OCPC recommends that if after design operational levels of the firm's treatment system are reached, the Regional Administrator or the Director determine a significant impact, the firm's discharge should tie-in to Whitman's collection system when it comes on-line.

13. Town of Whitman/MA 0101028 - EPA has informed OCPC that this permit is classified as no permit required (NPR) because it applies to the town's septic tanks. EPA will keep the permit on file and on NPR - inclusive printouts for reference. EPA stated that Whitman may have a treated discharge in the future. Division of Water Pollution Control comments on OCPC's interim outputs state that the exisiting permit regulates an "existing, proven point source of pollution" referring to the town's drainage system. OCPC recommends that the apparent controversy be investigated.

III. Wastewater Treatment and Disposal by Tieing in to a Municipal Wastewater Collection and Treatment System

Description: Industries presently discharging to surface water are those industries for which sub-surface disposal is inadequate. They would tie-in to municipal wastewater collection and treatment systems.

Evaluation: Certainly the applicability of a municipal wastewater collection and treatment facility will be dependent on the availability of this alternative in the OCPC 208 area. Current planning for the regional OCWPCD municipal collection and treatment system provides capacity for industrial wastewater flows in the system. There are, however, only two existing municipal collection and treatment systems in the entire region into which an industry not presently discharging to a collection system may connect i.e. Brockton and Bridgewater. If municipal facilities become available, industries will have to evaluate the costs to be incurred which will include the connection charge, user charge, Industrial Cost Recovery charge and costs due to pre-treatment of the firm's wastewater if necessary.

Those discharges which are likely to be eliminated as a result of implementing current facilities planning studies are:

1) Town of Abington Filter Bed System
2) Rumford Litho, Inc.
3) McIntire's Dairy, Bridgewater
4) Drew Tanning, Brockton
5) McCarthy Brothers Ice Cream, Whitman
6) Whitman-Hanson Regional High School, Hanson

1. Town of Abington Filter Bed System/MA 0101443 - The permit granted for the Abington filter bed system calls for the elimination of the discharge via a tie-in to the Rockland or the Old Colony Water Pollution Control District's treatment facility. The recently completed local 201 facilities study recommends that the northwest sector of Abington which includes the filter beds be tied into the Rockland system.

-Abington shall prepare a time schedule by December 31, 1977 for a proposed tie-in to the Rockland Sewage Treatment Plant. Tie-in to Rockland and elimination of the Abington discharge shall be achieved upon certification by the Regional Administrator and the Director that the Rockland STP is sufficiently capable of handling Abington's wastewater.
-Abington and Rockland shall execute an intermunicipal agreement by June 30, 1978.

2. Rumford Litho, Inc./MA 0023299 - OCPC is not recommending any changes in the permit requirements for the firm. The permits schedule of compliance calls for elimination of the discharge by October of 1977. Information obtained through EPA indicates that Abington granted the firm permission for the use of a holding tank to store the firm's wastes between pumpouts.

3. McIntire's Dairy/MA 0025755 - A draft permit based on site inspection by the state has been written. Possible tie-ins to the Bridgewater Sewage Treatment Plant (STP) by June 1, 1978 or to the OCWPCD facility in 1983 are suggested. In addition, the permit provides for investigating treating the existing effluent for a direct discharge meeting effluent limits. OCPC does not propose any changes to this permit.

4. Drew Tanning/MA 0005380 - As indicated in the interim outputs prepared by this office, Drew Tanning has tied in its discharge to the City of Brockton's municipal collection and treatment system. The facility will remain in EPA MISCS /computerized listing, classified as No Permit Required (NPR). EPA has indicated that NPR (tie-ins, discharge cessations etc.) remain in the computer file, properly labeled for accountability and reference.

5. McCarthy Brothers Ice Cream/MA 0023922 - EPA in responding to interim output recommendations has indicated that a permit for the firm's discharge will be drafted, drafting of the permit, however, is of low priority.

6. Whitman-Hanson Regional High School/MA 0101354 - EPA has provided OCPC with the proposed permit issuance for the facility. Advanced treatment effluent limits are proposed allowing for continued discharge from the facility. Status of the tie-in to a municipal collection and treatment system in Whitman must be reported annually. OCPC proposes no changes to the permit.

In light of the fact that costs associated with industrial waste treatment (i.e., ICR, pretreatment, etc.) are based on the volume and constituents of the firm's wastewater flow,measures taken to reduce either flow volume or constituents will provide for reduced treatment requirements and costs.

A. Provide for In-House Process Changes to Reduce Effluent Parameters

Description: Implementation of in-house process changes would entail changes to the system(s) used in the production of the firm's product or using less toxic or more easily treated raw or process materials.

Evaluation: Reduction of parameters in the effluent or increasing the treatability of the effluent by using a more easily treated material will reduce treatment costs.

B. Provide for Water Conservation Practices to Reduce Wastewater Flows

Description: Apply water conservation measures as discussed in Chapter 4 to both existing and new industries.

Evaluation: Although discussed as part of the municipal treatment and collection facilities, alternative wastewater conservation will improve the treatment capability and reduce the costs of any industrial wastewater treatment alternative.

IV. Discharges to a Surface Water Body For New Industries After Installing Facilities Capable of Tertiary Treatment of the Effluent

Description: Discharge to a surface water body in the OCPC area will require tertiary treatment. Firms opting for this alternative will be required to install and operate the necessary treatment systems to attain the effluent parameters levels set by the Division of Water Pollution Control (Westboro).

Evaluation: Surface water discharge may be desirable for several reasons. If an industry is meeting discharge limits set for it by the DWPC and included in its NPDES permit, it is not expected that such a discharge would negatively impact the existing water quality of its receiving water. In addition, a surface discharge with tertiary treatment may be of comparable cost to tieing in to a municipal wastewater collection and treatment system. Certainly a firm which will be required to pre-treat its effluent prior to discharging into a municipal collection system, in addition to expending monies for hook up to the system, plus paying user and ICR charges will be faced with significant costs. When compared to a surface discharge of tertiary effluent for which tax incentives for the purchase of treatment equipment exist and which eliminates the need for long term community assessments, tie-in to a municipal system may not be as desirable an alternative as expected.

It should be noted that new industrial discharges will have to comply with the anti-degradation policy as established by the DWPC. No new discharges will be allowed upstream of existing municipal wastewater treatment facility discharges.

CHAPTER 6

Urban Runoff/Construction and Development

Table of Contents

	Page
Background	6-1
-Impacts of urbanization	
-Stormwater control investigations under the 208 program	
I. Control Urban Runoff in Brockton	6-4
A. Control Urban Runoff Through Best Management Practices	
1. Place Priority on the Ellis Brett Pond and French's Brook Watersheds	
2. Implement Nonstructural "Best Management Practices" Throughout the City of Brockton	
B. Require an Urban Runoff Control Program Through the NPDES Permit System	
1. Issue a General Permit to Brockton For Stormwater Runoff Under the NPDES Permit System	
2. Make Stormwater Control a Condition of the Brockton Sewage Treatment NPDES Permit	
II. Control Urban Runoff in Other Urbanized Areas	6-9
A. Apply the NPDES General Permit System to All "Urbanized" Areas	
B. Investigate Stormwater Runoff Through a Continued 208 Program	
III. Adopt Preventive Measures for Future Development	6-11
A. Impose Controls Under Subdivision Regulations	
B. Impose Controls Within the Zoning By-Law	
C. Impose Controls Through a New Municipal By-Law	
D. Require Local Environmental Impact Statements on New Developments	

E&A analysis says that agricultural runoff is also a source of pollution problem as urban runoff.

OPC 208 Report DRAFT

P. 1-1 2nd paragraph
coliform reduction - doubtful

in Appendix → ? what are OPC sampling results

Sampling data does not indicate # of samples, what the #'s represent, flows of water sampled at time of sampling. composition site sampling at areas of no problems.

Analytical methods etc.

Chapter 4. Municipal Wastewater Disposal
P. 4-35 (bottom) — model correctness ?
WLA for Salisbury plain River

		BOD_5	NH_3	P	DO
Brockton WPCF	18.0 MGD	3.0 mg/l	1.0 mg/l	1.0 mg/l	7.0 mg/l

Chapter 5. Industrial Wastewater Disposal
{nothing important here}

Chapter 6. P 6-3 conclusion 5
even though levels can be significantly reduced can they be reduced below potential problem levels.

Chapter 6 → Urban Runoff / Costs & Development.

* we don't give people much to make choices about.

The topics in this chapter are related to the impacts on water quality from the creation and existence of developed urban areas. "Urbanization", as this process of development is called, has effects beyond the municipal and industrial wastewater disposal problems discussed in Chapters 4 and 5. During construction, when vegetation is removed from previously forested or grassed lands, erosion can occur more readily, and sediment can be carried into streams. This can reduce the flow capacity of a stream and increase flooding, and also damage the aquatic life by covering bottom vegetation and spawning areas with silt. Once development is completed, an urban area permanently alters the characteristics of streamflow, in terms of both water quality and water quantity.

• Water quantity: Urbanization increases impervious surfaces by creating paved and built-upon areas in place of pre-existing vegetation. The result is that the proportion of rainfall which infiltrates into the earth is reduced and the proportion which runs off across the land surface is increased. Surface runoff reaches streams more rapidly than water percolating through the ground; the net result of reduced perviousness, then, is to increase the quantity of water which reaches streams shortly after storms. Also, the collection and transport of runoff waters in storm sewers heightens this effect by increasing the speed at which surface runoff reaches streams. These changes therefore cause higher peak flows after storms, and hence more frequent and more severe flooding. (The use of floodplains and wetlands for urban development still further aggravates the situation by eliminating areas which serve to store water at periods of high flow and release it later. Wetlands and floodplain protection are discussed in Chapter 9.)

• Water quality: Water quality problems in streams are often at their worst in periods of low flow, when less water than normal is available to dilute continuous pollutant concentrations (as from wastewater and industrial discharges). By reducing infiltration and increasing the amount of streamflow immediately after a storm, urbanization thereby lessens the amount of precipitation which reaches groundwater and reduces the flow of groundwater into streams. It is this flow which furnishes most of the flow in streams during periods of little rain. Therefore, urbanization reduces this "base flow" and aggravates low flow conditions.

When storms do occur, water quality in streams draining urban areas is degraded by the pollutants carried into the streams by the runoff. These can include oil, grease, and metals from automobile bodies and exhaust, oxygen-demanding organic loadings from animal droppings and leaves and garden debris carried into the storm sewers, and sediment from sand and dirt on street surfaces. Less directly, water quality can be degraded if stormwater runoff overloads sewage treatment plants and causes them to bypass wastes without treating them.

Urbanization can also affect water quality by raising stream temperatures. Clearing of vegetation from streambanks allows sunlight to reach and heat the waters; runoff from paved areas is warmed by the heat stored there; and the reduction in groundwater flow lessens the cooling effect of such water.

Other adverse water quality impacts of urbanization are aesthetic ones: erosion of streambanks from increases in the volume and speed of storm flows; sedimentation of streams; and human misuse and abuse of streams for trash dumping.

Where urbanization has not yet occurred, a preventive process can be instituted to lessen these adverse impacts. Controls can be placed on the manner of development to minimize erosion and sedimentation, and measures can be required to reduce the rate, quantity, and pollutant loadings of surface runoff. Applying such measures to areas already developed is more difficult and costly.

Unlike municipal wastewater collection systems, in which waste is collected from a wide area and transported to one place for treatment, municipal storm drains collect water from small catchment areas and discharge those waters into nearby streams. (There are no combined sewer systems in the OCPC 208 Area -- i.e., there are no systems in which storm flows are directed into sewage mains for joint treatment at a central location.) Consequently, it is a matter of definition as to when individual drains are extensive enough in a community to be considered as a storm sewer "system". Storm sewers serve most developed areas of Brockton and the downtown area of Whitman. Elsewhere in the OCPC 208 Area, storm drains have been built for individual streets and subdivisions on a less systematic basis.

At the commencement of the OCPC 208 project, the extent and relative significance of local urban runoff pollution had been investigated only in a limited fashion. As part of its planning efforts for the Taunton River Basin, the Division of Water Pollution Control sampled five sites in Brockton in 1972 and 1973 during one dry-weather and two wet-weather periods. The sampling indicated that the background water quality of Salisbury and Trout Brooks in dry weather was good, but that levels of total and coliform bacteria, BOD, suspended solids, and phosphorus increased downstream of the downtown area during storms. (Division of Water Pollution Control, Taunton River Basin: Water Quality Management Plan (1973), pp. 56-58.) This evidence suggested that stormwater runoff was a pollution problem which merited attention in the 208 program.

The sampling programs which have been carried out during the two-year OCPC 208 project are described in Chapter 1, and sampling results are presented in the Appendix. In addition to several in-stream sampling programs, OCPC contracted with a consultant for the collection of stormwater samples from three drainage areas in Brockton, through the sampling of drainage pipes which discharge to streams. Samples were collected at short time intervals (24 samples during a 3 1/2 hour period) by automatic sampling equipment, during three storms. (The sampling results are contained in a report entitled: "Section 208 Stormwater Measurement Program Results", prepared for OCPC by its consultant, Energy and Environmental Analysis (EEA).) The results are now being used by EEA to estimate emissions for the city

as a whole. This analysis will be completed later in the summer. The sampling programs in Brockton have shown the stormwater runoff problem to be a complicated one. The sampling results from dry-weather periods (see the Appendix) revealed significant total and fecal coliform bacteria problems at many locations in Brockton, and instances of high nitrate, phosphorus, and chloride levels. Therefore, the judgment expressed in the DWPC Taunton River Basin Plan of 1973, that background water quality during dry weather is good, would now have to be reconsidered, based on this additional evidence. It does, however, remain true that wet-weather samples from Salisbury Brook, Trout Brook and the Salisbury Plain River show substantial increases in pollutant loadings over dry weather results for certain parameters, especially total coliform bacteria.

Additional difficulties in interpreting the sampling results are caused by the variation in pollutant loadings from one storm to the next and by the limited data on stream impacts from the temporary surge of pollutant loadings associated with stormwater runoff. Some conclusions can be made, however, which should be considered in selecting a stormwater runoff control program for the OCPC 208 area:

1) Within Brockton, the closing of Ellis Brett Pond to swimming is an instance where urban runoff has a definite impact on use of local water resources. Urban sources upstream of the pond therefore deserve attention.

2) The wet-weather sampling in Brockton showed that the French's Brook area in south-central Brockton had pollutant loadings (in terms of concentration and loadings per acre) well above those found in other areas. If it were necessary to single out one area within downtown Brockton for further scrutiny and control measures, the French's Brook area would deserve priority.

3) At the present time, it is difficult to separate direct stormwater runoff pollution from wastewater pollution in Brockton. The high coliform bacteria counts found in both dry and wet-weather samples upstream of the Brockton treatment plant could be due to sewage discharges into storm drains, either through direct tie-ins or by leaks in sanitary sewer mains. Also, the Brockton plant is overloaded during storms because of infiltration and inflow from storm sewers into sanitary sewers. The result is that sanitary sewage on occasion flows directly into the Salisbury Plain River without treatment or with only chlorine dosing. These problems are being corrected through the expansion of the Brockton plant under the 201 program and work to reduce infiltration and inflow problems.

5) Although phosphorus levels in the Brockton streams do rise during storms, the phosphorus concentration below the treatment plant is much higher than upstream of the plant (at least five times higher, sometimes more than 20 times higher). Consequently, while urban runoff controls may be desirable to reduce phosphorus loadings, high levels of phosphorus removal by the treatment plant would be more significant in reducing the concentration of phosphorus in the Salisbury Plain River.

6) The quantities of pollutants and the location of their emissions varied from one storm to the next, making it difficult to select one control over another on the basis of that control's effectiveness for a particular parameter. Besides French Brook, some areas of the city warrant further field investigation, since variations among storms suggest the existence of special intermittent sources which would not be corrected through general maintenance practice. I.e., if the problem is a sanitary sewer line which overflowed during one of the three storms sampled, additional street sweeping or catch basin cleaning would not eliminate the problem.

7) Although the sampling results indicate that control of runoff pollution is complicated, they do not justify a conclusion that such pollution is unavoidable. The variability in the data, both from one site to the next in the same storm and for each site among the different storms, suggests that there are indeed factors which cause pollution to occur in one instance and not another.

8) A stormwater control program can involve unexpected gaps in the availability of basic and necessary data. In this particular case, the lack of an up-to-date and complete drainage system map for the City of Brockton has been a problem for the 208 stormwater studies.

The remainder of this chapter is organized in three sections: stormwater control in Brockton; stormwater control in other urban areas; and preventive controls for urbanizing areas.

I. Control Urban Runoff in Brockton

This section discusses alternative strategies and regulatory programs for achieving a reduction in stormwater pollution loadings from Brockton. Control of urban runoff is likely to take a number of years, with some short-term measures possible and other measures dependent on the collection of more data and improvements in the state-of-the-art of stormwater control. What will be necessary is to identify more specifically the types of non-point sources which are contributing to identified urban runoff problems. This sort of inspection and analysis will in itself be expensive, requiring manpower and sampling capabilities. Control measures can vary in cost from fairly low (as for training drivers in improved sweeping procedures) to high (if structural solutions are warranted). If requirements are imposed on the City of Brockton and no financial or technical assistance is made available, the fiscal impacts would be heavy, and environmental gains would be slowed by resistance to the requirements.

A. Control Urban Run-off Through Best Management Practices

Two alternatives are presented: one, focusing on the known problem areas of Ellis Brett Pond and French's Brook Watershed: the second, applying controls to the city as a whole. In the short run, the first alternative has advantages of being tied to existing problems or to sites for which data exists on current emissions. However, to accomplish

a larger goal of abating water pollution in the Salisbury Plain River and its tributaries, a program which corrects runoff pollution throughout the city would be necessary. Therefore, the expertise gained in localized areas would ultimately have to be applied city-wide. Thus, the second alternative could be viewed as a long-term measure.

1. Place Priority on the Ellis Brett Pond and French's Brook Watersheds

Description: Priority would be given to two known problem areas. A proposal to restore Ellis Brett Pond to swimmable conditions, prepared by the 208 staff and the City of Brockton, has received approval from EPA, which will fund 50 percent of the costs, with the other 50 percent from local and state funds. A mix of structural and nonstructural measures may be required to correct problems associated with nearby commercial development and upstream sources. French's Brook, as mentioned above, showed the highest levels of stormwater pollution in the wet-weather sampling program. Field investigations and additional sampling would be conducted, and proposals developed to correct the problems identified.

In addition, the drainage sampling information already in hand for two catchment areas within Brockton would be used as the basis for "pilot project" tests of nonstructural runoff controls. One area, in the Tremont Street-Warren Avenue neighborhood, is an older area of single-family and two-and three-story apartment houses; the other, around Reece's Circle in northeast Brockton, is an area of post-World War II single-family housing. (The third area sampled was Westgate Mall, which would be covered by the Ellis Brett Pond program.) "Best Management Practices" suggested in stormwater control literature, such as more frequent street sweeping, use of more advanced sweepers able to pick up smaller particles, and catch basin cleaning, would be followed in various mixes, and sampling conducted to check on the effectiveness of these controls for various storms.

Evaluation: The concept of this alternative is to use the data gathered under the 208 project in ways that would be productive in the relatively short run. Estimated cost of the Ellis Brett project would be $213,000, and would result in a significant water quality improvement. The French's Brook project would provide a chance to determine whether localized pollution problems of this sort can be readily corrected, and at what cost. A rough estimate of the cost for the investigatory and sampling work would be $3,000. Structural solutions might be required, such as the rebuilding of sanitary sewers and storm sewers. The priority of such a project for 201 assistance (for the rehabilitation of an existing system) would have to be determined. The Tremont Street and Reece's Circle pilot projects would have to be carried out over a long enough time (perhaps two years) to allow for testing of practices during a variety of storms. $10,000 would be a rough estimate for such a project. These test areas would allow the evaluation of various techniques at the local level and provide a basis for deciding whether to require controls on a wider scale.

2. Implement Nonstructural "Best Management Practices" Throughout the City of Brockton

Description: Under this alternative, improved surface maintenance practices would be applied throughout the city. As examples: sweeping would be conducted more frequently and catch basins would be cleaned regularly. More litter baskets would be placed in public areas. Alternate-side parking regulations would be adopted to allow for efficient street sweeping. An ordinance would be passed setting standards for the maintenance of privately-owned areas, such as shopping center parking lots. Residents would be required to bag leaves and leave them at curbside for pickup.

Evaluation: Some capital costs would be associated with this alternative, since it would probably be necessary to purchase additional street sweepers. Operational costs would include the time spent by personnel in street cleanups, time necessary for training in proper operation, and the costs of publicizing and enforcing new regulations.

To the extent that this option involves adoption of new regulations, there is liable to be political resistance to the program, and some of the regulations may be difficult to enforce. This will particularly be true if it cannot be demonstrated that the controls will have a significant impact on water quality. A continued stream monitoring program would be warranted to check on the effectiveness of the control program, and this would impose additional costs. Without a determination as to the actual sources of wet-weather pollution loadings (i.e., whether they are related to surface activities or caused by sewerage interconnections), it cannot be said that better surface maintenance is necessarily the most cost-effective solution to Brockton's urban runoff problems.

B. Require an Urban Runoff Control Program Through the NPDES Permit System

Two alternatives are discussed for means by which an urban runoff control program could be made a mandatory part of overall water pollution control efforts as a part of the National Pollutant Discharge Elimination System (NPDES). A formal requirement for a stormwater control program appears warranted, on the basis of the sampling results obtained through the OCPC 208 program. The formal procedure imposes requirements on both the issuer of the permits and on the permittee. The issuer has the responsibility of assessing the effectiveness of the stormwater control program and justifying requirements by relating them to water quality impacts. The permittee is obligated to reduce stormwater pollution insofar as it is possible, and has the opportunity to formulate a control program and demonstrate good faith efforts to identify and abate pollution.

Without a formal stormwater control program, it will be difficult to justify controls upon other nonpoint sources, such as landfills and agricultural operations. It may be easier to identify pollution from, and specify control measures for, those sources, but if stormwater is contributing far more of the total load, control programs for other sources may not be sufficient to achieve water quality goals.

1. Issue a General Permit to Brockton for Stormwater Runoff Under the NPDES Permit System

Description: Under Section 402 of the Federal Water Pollution Control Act, permits have been issued to point source dischargers, specifying limits on effluent quality and schedules for upgrading to meet water quality standards. In accordance with recent court decisions, EPA has proposed to extend the permit program (known as the "National Pollutant Discharge Elimination System" or NPDES for short) to urban storm sewer systems. EPA proposes to issue general permits. The permits will apply to publicly and privately-owned storm sewer drains within a geographical area (which may conform with 208 Area boundaries). Individual permits could be issued for significant pollution sources or where there is evidence of noncompliance with approved 208 plans. The rationale for the proposed approach (which is being applied to some agricultural activities as well) was explained by EPA in the Federal Register, February 4, 1977 (A BMP is a "best management practice"):

> ...EPA is not prepared to impose uniformly applicable BMP requirements on all communities with stormwater pollution problems. Instead, BMP's must be tailored to the specific area which they serve, taking into consideration local variations in geography, geology, meteorology, rainfall, (and) topography...
>
> ...Given the variable nature of pollutant discharges from separate storm sewers ... and the inability to impose nationally applicable substantive requirements at this time, most first generation general permits will authorize current discharges. However, a failure to develop and implement adequate 208 plans may compel more substantive restrictions in second generation general permits or in individual permits, which could include conventional effluent limitations, management practices, or other appropriate requirements.

Under this alternative, it would be expected that the Massachusetts Division of Water Pollution Control would issue a corresponding state permit under the Clean Waters Act.

It would be possible to incorporate one of the best management practices alternatives listed above within the terms and conditions of the permit. Also, it would be possible to use the permit initially as a data-gathering tool, by requiring the submission of information on frequency of street sweeping, volume of material collected, etc.

Evaluation: If the permit system is to be an effective tool for abating stormwater pollution, both EPA and the DWPC will have to assign personnel with expertise in stormwater pollution analysis to overseeing such permits. While lack of national standards allows flexibility to meet local conditions, it also requires the ability and willingness of local water pollution control agencies to set significant conditions on their own initiative. The continued existence of a technical capability

within OCPC would be important to the operation of a permit system, since the intent of EPA is that the storm sewer permits be closely tied to the 208 plan. An obstacle to the effective use of a permit system is the lack of financial incentives, in that storm sewers are not now eligible for Section 201 construction grants. A commitment would have to be made for continued monitoring, which is expensive for stormwater analysis. See Chapter 5 for further discussion of the NPDES permit system, since some comments offered there on the present administration of the NPDES program would be applicable to this new extension of that program.

2. Make Stormwater Control a Condition of the Brockton Sewage Treatment Plant / NPDES Permit

Description: Under this option, urban runoff from Brockton would be viewed as a component of Brockton's total pollution loading to the Salisbury Plain River, along with the treatment plant effluent. The NPDES permit for the Brockton plant would therefore be rewritten as a joint permit for Brockton's stormwater and wastewater discharges. The compliance schedule for stormwater control would specify a series of actions to identify and reduce stormwater runoff, including data gathering and reporting, changes in municipal ordinances such as those mentioned above and corrective measures where needed.

Evaluation: This alternative would tie stormwater control more closely to an existing program. It would provide a stronger, more enforceable set of controls than under the first alternative, since 201 grant assistance for wastewater treatment would be linked to observance of a stormwater control schedule. A joint permit system would encourage an integrated approach to setting allowable loads based on stream capacity. For example, if Brockton's allocated load were fixed, then the city and the DWPC could consider which mix of stormwater controls and levels of treatment plant operation would be most cost-effective in meeting that load allocation. DWPC plans to have the capability to incorporate wet-weather loadings into its dry-weather river basin models, so as to determine the total allowable load, by the end of 1977.

An objection which would probably be raised to this alternative is that it would disrupt the present administrative arrangements for issuance of municipal permits and make the process more complicated. Also, it would require coordination between those heretofore responsible for overseeing conventional treatment plant permits and those with expertise in stormwater control. A response to this would be that such coordination will be necessary in any case if permit conditions are to be based on actual loadings from all sources.

Under this approach, Brockton is made responsible for regulating both private and public stormwater discharges in the city. A permit of this sort could not cover upstream sources outside the city limits and therefore beyond Brockton's control, which would have to be controlled under separate permits for those areas.

II. Control Urban Runoff in Other Urbanized Areas

Stormwater control programs would be applied to other developed areas besides the City of Brockton. Since no special wet-weather sampling program has been applied to these areas under the 208 program (due to the priority given to assessing runoff levels in Brockton), a control program would consist initially of sampling to assess the needs for controls and collection of information on the extent of drainage systems and present maintenance practices. (The experience of the 208 program in Brockton indicates that keeping an up-to-date municipal drainage map is of primary importance.) Where problems were identified, control measures would be developed, as for Brockton. Connections of waste discharges to storm drains are alleged to be a problem in Whitman and may exist in other downtown areas, so that as with Brockton, a survey would be required to isolate those problems which are due to permanent dry-weather flows from those actually related to stormwater runoff. As is the case for Brockton, the investigation and control of runoff in other urban areas will involve additional costs. Lacking data on the present extent of runoff pollution, it is not possible to estimate the environmental improvement that would result from a control program. Priority for investigation might best be given to places where urban runoff could potentially be significant to particular water bodies, such as Island Grove Pond in Abington, Hobart Pond in Whitman, and Forge Pond in East Bridgewater, all of which are close to developed areas.

Two alternatives are presented here for implementing such a program.

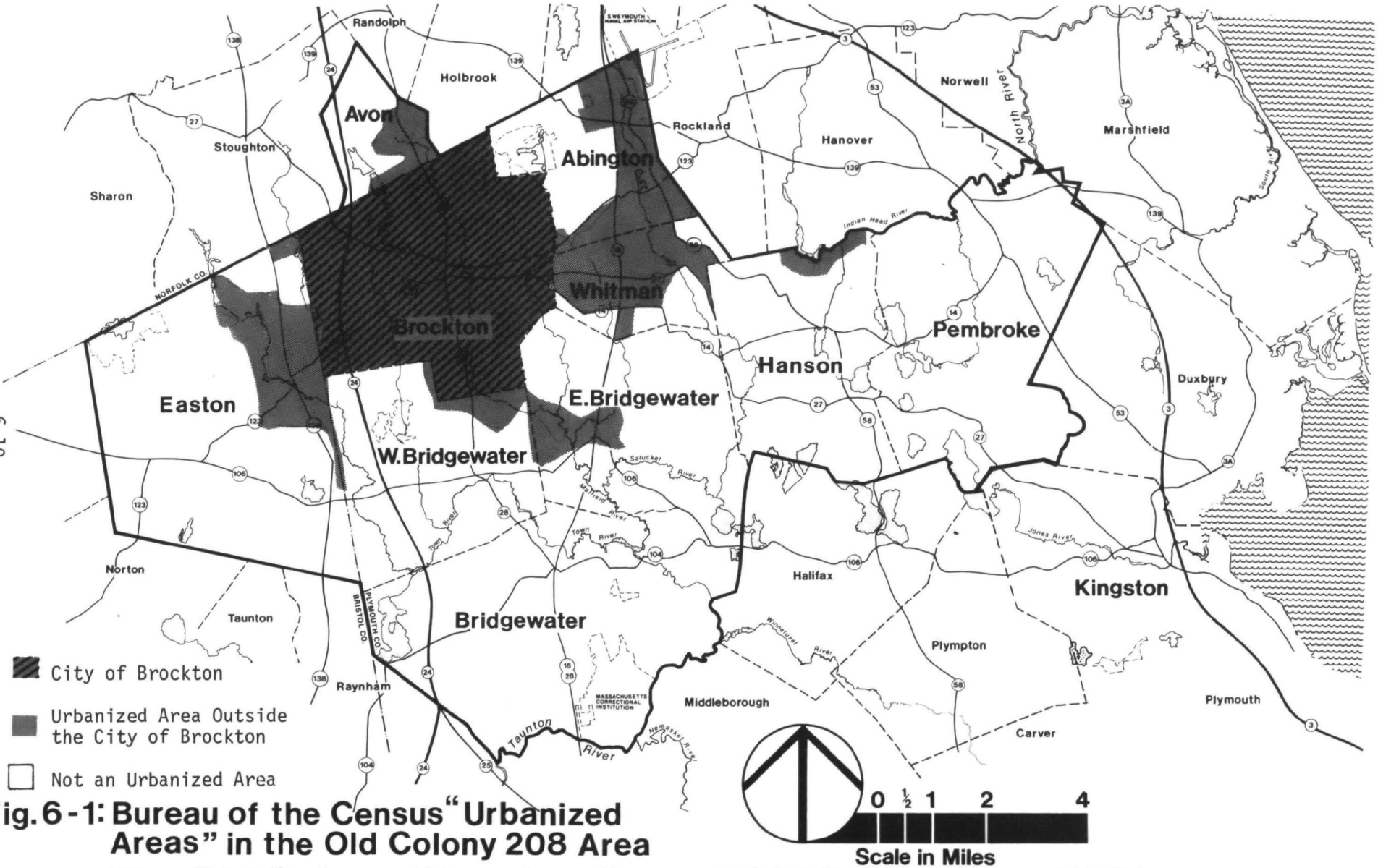
A. Apply the NPDES General Permit System to All "Urbanized" Areas

Description: The applicability of the NPDES point-source permit program to storm sewers was described above in the section on Brockton. Under the terms of the EPA regulations, all separate storm sewers are to be covered by the general permit system (unless they are otherwise covered by individual permits). The term "separate storm sewer" is defined by EPA as:

> ...a conveyance or system of conveyances (including but not limited to pipes, conduits, ditches, and channels) located in an urbanized area and primarily operated for the purpose of collecting and conveying storm-water runoff. (40 CFR 125.52)

The term "urbanized area" has a specific official meaning: it refers to those areas so designated by the Bureau of Census. Figure 6-1 shows the portions of the OCPC 208 Area which are presently so designated. Included are the entire city of Brockton, southeastern Avon, northeast Easton, most of Whitman, the eastern and southern parts of Abington, East Bridgewater Center, a portion of West Bridgewater adjacent to the Brockton line, and a small area in Hanson along the Indian Head River. No areas in Bridgewater or Pembroke are designated as "urbanized areas".

Outside of these areas, the storm sewer permit program would only apply if the EPA Regional Administrator designated a particular storm sewer system as a "significant contributor of pollution" to navigable waters.



6-10

Fig. 6-1: Bureau of the Census "Urbanized Areas" in the Old Colony 208 Area

The Old Colony Planning Council/ 208 Program, 1977

General permit conditions are to be the same for all storm sewers within a particular geographical area. EPA is to designate these geographical areas (called "General Permit Program Areas", or GPPA's for short). Given the different level of problem and the amount of sampling data available for Brockton as opposed to the other areas, it would be best to establish one GPPA for Brockton and another for all other urbanized areas in the 208 Region.

The general permit program would be used to require the control program outlined above (including data collection as an initial step). Additionally, the general permit system would be a means for requiring the adoption of preventive measures, such as those described below (see part III).

Evaluation: The general permit system would be a way to implement investigation of stormwater runoff outside of Brockton. The permit program would be difficult to implement without the existence of an on-going 208 agency able to carry out the investigations and assign priorities. Also, the expense of such work, based on the funds expended under the 208 program for stormwater runoff studies in Brockton, could be in the tens of thousands of dollars. Investigation and elimination of wastewater tie-ins to storm drains might be fundable under a local 201 program, but otherwise, obtaining funds would be a problem. The use of the Bureau of Census definition for urbanized areas has drawbacks for the establishment of stormwater control regulations. For example, Bridgewater center is more heavily developed than some of the designated urbanized areas, and yet none of Bridgewater is so designated.

B. Investigate Stormwater Runoff Through a Continued 208 Program

Description: OCPC would continue to play a role in the investigation of nonpoint sources, including stormwater runoff. Provision would be made for stormwater sampling in urbanized areas outside of Brockton to determine if stormwater runoff were a problem.

Evaluation: This approach would leave open the priority to be given to this topic on a region-wide basis within an on-going 208 program. It would allow for investigations or case studies of a selected number of areas, rather than uniform data collection as might be legally required under a general permit. Where a problem were found to exist, recommendations could be made to EPA on the imposition of individual or general permits. The cost would be less than that to implement a full-scale general permit program, since administrative costs for reporting information would be reduced, and costs of sampling and fieldwork could be limited by the selection of areas for investigation. However, sources of funding would still have to be found for whatever work was to be done.

III. Adopt Preventive Measures for Future Development

Description: Each town would institute a series of controls to minimize adverse water quality impacts from construction and land development. (Wastewater disposal is discussed in Chapter 4.) A control program would consist

of measures related to the following topics:

•Sediment and erosion control -- during the construction period when land surfaces are exposed, steps would be required to prevent erosion and subsequent sedimentation. They would include limits on the land surface to be exposed at any one time, requirements for mulches or plant covers on exposed areas, diversion of drainage from exposed areas, and prompt revegetation upon project completion.

•Drainage controls -- Drainage needs to be engineered in such a way as to prevent flooding on the site while not causing flooding problems downstream -- i.e., a system which rapidly removes water from a project area may solve problems there while creating new ones by increasing runoff rates and volumes downstream. Also, fast-moving water can carry greater sediment loads (and the pollutants which are attached to soil particles), so "efficient" drainage can increase pollutant loadings. Proposed drainage systems should therefore be reviewed with environmental considerations in mind. The objective should be to have runoff patterns after construction resemble as closely as possible those existing beforehand. Devices to slow direct runoff to streams (such as detention basins or temporary ponding areas) and use of natural systems as much as possible (such as providing dry wells for rooftop and gutter drainage in preference to connections with storm drains) would be considered. The drainage "system" would be considered in the widest sense as involving the design measures which can minimize the rate or volume of runoff as well as the channels or pipes provided for the carrying and discharge of stormwater.

•Surface maintenance -- To reduce the pollutant loadings carried in stormwater, regular cleaning of paved areas and catch basins would be required.

•Wetlands and floodplain protection -- As mentioned earlier, these natural areas are important for water storage, and their development leads to changes in stream flow. Measures to offset the loss of wetland storage capacity through manmade storage structures are expensive and often ineffective. Measures to protect wetlands and floodplains are discussed separately in Chapter 9.

A control program would therefore include a requirement that development proposals be reviewed for the adequacy of sediment and erosion controls and drainage provisions, and that surface maintenance be required after a development is completed. Regulations would need to apply both to residential subdivisions and to developments which occur without subdivision of land (such as commercial and industrial projects and apartments).

Of the ten Old Colony 208 Area communities, only two (Abington and Pembroke) presently require sediment control plans in subdivision proposals. Four towns (Abington, Avon, Easton and Pembroke) require that drainage computations be made. No communities now require such measures of non-subdivision developments.

Construction of state highways or other state facilities would generally be outside the jurisdiction of communities to regulate. The review process under the Massachusetts Environmental Policy Act would be the most appropriate manner in which to impose such requirements. The extension of Route 495 into Bridgewater would be a case where such review is warranted.

Evaluation: For the OCPC 208 Area, one cannot overemphasize the importance and environmental significance of establishing controls on future development. The 208 Area is due to undergo substantial development in the next twenty years, as suburbanization and urbanization occur throughout the region to one degree or another. OCPC's population projections (see the Introduction) are that, between 1975 and 1995, the 208 Area's population will grow by over 50,000. The increase in the total regional population will be 27.8%. Six of the communities (Bridgewater, East Bridgewater, Easton, Hanson Pembroke, and West Bridgewater) are projected to undergo population increases of 40% or greater, with Bridgewater the highest at 59.6%. Over 7000 acres (more than 11 square miles) are expected to be developed for residential purposes alone. Unless water quality protection is established as an active purpose of development controls in each community, pollution from sedimentation and urban runoff is highly probable, both during the period of construction and for all the years thereafter. While it is true that all of the proposals would increase the workload of administrative authorities and require a degree of expertise on the part of those reviewing plan proposals, there would be substantial public benefits from lessened adverse environmental impacts and less need to rectify, often at public expense,errors made in drainage system installation.

Each of the approaches discussed below has its limitations. Because of the limited coverage of each approach, a combination may be wisest: for example, a municipal by-law requiring sediment and erosion controls, drainage system review, and surface maintenance, supplemented by provisions on the same subjects within the subdivision regulations. An impact statement requirement may be particularly desirable for large projects in which issues of significant impacts are likely to be raised in any case. The effectiveness of administration for any of these approaches will depend on the expertise of enforcing authorities. It would be desirable to have professional engineering assistance available, and beneficial to arrange with the Conservation District and SCS for their help as warranted.

Listed below are alternative municipal actions to control problems associated with construction and development.

A. Impose Controls Under Subdivision Regulations

Description: Subdivision controls would be amended to improve the environmental soundness of new developments. Table 6-1, "Subdivision Regulation Practices", identifies present controls. (The table is reproduced from an OCPC report, Land Use Policy and Implementation: Subdivision Control (1976). That report discusses fully the measures listed in the table and the reasons for including them in subdivision regulations.) The Planning Board would, under enabling law, remain the approving authority, but provisions would be made for review of all development proposals by the Conservation Commission and the Highway Department.

In order for such regulations to be effective, the Planning Board would need to have technical expertise available to review the subdivision plans. Bridgewater, Easton and Brockton have municipal engineers; other towns use consulting engineers. For review of sediment and erosion control plans, towns

could seek assistance from the Soil Conservation Service through referral by the Conservation District.

Evaluation: Additional informational and review requirements would impose costs upon the developer and the community (which might raise review fees to cover its own costs). However, these costs would be offset by the benefits of preventing sedimentation during construction and later problems with inadequate or improper drainage. At present rates of development, SCS would probably be able to offer assistance for review of subdivision proposals, but it might at a future time have to seek additional funding from the federal government or from local authorities through a fee system to cover manpower costs.

Subdivision regulations could not be used to require future surface maintenance, since the final acceptance of the completed subdivision would end the developer's responsibility. However, since the streets of an accepted subdivision are generally maintained by the local highway department anyway, this would not be much of a drawback. Subdivision regulations do not apply to land development which occurs on a single parcel or on frontage of an established street,so that subdivision control in itself would be insufficient to control all significant developments.

B. Impose Controls Within the Zoning By-law

Description: Regulations would be included in the zoning by-law to require sediment control and drainage plans on the part of all developments and to require maintenance of parcel surfaces in privately-owned areas. The building inspector would be the agent responsible for enforcement, with the Board of Appeals having regulatory authority.

Evaluation: Under this option, all developments, including those which did not involve land subdivision, would be covered. A training program for building inspectors would probably be necessary before they could carry out this new responsibility adequately; the workload of the inspectors would increase substantially, if every new development involved the filing of a sediment and erosion control plan. A possible confusion in authority could arise between the Planning Board and the Board of Appeals, in cases where the Planning Board wished to impose its own requirements under the subdivision control regulations.

Imposition of maintenance controls under the zoning by-law would face the problem of covering existing developments. Controls can in fact be placed on existing structures, but there is a strong inclination to view such developments as "non-conforming uses" which should be exempted when a new regulation is adopted. This attitude would be a drawback to using the zoning ordinance for such a regulation.

C. Impose Controls Through a New Municipal By-Law

Description: Controls on sediment and erosion, drainage, and surface maintenance would be adopted under the general municipal by-law provisions

TABLE 6-1

Subdivision Regulation Practices

● **Practice included in the regulations**

	Town and its last major revision	Abington, 1976	Avon, 1974	Bridgewater, 1954	Brockton, 1957	East Bridgewater, 1965	Easton, 1972	Hanson, 1965	Pembroke, 1976	West Bridgewater, 1961	Whitman, 1966
Administration	**Definitive Plan**										
	Proposed topography	●	●	●	●		●	●	●	●	
	Soil conditions	●	●				●				
	Identification of outstanding natural features	●	●				●		●		●
	Locus map with zoning	●	●						●		
	Drainage computations	●	●				●		●		
	Multi-departmental review	●							●		
	Performance Guarantee										
	Maintenance costs, term	2 years	2 years								
	Contingency factor	10%	10%					10%			
	Planning Board alteration of performance guarantee	●	●						reduction only		
	Formal procedure for construction cost estimate	●	●								
	Formalized inspections by the responsible agencies	●	●			●	●	●	●		
General Requirements & Design Standards	As-built plan	●							●		
	Planning Board determination of which natural features might be preserved	●									
	Underground utilities	●	●						●		
	Bicycle paths								●		
	Natural feature buffer						●				
	Sediment control plan	●							●		
	Tree preservation regulation	●									
	Minimum guidelines for public land Size	● at least 5%	● at least 5%								
	Protective covenant	●	●								

Source: OCPC, Land Use Policy and Implementation: Subdivision Control (1976)

of Chapter 40 of the General Laws. Enforcement authority could be granted to any town board, such as the Planning Board, the Conservation Commission, Board of Selectmen, or the Board of Appeals.

An option under this approach would be to sign an agreement with the county Conservation District, providing for a review by the District supervisors and the Soil Conservation Service (SCS) of sediment control programs.

Evaluation: This approach allows more flexibility in administration then the zoning by-law route. The Conservation Commission would in some cases be the logical permitting authority, based on its previous experience with water quality impacts of development. Alternatively, the Planning Board might be the most logical choice, because of its general oversight of new development. Under Chapter 40, municipal by-laws cannot forbid soil disturbance carried out as part of an approved subdivision plan. This means that separate subdivision regulations would be necessary to prevent a loophole in the town by-law; also, that the assignment of by-law authority to the Planning Board would have the advantage of placing all sediment control responsibility in one place.

Enforcement of surface maintenance regulations would be administratively difficult. The proper person to oversee this would probably be the municipal highway superintendent or director of public works.

D. Require Local Environmental Impact Statements on New Developments

Description: Subdivision plans and site plans would be required to include a statement of expected impacts on the environment (including pollution of water, land erosion or increased consumption of water.) Easton added such a requirement to its zoning by-law in 1974, but has not recently enforced it.

Evaluation: This approach encourages a broader view of the impacts of development than do specific requirements on sedimentation, drainage, etc. However, the expertise may be lacking for adequate use of this provision: who will judge the developer's assessment of the impacts? Will the developer himself have the expertise to make such an assessment? This approach is an open-ended one, in that it is difficult to specify the level of detail which such an impact statement should entail; the administering authority would have to draft regulations explaining the requirements in more detail, to lessen the delays and revisions to filed statements which would otherwise be necessary. If the requirement is purely an informational one, it may be less effective than the approaches previously described, in which requirements are imposed so that environmental impacts, if any, will be minimized.

CHAPTER 7

Agriculture

Table of Contents

	page
Background	7-1
-Agricultural Types and Acreage in the OCPC 208 Area	
-Extent of Water Quality Problems	
-Management System Functions Considered in the Alternatives	
I. Continue Existing Arrangements for the Control of Agricultural Pollution	7-6
II. Establish a Formal System of Coordination Among Existing Agencies	7-11
III. Establish a Regional Agricultural Non-Point Source Management Agency	7-18

Agriculture presently accounts for about 9300 acres in the OCPC 208 area, or about 8.4% of the total land area. Principal types of agriculture are cranberrying, livestock (especially dairy cattle), and fruit and vegetable farms. Most of the area's cranberry bogs are located in the towns of Hanson and Pembroke; bogs are also located in Bridgewater, East Bridgewater, and Easton. Dairies and vegetable farms are most extensive in Bridgewater, East Bridgewater, and West Bridgewater, but every OCPC 208 Area community has at least some agricultural land. Table 7-1 summarizes data on agricultural land use.

Section 208 (b) (2) (f) of the 1972 Federal Water Pollution Control Act Amendments directs that 208 plans include:

> . . . a process to (i) identify, if appropriate, agriculturally and silviculturally related nonpoint sources of pollution, including runoff from manure disposal areas, and from land used for livestock and crop production, and (ii) set forth procedures and methods (including land use requirements) to control to the extent feasible such sources . . .

The potential pollution problems associated with agriculture depend on the type of agriculture practiced and the materials used:

- Cranberries-Pollutants potentially associated with cranberry operations include pesticides and fertilizers applied to bogs, and organic debris remaining after harvesting.

- Livestock Operations-Pollution problems potentially associated with such operations involve the storage and use of animal wastes, and the direct contact of animals with waterways.

- Fruits and Vegetables-Fruit and vegetable operations in the Old Colony 208 area include the growing of sweet corn and other garden vegetables, the cultivation of blueberries and strawberries, and the raising of field corn for animal feed. Potential pollution problems from such operations include pesticide runoff, erosion and sedimentation, and fertilizer nutrient runoff.

Sampling programs conducted during the OCPC 208 study are discussed in Chapter 1, Documentation, and results from problem sites are presented in the Appendix. Evidence of agricultural pollution has been found at several locations. The most troublesome source type is dairy farming. Table 7-2 presents, town by town, a summary of documented agricultural pollution problems, with reference to site numbers given in the Appendix. In some cases, agriculture is not the only suspected source. Also shown in Table 7-2 for each town are the source types which warrant a program to prevent problems from arising in the future. Prevention of future problems will be significant to a community relative to the type and amount of agricultural land in the town.

The water bodies appearing to be the most significantly affected by agricultural pollution are the Taunton River and Lake Nippenicket in

TABLE 7-1

AGRICULTURAL LAND USE IN THE OCPC 208 AREA

Community	Total Acreage	Agricultural Acreage	Agricultural Land as % of Community	% of Total Agricultural Land in 208 Area
ABINGTON	6,381	157	2.5%	1.7%
AVON	2,790	16	0.6%	0.2%
BRIDGEWATER	17,466	2,312[a]	13.2%[a]	24.9%[a]
BROCKTON	13,872	136	1.0%	1.5%
EAST BRIDGEWATER	11,105	1,579	14.2%	17.0%
EASTON	18,842	512[b]	2.7%[b]	5.5%[b]
HANSON	9,978	1,733	17.4%	18.7%
PEMBROKE	15,040	483[c]	3.2%[c]	5.2%[c]
WEST BRIDGEWATER	10,031	2,047	20.4%	22.1%
WHITMAN	4,467	293	6.6%	3.2%
TOTAL 208 AREA	109,972	9,268	8.4%	100.0%

a - Excludes 501 acres of agricultural land in public ownership

b - Includes only agriculturally assessed land

c - Includes cranberry bogs only

Source: Land Use/Water Quality Issues in the Old Colony 208 Area. OCPC, 1976.

TABLE 7-2: DOCUMENTED AGRICULTURAL POLLUTION PROBLEMS AND RECOMMENDED PREVENTIVE PROGRAMS

COMMUNITY	DOCUMENTED PROBLEMS (Site numbers refer to Appendix)	PREVENTIVE PROGRAMS RECOMMENDED FOR:
AVON	-	-
ABINGTON	Dairy Processing (see Chapter 5, Industrial Wastewater Disposal)	-
BRIDGEWATER	Dairy Farming: Taunton River and tributaries (BRI-4, TR-03, TR-06) Lake Nippenicket (BRI-6, EEA-N-3) Dairy Processing (see Chapter 5, Industrial Wastewater Disposal)	Livestock Operations (Dairy Farming)
BROCKTON	-	-
EAST BRIDGEWATER	Dairy Farming: Black Brook (EB-6, EB-06)	Livestock Operations (Dairy Farming)
EASTON	Dairy Farming: Poquanticut Brook and New Pond (EEA-N-1)	-
HANSON	-	Cranberrying
PEMBROKE	Cranberrying: Stetson Pond (neighborhood complaints of organic debris)	Cranberrying
WEST BRIDGEWATER	Dairy Farming and/or Field Corn: Town River (TW-02)	Livestock Operations (Dairy Farming) Fruits and Vegetables

NOTE: In some cases, agriculture is not the only suspected source.

Bridgewater and the Town River in West Bridgewater. These are instances where abatement of agricultural pollution should receive priority. In addition, discharges from dairy processing firms are pollution sources in Abington and Bridgewater. These are more properly categorized as industrial wastewater disposal problems and so are discussed in Chapter 5.

This chapter discusses a number of control measures to curb existing agricultural pollution and to prevent any future problems. Some of these measures are applicable to agriculture in general; others are, for legal or technical reasons, applicable to a separate source type, whether cranberries, livestock operations, or fruits and vegetables. Based on the present location of these agricultural activities, control measures specific to each of them will be of more interest to some communities than to others. Control programs for these three source types are most applicable to the following communities:

- Cranberries - Hanson and Pembroke.
- Livestock Operations - Bridgewater, East Bridgewater and West Bridgewater.
- Fruit and Vegetables - West Bridgewater.

For each of these three agricultural types, the suggested control programs are designed to define and assure compliance with "Best Management Practices" ("BMP's", for short). The Environmental Protection Agency defines that term as follows (EPA, Guidelines for State and Areawide Water Quality Management Program Development, Chapter 7, pp. 2-5):

> "The term "Best Management Practice" refers to a practice or combination of practices, that is determined by a State (or designated areawide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals".

For cranberrying, Best Management Practices cover the amount, timing, and method of chemical application, and bog flooding and draining procedures (including cleanup of organic debris). A tangential problem is the impact on pond water levels when water is withdrawn from ponds for use on bogs or returned to ponds after such use. Sprinkler systems (now used on about 80% of Massachusetts bogs) should be encouraged, since they allow a more controlled method of pesticide application than use of airplanes, and also reduce water needs for irrigation and prevention of frost damage, thus lessening conflicts with other water users.

For livestock operations, BMP's need to address procedures for manure storage and disposal, grazing practices, and means of minimizing direct runoff to streams.

For fruit and vegetable growing, BMP's need to cover the use of chemicals for pest control and fertilization, and the prevention of erosion and sedimentation.

Three alternatives are presented below for control of agricultural pollution. The alternatives consist of "packages" of controls, with the first alternative generally reflective of existing programs and the succeeding alternatives representing in turn increasing levels of public activity. The items within each package are not necessarily mutually dependent, but they are presented as a package to indicate the types of measures which would follow from a commitment to a particular objective. Each of the packages represents a "management system"--i.e., an arrangement of agencies with powers to carry out the various tasks that are involved in pollution control, including establishment of standards, provision of technical and financial assistance, monitoring, and enforcement. The management system may be centralized in one agency or be distributed among agencies. The more centralized systems could have higher administrative costs and would take more effort to implement, but could be more effective. It might be possible to select, in the short run, an alternative which required few changes and move, ultimately, towards an alternative distinctly different from present arrangements.

Under any alternative, there could be advantages to formalizing agency roles in relation to pollution control. For example, the experiment stations and extension services are now financed partially from state funds appropriated through the University of Massachusetts budget. If the funds used to pay for those functions related to pollution control (such as sampling, research, and some forms of technical assistance) were so identified, it might be possible to use those expenditures as the state matching share for federal grants and increase the total funds available for pollution control management in Massachusetts.

The following functions will be considered in describing and evaluating the management system alternatives:

- Definition and updating of Best Management Practices
- General educational programs
- Site-specific technical assistance
- Financial assistance
- Controls on pesticide use
- Monitoring
- Investigation of complaints
- Encouragement of voluntary compliance with BMP's
- Enforcement of mandatory controls

I. Continue Existing Arrangements for the Control of Agricultural Pollution

Description: Presently, a number of agencies are responsible for providing technical and financial assistance or enforcing pollution controls. Among the agencies with current roles are: the U.S. Department of Agriculture, through the Soil Conservation Service (SCS) and the Agricultural Stabilization and Conservation Service (ASCS); the agricultural experiment stations of the University of Massachusetts; the Cooperative Extension Service of the University of Massachusetts and the U.S. Department of Agriculture; the county Conservation Districts; the Environmental Protection Agency; the Division of Water Pollution Control; and the State Pesticide Control Board. In some instances, there are formal arrangements between agencies (as between SCS and the Conservation Districts); in other cases, cooperation is informal and ad hoc.

Management system functions are presently performed as follows:

- Definition and Updating of Best Management Practices--No agency is formally responsible for establishing the scope and content of BMP standards for any agricultural activity. In practice, a number of agencies do suggest practices which are widely followed on a voluntary basis. For cranberrying, the Cranberry Experiment Station in East Wareham is looked to for guidance. The Station is funded by the University of Massachusetts to carry out research on cranberry growing and provide technical assistance to growers. Since it came into existence in the early 1960's, the Station has been investigating the costs and environmental impacts of various methods for controlling pests and increasing cranberry yields. It distributes charts on pesticide and fertilizer use to growers. The Station has laboratory facilities and full-time chemists. For livestock operations, investigation of manure storage and spreading methods has been conducted through the UMass Department of Agricultural Engineering. In practice, the Cooperative Extension Service county livestock specialists assist farmers in determining BMP's on a case-by-case basis. Also, the Soil Conservation Service (SCS) provides specifications for manure handling facilities when it is called upon for assistance. For fruit and vegetable growing, the Waltham Experiment Station is comparable to the Cranberry Experiment Station for cranberrying. SCS provides specifications to farmers on measures to control erosion and sedimentation on a case-by-case basis.

- General Education Programs--The Cranberry Experiment Station, as mentioned, issues publications and conducts workshops for the benefit of growers. The Cooperative Extension Service provides similar information for other farmers, as does the Waltham Experiment Station, as well as education through 4-H.

- Site-Specific Technical Assistance--The Cranberry Experiment Station will, when requested, provide assistance and advice to an individual grower. The Cooperative Extension Service field specialists in livestock and vegetables will do the same for their categories. Farmers may, at their own initiative, seek the assistance of SCS in the preparation of a "conservation plan" for their property. The county Conservation District is responsible for authorizing SCS assistance. Conservation plans can include provisions for crop rotation,

manure storage and application, erosion and sedimentation controls, and irrigation systems (including cranberry bog sprinkler systems).

• Financial Assistance--Two principal sources of aid exist. First, under the Agricultural Conservation Program, the Agricultural Conservation and Stabilization Service (ASCS) of the U.S. Department of Agriculture may make grants to farmers for up to 50% of the cost of measures needed to carry out a conservation plan, up to a limit of $2,500 per farming operation. Second, the Small Business Administration (SBA) may make long-term loans to business enterprises for the cost of pollution control measures. The interest rate for such loans corresponds to the rate for federal borrowing, and is currently just over 6 percent. To be eligible, the project must be certified by EPA as a pollution control measure. Under recent EPA-SBA agreements, agriculturalists are eligible for these loans. The loans could offset the cost portion of control measures not covered by ASCS grants.

• Controls on Pesticide Use--The Pesticide Control Board, presently located in the Department of Environmental Quality Engineering, oversees use of pesticides. To place Massachusetts in compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended (P.L. 92-516), the Pesticide Control Board has been conducting courses and examinations for commercial applicators (who must be certified by October, 1977 to be eligible to use "restricted-use" pesticides, as defined by EPA). "Pesticide", as defined under FIFRA, includes insecticides, herbicides, and fungicides. To be certified, applicators must demonstrate general knowledge of proper pesticide use and specific competency for the type of operation in which they are involved.

• Monitoring--The Cranberry Experiment Station has performed some stream sampling in its investigation of the potential for pollution from cranberrying and does undertake investigations upon request. OCPC has conducted sampling for agricultural sources under the 208 program. The Division of Water Pollution Control has legal responsibility for both point and nonpoint sources of pollution and can investigate at its choosing specific agricultural problems. The Ocean Spray Cranberry Company, a grower's cooperative, samples random batches of berries brought to it for processing to detect any pesticide residues and keep contaminated berries from being used.

• Investigation of Complaints--It is unclear to whom complaints of agricultural pollution are to be directed. Complaints can be made to the Cranberry Experiment Station or the Division of Water Pollution Control. There is no formal means, however, by which an individual or official body can bring forth a complaint and have it aired before all agencies which might have a role in its resolution short of legal enforcement action.

• Encouragement of voluntary compliance with BMP's--Nearly all of the agencies mentioned to this point act in one way or another to encourage voluntary compliance. Also, farmers' groups, such as the Cranberry Growers Association, the Farm Bureau, and the Grange are interested in protecting the overall reputation of agriculture from actions of individuals. As just mentioned, however, there is no organized way presently to bring the power of "peer group pressure" to bear.

• Enforcement of Mandatory Controls--Federal and state regulations on pesticide use are mandatory controls which are, as mentioned above, enforced by the Massachusetts Pesticide Control Board. The Division of Water Pollution Control has general authority over all pollution sources. No specific requirements, like those imposed on municipal and industrial wastewater dischargers, have yet been placed on any agricultural operations with the exception of those "concentrated animal feeding operations" (feedlots) which are considered to be point sources under the 1972 Federal Water Pollution Control Act Amendments (P.L. 92-500). Those agricultural point sources are subject, like other point sources, to the National Pollutant Discharge Elimination System (NPDES) permit program (the NPDES program is explained in Chapter 5, Industrial Wastewater Disposal). The regulations issued by EPA on the applicability of the NPDES program to feedlots are summarized in Table 7-3. To date, no feedlot in the OCPC 208 Area has been issued an NPDES permit. EPA has recently proposed a general-permit program which would apply to cranberries. Since this program is not yet in existence, it is not discussed here but is instead discussed under Alternative II.

Evaluation: Given the number of agencies with long-standing experience in this field, retention of the present system has advantages, in that it would involve no administrative changes and would rely on rapport between the agencies and agriculturalists for voluntary compliance. However, the existence of pollution problems (see Chapter 1, Documentation) suggests that the present system has not been entirely effective in controlling agricultural pollution. Also, forthcoming changes in federal regulations (particularly as applies to cranberries) may make it desirable to formalize and define the roles of existing agencies.

The following is an evaluation of present functions:

• Definition and Updating of Best Management Practices--BMP's are, in effect, being recommended to farmers by existing agencies, more formally in the case of cranberry growing and fruit and vegetable growing than for livestock operations. Recommended practices for cranberries, fruits, and vegetables appear to conform to the EPA definition of Best Management Practices, except that organic debris clean-up has not yet been a subject of Cranberry Experiment Station recommendations. For livestock operations, BMP's appear to be more subject to individual discretion and are, necessarily, more dependent on a case-by-case evaluation.

• General Education Programs--Existing programs appear sufficient to provide guidance to those farmers who are interested in drawing upon the expertise of agricultural agency specialists. Nearly all cranberry growers receive instructional information regularly. Other agricultural categories are less closely organized, but opportunities exist through Extension Service mailings and farm association newsletters to reach a substantial percentage of agriculturalists.

• Site-Specific Technical Assistance--Existing agencies appear to have sufficient manpower and expertise to provide assistance upon request.

TABLE 7-3

THE NPDES PERMIT PROGRAM AND "CONCENTRATED ANIMAL FEEDING OPERATIONS"

An "animal feeding operation" is a lot or facility in which:

(1) Animals are confined and fed for a total of at least 45 days in any twelve-month period,

AND

(2) Crops, vegetation, forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility.

Only "concentrated animal feeding operations" are subject to the NPDES permit system. An "animal feeding operation" is considered to be "concentrated" if it meets one of the following conditions:

(1) More than 1000 animal units* are confined and there is a discharge of a pollutant which reaches navigable waters,

OR

(2) More than 300 animal units* are confined and pollutants are discharged to navigable waters through man-made pipes or ditches or are discharged directly to waters coming into direct contact with the confined animals,

OR

(3) Less than 300 animal units* are confined and pollutants are discharged to navigable waters through man-made pipes or ditches or are discharged directly to waters coming into direct contact with the confined animals, AND the EPA Regional Administrator designates the facility as a concentrated animal feeding operation based on factors relative to the significance of a pollution problem.

EXCEPTION: An operation is not subject to the permit requirement if a discharge occurs only in the event of a 25-year, 24-hour storm event.

* The number of "animal units" is computed by adding:

(Slaughter and feeder cattle) x 1.0
+ (Mature dairy cattle) x 1.4
+ (Swine over 55 pounds) x 0.4
+ (Sheep) x 0.1
+ (Horses) x 2.0

Also, 30,000 laying hens or broilers equal 1000 animal units and 9,000 hens or broilers equal 300 units, for facilities with liquid manure handling systems.

SOURCE: Summarized from 40 CFR 124.82, effective March 18, 1976.

• Financial Assistance--ASCS grants are presently being made for such purposes as the installation of sprinkler systems in cranberry bogs and the construction of manure storage facilities. The fact that measures must be long-term in nature to be eligible for ASCS grants limits this program's application to fruit and vegetable operations. The $2,500 limit on an ASCS grant is an obstacle to the financing of manure storage facilities, which can cost in the tens of thousands of dollars. The SBA loan program has not yet been utilized by the area's farmers. One reason is a lack of publicity for the program; but even were that to be overcome, there would be other reasons for a lack of interest in the program. First, although the SBA interest rate is below commercial rates, it is still high enough to be a problem for those unable to finance a loan through other channels. Second, EPA will still have to determine a procedure for certifying that certain measures are for the purpose of pollution control and thereby eligible for a loan. A simplified procedure will be necessary to encourage participation.

• Controls on pesticide use--The regulatory program of the State Pesticide Control Board will cover all commercial applicators by October. Federal aid has helped to pay for the initial program of training and testing. The state will have to furnish sufficient funds to the Board for any future re-testing of applicators for new substances. The applicator licensing program provides a basis for enforcement against violators, but doesn't ensure that violators will be detected or that the Board will have sufficient manpower to investigate complaints or to initiate its own investigations.

• Monitoring--There is no permanently established program of periodic stream sampling for agricultural sources (which would require fairly expensive and sophisticated analysis for a range of pesticides). Sampling of crops by cranberry companies does provide a strong existing incentive for following directions on pesticide use: a grower whose crop is rejected for processing because of pesticide residues loses his entire year's revenue. The fact that no pesticides are found on the product does not rule out the possibility of pesticides being released to surface water during the course of the growing season, but it does increase the likelihood that growers would follow the directions of the Experiment Station on pesticide use, out of self-interest.

• Investigation of Complaints--The only agency clearly responsible for investigating complaints is the Division of Water Pollution Control. Oversight of municipal and industrial point source dischargers is viewed by the Division of Water Pollution Control as having priority in the allocation of its resources.

• Encouragement of Voluntary Compliance with BMP's--Overall, voluntary compliance seems to be effective for cranberry and fruit-and-vegetable operations, where there is a large measure of self-interest in observing BMP's. For cranberry growers, minimizing use of chemicals minimizes costs, and growers are sensitive to the adverse publicity that would result from any evidence of pesticide misuse by cranberry growers. Experiment Station personnel believe that most growers closely observe the instructions on pesticide and fertilizer use mailed to them by the Station. Fruit and vegetable growers are aware that control of erosion protects the long-term productivity of their land. Observation of BMP's can in many cases be in the interest of dairy farmers,

especially for those who are able to use manure effectively in place of commercial fertilizers. However, if more manure is produced than can be absorbed by the land available, or if storage facilities are required to prevent pollution, BMP's may impose costs upon farmers which they would not incur voluntarily unless they were sensitive to the pressure exerted by the airing of complaints.

• Enforcement of Mandatory Controls--Despite the requirements of the Massachusetts Clean Waters Act, which does apply to both point and nonpoint sources, the Division of Water Pollution Control is in fact exercising a very limited jurisdiction over nonpoint sources at the present time. If Alternative I is selected, then the implication will be that the current level of enforcement should be continued. The sampling data collected under the 208 program suggests that a stronger basis for enforcement action, whether through formal adoption of BMP's or the creation of a permit system, is warranted for some agricultural sources.

II. Establish a Formal System of Coordination Among Existing Agencies

Description: Under this alternative, existing agencies would continue to be relied on, but formal agreements or Memoranda of Understanding (MOU's) would be signed to define roles, areas of responsibility, and procedures for mutual assistance. The purpose of these agreements would be to ensure that gaps in authority are overcome and to define agencies with specific legal responsibilities. This alternative would also provide a means for implementing proposed permit systems, as described below.

To make a coordinated approach effective, it would be necessary to designate one agency as a "lead agency" with overall responsibility for coordination. This agency would be responsible for keeping records of actions involving more than one agency, for reviewing the effectiveness of interagency arrangements, and for reporting annually on the relevant activities of the agencies it oversees. If this alternative is selected for the final plan, the county Conservation Districts would be recommended to be the lead agencies for the towns in the respective counties:

Norfolk County: Avon

Bristol County: Easton

Plymouth County: Abington, Bridgewater, Brockton, East Bridgewater, Hanson, Pembroke, West Bridgewater and Whitman

In the short run, OCPC would assist the Conservation Districts in establishing this coordinated approach. Once the interagency agreements were established, OCPC would participate as one of the interested parties, but the Conservation Districts would act as the lead agencies without OCPC staff assistance. Priority would be given in the initial period to the Plymouth County Conservation District, which includes 94% of the agricultural land in the OCPC 208 Area.

Following is a description of how the most important management functions would be carried out under this alternative:

• Definition and Updating of Best Management Practices--
For cranberries, the Cranberry Experiment Station in East Wareham would be delegated the responsiblity for this task. It would prepare a statement of Best Management Practices and present it to the Conservation District for approval. The Station would seek the active participation of cranberry growers in defining BMP's. The Conservation District would circulate the statement of BMP's to Conservation Commissions, the Division of Water Pollution Control, OCPC, SCS, ASCS, the Cooperative Extension Service, and any other interested environmental groups or agencies for their comments before acting to approve or modify the statement of BMP's. The Station would inform the Conservation District annually of any recommendations for change.

For livestock operations, the Massachusetts Livestock Manure and Waste Management Committee would be designated to prepare a statement of BMP's. This Committee, which includes both farmers and faculty members of the UMass Department of Food and Agricultural Engineering, has already prepared a draft report on this subject. The Committee would complete its report to serve as guidance on BMP's. The Conservation District would, as with the statement on cranberrying, circulate the statement to interested parties before adopting or modifying the statement. The Chairman of the Department of Food and Agricultural Engineering would inform the Conservation District annually of any recommendations for change.

For fruits and vegetables, the Waltham Experiment Station would prepare a statement of BMP's and seek the participation of vegetable farmers in defining these practices. Provisions for public comment, adoption by the Conservation District, and updating would correspond to those for cranberries and livestock operations.

Once adopted, these statements of BMP's would serve as official guidance to technical personnel for agricultural assistance agencies and would become the basis of conditions specified in any state or federal permits or other enforcement action.

• General Educational Programs--Agencies would continue to perform their present functions. As statements of BMP's were adopted, they would be supplied to all agriculturalists to inform them of what was considered desirable and achievable. The Conservation District would serve as a channel for providing information to farmers on any new federal or state regulations, and workshops would be conducted as needed.

• Site-Specific Technical Assistance--Provisions for technical assistance would remain as at present (see Alternative I). SCS, the Extension Service, and the Cranberry Experiment Station would inform the Conservation District of assistance provided, and the District would keep a record of this assistance.

• Financial Assistance--ASCS assistance for measures included in conservation plans would continue as at present. The 208 plan would contain a recommendation to Congress that the $2,500 ceiling on grants to a single agricultural operation

be removed. To make the Small Business Administration loan program most workable, EPA would delegate to the Conservation Districts the responsibility for certifying that a proposed measure was for the purpose of pollution control and thereby eligible for loan assistance.

- Controls on Pesticide Use--The State Pesticide Control Board would remain responsible for enforcement of pesticide regulations. It would inform the Conservation District of any actions taken affecting applicators within the District's jurisdiction.

- Monitoring--A nonpoint source sampling program would be established on a permanent basis. Presently, the Division of Water Pollution Control conducts periodic sampling to provide data for its river basin water quality models. This would be supplemented by a sampling program geared to the identification of nonpoint sources and monitoring of known problem areas. As the agency responsible for updating the 208 plan, OCPC would conduct this sampling program (contracting with a private firm, Bridgewater State College, the Cranberry Experiment Station, or the DWPC for the analysis). OCPC would meet with the Conservation District to discuss the selection of the sampling sites and to review findings. Existing monitoring programs, such as the self-monitoring of growers for pesticide residues, would continue.

- Investigation of Complaints / Encouragement of Voluntary Compliance with BMP's--As part of a voluntary compliance system, procedures would be established to receive complaints, investigate them, and apply pressure for changes in practices where complaints were found to be valid. The following is suggested as the model for such a procedure:

Complaints (whether from a town, public agency, or individual) would be filed with the Conservation District, which would then refer the complaint to a standing Advisory Committee. This Committee would include representatives of the Extension Service, Cranberry Experiment Station, SCS, the DWPC, OCPC, and other interested agencies, as well as local farmers and representatives of conservation commissions and watershed associations. The Committee would investigate the complaint, arrange where necessary for the collection and analysis of samples, review agricultural practices, and report its findings and recommendations to the Conservation District. (The Committee might prefer to organize separate sub-committees on cranberries, livestock operations, and fruit and vegetables, since different individuals would be involved in each category. Also, the Bristol and Plymouth County Conservation Districts would probably wish to consider having joint committees). The District would inform the complainant and the farmer of the Committee's findings and recommendations, and would make sure that the farmer was aware of the assistance available to him for carrying out any needed changes in practices.

- Enforcement of Mandatory Controls--In the short run, mandatory controls would be placed only on those activities now subject to EPA permits or proposed for inclusion in the NPDES permit program, and on operations identified as problems in the OCPC 208 sampling program.

The mandatory controls would be as follows:

--Cranberries: In accordance with judicial decisions, the Environmental Protection Agency has proposed to place cranberry operations under the NPDES point-source permit program. Cranberry growing qualifies for the NPDES system as an agricultural point source because it involves the application and return flow of irrigation and harvesting waters. (See the Federal Register, July 12, 1976. Regulations are contained at 40 CFR 124.84.) Instead of issuing permits to individual cranberry growers, EPA proposes to issue a general permit for a geographical area (called a "General Permit Program Area," or GPPA for short) and require that all growers within that area observe Best Management Practices. (See the Federal Register, February 4, 1977.) Separate GPPA's could be established along the boundary lines of the 208 agencies in southeastern Massachusetts (OCPC, the Southeastern Regional Planning and Economic Development District, and the Cape Cod Regional Planning and Economic Development Commission), or along county lines (Bristol, Plymouth, and Barnstable), but the simplest arrangement would be to establish one GPPA for the three-county area, with uniform BMP's recommended by the Experiment Station to the Conservation Districts and accepted by EPA as the basis for its permits. Growers operating under the general permit system would not be required to provide sampling results like those required now from industrial and municipal point dischargers.

The DWPC, which is responsible for enforcing other permit programs, would enforce this general permit program as well. However, the DWPC would follow different procedures for complaint investigation than it does for more conventional point sources: it would instead rely initially upon the mechanism described above for voluntary compliance, with investigation of complaints through the Conservation District and its Advisory Committee. If the grower refused to accept the findings of the Advisory Committee and follow its recommendations, or if the original complainant were dissatisfied with the findings, the case would be referred to the DWPC for investigation and enforcement. Violators of the general permit would be subject to the same enforcement orders and penalties as other point dischargers. One option available to the DWPC and EPA would be to require an individual permit for growers found to be violating general permit conditions, with specific standards for operation and self-monitoring and reporting requirements.

The DWPC would still act on complaints independently, rather than through the Conservation District, in cases where speed was essential to prevent continuing pollution.

--Livestock Operations: On March 18, 1976, EPA revised its regulations as to which animal feeding operations were to be considered agricultural point sources subject to the NPDES permit system. The revised regulations were in response to judicial review of earlier 1973 regulations. Table 7-3, presented in Alternative I, summarizes the 1976 regulations. The regulations define which farms are "concentrated animal feeding operations" and are therefore required to obtain individual permits under the NPDES system. Operations with more than 1000

animal units are all subject to the permit system if they result in discharges, whether or not the discharge is through a man-made conveyance. As OCPC interprets these regulations, at least one dairy operation in the 208 Area, Cumberland Farms of Bridgewater, should be placed under the NPDES permit system. The status of the Cumberland Farms permit is discussed in Chapter 5. Operations with over 300 animal units would be subject to the permit system if discharges reach streams through man-made conveyances, and those under 300 units are subject if the EPA Regional Administrator determines the discharge to be a significant one. OCPC has data on problem sites; it would ask the DWPC to investigate these sites and determine whether they should be included under the NPDES program.

For farms which did not qualify for inclusion under the Federal NPDES program, the DWPC would still be able to impose controls under the powers granted to it by the Massachusetts Clean Waters Act. One option for carrying out these responsibilities would be for the DWPC to issue a general permit to all livestock operators, specifying BMP's (as established by the Conservation District), and then require individual permits on a case-by-case basis in those instances where sampling revealed the existence of pollution. Based on its own sampling, OCPC estimates that 5 to 7 sites would deserve priority for investigation by the DWPC. An initial condition of an individual state permit could be a requirement that the farm operator seek SCS assistance through the Conservation District in developing or updating a conservation plan, and that the operator demonstrate a commitment to carrying out the plan.

For any complaints of noncompliance with federal or state permits on livestock operations, the DWPC would follow the procedure just outlined for cranberry operations, with a reliance as far as possible on voluntary cooperation and pressure via the Conservation District.

--Fruit and Vegetables: No fderal permit program exists which would apply to fruit and vegetable growing in the OCPC 208 Area. The DWPC could adopt a permit program under the Massachusetts Clean Waters Act, but given the current lack of evidence of pollution problems from this type of agriculture, such a permit system appears unwarranted. The DWPC would therefore rely on the voluntary procedures for adoption of BMP's, and require individual permits only if future sampling by the DWPC or OCPC revealed that a specific operation was causing a pollution problem. As with livestock operations, an initial condition of such a permit could be the preparation of a conservation plan.

Evaluation: Such a management system would involve added administrative costs in coordination, but in return would result in more efficient use of existing expertise and lead to environmental improvements. The exercise of defining roles would result in a better understanding of agency functions and lead to an elimination of duplication as well as a recognition of gaps in responsibility.

The greatest additional burden, in comparison with present arrangements, would be placed on the Conservation Districts. The

Districts presently exercise some of the functions of a lead agency, in that they help to coordinate local activities of SCS, ASCS, and the Extension Service. However, the Conservation Districts presently have no full-time staff of their own. It would be advisable for the Plymouth and Bristol County Conservation Districts to have a staff able to handle records, arrange meetings, and answer inquiries. Present voluntary efforts by the District supervisors would probably not suffice for this. One possibility would be for the Cooperative Extension Service to serve as the staff to the Districts, since the workload is not expected to be so great as to require a full-time staff solely for work on pollution control activities. Additional state financial support should be provided for the Conservation Districts if they are designated as lead agencies under this alternative. OCPC would also incur staff time expenses during the initial two years of this program in setting up administrative arrangements and fostering interagency cooperation. OCPC has, during the course of the 208 program, met on several occasions with agricultural agency officials and farmers, both separately and as part of day-long joint meetings on the 208 program's relationships to agriculture and the definition of BMP's. The approach suggested in this alternative appears workable, if the reaction of those involved in these meetings can be taken as a guide. Farmers and existing agencies are eager to participate actively in a control program for agriculture: statements on BMP's for cranberries and dairy operations have already been drafted by agency personnel with the assistance of farmers. This alternative maximizes the role of existing agencies and the participation of farmers.

Since this second alternative is, to a large measure, an extension and expansion of the first, many of the comments in the evaluation of the first alternative apply here. Some additional comments may be made on the functions just described:

- Definition and Updating of Best Management Practices--Formal adoption of BMP's, as provided for under this alternative, would establish a consensus as to what should properly be expected of farmers. It would encourage uniform enforcement of regulations and would provide a standard to which the public could refer in seeking resolution of complaints. The Experiment Stations and the UMass Department of Agricultural Engineering would have to be assured of continued funding to allow for research on updating BMP's.

- General Educational Programs--Existing programs provide a means for reaching farmers through sources which they are familiar with and respect. It would be less costly and more effective to use these programs for disseminating information on new programs than to attempt to organize instructional efforts by separate regulatory agencies. Given the degree of self-interest for farmers in pollution control and the difficulty and expense of monitoring programs, educational efforts rate priority in an agricultural pollution control program.

- Site-Specific Technical Assistance--The Conservation District would play somewhat more of a coordinative role than at present, to assure that all agencies which could assist on a particular problem were in fact called upon.

• Financial Assistance--Delegation of SBA loan certification to the Conservation Districts would encourage farmer participation, since it would allow the farmer to deal more comfortably with a local agency. Raising the $2,500 limit for ASCS grants would be most significant to the construction of manure storage facilities.

• Controls on Pesticide Use--Proper use of pesticides could be best achieved by the Pesticide Control Board's regulations on when pesticides may be used, and the advice of the Experiment Stations on which pesticides should be used and how to use the least amount possible.

• Monitoring--A regular program of sampling would serve as a check on the effectiveness of educational and technical assistance programs, and also as evidence to judge the need for regulatory programs. Even a minimal sampling program would cost several thousand dollars per year, however, and sampling cannot in itself be relied on to spot all nonpoint pollution problems, given the dispersed and intermittent nature of the source discharges.

• Investigation of Complaints / Encouragement of Voluntary Compliance With BMP's--Voluntary compliance minimizes costs of administration and enforcement. Voluntary compliance lacks a means of forcing noncooperative farmers to observe BMP's, but there are some incentives and pressures which could achieve that end. For instance, cranberry growers have reasons for wishing to see BMP's observed universally, since an incident involving one grower could have serious adverse impacts on all. Use of an Advisory Committee under the Conservation District to investigate complaints could promote voluntary compliance through a sort of peer pressure, since the Committee would include both public representatives and practicing farmers. It would encourage farmers to "keep their own house in order" and share responsibility for compliance. Such a mechanism would also provide a check on the success of voluntary compliance and be a means of evaluating it: farmers would realize that, if voluntary compliance failed to prevent pollution, there would ultimately be pressure for stricter mandatory controls.

• Enforcement of Mandatory Controls--Some administrative costs will be associated with the proposed controls. However, the proposals have been designed to minimize costs, both for the regulatory agencies and the farmers, by limiting the number of individual permits which had to be issued. For cranberries, the general permit system would, in effect, rely largely on voluntary compliance, since no self-monitoring or individual reporting would be required by those operating under the general permit system. It would, however, provide a basis for enforcement action, since operators would, like industrial dischargers under the NPDES system, be subject to penalties for failure to observe the conditions of the permit. The general permit system would be a mandatory compliance mechanism with a minimum of paperwork. For livestock operations, only those few already identified as problems would become the subject of DWPC investigation. The proposed system would therefore provide priorities for the work of regulatory agencies and allow farmers to avoid permit system burdens by observing BMP's.

III. Establish a Regional Agricultural Non-Point Source Management Agency

Description: Under this alternative, a new agency would be created with responsibility for functions now carried on by the several agencies mentioned throughout this chapter. This agency would be responsible for control of all agricultural non-point sources. (In the future it could expand to include all non-point sources with the exception of urban runoff.) Its functions would include setting standards, monitoring, offering technical assistance, and taking enforcement action.

Evaluation: This alternative would require substantial changes in existing arrangements and, in some cases, statutory changes at both the state and federal levels to allow for delegation of technical and regulatory functions to such an agency. For this reason, it can only be viewed as an alternative for the long run. Such an agency would offer administrative efficiencies, since there would be clear authority within the agency for organizing its own functions (as compared with the first two alternatives, where responsibilities must be determined by interagency negotiation). Also, this alternative in the long run would allow for a better overview of all pollution problems than would exist under the other alternatives, which would focus more narrowly on agricultural pollution. In a regional agency of this sort, planning would not be separated from control enforcement. Such an agency would be able to incorporate some existing agencies, but others would be replaced. This would make necessary the creation of new ties with farmers and might lessen the degree of voluntary compliance. On the other hand, it would free the enforcement agency from any existing habits and assumptions which might lessen enthusiasm for enforcement.

OCPC, as the regional planning agency, could serve as the nucleus for a regional water quality management agency. Another possibility would be the Conservation District, and a third would be a regional state water quality office incorporating the various functions now fulfilled by several agencies in the Executive Office of Environmental Affairs and the Water Resources Commission. Under any of these options, the problem of public representation would have to be considered, so that decisions made by the management agency would be subject to local review.

The concept of a regional water quality management agency is discussed further in Chapter 10.

CHAPTER 8

Residuals Management

Table of Contents

	page
Introduction	8-1
I. Identify an Agency to Carry Out the Planning Mandates of P.L. 94-580, The Resource Conservation and Recovery Act	
Alternatives	
A. Assign OCPC (The 208 Water Quality Planning Agency) as The Solid Waste Planning and Management Agency	
Previous OCPC Solid Waste Studies	
Existing Community Disposal Methods	
B. Assign Some Other Agency as the Solid Waste Planning and Management Agency	
II. Identify All Residuals Generated in the OCPC 208 Area and Identify Problems Associated with Their Disposal Practices	8-9
Alternatives	
A. Provide Additional Surveillance and Evaluation of Those Residuals For Which Disposal Methods are Not Presently Known to be Impacting Water Quality	
B. Evaluate NPDES permits Existing Municipal and Industrial Discharges to Asses Volumes of Sludge	
C. Provide for Expanding On-Going Sampling Programs for Those Residual Disposal Techniques Presently Known to be Impacting Water Quality	
III. Identify Control Measure for Disposal of Residuals on Land or in Excavation to Protect Ground and Surface Water Quality	8-10

The disposal of residual wastes in the OCPC 208 area is one of the more complex problems with which the region is faced. Due to the very nature of the generation of residuals and the great variety of sources of residuals no one disposal alternative offers adequate safeguards as a long term technique for the preservation of surface and groundwater quality in the OCPC 208 area. The region presently faces disposal problems with residuals generated by existing sewage treatment facilities, industries, automotive service companies, restaurants, building demolition operations and the municipal residuals generated by the average homeowner (see the OCPC publications Solid Waste Management, Industrial Cost Recovery, Industrial Wastewater Survey and Chapter 4 of this document). Although several of these residuals are not, as yet, evident as water quality problems, the management and disposal of these same materials is highly inefficient. The area's landfills are the primary source. of water quality problems related to residuals disposal.

It is expected that a great deal of the work done to date as part of OCPC's 208 program will be incorporated into the program to be established under the mandates of P.L. 94-580, the Resource Conservation and Recovery Act (RCRA). The stated objectives of that Act are to promote the protection of health and the environment and to conserve valuable material and energy. In order to fullfill the objectives of the Act an extensive evaluation of solid waste disposal practices and techniques is to be undertaken. The Act calls for providing technical and financial assistance for the development of solid waste management plans. Future open dumping on the land will be prohibited under the mandates of the Act in addition to requiring the conversion of existing open dumps to facilities which do not pose a danger to the environment or to health. The disposal of hazardous wastes is to be investigated and regulations are to be promulgated for their treatment, storage, transportation and disposal. Research for improved solid waste management and resource conservation techniques will be promoted.

The alternatives presented here identify processes to control the disposition of all residual waste generated and the disposal of pollutants on land or in subsurface excavations in the OCPC 208 area which could affect water quality and are intended to provide for eventual compliance with the RCRA (Resource Conservation and Recovery Act). The alternatives identify an agency to carry out the mandates of the RCRA; identify the residuals generated in the OCPC 208 area; and identify control measures for disposal of residuals on land or in excavations while protecting ground and surface water quality.

I. Identify an Agency to Carry out the Planning Mandates of P.L. 94-580, the Resource Conservation and Recovery Act.

Clearly any process which will fulfill the 208 plan requirements of Sections b(2)(j) and b(2)(k) will require assimilating data gathered as part of the 208 study program into the planning efforts of P.L. 94-580.

A. Assign OCPC (the 208 Water Quality Planning Agency) as the Solid Waste Planning and Management Agency.

Description: As a 208 agency the Old Colony Planning Council would be

designated as the solid waste planning and management agency for the region.

Evaluation: On the basis of both previous planning and current studies, a regional agency such as OCPC which already has planning capabilities in other environmental areas makes a logical choice. OCPC has done the following previous planning:

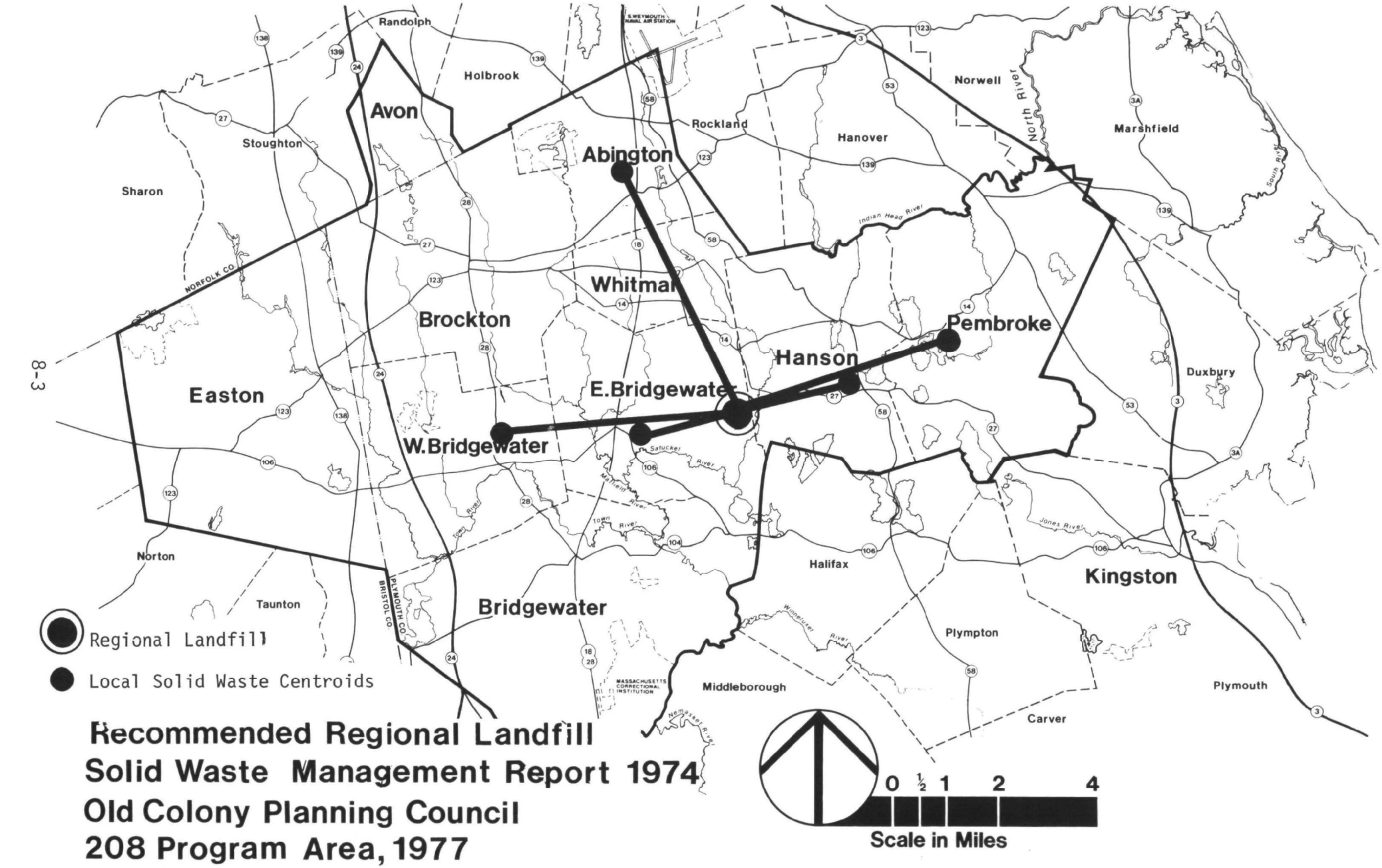
·Identification of disposal practices and needs - OCPC has previously completed a report evaluating regional alternatives for disposal of municipal residuals entitled 1974 Solid Waste Management. The report recommended that those communities with existing landfills upgrade their operations to meet current Massachusetts regulations and that the towns of Abington, East Bridgewater, Hanson, Pembroke and West Bridgewater dispose of their wastes at a regional landfill in East Bridgewater (see figure 8-1). This recommendation was based on the expectation of significant cost savings as well as the assumed reduction in the potential for environmental problems with the operation of a single centralized landfill.

·Survey of past and present landfill operations - Past, and in many instances present, disposal practices, as well as disposal site selection criteria have contributed to landfill-related water quality problems and have created the potential for more serious long term water quality problems. Within the region, municipal landfills are in operation in East Bridgewater, Easton, Pembroke, and West Bridgewater. Of these four landfills, the landfills in East Bridgewater, Pembroke and West Bridgewater have been cited by the State Department of Public Health for various operation problems. The remaining OCPC 208 communities have sought and engaged themselves in alternative disposal practices. Avon, Brockton and Whitman currently contract for residuals disposal at a privately-owned and operated resource recovery and recycling facility located in East Bridgewater. The communities of Abington, Bridgewater and Hanson are currently disposing of their municipal residual wastes at disposal sites outside of the OCPC 208 area. The disposal practices of each OCPC 208 community are discussed below:

Abington: Abington is presently disposing of its refuse and garbage in Randolph. Refuse had formerly been disposed of at an in-town, municipally operated landfill located on Groveland Street. As indicated in the water quality sampling results (see the appendix), the former site is a suspected source of several elevated levels of pollution parameters in the Stream River. The former landfill site is extremely wet and a small stream passes directly through the landfill. On the basis of an inspection of the site additional in-stream and boring samples for leachate flows are presently being taken at the site.

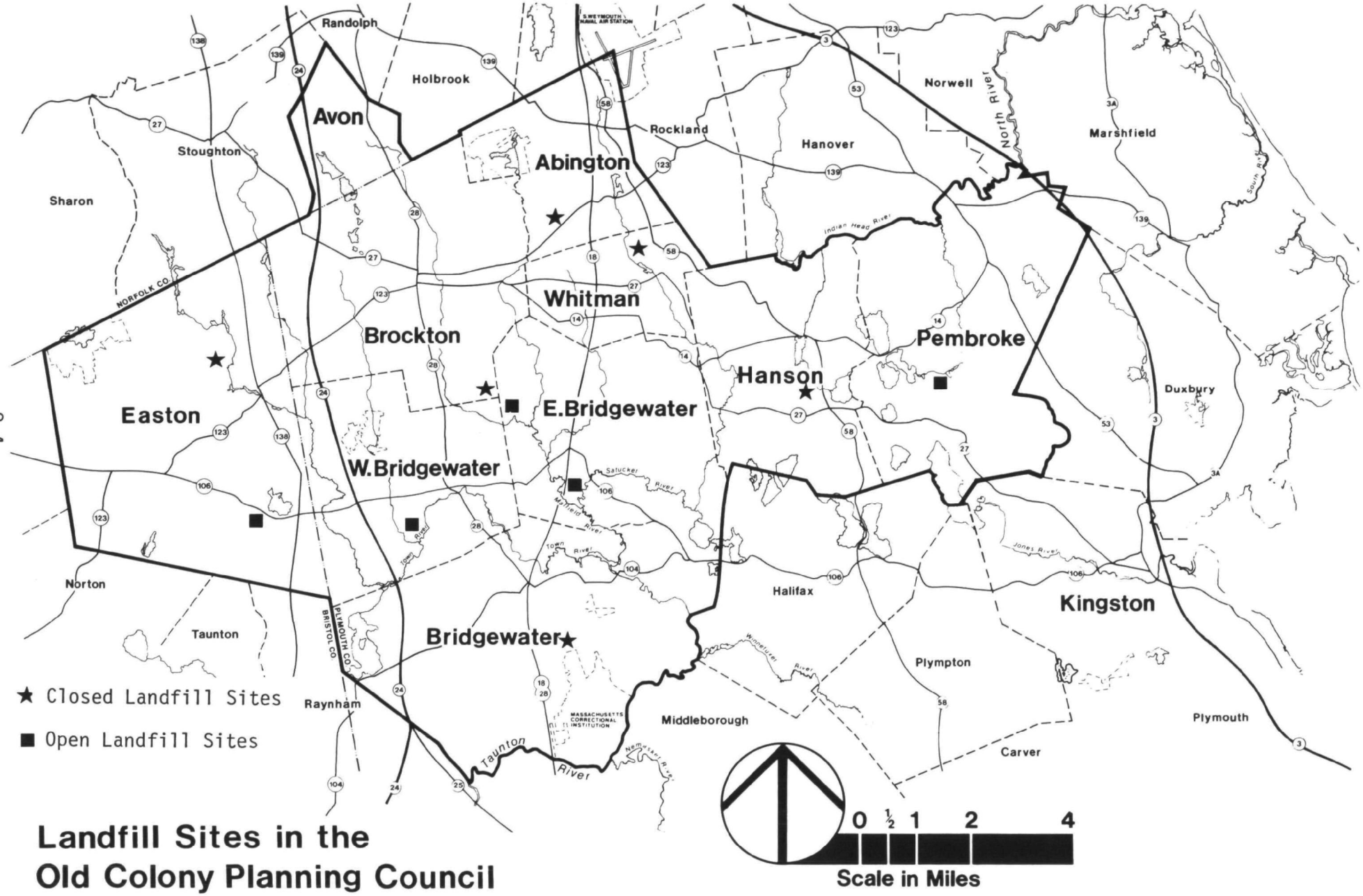
Avon: Avon is presently engaged in a long-term refuse disposal agreement with the East Bridgewater Resource Recovery Center. Due to severe operational problems the former in-town municipally operated landfill on Wales Street was closed in 1974. The closed landfill site is being developed into an industrial area.

Bridgewater: Refuse collected in Bridgewater is presently disposed of in Plainville. The town has formerly disposed of its refuse at a privately owned



8-3

Recommended Regional Landfill
Solid Waste Management Report 1974
Old Colony Planning Council
208 Program Area, 1977
Fig. 8-2



Landfill Sites in the Old Colony Planning Council 208 Program Area, 1977
Fig. 8-2

landfill site off Winter Street. The former landfill site had limited room for expansion and had recurring operational problems which necessitated its closing. As a result of comments received at a 208 water quality workshop held in Bridgewater additional surface water sampling as well as boring samples to assess leachate generation at the site is presently being conducted.

Brockton: Brockton presently disposes of its municipally collected refuse at the East Bridgewater Resource Recovery Center and has done so since 1973. Prior to that Brockton operated a landfill on Thatcher Street. According to information provided by Brockton officials, the former landfill site, although closed, has not been sealed. Efforts are currently under way to seal the landfill.

East Bridgewater: Refuse is currently disposed of at a municipally owned and operated landfill in East Bridgewater. The landfill has recently been cited for several operational problems in response to which East Bridgewater has initiated several corrective practices. As indicated in the water quality sampling results leachate from the landfill is suspected of contributing to water quality problems in the Matfield River. Additional sampling is to be done by OCPC at the site.

Easton: Easton presently disposes of its refuse at an in-town municipally owned and operated landfill on Prospect Street. The landfill has, in the past operated successfully and is expected to continue doing so. In 1974 it was projected that the present site was adequate for approximately 20-25 years of operation. In addition it was estimated that adequate cover material was available for at least ten years. There is a closed landfill at the end of Baldwin Street in North Easton. Two of the town wells are located 2000 feet from the site.

Hanson: The town of Hanson presently disposes of its refuse in Berkely. A transfer station, owned and operated privately, is located at the site of the former Hanson landfill.

Pembroke: Pembroke presently disposes of its refuse at a municipally owned in-town landfill located on Hobomock Street. The landfill has frequently been cited by the State Department of Public Health for various operational inadequacies of which generation of leachate has been one of the more recent problems. In light of existing operational problems, wet conditions at the site and the fact that expansion of the site has been proposed, surface and boring samples are presently being collected at the site to assess existing leachate generation.

West Bridgewater: Refuse is presently disposed of at the town-owned landfill on South Elm Street. The existing site was converted from an open burning dump and its transition to a landfilling operation has not been very successful. The State Department of Public Health has cited the landfill several times in recent years. In light of the problems with the present iste and a proposed closing of the site by October 1977 a committee has been formed in West Bridgewater to study the situation.

Whitman: Whitman has opted for disposing of its refuse at the East Bridgewater Resource Recovery Center. In so doing Whitman signed a 10 year contract with East Bridgewater Associates who run the facility. There are presently problems at the former Essex Street landfill site. The area surrounding the site is extremely wet with wetlands located directly behind the landfill site. Frequent outbreaks of leachate have been a problem at the site. On the basis of reported outbreaks of leachate and discussions at the 208 water quality workshops held in Whitman the closed landfill was selected for additional sampling by OCPC. This sampling is currently on-going.

East Bridgewater Resource Recover Center: At the present time the East Bridgewater plant is primarily an incinerator. Its present processing capacity is 1200 tons per day (TPD) but can be expanded to 1800 TPD. In-coming refuse is shredded before going through a magnetic separation process where metals are separated from the refuse; the remaining refuse is further classified and shredded before it is incinerated. The amount presently incinerated amounts to approximately 67% of the waste. Included at the Resource Recovery Center is a 35 acre landfill which is used to landfill the residue from the operation.

·Mapping of past and present refuse dumping sites (see figure 8-2).

·Identification of future disposal needs - OCPC is currently conducting a regional survey of former and existing landfill sites to evaluate leachate generation at each site. The results of this survey will serve as the basis for the need for alternative disposal practices or alternative disposal sites in those communities where water quality is shown to be impacted by leachate.

·Study of industrial residual disposal practices - As discussed in Chapter 5 of this report Brockton is the primary location of major industrial operations in the 208 area. OCPC's 208 program funded, in conjunction with the City of Brockton's 201 facilities study, the preparation of the Industrial Cost Recovery (ICR) program required for the upgrading and expansion of the City's wastewater treatment facility. Development of the ICR program involved the preparation of an industrial wastewater survey and preparation of a report. In addition to identifying industries which will be required to participate in the pre-treatment and ICR programs (see Table 8-1), residual wastes including waste oil and grease were examined. Generation and disposal practices were identified as a result of surveying all of the City's gas stations and its major restaurants (see Tables 8-2 and 8-3). As a result of the industrial wastewater survey, preliminary projections as to volume and constituents of pre-treatment of residuals to be generated by affected firms are currently being made. (see the OCPC publications Report Upon Industrial Cost Recovery Program and Industrial Wastewater Survey Report No. 1).

B. Assign Some Other Agency as the Solid Waste Planning and Management Agency

Description: Other possible agencies for assignment could be the counties of the State Bureau of Solid Waste.

Evaluation: While having programatic functions in regulation of solid waste, neither the counties nor the state agencies have a regional configuration

TABLE 8-1

INDUSTRIAL COST RECOVERY PAYMENTS

INDUSTRY	WASTEWATER LOADING			ANNUAL COST PER PARAMETER			COST RECOVERY PAYMENTS	
Major Wet Industries	Flow gpd	BCD lb/day	ss lb/day	Flow $	BOD $	SS $	Annual $	Recovery Period $ (20 years)
Alden Products Co.	7,175	0	0	$ 224.22	$ 0	$ 0	$ 224.22	$ 4,484.40
Barbour Welting Co.	20,260	230	80	633.13	749.11	328.56	1,710.80	34,216.00
Churchill Supply Co.	18,825	210	113	588.26	683.97	464.09	1,736.34	34,726.80
Columbia Tanning Corp.	60,000	350	168	1,875.00	1,139.95	689.98	3,704.93	74,098.00
Drew Tanning Co.	21,090	88	150	659.06	286.62	616.05	1,561.73	31,234.60
Garland Corp.	11,550	3	2	360.94	9.77	8.21	378.92	7,578.40
Hesse-Eastern Div. of Norris, Ind.	21,400	5	6	668.75	16.29	24.64	709.68	14,193.60
Howard D. Johnson Co.	98,180	418	122	3,068.13	1,361.43	501.05	4,930.61	98,612.20
Rofor Precision Plating Co.	10,560	0	1	330.00	0	4.11	334.11	6,682.20
Stone-Tarlow Sole Corp.	1,200	11	5	37.50	35.83	20.54	93.87	1,877.40
F. B. Washburn Candy Co.	20,000	6	6	625.00	19.54	24.64	669.18	13,383.60
Wind Specialty Co.	7,400	0	0	231.25	0	0	231.25	4,625.00
Sub-Total	297,640	1,321	653	$9,301.26	$4,302.51	$2,681.87	$16,285.64	$325,712.80
Minor Wet Industries								
Enterprise Publishing Co.	130	0	0	$ 4.06	$ 0	$ 0	$ 4.06	$ 81.20
CTR Mfg. Corp.	830	0	0	25.94	0	0	25.94	518.80
Liberty Baking Co.	825	1	1	25.78	3.26	4.11	33.15	663.00
Orange Crush Bottling Co.	2,520	1	1	78.75	3.26	4.11	86.12	1,722.40
Superior Baking Co.	975	1	1	30.47	3.26	4.11	37.84	756.80
Tarpy, Inc.	1,360	1	1	42.50	3.26	4.11	49.87	997.40
Sub-Total	6,640	4	4	$ 207.50	$ 13.04	$ 16.44	$ 236.98	$ 4,739.60
Total								
Wet Industries	304,280	1,325	657	$9,508.76	$4,313.55	$2,698.31	$16,522.62	$330,452.40

TABLE 8-2

SERVICE STATIONS CONNECTED
TO THE SANITARY SEWER SYSTEM

Brockton, Massachusetts

STREET ADDRESS	NAME	OIL TRAP - MAINTAINED		WASTE OIL TANK - COMPANY
Ashland Street				
210 East	Vinny's Sunoco	No	-	500 gal. - Northeast Waste Removal
253	Ashland St. Shell	Yes	No	500 gal. - not certain
Belmont Street				
351	Corayer's Service Station	No	-	500 gal. - not certain
	Carney Brothers & Fairside	No	-	275 gal. - Peirce Oil Service
485	Fairgrounds Citgo	Yes	No	Yes - not certain
827	Ronnie's West Side Sunoco	Yes	Yes	Yes - P.P.C. Resources
899	Arco Tire	Yes	No	Yes - not certain
945	Sneider's Texaco	No	-	Yes - MacDonald & Watson Waste Oil
1012	Coe's Mobil	Yes	No	300-500 gal. - Peirce Oil Service
1016	Dreystad Cadillac	Yes	No	Yes - Peirce Oil Service
Center Street				
170	Berretta Buick-Opel Inc.	No	-	Yes - Peirce Oil Service
234	Imperial Service Station	No	-	Yes - MacDonald Watson Waste Oil
365	Center St. Arco	Yes	No	500 gal. - Western Waste Oil
491	Saba's Citgo	No	-	Yes - Western Waste Oil
530	Eastway Service Station	Yes	No	Yes - P.S.C. Resources, Inc.
731	Belmosto's Service Station	No	-	500 gal. drum - not certain
Court Street				
70	A & B Automotive	No	-	Drums - not certain
369	Armand's Exxon Station	Yes	No	500 gal. - Western Waste Oil

(Partial list--taken from Industrial Wastewater Survey Report No. 1, October 1976 (Brockton Sewer Department, Fay, Spofford, & Thorndike, Inc. Engineers))

TABLE 8-3 - MAJOR RESTAURANTS

Street Number	Name	Grease Trap(s)	Grease Disposal with solid wastes	Grease Disposal special pickup (sold)	Garbage Disposal Unit(s)
Belmont Street					
525	McDonald 's	2	-	yes	none
606	Burger King	1	-	"	"
708	Friendly Ice Cream Shop	2	-	"	"
726	Producer's Dairy Restaurant	2	yes	"	"
885	Burger Chef	1	-	"	"
1005	Royal Rib Restaurant	3	-	"	"
Crescent Street					
665	Burger King	1	-	yes	none
675	Papa Gino's Restaurant	1	yes	-	"
696	Friendly Ice Cream Shop	none	yes	-	"
741	Jack-in-the-Box	1	-	yes	"
775	JB's Big Boy Family Rest	1			"
782	Christo's	2	-	yes	1
793	Dip 'n Sip	1	-	-	-
Main Street					
265	Wah Sun Restaurant	1	-	yes	none
1245	Jack-in-the-Box	1	-	"	none
1267	Kentucky Fried Chicken	1	-	yes	none
1507	Capeway Manor	2	-	"	1
2079	Friendly Ice Cream Shop	2	-	"	none

(Partial list--taken from Industrial Wastewater Survey Report No. 1, October 1976 (Brockton Sewer Department, Fay, Spofford, & Thorndike, Inc. Engineers))

with elected officials of the towns as part of their structure. In addition coordination with the water quality planning activities on the regional level would be more difficult.

II. Identify all Residuals Generated in the OCPC 208 Area and Identify Problems Associated with their Disposal Process.

As discussed above, OCPC's efforts have determined several of the sources of residuals in the area as well as determining that water quality problems exist with the disposal of these same residuals.

A. Provide Additional Surveillance and Evaluation of Those Residuals for which Disposal Methods are Not Presently Known to be Impacting Water Quality

Description: This alternative will require the expansion of the residuals survey program relative to the disposal of waste oil and grease into the non-Brockton OCPC communities (i.e. gas stations and restaurants). In addition, an areawide evaluation of disposal practices for demolition wastes, industrial residuals, toxic wastes (i.e. pretreatment residuals as well as septage hauler loads refused at wastewater treatment plants) and scrap storage (i.e. junk cars, metals, etc.) will be required.

Evaluation: This alternative provides for the establishment of a preventive program whereby early detection of "problems" due to the disposal of these residuals is possible. In addition survey data will equip the solid waste planning agency with an accurate assessment of present disposal techniques.

B. Evaluate NPDES permits for Existing Municipal and Industrial Discharges to Assess Volumes of Sludge

Description: Revised NPDES permits written for discharges within the OCPC 208 area would be reviewed. Effluent limitations, in comparison to existing effluent quality would be examined. 201 Facilities planning performed in conjunction with NPDES permit requirements for elimination of discharges would be reviewed by the designated Solid Waste Planning and Management Agency.

Evaluation: Evaluation of existing effluent quality in comparison to NPDES permit required effluent quality will provide the basis for projecting a residual waste volume and its parameter characteristics.

C. Provide for Expanding On-Going Sampling Programs for Those Residual Disposal Techniques Presently Known to be Impacting Water Quality

Description: As discussed in the previous section landfills in the area are currently the object of a sampling program being conducted by OCPC. This alternative provides for the establishment of an on-going subsurface and surface water sampling program on an areawide basis.

Evaluation: In light of the fact that several surface water bodies are presently being impacted by leachate from both closed and operating landfills, continuous monitoring at both existing problem landfills and those landfills

not presently known to be a water quality problem will provide data capable of serving as an accurate indicator of leachate problems. The sampling data will serve as the impetus for taking various corrective measures where determined necessary.

III. Identify Control Measure for Disposal of Residuals on Land or in Excavations to Protect Ground and Surface Water Quality

Within the OCPC 208 region the only means for the disposal of residual wastes is disposal in the area's landfills. In light of the fact that currently operating landfills as well as former landfills in the areas are negatively impacting surface water quality, existing control measures require extensive revamping. In addition previously recommended control measure must be reassessed (such as those in the OCPC report Solid Waste Management).

A. Provide for Elimination of Existing Landfill Related Problems Impacting Water Quality

1. Assess the Advisability of Providing Structural Corrective Measures to Landfills Shown to be Leachate Problem Sources

Description: Various structural methods for correcting landfill site inadequacies from which leachate problems have been detected will be evaluated at those landfills shown to be problems by the on-going landfill sampling program. Landfills presently being sampled are in Abington (closed), Bridgewater, East Bridgewater, East Bridgewater Resource Recovery Center, Pembroke, Rockland (at the Hanson border), West Bridgewater and Whitman.

Evaluation: Leachate is the primary source of water quality problems related to landfills in the OCPC 208 area and as such a majority of the corrective measures assessed will address the leachate generating characteristics of landfills. Availability of adequate treatment capabilities of the collected leachate will be reviewed.

2. Assess the Operational Integrity of Currently Operating Landfills and the Advisability of Continued Operation of These Same Facilities

Description: Information in regard to leachate generation, expandability of the existing landfill, availability of cover material, proximity to wetlands (for both operating area and expansion area), projected useful life of the site and projected costs to correct any current operational deficiencies to comply with regulatory agency mandates should be assessed for each landfill. Upon evaluation of these criteria the advisability of continued operation of the existing landfill will be assessed.

Evaluation: Upon completion of this assessment accurate evaluations of in-town landfills will be available for applicable communities. Costs of continued operation of a landfill such that the potential of impacting water quality is reduced or eliminated will be available.

3. Re-evaluate Community Attitudes Towards Regional Solid Waste Solutions in Those Communities where Continued In-town Landfilling Seems Infeasible

Description: Based on information gathered in alternative B above, several alternative measures of residual disposal proposed as part of the 1974 Solid Waste Management Report (i.e. a regional landfill in East Bridgewater and disposal at the East Bridgewater Resource Recovery Center) will be given renewed evaluation. In order to assess the implementability of the alternatives considered, local attitudes towards regional configurations of disposal options were surveyed in the 1974 report. At that time, which was prior to the implementation of more stringent enforcement programs and landfill operational requirements, community attitudes were strongly opposed to regional landfilling operations. This alternative will require that those communities presently operating in-town landfills be reconsidered as part of a regional solid waste disposal operation.

Evaluation: For several of the areas existing local landfill operations, compliance with state regulations related to landfill operational practices has and will continue to result in significantly higher expenditures of local funds as part of landfill operational budgets. When these costs are evaluated in conjunction with projected useful life of the landfills, the results may result in a change of community opinion.

CHAPTER 9

Local Environmental Management Programs

Table of Contents

	Page
Description of Environmental Management Problems	9-1
I. Lakes Management	9-10
A. Shoreline Regulations	9-14
B. Limit the Use of Phosphate Detergents	9-15
1. Voluntary Limitation of Phosphate Detergent Use	
2. Adopt a State Law Prohibiting the Sale of Phosphate Detergents	
C. Remove Nutrients From Lakes or Lessen Their Impacts	9-15
D. Seek Outside Funding to Implement Programs	9-17
II. Wetlands and Floodplain Protection	9-17
A. Protection of Wetlands by Means of the Wetlands Protection Act	9-18
B. Protect Wetlands by Means of Wetlands Protective Orders	9-23
1. Coastal and Inland Restrictions Programs	
2. Conservation Restrictions	
3. Scenic River Designation	
C. Protect Wetlands by Designation as an Environmentally Critical Area	9-25
D. Protect Wetlands and Floodplains Through Enactment of Provisions in the Zoning By-Law	9-25
1. Wetlands and Floodplain Protection Districts	
2. Other Provisions of Zoning By-Laws	
E. Protect Wetlands and Floodplains in Town By-Laws	9-27
F. Utilize Provisions of Federal Legislation to Protect Wetlands and Floodplains	9-28
1. HUD National Flood Insurance Program	
2. Utilize the Army Corps of Engineers 404 Program	
3. Environmental Protection Agency's Policy Statement: Protection of Nation's Wetlands	
4. Executive Order 11990, Protection of Wetlands	

III. Earth Removal 9-30

A. Incorporate Water Quality Objectives in Sand and Gravel Regulations 9-34

1. Update Earth Removal By-Laws

2. Impose State Permit Requirements on Sand and Gravel Removal under the Massachusetts Clean Waters Act

B. Provide for Regulation of Coal Mining 9-35

1. Adopt Municipal Regulations for Coal Mining

2. Adopt State Regulations for Coal Mining

IV. Preservation of Agricultural Land 9-36

V. Natural Areas Protection 9-37

A. Prepare Open Space and Conservation Plan

B. Designation of Critical Environmental Areas

1. Designate the Hockomock Swamp as a Critical Environmental Area

VI. Pesticide Programs (Non-Agriculturally Related) 9-40

Hydrologically sensitive areas, those that play a significant role in the flow, storage, and recycling of water, include aquifer recharge areas, wetlands, floodplains, ponds and streams and shorelines. In the past, natural characteristics of hydrologically sensitive lands, such as permeability of the soil, elevation of the groundwater table, and the proximity of streams and wetlands have been ignored by land owners, builders, and developers. Many of the existing water quality problems in the OCPC 208 area result from the lack of a full understanding of the natural functions of the land. Such an understanding may be developed through an environmental management program, designed to prevent future water quality problems.

Environmental management enables the on-going protection of land and water resources, as well as the continued monitoring of potential pollution sources and the eventual abatement of these hazards. Environmental management programs are unlike many pollution control programs because they include the entire spectrum of land and water resources.

Local environmental management programs begin with public education and awareness of local resources. Next a detailed, accurate, field-checked inventory of town land use should be prepared. Land use categories would inlcude but not be limited to: wetlands, floodplains, ponds and lakes, agriculture (intensive and extensive), mature woodland, and residential, commercial and industrial land. Further analysis of the land would include the mapping of soils, aquifer recharge areas, depth to groundwater, drainage basins, wildlife habitats, and endangered species habitat.

One goal of the 208 study is to identify environmentally sensitive areas. This is not intended to be a complete identification of all environmentally critical areas because the 208 study is a water quality study and thus the areas inventoried are only those that have a potential for affecting water quality. The types of areas inventoried include drainage basins, soils, mature forests, wetlands, floodplains, aquatic environment - ponds, streams, and lakes, and endangered species habitat and groundwater.

Drainage basins were mapped using the U.S.G.S. topographic sheets which are at a scale of 1" = 2000', the drainage basins were delineated and a drainage map was made, also at the 1" = 2000' scale. The drainage basin map was used to help determine water quality sampling sites and is being used in sewer service area delineation. It is also used for site specific technical assistance to determine which surface water bodies various activities occurring on the land, such as the placement of a salt pile, might be affecting.

Soils of the OCPC 208 area have been surveyed and mapped by the Soil Conservation Service and published in the Plymouth County Soils Report, the Eastorn Soil Report and the Avon Soil Report. The soils were originally mapped at a scale of 1" = 1320' and had an inclusion rate of 15-30%. Inclusions are areas of a soil type other than that of the soil designated. In order to use soils information on a more site specific basis, it is necessary to have a town soil report made. Table 9-1 lists the towns in the OCPC 208 area that have detailed soils surveys and the year that they were completed.

TABLE 9-1

COMMUNITIES WITH DETAILED SOIL SURVEYS

IN THE OCPC 208 AREA

Community	Year Soil Survey Completed
Abington	-
Avon	1963*
Bridgewater	1970
Brockton	-
East Bridgewater	1966
Easton	1969
Hanson	1973
Pembroke	1968
West Bridgewater	1972
Whitman	1963*

*Note: These early community soil surveys map general soil characteristics only. They are not as detailed as the current series of town soil reports.

Mature forests in the OCPC 208 area have been mapped based on forest types from the Massachusetts Map Down program carried out by Professor MacConnell at the University of Massachusetts. Utilizing knowledge of the normal mature height of the most commonly occurring trees in the 208 area, a map was prepared at the 1" = 2000' scale of mature forests.

Although on the level of the two year 208 study it is not possible to quantify the effect, it is possible to qualitatively assess the impact of large scale residential construction or construction of sewage treatment facilities on areas of mature dense forests. A forest normally evapotranspires large amounts of water. Water present in the soil is taken in through the root hairs, conducted up the trunk and either evaporates from the tree or is transpired through small pores in the leaves called stomata. When mature, dense forests are felled, the water that had been removed to the atmosphere via the trees moves into brooks and streams and raises the level of the brook and increases the size of the downstream floodplain. In New England many of the soils are subject to fragipan formation - the formation of an impermeable layer at the top of an iron oxide or aluminum oxide layer. Where tree roots are present this layer is broken up and penetrated allowing the downward percolation of water. With the removal of the trees and their roots an impermeable layer can form which impedes water flow, making the soil unsuitable for septic tanks. The leaves of trees break the fall of precipitation which reduces the kinetic energy and thus the eroision of the soil below. In addition the litter layer on the forest floor breaks the fall and promotes infiltration. Together these qualities promote the movement of water into the soil and down to the groundwater and prevent rapid overland flow by water which would cause sedimentation of downstream surface waters.

Wetlands and floodplains were mapped for each community at a scale of 1" = 1000' and for the region as a whole at 1" = 2000' using four infromation sources: the MacConnell Map Down maps, HUD preliminary floodplain maps, community wetlands maps, and U.S.G.S. topographic maps. The Pembroke Conservation Commission wetlands map was utilized in Pembroke as the only source of information. The MacConnell Map Down maps were not able to be utilized exclusively both because they were made six years ago and because the definition of wetlands used in that study does not include wooded swamps as being a wetland.

Table 9-2 illustrates the changes in non-wooded wetlands in the 208 area from 1951 to 1971 according to MacConnell Map Down figures. It is interesting to note that five of the communities have shown an increase in the amount of land shown as wetland. This is partly due to the eutrophication of shallow water bodies over the 20 years (see also Fig. 9-1).

No field check of these lands has been performed to date so that the wetlands and floodplains maps show the approximate location and size of the various wetlands and floodplains, but can not be used for site specific work.

TABLE 9-2

CHANGE IN WETLANDS, 1951-1971

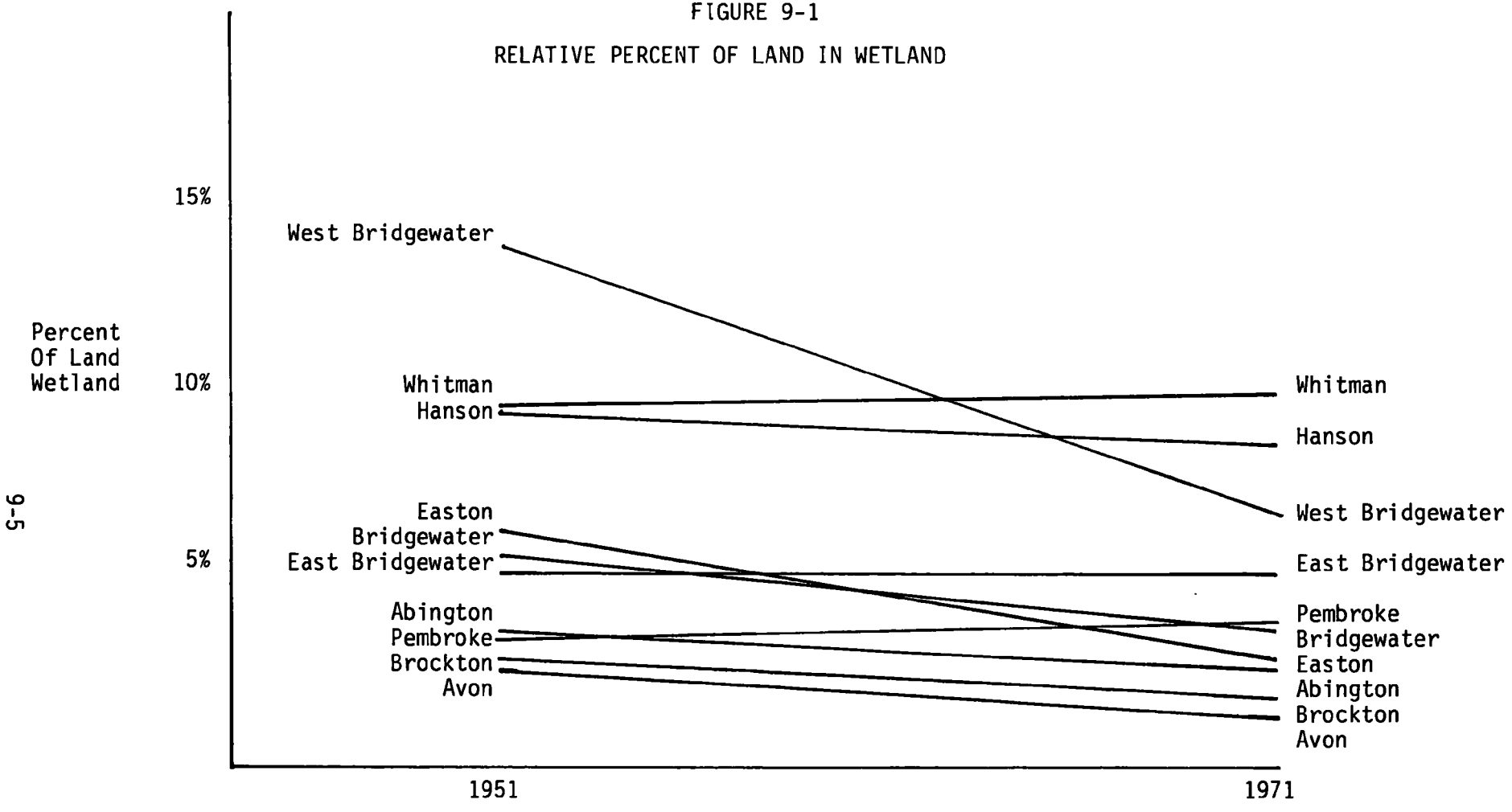
(area in in acres)

	1951	1971	Change In Acres	Percent Change
ABINGTON	280	266	- 14	- 5.0%
AVON	208	179	- 29	13.9%
BRIDGEWATER	1,292	1,146	-146	-11.3%
BROCKTON	416	243	-173	-41.6%
EAST BRIDGEWATER	710	745	+ 35	+ 4.9%
EASTON	1,309	673	-636	-48.6%
HANSON	1,218	1,256	+ 38	+ 3.1%
PEMBROKE	1,648	1,818	+170	+10.3%
WEST BRIDGEWATER	1,344	707	-637	-47.4%
WHITMAN	416	438	+ 22	+ 5.3%

Source: MacConnell, W.P., Remote Sensing, 20 Years of Change in Plymouth, Bristol and Norfolk Counties, Massachusetts, 1951-1971, Planning and Resource Development Series No. 23, Cooperative Extension Service.

FIGURE 9-1

RELATIVE PERCENT OF LAND IN WETLAND



(Source: MacConnell, Massachusetts Map Down)

The wetlands and floodplains maps were used to determine the amount of available, developable land and to make the land use projections. They have been given to the Old Colony Water Pollution Control District in order that they may avoid these areas when laying out interceptor routes and siting the treatment plant. The maps will be used in environmental impact assessment work of the 208 staff. For a further discussion of wetlands and floodplains see below.

Discussion of the aquatic environment is divided into three categories, ponds, streams and rivers, and potential for restoration of fishing.

Initially it was felt that the inventory of water bodies was essentially done. Further examination showed that more extensive work was necessary to inventory all the ponds and lakes in the area. The initial source of information was obtained from the University of Massachusetts pond inventories for Plymouth, Norfok and Bristol counties. This information was checked by using aerial photographs and U.S.G.S. topographic maps. A check was then made at the assessor's offices to determine the location of the ponds and to add additional ponds and lakes. This proved to be a very fruitful source of information, as many ponds and lakes were found that had not been previously noted. This information was then checked with the local Conservation Commissions. A profile sheet (an example is given in Table 9-3) was prepared for each pond or lake which gives the areal characteristics, the ownership, past and present usage, including potential for fish productivity, and water quality. The information for the profiles were obtained from a variety of sources including the Massachusetts Division of Fish and Wildlife, the Division of Waterways, the Public Access Board, and the Division of Water Pollution Control. The ponds information was used in the land use projections and will be used to consider proposals for any changes in water quality standards and for implementation of the 208 study.

Stream and river characteristics were obtained from the Division of Water Pollution Control water quality sampling programs and from OCPC sampling programs (see the Appendix). This information is used to help identify potential pollution sources and to correlate trends and patterns of water quality.

Streams which are capable of being restored for fishing are being compiled based on water quality sampling performed by the 208 study and on criteria set forth by the Environmental Protection Agency. Both chemical and biological constituents of the waters are being examined in evaluating pollutants effects on fish. Additional information was obtained through interviews with the Massachusetts Division of Fish and Wildlife and the Division of Marine Fisheries and the U.S. Fish and Wildlife Service.

Another environmentally critical area of concern to the 208 program are endangered species habitats. Under the Endangered Species Act of 1973 no federal funds can be utilized for an activity that would be detrimental to an endangered or threatened species, such as the building of a sewer interceptor. Unfortunately, although a list can be compiled (see Table 9-4) of such species in this area, not enough information is available to map the location of their habitat. This list was compiled from information available through the Grey Herbarium, the Oakes Ames Herbarium, the Arnold Arboretum and the Museum of Comparative Zoology and Harvard University; the Mass. Division of Fish and Wildlife and the State Conservationist, U.S.

TABLE 9-3

NAME OF POND: CLEVELAND POND

Areal Characteristics

Location: Ames Nowell State Park
Town: Abington
Stream System: Beaver Brook
Street Access: Linwood Street
Assessors Map:
Elevation: 143 feet
Number of Acres: 88 (100 acres)
Drainage Area: 2150 acres
Mean Depth: 3 feet **Maximum Depth:** 6 feet
Pond Type: Artificial

Ownership

Owner: Public, State-owned -- DNR (Part of Ames-Nowell State Park)

Great Pond: No
Flowing Rights:

Uses

Pond Margin Uses: Wooded, park and swamp

Pond Uses:
Present: Fishing, camping and aesthetic

Past: In past was named Semloh Pond (1930)

Potential for fishing: Present productivity -- 60 to 100 lbx of fish per acre; potential over 100 lbs of fish per acre

Water Quality

Classification: B
Water Type: Warm Water; not suitable for trout
Data: Surveyed 8/4/75

Temp. profile - not stratified; D.O. profile - depleted on bottom, surface = 7.9 mg/l, 6' = 1.1 mg/l. This depletion is probably temporary; pH - low at 6.6; alk. - higher than other ponds but still low at 20 mg/l; susp. solids - 8 mg/l (high for lakes); total solids - 124 mg/l; NH_3 - Beaver Brook inlet high at 0.39 mg/l surface 0.03 mg/l, 5' - 0.12 mg/l; NO_3 - present in Beaver Brook inlet at 0.2 mg/l but undetectable elsewhere; T.P. - high in Beaver Brook inlet at 0.55 mg/l; surface 0.09 mg/l, 5' = 0.11 mg/l, high for a pond; transparency low at 2.5 feet, color was high in the pond inlet = 300, surface = 130, 5' = 140.

Possible Pollution Sources: Septic system failures and agricultural runoff

Other Comments: Mass. Water Resources Study -- potential reservoir site (TA-4802)
Dam height 6'± from level of pond

Water Quality data continued: Algae analysis: only greens found at 344 ASU. This was most greens of the 7 lakes investigated, but still not too bad. Because of its shallowness the whole pond experiences weed growth. Particularly widespread were pickerelweed, fanwort, milfoil, watershield, duckweed and pondweed with about 4 other types found medium to sparse. This is a shallow, weed-infested pond. Beaver Brook inlet apparently contributes heavily to the eutrophication of this pond. Noteworthy, however, was the absence of NO_3 in the pond.

TABLE 9-4

ENDANGERED SPECIES IN THE OCPC 208 AREA

FAUNA

Southern Bog Lemming - Synaptomys Cooperi Stonei
- Status - Undetermined
- Habitat - bogs; dense swamps; cool, dense forest undergrowth
- Locale - Plymouth County

Plymouth Red-Bellied Turtle - Chrysemys rubriventris bangsi
- Status - Endangered
- Habitat - quiet, shallow, warm-water ponds
- Locale - Plymouth County
  Boot Pond, Plymouth - type locale
  southshore of Nawshon Island

Spotted Salamander - Ambystoma maculatum
- Status - Endangered
- Habitat - underground im moist woodland
- Locale - statewide
  collected in Barnstable and Dukes Co-nties in 1974, and Holbrook in 1973. Previously collected in Newton, Malden, Lynn, Lexington, Brookline, and Cambridge

Marbled Salamander - Ambystoma opacum
- Status - Endangered
- Habitat - woodlands
- Locale - Plymouth and Bristol Counties
  previously collected in Westport Woods (1960), Wareham, Charlton, Sudbury, Waltham, Worcester, Arlington, and Salem

Eastern Box Turtle - Terrapene carolina
- Status - undetermined
- Habitat - fields, meadows, open woodland; usually near water
- Locale - statewide
  Previously collected in Moose Hill, Sharon (1975); Barnstable County, Wareham, Sandwich, Concord, Springfield and Lancaster

FLORA

Orchidaceae

Isotria medeoloides (= Pogonia affinis) - Small Whorled Pogonia
- Status - Endangered
- Habitat - dry woodland
- Locale - New Hampshire and Vermont south to North Carolina. Massachusetts is at the northern extension of its range. Previously collected in East Hadley

Cypripedium arietinum - Ram's-Head Lady's-Slipper
- Status - Threatened
- Habitat - damp or mossy woods or bogs
- Locale - Canada south to northern New England, rarely to central and western Mass. Previously collected at Mount Toby and in Sunderland.

TABLE 9-4 (cont.)

Scrophulariaceae
Agalinus acuta (= *Gerardia acuta*) - Gerardia
Status - Threatened
Habitat - Dry sandy soil
Locale - Cape Cod to Long Island, inland to Middlesex and Worcester Counties. Previously collected in Natick, Pocasset, Clinton and West Tisbury.

Cistaceae
Helianthemum dumosum - Rockrose
Status - Threatened
Habitat - dry sands, barrens and open woods
Locale - Southeast Mass., Block Island, Rhode Island and Long Island. Previously collected at Buzzards Bay and West Tisbury.

Compositae
Eupatorium leucolepsis var. *novae-angliae* - White scaled Joe-Pye-Weed of New England
Status - Threatened
Habitat - sandy and peaty pond shores
Locale - Plymouth County, Mass. and Washington County, R.I. Previously collected on the damp sandy shore of Loon Pond, Lakeville; on the gravelly upper beach of King Pond, Plymouth County, at the edge of Triangle Pond in Plymouth, and on the shore of Smelt Pond in Kingston

Cyperaceae
Scirpius longii - wool grass
Status - Threatened
Habitat - meadows, swamps and fresh marshes
Locale - Nova Scotia to North Carolina.
Previously collected on an open, mucky marsh in a sand plain in the southern part of Easton, in a large swamp on the main road to Taunton, in the Charles River meadows in Dedham, and the Neponset River meadows near Canton

Isoetaceae
Isoetes eatonii - Quillwort
Status - Threatened
Habitat - fresh ponds, streams and shores or tidal flats
Locale - southern New Hampshire to New Jersey
Previously collected submerged in the mud of a cove of Lake Pearl in Wrentham

Conservation Service.

The final environmentally critical area of concern is gorundwater which is discussed in detail in Chapter 3.

For an environmental management program the information that has been compiled would be reviewed and compared to the projected land use patterns. Spatial land use projections were made for each community on the basis of present trends. After environmentally sensitive areas are mapped the projected land use maps are overlaid to determine an environmental land use plan. Although the population numbers do not change, the spatial arrangement of land use may very well need to change and also public services to support that population may need to change. This would be developed into a preferred land use plan. Recreation, open space and environmentally critical areas would be delineated and protection and management strategies considered. The information prepared by such a program would form the basis of an environmental management program.

Environmental management programs at the local level can be implemented through a variety of mechanisms, including zoning, subdivision control, open space and conservation plans, land acquisition, Board of Health regulations and town by-laws. State and federal programs which may be utilized include floodplains and wetlands regulations, funding for the acquisition of outdoor recreation and conservation lands, and state agricultural land policies (including the purchase of development rights). An additional element in an environmental management program is water conservation (see Water Conservation in Chapter 4) which whould be promoted at all levels of government.

There are many components of a local environmental management program such as lakes management, floodplains and wetlands protection, earth removal control, agricultural and open space preservation, designation of environmentally critical areas such as the Hockomock Swamp, and pesticide control programs (non-agriculturally related).

I. Lakes Management

The numerous lakes and ponds in the OCPC 208 area provide a variety of uses to many different segments of the population. These include drinking water supplies, irrigation and all types of recreational uses. Table 9-5 is an inventory of all alkes and ponds in the OCPC 208 area with a surface area greater than five acres. Also included in this table are pond uses, availability of sampling information, identified water quality problems, acreage and Great Ponds.

Lakes and ponds deserve special planning consideration because they act as sinks which retain the drainage flows from the surrounding watershed. Nutrients and pollutants contained in this runoff water accumulate in lakes. Natural lakes maintain a delicate balance of nutrients which control the growth of vegetation. Alteration of the major nutrient sources, phosphorus and nitrogen, directly affect the rate of algae and aquatic plant growth.

As indicated by the sampling results of the OCPC 208 program (Appendix) several pollution-indicating parameters exceed recommended levels in lakes in the region. These parameters include dissolved oxygen, total coliform and fecal coliform, total phosphorus, nitrate-nitrogen, and chlorides.

TABLE 9-5
INVENTORY OF LAKES AND PONDS IN OCPC 208 REGION

	Swimming	Fishing	Boating	Water Supply	Irrigation	Water Sampling	Water Quality Problems	Great Pond	Acres
ABINGTON									
Cleveland Pond	x	x				x	x		88
Cushing Pond									10
Hunts Pond									6
Island Grove Pond	x	x	x			x		x	38
Shumatuscacant River Pond									5
AVON									
Brockton Reservior				x		x			89
Waldo Lake		x		x					70
BRIDGEWATER									
Carver Pond		x				x	x		35
Clay Pit Pond									8
Cross Street Pond									26
Great Hill Pond, Mosquito Pond									7
Ice Pond									6
Lake Nippenicket	x	x	x			x	x	x	354
East Nippenicket Pond									5
Nunkets Pond, Nuggerty Pond								x	8
BROCKTON									
Bigney Pond									4
Ellis Brett Pond						x	x		drained
Lower Porter Pond		x							6
Upper Porter Pond		x							13
Thirty Acre Pond		x	x			x			30
Waldo Lake		x				x			70
EAST BRIDGEWATER									
Forge Pond						x			6
Jones Pond		x							5
Plymouth Street Pond									117
Robbins Pond	x	x	x			x		x	124

TABLE 9-5 (cont.)

	Swimming	Fishing	Boating	Water Supply	Irrigation	Water Sampling	Water Quality Problems	Great Pond	Acres
EASTON									
Ames Pond									12
Ames Long Pond	x	x						x	65
Bigney Pond									4
Dean Pond									2
French Pond									63
Leach Pond, Wilbur Pond			x					x	102
Little Cedar Swamp Pond					x				11
Monte Pond									7
Morse Pond			x			x		x	10
New Pond						x			16
Old Pond, Furnace Village Pond									7
Picker Pond								x	10
Puds Pond	x								16
Reservoir					x				30
Shovel Shop Pond		x						x	10
Ward Pond									9
HANSON									
Burrage Pond					x				202
Chandler Mill Pond									6
Cushing Pond								x	40
Elm Street Pond									58
Factory Pond						x		x	58
Indian Head Pond	x		x		x			x	118
Maquan Pond	x	x	x			x		x	48
Monponsett Pond	x	x	x	x	x	x		x	528
Reservoir									14
Wampatuck Pond	x	x	x			x		x	62
PEMBROKE									
Arnold School Pond									12
Chaffin Reservoir					x	x			16
Lower Chandler Pond								x	30
Upper Chandler Pond									10
West Chandler Pond								x	12
Dyer's Factory Pond								x	
Furnace Pond	x	x	x	x		x		x	107
Herring Brook Pond		x							6

TABLE 9-5 (cont.)

	Swimming	Fishing	Boating	Water Supply	Irrigation	Water Sampling	Water Quality Problems	Great Pond	Acres
PEMBROKE (cont.)									
Hobomoc Pond	x							x	
Howard Pond									5
Mill Pond									8
Oldham Pond	x	x	x			x			235
Pelham Pond					x				5
Reservior		x			x				100
Great Sandy Bottom Pond				x		x		x	109
Little Sandy Bottom Pond	x				x			x	61
Silver Lake				x		x	x	x	640
Standish Street Pond					x				8
Stetson Pond	x	x	x			x		x	93
Tubbs Meadow Brook Pond									5
WEST BRIDGEWATER									
Mill Pond		x							8
West Mewdow Pond		x	x						25
Town River Pond		x	x						18
WHITMAN									
Hardings Pond									
Hobarts Pond		x				x	x	x	15
Peat Hole									

Suspected sources of these pollutants are failing septic tanks and runoff from agricultural land and paved surfaces.

A fundamental component of a lakes management program is sampling. Sampling programs may be initiated for two major purposes, 1) for the identification of pollution sources so that corrective action may be taken and 2) to monitor a suspected pollution source. The regular sampling of public water supplies is currently required by State laws, as is the collection of bathing beach water samples at approved bathing beaches at least twice monthly during the bathing season by the local Board of Health. Another existing sampling program is administered by the Division of Water Pollution Control as part of their lakes surveys.

A lakes management program would initiate an in-depth sampling program to isolate pollution sources and recommend abatement and cleanup measures. Samples would be taken during each season of the year at various locations and depths of the lake and also in the main tributaries. To facilitate water quality analysis the State Department of Environmental Quality Engineering (DEQE) could be responsible for taking and analyzing the samples and laboratories for water quality analysis would be the same that are to be used for the implementation of the Federal Safe Drinking Water Act (see Chapter 3). Such a program would have the advantage of standardizing all water quality testing by a community. It also would allow local Boards of Health more time to devote to other public health problems such as on-site disposal of wastewater.

Another major component of a lakes management program would be to control the flow of pollutants from the land into lakes and ponds. Pollution sources include failing septic tanks and cesspools (see Chapter 4), agricultural runoff (see Chapter 7), solid waste disposal (see Chapter 8), and new construction (see Chapter 6). The types of regulations which should be considered in a lakes management program are the requiring of sediment and erosion control plans for new construction (Chapter 6), requiring special Board of Health regulations around ponds such as requiring the expansion of leaching areas for seasonal homes being converted to year-round use (Chapter 4), best management practices for agriculture (Chapter 7), and requiring a setback of either a fixed or flexible distance for other land uses which may contribute pollutants to the pond via shoreline regulations.

A. Shoreline Regulations

First shoreline regulations need to define exactly what the "shoreline" is.

A fixed definition of the shoreline would define it as being a specified distance from the banks or edge of the water body. This could vary from 50' to 300' depending on the degree of regulation and the administrative capabilities of the review board. Fixed boundaries have the advantage of being easily defineable, but the distinct shortcoming that they may not be comprehensive enough to protect the water body.

A second method to define a shoreline is to have flexible boundaries which would vary as needed to allow for adequate protection of the lake or pond. One way would be to adopt a specified elevation above the mean water level that would be included in the regulated zone of the adjacent

shoreline. The distance from the lake would vary depending on the slope of the land. Another possibility is to establish a fixed distance from the crest of the nearest slope to the lake. Flexible boundaries are difficult to define but can provide adequate protection for lakes and ponds.

Second, shoreline regulations need to define permitted and prohibited uses. Shoreline regulations may be utilized to prohibit all uses in a specified area with distinct boundaries. Uses which would be prohibited include sanitary landfills, sand and gravel removal operations, and high density development. Shoreline zoning may be adopted as an amendment to zoning by-laws or ordinances. Presently Easton is the only town in the OCPC area to have adopted any special shoreline regulations and that is for a five foot setback from streams established in the subdivision regulations. Shoreline regulations can be an effective method to distinguish lake and pond shorelines from other less critical areas so that special regulations may be adopted.

B. Limit the Use of Phosphate Detergents

Lakes are particularly sensitive to increased phosphorus levels which act as a fertilizer to aquatic plants. High phosphorus levels can cause algal blooms and increased weed growth, thus limiting potential uses of the lake. This alternative would limit the use of one of the major sources of phosphorus, laundry detergents on a town-wide basis. In order for such regulations to be effective, limitation of the use of phosphate detergents would be necessary on a state-wide basis.

1. Voluntary Limitation of Phosphate Detergent Use

Description: This alternative would encourage the voluntary reduction of phosphate detergent use in home adjacent to or near lakes or ponds. Voluntary limitation would be encouraged through educational programs directed toward homes that have the greatest impact on the pond.

Evaluation: Voluntary limitations have no enforcement provisions and therefore may not be completely effective, but with the appropriate educational program and the possible threat of more stringent regulations, this alternative could reduce phosphate pollution.

2. Adopt a State Law Prohibiting the Sale of Phosphate Detergents

Evaluation: This is the most effective alternative for the reduction of phosphoruse levels in lakes and ponds. Legislation of this type has been introduced into the State legislature as House Bill No. 3407. It would "restrict the sale of detergents containing phosphates and prevent further pollution of lakes and waters within the Commonwealth".

C. Remove Nutrients From Lakes or Lessen Their Impacts

The removal of nutrients approaches lake pollution from the point of view of removing or minimizing the impacts of pollutants after they are in the lake or pond (This section is based on "Weeds Got You Down", Southern Rockingham Regional Planning District Commission, N.H.).

This method is best suited to situations where the pollution sources are not possible to be identified or would require great expense to correct. However the removal of nutrients and minimizing of impact of high nutrient concentrations can only provide temporary short-term relief from the increased plant and algal growth associated with high nutrient levels. This method will have no effect on the pollution sources, thus a re-occurrence of the problem is inevitable.

Nutrient removal may be accomplished by dredging, aeration and chemical controls.

Dredging is very effective in the removal of nutrient-rich bottom sediments which support rooted aquatic plants. This method is a relatively long term solution to aquatic plant removal because re-growth is unlikely for several years. However dredging will reduce the clarity of the water, which could lead to a temporary suspension of swimming. In addition, dredging may actually increase the nutrient concentrations in the water by disturbing the bottom sediments. The costs of dredging are approximately $1.50 per cubic yard.

Aeration of lakes and ponds is used to control algae or non-rooted aquatic plants by the use of air compressors and air nozzles to bubble air into the deepest sections of the lake. This process will mix surface water which has high nutrient concentrations with deeper water which has fewer nutrients. It also introduces oxygen into the water. Aeration will result in the decrease of surface water nutrient concentrations and water temperatures which will inhibit the growth of algae in the sunlit zone. However, aeration must be continuous to prevent the return of algal growth. Aeration will have no effect on the total amount of nutrients in the lake which can be used for future growth. The costs of an aeration program for one year in a lake of 180 acres would be approximately $6250.

Chemical controls are divided into two categories, those that kill plants and algae (herbicides and algicides) and chemicals that inactivate nutrients. Algicides and herbicides are able to kill algae and aquatic plants in one week with a minimum amount of manpower. However, repeated applications are necessary to prevent the growth of new vegetation. Another problem is that if the dead aquatic plants are not removed, they will decompose, releasing nutrients into the water and adding to the bottom sediments. The costs of chemical treatment range from $100 to $200 per acre. Nutrient inactivation utilizes non-toxic chemicals such as lime and alum to physically bond nutrients to compounds that will settle to the lake bottom. Nutrient inactivation is most effective in eliminating high phosphorus levels. The chemicals used in this process are safe to both animals and plants. This method is usually used in conjunction with aeration. The cost for the aeration equipment and the chemical treatment range from $300 to $500 per acre.

D. Seek Outside Funding to Implement Programs

One possible source of funding is Section 314 of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) which provides for lakes restoration for publically-owned lakes and ponds. The goals of the Section 314 program are to develop and demonstrate new or improved methods for the prevention, removal, reduction and elimination of pollution in lakes including the undesireable effects of nutrients and vegetation. Approved projects are eligible for 50% federal funding with the remainder to be supplied by state and local programs.

Polluted and degraded lakes may be restored for recreational uses by two methods, restricting the input of nutrients and pollutants and by providing in-lake treatment for the removal of or inactivation of undesireable materials. Reducing or eliminating the sources of pollution may be sufficient to restore lake water quality. In other lakes with more severe problems, in-lake methods may be required.

A 314 grant was recently awarded to the City of Brockton for the restoration of Ellis Brett Pond the Thirty-Acre Pond. The application was conceived of and applied for by the OCPC 208 staff. Ellis Brett Pond is a five acre pond which is located in the city owned D.W. Field Park. A popular swimming area in the City for many years, Ellis Brett Pond has been closed since the mid-60's because of stormwater runoff from the adjacent Westgate Mall.

II. Wetlands and Floodplain Protection

Wetlands and floodplains are important to the preservation of surface and groundwater quality for a variety of reasons. Wetlands have a natural capacity to filter sediments and nutrients from flowing water. Floodplains, by reducing streambank alteration, reduce erosion and consequent sedimentation during floods. Wetlands and floodplains are able to absorb large amounts of water. This function has several consequences. First, it means that wetlands can serve as recharge areas for water supplies. Second it means that filling of the wetland or floodplain decreases the water holding capacity of the land which leads to greater storm flows. Having larger amounts of water during a flood which is also moving at a greater velocity leads to erosion of stream banks and also to greater infiltration/inflow in sanitary sewers and greater flow in storm sewers.

The connection between the filling in of the wetland and the flooding in a business district downstream due to over-flowing storm sewers is often not made by the average person. Nor is the connection made between the filling of the upstream wetland and the increase in dirty water downstream or the filling of the wetland and the drop in water table level at the town wells.

For all these reasons it is necessary to protect the physical, biological and chemical integrity of wetlands and floodplains to assure that there will not be future degradation of surface or groundwater.

Table 9-6 shows the status of the local wetland and floodplain regulations in each of the 208 communities. Table 9-7 was done by the Soil Conservation Service as part of their floodplain inventory in 1976 It is interesting for it surveys local opinion and knowledge about the status of floodplains and floodplain zoning. The yes answer under floodplain zoning for Hanson refers to the fact that Hanson has an Agricultural-Recreation Zone which has some relevant provisions to wetland and floodplain protection. However not all wetlands or floodplains are included in this zone. The yes answer for West Bridgewater as to whether it has floodplain zoning is incorrect, it does not.

A. Protect Wetlands by Means of the Wetlands Protection Act (M.G.L.A. c.131 s.40)

Description: Any person wanting to remove, fill, dredge or alter a wetland must first obtain all locally required variances or permits for the development and file a Notice of Intention with the Conservation Commission, the Department of Environmental Engineering (DEQE) and the Department of Public Works (DPW). The Conservation Commission within 21 days makes a determination as to whether the land comes under the provisions of the Act. This determination is not appealable.

After a public hearing is held, the Conservation Commission makes a determination as to whether the proposed work is significant to a public or private water supply, to a groundwater supply, to flood control, to storm dammage prevention, to prevention of pollution, to protection of land containing shellfish or to protection of fisheries. If the proposed work will be significant, the Conservation Commission may impose and Order of Conditions on the owrk which may effectively halt the proposed work.

This determination may be appealed to DEQE either by DEQE itself, the applicant, abutters of the land, or any ten residents in the town. DEQE may then make superceding Orders of Condition. Final orders are recorded with the Registry of Deeds.

Evaluation: Many of the problems inherent in the administration and enforcement of the Wetlands Protection Act are also problems with other means of protecting wetlands and floodplains. Thus they will be discussed in full here and then merely referred to in other parts.

The first problem is one of notification - notification to the public that the Wetlands Protection Act is applicable to them and notification to the Conservation Commission that someone proposes to do work in a wetland. Many times new residents will purchase a house with the intention of filling in a part of the wetlands to make a garden or to build a swimming pool or other structure without knowing that they must file with the Conservation Commission. When they are

TABLE 9-6

STATUS OF LOCAL WETLAND/FLOODPLAIN REGULATIONS

Community	Conservation Commission Wetlands Protection Act	Zoning By-Law Provision			HUD Flood Insurance Program Status of Flood Insurance Rate Study
		Wetland	Floodplain	Watershed Protection	
Abington	X	X	X		Final, Sept., 1977
Avon	X		X	X	Draft, August, 1977
Bridgewater	X				Draft, December, 1977
Brockton	X	x	X	X	Draft, July, 1977
East Bridgewater	X	x	X		Draft, October, 1977
Easton	X		X		Draft, March, 1978
Hanson	X				Not being studied
Pembroke	X		X	X	Draft, Sept., 1977
West Bridgewater	X				Draft, October, 1977
Whitman	X		X	X	Not being studied

TABLE 9-7

SCS FLOODPLAIN INVENTORY, 1976

Community	Floodplain Zoning	Development Pressure in Floodplain (local opinion)	Flood Management Plan for Reservoirs	Plans to Acquire Floodplains, Wetlands	Three Most Important Inland Wetlands (local opinion)
Abington	Yes	Limited	No	No	Beaver Brook Shumatuscacant River tributaries
Avon	Yes	Limited	Yes	Yes	Scattered wetlands of small acreage
Bridgewater	No	Moderate	No	Yes	Taunton River Lake Nippenicket Carver's Pond
Brockton	Yes	Moderate	No	Yes	Washburn Meadow D.W. Field Park Salisbury River & Brook
East Bridgewater	Yes	Limited	No	Yes	Poor Meadow Brook Satucket River Meadow Brook
Easton	Yes	Limited	No	-	Hockomock Swamp Borderland Swamp Little Cecar Swamp
Hanson	Yes* (agricultural-recreation zone)	Limited	Yes	Yes	None
Pembroke	Yes	Limited	No	Yes	Cedar Swamp North River Kingston St. Swamp
West Bridgewater	Yes* (incorrect)	Limited	No	Yes	Hockomock Swamp Black Betty Swamp
Whitman	Yes	Limited	No	Yes	Hobart Pond Bear Meadow Peat Hole

informed of this by a neighbor or by the Conservation Commission, usually after the work has already begun, the Conservation Commission may be reluctant to enforce the regulations and impose the costs of removing the fill. In addition the Conservation Commission often does not know what work is being done unless someone tells them and many times neighbors are reluctant to inform on their neighbors. One method which can be used to help with this problem is to have all requests for building permits, septic system installation approvals and subdivision approvals referred routinely to the Conservation Commission.

A second problem is that the Conservation Commission is a volunteer group, is often lacking in knowledge or expertise, often has no paid staff and can often be at odds with the rest of the community or other town boards. At a recent town meeting in the Old Colony area the entire budget of the Conservation Commission was deleted, although it was restored at a later town meeting. In addition, the Conservation Commission may find itself at odds with the Board of Selectmen or other boards about decisions as to where to site public facilities such as sewage treatment facilities, police or fire stations, or schools.

A third problem is that the Conservation Commission must determine whether or not the land involved in the proposed project is a wetland. Clearly the preferred alternative would be to have the wetlands mapped onto the assessor's sheets with a copy of the assessors sheets at the building inspector's office, at the Planning Board, at the Board of Health and at the Conservation Commission. This is an expensive task and only the more sophisticated communities have had the resources to do mapping at all, if not on assessors sheets. The communities of Abington, Bridgewater, Brockton, East Bridgewater, Easton, and Pembroke have wetlands maps. In Hanson the wetlands were mapped on the basis of the soils map using only the criteria of "very poorly drained" soils. The Soil Conservation Service says that all "very poorly drained" soils are wetlands and that some "poorly drained" soils are wetlands. Wetlands on poorly drained soils were not included in the Hanson mapping so that it is not complete. In Whitman the wetlands were mapped on the basis of the surficial geology (landforms) with alluvial soils being used as the basis to demarcate the wetlands. Like Hanson this does not give a complete mapping of the wetlands. Another source of information that has been used are the MacConnell Map Down maps referred to above which are based on aerial photographs. The difficulty with using them i.e. the fact that wooded swamps are not included as wetlands has been discussed above.

A fourth problem is in the determination of whether an action is significant. Each case is presented on a case-by-case basis so that there is little way to assess cumulative impacts. In addition with each case coming in individually there is not way to do long range planning for the protection of wetlands. The problem of cumulative impacts is a more severe one however. Under the HUD flood insurance program discussed below, no filling of floodplains may occur if it will raise the 100 year flood level by more than one foot. Each person may fill to less than one foot but either the last person must be denied because his fill would take it above one foot or the cumulative impact of each fill will raise the flood level more than the one foot limit.

A fifth problem is the taking issue. If a public regulation renders a piece of land substantially without value and does not compensate the owner for the loss in value, the courts may declare such regulation a taking. Courts in Massachusetts have found that for floodplain regulations as much as 80% of the value of the land could be lost by the enforcement of the regulation and that it is not a taking if the enforcement was done to protect the public health and safety. However if the enforcement were to be for the enhancement of wildlife values or to protect the biological integrity of the wetland, the courts might rule otherwise. In addition the taking issue does serve to restrain the actions of the Conservation Commissions to impose Orders of Conditions that effectively prohibit action rather than regulate actions.

A sixth problem is that the Orders of Conditions may be superceded by DEQE. DEQE can initiate review of a case on its own as well as hearing appeals from an aggrieved person. In some communities this has led to a sense of frustration on the part of Conservation Commission members who feel that the state will over-ride anyway so why bother to be very strict or to try to make a case for a more uncertain project.

A seventh problem is that certain actions such as mosquito control projects, flooding and draining of cranberry bogs, agricultural lands, anything so designated in a special act of the legislature, or emergency projects are exempt from the provisions of the Act. In the West Bridgewater and Bridgewater areas, at many of the water quality workshops, many expressions of frustration have been registered about the agricultural exemptions to the Wetlands Protection Act.

The last problem is one of the more important problems and that is the problem of enforcement of the Act. The Conservation Commission can enforce the Act, as well as a Natural Resources Officer, but it has not police power. The Conservation Commission can issue a Cease and Desist Order, but his has no statutory standing. It only tells the violator that he is in violation and that the Conservation Commission intends to prosecute. The Conservation Commission can also issue a Request for Compliance, but this has even less weight than a Cease and Desist Order.

After the issuance of a Cease and Desist Order, civil action in Superior Court can be initiated which asks the court to order the violator to stop, to refrain from future activity, to restore the wetland, to file a Notice of Intent, to record an Order of Conditions, to comply with an Order of Conditions, or to complete required work. This civil action must be in the name of the town and must be handled by Town Counsel. It has happened in this area that the town has refused to let the Conservation Commission use the Town Counsel so that the Wetland Protection Act could not be enforced by civil action. A criminal action may also be filed in District Court, but that court can only impose a punishment or fine for past violation and cannot force the completion of required work, etc. Some judges will hold the threat of a fine or even imprisonment over a person however to force compliance.

B. Protect Wetlands by Means of Wetlands Protective Orders (Coastal Restrictions M.G.L.A. c.130 s.105; Inland Restrictions, M.G.L.A. c. 131 s.40A; Conservation Restrictions, M.G.L.A. c.184 s.23-33; Scenic Rivers, M.G.L.A. c.21 s.17B)

1. Coastal and Inland Restrictions Programs

These programs are administered by the Department of Environmental Management (DEM) which identified the wetlands, holds public hearings, and gives notice of the proposed protective orders to the affected owners. If an inland wetland is involved , DEM gets approval from the Board of Selectmen or the City Council. DEM then adopts orders regulating, restricting or prohibiting dredging, filling, removing, altering or polluting wetlands, Final orders are recorded in the Registry of Deeds.

Evaluation: Like the Wetlands Protection Act, the taking issue is a problem with wetlands protective orders. However, if the courts find that there has been a taking, DEM can take a fee or lesser interest in the land through eminent domain proceedings.

Another problem is in the identification of wetlands. Although some 17,000 acres of coastal wetlands have been identified and orders recorded, in eight years of the inland restrictions program only wetlands in the Charles River basin have been restricted and even there the program is not complete. In the 208 area, only wetlands along the North River in Pembroke have been included in the coastal restrictions program (Figure 9-2).

An advantage of the restrictions program is that it does allow for comprehensive planning. All the wetlands in a river basin are included. Another advantage is that orders can be put on even small activities which cumulatively can add up to larger problems.

2. Conservation Restrictions

Description: Conservation restrictions are given by a private landowner (or sold) to a public agency or charitable corporation. The person giving the restriction receives in return a lowered property tax assessment and estate taxes.

The private owner (often after being approached by the Conservation Commission) gives a restriction, easement, covenant or condition on a deed or will, etc. appropriate to retaining the wetlands in their natural condition. A restriction can run with any kind of land but is being discussed in its applicability to wetlands. The approval of the Board of Selectmen is obtained and meeting with the Board of assessors is held. A form is filed with the Dept. of Environmental Qualtiy Engineering (DEQE) which performs a field inspection and legal review of the instrument. If the restriction is to be held by the city, town or a commission, DEQE approves it. If it is to be held by a charitable corporation, it is approved by the Mayor, the Board of Selectmen or Town Meeting. The restriction is then recorded with the Registry of Deeds.

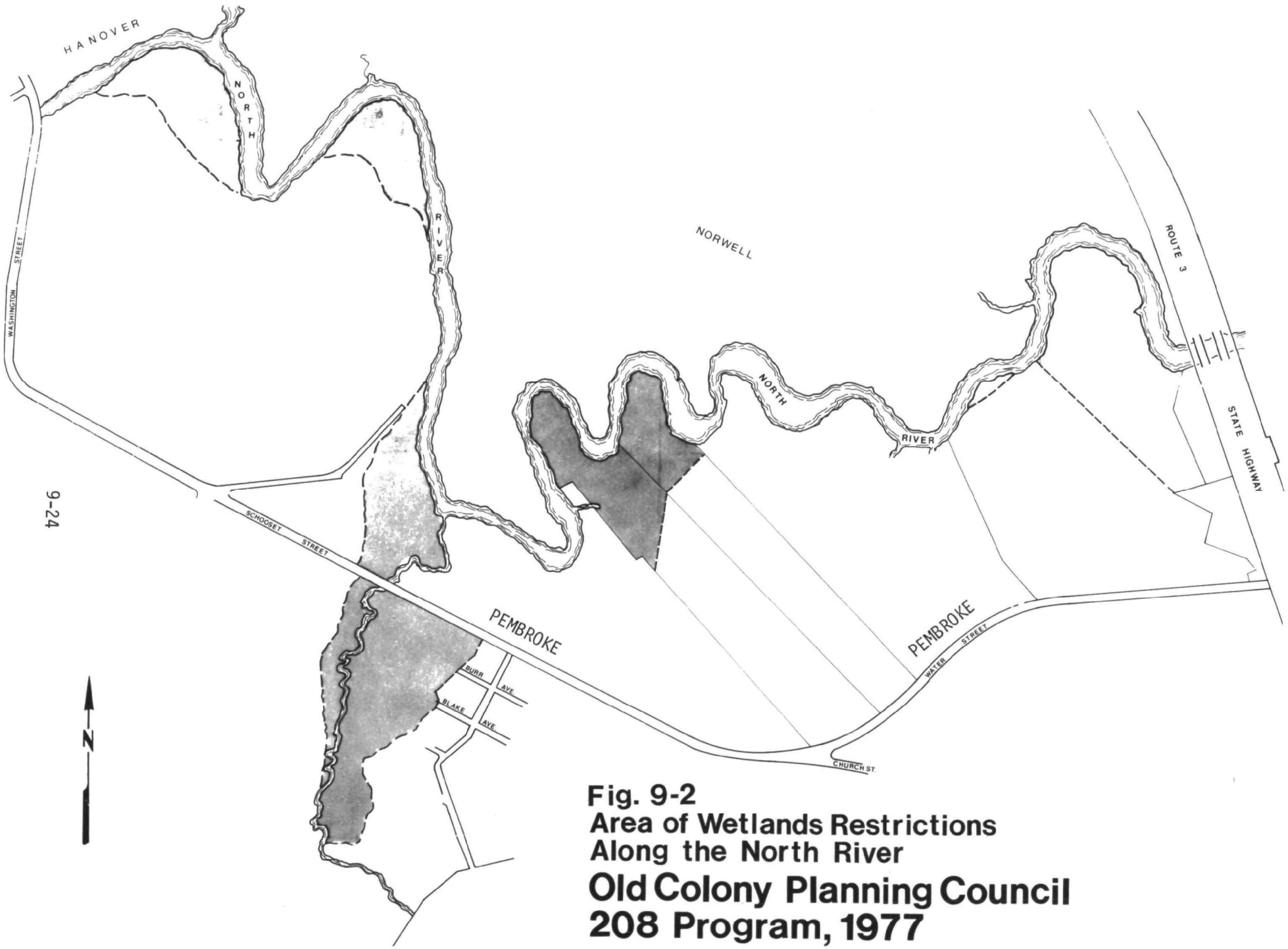


Fig. 9-2
Area of Wetlands Restrictions Along the North River
Old Colony Planning Council
208 Program, 1977

Evaluation: The problems are clearly that the program is entirely voluntary and depends not only on the good will of the private landowner but also on his or her financial ability to give the restriction.

3. Scenic River Designation

Description: Under the Scenic Rivers Act, the Department of Environmental Management (DEM) may designate a river as a Scenic River and place restrictive orders on lands within 100 yards of the bank of the river. Thus where there are wetlands or floodplains within 100 yards of a river, restrictive orders like the Wetlands Protective Orders may be placed on the wetlands and floodplains.

Evaluation: At the present time the North River has been named as a pilot project for designation as a Scenic River. The communities of Hanson and Pembroke as well as the Old Colony Planning Council 208 program are represented on the Advisory Committee which is working with DEM to determine the kinds of restrictive orders.

At the same time as the pilot project is going on, DEM is reviewing other rivers in the Commonwealth as to possible designation. Rivers with great scenic value and active citizen involvement would be given greatest priority. Proposals for Scenic River designation for other rivers are being requested by DEM.

C. Protect Wetlands by Designation as an Environmentally Critical Area

Wetlands, like other kinds of environmentally critical areas, may be designated by the Secretary of the Executive Office of Environmental Affairs. For a discussion of this see below.

D. Protect Wetlands and Floodplains Through Enactment of Provisions in the Zoning By-Law (Zoning Enabling Act, M.G.L.A. c.40A)

1. Wetlands and Floodplain Protection Districts

Description: Under the provisions of the Zoning Enabling Act a community may enact floodplain, wetland or watershed protection zoning in their zoning by-laws. In general such by-laws restrict certain uses in areas designated as floodplain, wetland or watershed for the purposes of protecting the natural resource involved, protecting the public health, and protecting the public safety. The provisions are enforced by the Buildling Inspector and variances are given by the Board of Appeals. Most floodplain and wetland districts are overlay districts. All the fules and regulations that apply to the underlying zoning district (i.e. residential, commercial, industrial etc.) apply with the special regulation pertinent to the floodplain or wetland applying to the areas delineated in addition. Table 9-8 lists each community as to whether its floodplain/wetland/watershed protection zoning by-law is in conformance with a suggested model by-law which would protect surface and groundwater.

TABLE 9-8

COMMUNITY CONFORMANCE WITH MODEL PROVISIONS OF WETLANDS, FLOODPLAIN, WATERSHED PROTECTION ZONING

Community	Name of District	Purposes					Prohibited Uses			Board of Appeals & Procedures				
		Preserve & protect water-related lands	Maintain ground- and surface water supplies	Reduce flood hazard	Reduce flood costs	Prevent pollution of ground- and surface water	No new buildings	No dumping, filling	No on-site system in floodplain watershed	Appeal only if land not in floodplain, wetland or watershed	Environmental assessment required	Referred to Board of Health	Referred to Conservation Commission	Referred to Planning Board
Abington	Floodplain and Wetlands Protection District	X		X	X					X	X	X	X	X
Avon	Floodplain District	X	X	X	X									
	Watershed Protection District	X	X			X	X	X	X			X	X	X
Bridgewater	None													
Brockton	Floodplain, Watershed & Wetland Protection District	X	X	X	X		X	X	X			X	X	X
East Bridgewater	Floodplain & Wetlands Protection District	X		X	X		X	X	X	X				
Easton	Floodplain District	X		X			X	X		X		X	X	X
Hanson	Agricultural-Recreation District has some relevant procedures	X		X										
Pembroke	Floodplain & Watershed Protection District	X	X	X		X	X	X		X				
West Bridgewater	None													
Whitman	Floodplain & Watershed Protection District		X	X	X		X	X	X			X	X	X

Evaluation: Many of the problems of floodplain or wetland zoning are the same as with the other wetland/floodplain protection measures (i.e. the problem of how to identify the wetlands or floodplain, the taking issue, the determination as to the significance of the wetlands or floodplain, and the lack of public knowledge as to the applicability of the floodplain or wetland zoning before purchase of land).

One problem with the zoning by-law route is that variances are granted by the Board of Appeals, often with no Conservation Commission input. The Building Inspector and the Board of Appeals in addition may lack the expertise to make adequate determinations as to the involvement of wetlands or floodplain or as to their significance. As is pointed out in Table 9-8 a model by-law would have a variance granted only if it could be shown that the land in question was not actually in the floodplain or not a wetland. In addition an environmental impact statement would be required for a variance and all requests for variances would be referred to the Board of Health, to the Conservation Commission and to the Planning Board.

However, an advantage of having floodplain and wetland zoning is that under the provisions of the Wetland Protection Act the person proposeing to do the work must obtain all zoning permits and requirements first before going to the Conservation Commission for a wetlands act determination. Thus putting wetlands protection in the zoning by-law can preclude DEQE review and possible override.

2. Other Provisions in the Zoning By-Law

Description: In addition to the creation of wetland or floodplain districts, other provisions can be written into the zoning by-law which would protect wetlands and floodplains. The Town of Easton, for example, has a requirement that any use permitted by right or special permit in any District be done in conformance with certain Environmental Performance Standards. This provision reads in part as follows, "Any use permitted by right or special permit in any District shall not be conducted in a manner as to emit any ... substance, conditions or element in an amount as to affect adversely the surrounding environment."

Evaluation: As with all performance standards the problem is to enforce them. There has to be someone to notice that there has been a violation, to measure the violation, to prove it and then to enforce the standard.

E. Protect Wetlands and Floodplains by Provisions in Town By-Laws

Description: The Town of Dennis has recently enacted general wetlands by-laws as a part of the town by-laws rather than as a part of the zoning by-laws. No communities in this area have done so. In it "The Conservation Commission is empowered to deny permission for any dredging, filling or altering of subject lands within the town, if, in its judgement such denial is necessary to preserve environmental quality of either or both the subject lands and contiguous lands".

Evaluation: Having such a town by-law has some clear advantages. First unlike all of the above wetlands and floodplain protection measures, lands which are not actually wet or floodplain but which if left unregulated could destroy or harm the wetland or floodplain are included in the regulation. Second since a person proposing to do any work must receive Conservation Commission approval first under the town by-law, review and possible override by DEQE is precluded. Third the Conservation Commission is empowered to prohibit activities as well as to regulate them. Some lawyers have questioned the legality of having such a town by-law but to this date there has been no litigation to test it.

F. Utilize Provisions of Federal Legislation to Protect Wetlands and Floodplains

1. HUD National Flood Insurance Program

Description: The purpose of the HUD flood insurance program is to make flood insurance available to homeowners and others in towns which have areas considered to flood hazard after the community has enacted land use management tools to reduce the risks of flooding in that community. All of the communities in the 208 area have areas with flood hazards and all of them are in the Emergency Program. Table 9-6 summarizes the status of the communities in relation to the HUD flood insurance program.

Flood Hazard Boundary maps were initially drawn up to determine which communities would come under the provisions of the Act. These were very crudely drawn and rapidly made. If a community felt that it had no flood hazard areas, it could appeal and withdraw from the flood insurance program. Once the Flood Hazard maps were made a town entered the emergency program and federally subsidized flood insurance became available.

A final map called a Flood Insurance Rate Map is then drawn with precise and accurate boundaries. Once that map is adopted by the community, the community must require that the bottom floor of any new buildings be elevated or floodproofed for a non-residential building to a level equal to the elevation of the 100 year flood. And secondly the community must prohibit any filling in of the flood hazard area which would raise the 100 year flood by more than one foot.

Evaluation: The objective of this program is to prevent the expenditures of Federal money for flood relief by preventing building in the floodplain in the first place or insuring that what building is there is flood-proofed, and to prevent loss of human lives. The objective is not necessarily to protect the land or the water quality. Any large scale developer who has a piece of land located such that it would pay to flood-proof the property would be allowed to locate in the floodplain. Such large scale developers may well find that the low cost of floodplain land and the presence of flood insurance would make it worthwhile. Stricter floodplain regulations are necessary in order to protect against the loss of floodplain by development.

2. Utilize the Army Corps of Engineers Section 404 Program

Description: Under Section 404 of P.L. 92-500, the Corps is authorized to give permits for all dredge and fill operations on all costal and inland navigable waters and contiguous or adjacent costal and freshwater wetlands. In affect this covers all natural lakes larger than 5 acres, and all streams with a flow of greater than 5 cubic feet per second and a drainage basin of greater than 3 square miles. Agricultural operations and conservation practices such as terracing, check dams and land levelling will not require a permit. A system of general permits is being considered for such activities as minor modifications of roadways, logging roads, small pilings and piers and minor soil and water conservation projects. For a wetland to come under the provisions of this permit system, it must be periodically inundated by a stream and have vegetation that relies on that inundation.

Evaluation: Many of the previously discussed limitations to wetlands protection measures also apply to the Corps 404 permit program, especially the public notification problems and the identification of affected wetlands. Since a permit is required, the program is potentially a powerful tool for the protection of wetlands and floodplains from dredging and filling. The full application of this permit program began in July, 1977 and thus it is difficult to tell how effective it will be.

3. Environmental Protection Agency's Policy Statement: Protection of Nation's Wetlands

Description: This policy statement outlines four goals of EPA to protect wetlands: 1) to give particular cognizance to any proposal that has the potential to damage wetlands in its decision-making; 2) to minimze alterations in the quantity and quality of the natural flow of waters into wetlands and to prevent violation of applicable water quality standards; 3) "to not grant Federal funds for the construction of municipal wastewater treatment facilities...which may interfere with the existing wetland ecosystem", and 4) to promote environmentally protective measures in waste treatment facilities under a Federal grant program or as a result of a Federal permit. A public hearing may be held if there is a projected significant environmental impact to a wetland from a sewage treatment plant on the wetlands issue.

Evaluation: This policy statement is not widely known or followed. If it were adhered to in the planning for sewage treatment facilities or in permits it could have far-reaching effects.

4. Executive Order 11990 Protection of Wetlands

The President in futherance of the National Environmental Policy Act has set forth the following policies in order to avoid long and short term adverse impacts associated with the destruction and modification of wetlands: 1) "each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to

preserve and enhance the natural and beneficial values of wetlands in carrying out agency responsibilities..." and 2) each agency shall avoid providing assistance for new construction located in wetlands unless there is no praticable alternative and the proposed action includes all practicable measures to minimize harm to wetlands.

In carrying out these policies, each agency shall consider: a) public health safety, and welfare, including water supply, quality, recharge and discharge; pollution; flood and storm hazards; and sediment and erosion; b) maintenance of natural systems including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources; and c) other uses of wetlands in the public interest, including recreational, scientific, and cultural uses.

III. Earth Removal

Removal of vegetation and soil from the land surface can allow erosion to occur and raises the possibility of sedimentation of streams and ponds. Soil disturbance may occur either as part of construction activities or for the purpose of removing sand and gravel for building materials. Construction-related earth removal is discussed in Chapter 6, Urban Runoff/Construction and Development. This section discusses municipal earth removal laws as they relate to sand and gravel mining.

Sand and gravel mining currently occurs in all OCPC 208 area communities except Avon, Abington, and Whitman. Easton, Hanson, Pembroke, and Bridgewater have most of the active sites. Figure 9-3 is a map of active sand and gravel sites in the OCPC 208 Area, based on field surveys in 1976 and 1977.

Based on local perceptions as to the relative significance of sand and gravel operations as a pollution source, OCPC has not given high priority to investigation of sand and gravel operations. Some streams below sand and gravel operations were tested as part of the non-point source sampling program, but not all sites were so monitored, and there was no field inspection of such sites within the 208 program. To this point, then, no water quality problems from this source have been identified, but additional investigation may be warranted.

Besides causing stream sedimentation, sand and gravel removal raises a potential problem of groundwater contamination should the water table be exposed and activities occur at the site which could allow pollutants to reach the groundwater. This possibility, and the desirability of regulations to forestall it, are discussed in Chapter 3.

Reasons unrelated to water pollution control have been principally responsible for the adoption of earth removal regulations in every OCPC 208 Area community. Surface mining can create nuisance conditions, including dust, noise, heavy truck traffic, vibration, unpleasant aesthetic impacts, and safety hazards. Because it depends on the on-site availability of a particular resource, sand and gravel removal can pose conflicts with adjacent landowners affected by the nuisance.

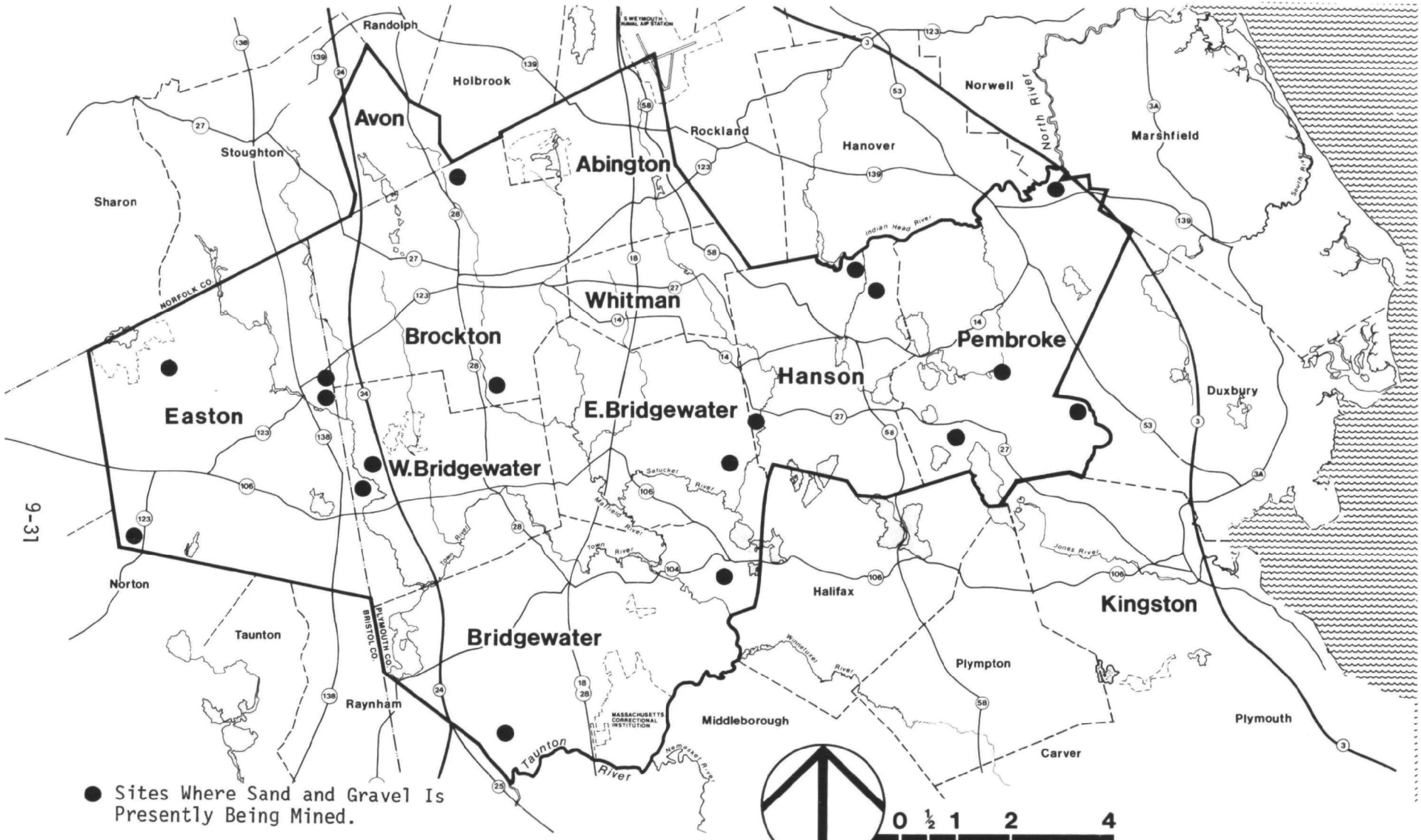


Fig. 9-3 Sand and Gravel Removal Operations

Old Colony Planning Council /208 Program, 1977

Earth removal can be regulated either through a general by-law adopted under Chapter 40 of the General Laws or through a zoning by-law adopted under Chapter 40A. Under Chapter 40 by-laws, the permit power may be given to any regular or special board. Under Chapter 40A by-laws, the permit power must be given to the zoning board of appeals or the selectmen. Existing operations may be exempted from a permit requirement under a grandfather clause, but this is up to a town's discretion -- existing operations can be regulated, if the town so chooses.

Table 9-9 presents information on the current status of earth removal regulations in the OCPC 208 Area communities, with emphasis on those regulations which would pertain to water quality protection. The towns with the most complete regulations overall are Easton, Hanson, Pembroke, and East Bridgewater. Following is an explanation of the items in the table:

1) Type of By-law -- eight communities have general by-laws, one (East Bridgewater) has a zoning by-law provision, and one (Whitman) has both. In Easton, earth removal is regulated under general by-law, but the zoning by-law (1973) limits this activity to the industrial districts and (by special permit) to the floodplain district. In all of the communities with general by-laws, permits are issued by the Board of Selectmen. The Board of Appeals issues permits in East Bridgewater.

2) Review by other boards -- In Abington, East Bridgewater, and West Bridgewater, the Planning Board may review the proposal and make comments; in Easton, the building inspector does so.

3) Date of by-law -- Newer by-laws tend to include more specific regulations. The date is significant for towns which exempt pre-existing operations.

4) Regulations of pre-existing operations -- Avon and West Bridgewater, by not specifically excluding such operations from permits, seem to include them. Four towns regulate existing operations to some degree, as stated in the notes.

5) Stone/rock removal covered by by-law -- See comments below on "Coal Mining". Those towns whose earth removal laws specifically apply to "stone" and "rock", and not just soil, loam, clay, sand, or gravel, may have a basis on which to regulate coal mining.

6) Features required in plans -- four towns specify information which must be presented when a permit is applied for, usually in terms of both existing and proposed conditions. Only Easton and Pembroke require that streams and other surface waters be shown on maps, and only Easton requires that the ground-water elevation be determined and shown.

7) Plan preparation by engineer or surveyor -- three towns state that a registered engineer or surveyor must prepare the applicant's plans.

8) Deposit for municipal review expenses - Easton and Pembroke require the applicant to pay a deposit out of which the town pays the cost of arranging professional review of the applicant's plans.

9) General authorization to impose conditions -- although the power to

TABLE 9-9

CURRENT EARTH REMOVAL REGULATIONS

	Abington	Avon	Bridgewater	Brockton	East Bridgewater	Easton	Hanson	Pembroke	West Bridgewater	Whitman
1. Type of By-Law (Z:Zoning (Ch. 40A), G:General (Ch. 40))	G	G	G	G	Z	G	G	G	G	(1)
2. Recommendation or review by other boards or officials	Pl. Bd.				Pl. Bd.	Bld. Insp.			Pl. Bd.	
3. Date of By-law	1977	1967	1950	1958	1973	1972	1972	1974	1957	1956
4. Regulations apply to pre-existing operations		X			(2)	(3)	(4)	(3)	X	
5. Stone/rock removal covered by by-law		X			X	(5)	X	X		
6. Features required in plans:										
Topography (contours)					X	X		X	X	
Location of surface waters						X		X		
groundwater elevation						X				
drainage					X	X		X		
vegetative cover					X			X		
7. Engineer or surveyor to prepare plans						X		X	X	
8. Deposit for municipal review expenses						$25/ acre		$500		
9. General authorization to impose conditions	X				X	X	X	X	X	X
10. Specific conditions stated on:										
a) mimimum distance between excavation and natural streams						100'	50'			
b) no direct drainage to streams & ponds						X	X			
c) standards for restoration	X					X	X			
d) protection of ground-water table						X				
e) maximum exposure of uncovered land at one time						5 ac.	5 ac.			
f) prohibition of snow dumping										
11. General authorization to require bond					X	X	X	X	X	X
12. Specific requirement for bond						$3000/ acre	$1000/ acre	(6)		
13. Maximum period for permit (years)					'	'	'	'	'	3

Notes:

(1) Whitman has a general by-law but also has a zoning by-law provision making earth removal allowable by special permit only in General Residential, Highway Business, General Business, and Industrial Districts. Therefore, to conduct earth removal in Whitman, one would have to obtain a special permit from the Board of Appeals under the zoning by-law and then a permit from the Board of Selectmen under the earth removal by-law.

(2) Existing operations were covered unless they had been in continuous operation for the five years preceding the by-law adoption.

(3) Restrictions are placed on the expansion of current operations without a permit.

(4) Existing operations subject to the by-law as of 1973.

(5) Stone only.

(6) Amount to be determined based on estimated cost of site restoration.

impose conditions may be implicit in the power to issue a permit, the permitting authority may be on stronger ground legally where the by-law is clear in granting the power to set conditions.

10) Specific conditions -- most of the by-laws leave to the discretion of the permitting board standards by which to set conditions. In Easton and Hanson, specific conditions are established within the language of the by-law. A buffer strip must be left between the edge of the excavation and a "natural stream"; "drainage shall not lead directly into streams or ponds"; restoration of loam and vegetation is provided for; and erosion potential is minimized by allowing active operations on only five acres at a time. Easton is the only town which mentions groundwater protection:

> No gravel shall be removed closer to the maximum groundwater elevation than would preclude its subsequent re-use according to existing public health standards.

The language suggests a minimum distance of 5 to 10 feet between the bottom of the excavation and the maximum groundwater elevation, to allow for the four-foot distance between the bottom of a leaching field and the water table required under the State Environmental Code.

None of the municipal earth removal by-laws in the OCPC 208 Area include prohibitions on snow dumping (i.e. disposal of snow removal from highways and parking areas) in sand and gravel pits. As explained in Chapter 3, Groundwater Protection, such a regulation would be desirable to prevent sodium pollution of groundwater. OCPC is not now aware of current uses of pits locally for this purpose.

11) and 12) Bonding -- Six towns grant authority to require bonds. Three towns specifically require such bonds.

13) Permit period -- four towns place no limit on the permit period in the by-law. The others provide for periodic review by limiting the permit period (generally to a maxiumum of one year).

A. Incorporate Water Quality Objectives in Sand and Gravel Regulations

As a preventive measure, water quality objectives can be incorporated into regulations on sand and gravel operations. The following provisions would be the most important for protecting ground and surface waters:

.Require plans showing present and proposed surface contours, drainage provisions, and vegatative cover, as well as location of surface waters and groundwater elevation.

.Establish requirement for a minimum buffer distance to streams and to groundwater.

.Prohibit direct drainage to streams and ponds.

.Prohibit snow dumping at sand and gravel pits.

.Limit land exposed for excavation at any one time.

.Require a bond for restoration.

.Limit permits to one year and review site operations before granting renewals.

.Apply regulations to existing as well as future operations. Such regulations could either be adopted by amending existing by-laws or by instituting state controls.

1. Update Municipal Earth Removal By-Laws

Description: Existing municipal by-laws would be amended to incorporate the measures just listed.

Evaluation: The changes required would depend on present regulations, as listed in Table 9-9 and discussed above. Easton most closely meets these suggestions. Hanson, Pembroke, and East Bridgewater would need somewhat more detailed regulations than they now have, but to have relatively strong by-laws already. Other towns have weaker ordinances. Considering the location of sand and gravel deposits and present municipal regulation, Bridgewater and West Bridgewater would appear to be most in need of revisions to local regulations. Additional public costs of amended regulations would be minimal; a community might wish to follow the example of Easton and Pembroke and impose a fee to cover plan review costs. Private expenses on the part of the operator would include the costs of plan preparation and site restoration, and the revenue not realized if regulations restrict excavation close to the water table or near streams.

2. Impose State Permit Requirements on Sand and Gravel Removal Under the Massachusetts Clean Waters Act (G.L. Chapter 21)

Description: The Division of Water Pollution Control (DWPC) has the authority to regulate both point and nonpoint sources, and could exercise this power to regulate sand and gravel removal, either through a system of general permits imposing these environmental standards, or by individual permits for each operator.

Evaluation: The DWPC is reluctant to involve itself in regulating this type of source, considering its limited manpower and its perception of pollution control priorities. Given the existence of earth removal laws in every OCPC 208 Area community, amending these by-laws seems a simpler matter than superceding them with a new layer of state regulation.

B. Provide for Regulation of Coal Mining

Description: In the late 19th and early 20th century, coal was mined from several small operations in Rhode Island and southeastern Massachusetts (the closest to the OCPC 208 Area being Mansfield). With the rise in energy prices, interest in coal mining locally has been renewed, and some preliminary explorations have been conducted by the Boston College Weston Observatory,

funded by federal and private grants. It is still too early to say whether local coal deposits are extensive enough or of sufficent quality to make their development economically feasible. The Narraganset Basin formation which is being investigated underlies the entire OCPC 208 area with the exception of Avon, northern Brockton, northern Easton, Abington, and eastern Pembroke. Initial explorations by the Boston College research group found coal seams in Mansfield, Mass. and Bristol and Portsmouth, R.I. The only hole drilled in the OCPC area, in West Bridgewater, did not show the presence of coal. More exploration is planned in both the Mansfield area and towns to the each which are still largely unexplored. Weston Observatory -- Boston College, Interim Report: The Pennsylvania Coal-Bearing Strata of the Narragansett Basin, 1977.

1. Adopt Municipal Regulations for Coal Mining

Description: Communities could specify coal and other subsurface materials as within the purview of the municipal earth removal by-law.

Evaluation: Presently, "stone" and "rock" are included in the items subject to the by-laws of Avon, East Bridgewater, Easton (stone only), Hanson, and Pembroke. However there is a legal question as to whether chapter 40 by-laws can be applied to minerals other than sand and gravel.

Evaluation: A problem with municipal regulation of coal mining would be lack of local expertise in evaluating the proposals. Also, from the point of view of the prospective mining company, a system of municipal regulations could be more difficult, since it would become necessary to secure permits and answer to varying regulations in a number of towns whenever the deposits overlapped town boundaries. Conversely, a town would have no way to protect itself from operations in a neighboring community that had environmental (and social impacts) on the first town.

2. Adopt State Regulations for Coal Mining

Description: Coal mining would be regulated under new state statutes, with the Executive Office of Environmental Affairs responsible for administration and enforcement.

Evaluation: Under this option, full scale environmental impact reviews would be ordered, and a professional staff would be available to review plans. Operations affecting more than one municipality could be assessed more readily than with a municipal regulatory system. This is not at all an immediate pollution problem, but it is a potential one, and it would be wise to have regulations in place rather than seek to impose them after mining has begun: for all concerned, including the operators, it would be better to know the "ground rules" (all puns intended) ahead of time.

IV. Preservation of Agricultural Land

Agricultural land is a major component in not only the open space and environmental management programs of a town but also the "quality of life and the character of a town". Major agricultural activity in the OCPC area includes fruit and vegetables, dairy, and cranberry operations. As in other areas of Massachusetts, New England, and the Northeast, agricultural land acreage is constantly decreasing (see Table 7-1). Agricultural land in the region is

able to produce a significant amount of food for local consumption. The preservation of agricultural land is consistent with the state agricultural land preservation policy which has the goals of working toward self sufficiency in food production. For a complete discussion of agricultural land preservation refer to the separate publication, Agricultural Land and Preservation Issues in the OCPC 208 Area, April, 1977. For a discussion of the water quality problems associated with agricultural operations, see Agriculture, Chapter 7.

V. Natural Areas

Open space may be defined as land in public ownership or quasi-public such as educational institutions, church, and sportsman's associations. These lands may be open, non-wooded lands, agriculture, wetlands, or woodland.

Open space land can play a significant role in the maintenance of water quality through natural ecological processes.

Open space may be acquired by a variety of techniques from outright acquisition, to purchase of conservation easements, or preferential tax assessments. Open space is utilized for different uses ranging from active recreation, to walking trails and picnic areas, to land which is maintained for its natural value.

A. Prepare Open Space and Conservation Plan

Open space conservation plans are usually prepared by the conservation commission, a private consultant, or a specially appointed town committee. Open space and conservation plans should be prepared to meet the minimum requirements established by the Federal Land and Water Conservation Fund and the Mass. Self Help Program. The Federal Land and Water Conservation Fund, established by Act of Congress, 1965, provides up to 50 percent reimbursement for the acquisition and development of outdoor recreation land. The Massachusetts Self-Help Program (General Laws Chapter 132A, Section 11) will reimburse communities up to 50 percent for the acquisition only of conservation lands. To receive assistance through either or both of these two programs, a municipality must submit an approved conservation and/or recreation plan. For approval, the conservation or recreation plan must include the following:

1. A statement of agency participation and methodology of plan development
2. Background data on physical, social, and economic factors important to open space and/or recreation policies
3. A statement of municipal conservation and/or recreation goals and objectives
4. An inventory of public, quasi-public, and private (but used by the public) conservation and/or recreation facilities
5. An analysis and statement of community conservation and/or recreation needs

6. A five year action program

7. Written comments on the plan from the local planning board and the Regional Planning Agency

For a complete listing of the status of each OCPC 208 area community's conservation plan see Table 9-10.

B. Designation of Critical Environmental Areas

Description: Under Section 8.2 of the Regulations of the Executive Office of Environmental Affairs adopted under the Massachusetts Environmental Policy Act (C.30, S.62) the Secretary of Environmental Affairs may designate Areas of Critical Environmental Concern. The Massachusetts Environmental Policy Act (MEPA) causes all projects or activities that require state permits to file an environmental assessment form. For projects or activities "which may cause damage to the environment" environmental impact reports must be prepared. State agencies are granted "categorical exemptions" for projects and activities which are deemed to have an insignificant environmental impact. The designation of a critical environmental area would invalidate all categorical exemptions for that particular land area.

Areas of Critical Environmental Concern must be in danger of uncontrolled development which could result in irreversible damage to the environment. These areas may include, "inland and coastal wetlands, rare and valuable ecosystems and habitats, rivers, streams, and floodplains; natural areas; Great Ponds, reservoirs, soils and aquifers determined to be of regional significance; parks, reservations, forest, recreation or open space lands determined to be of regional significance; and fish, bird or other wildlife management areas. The proposed designation of a critical environmental area would be open to public review and comment, which would include a public hearing. In addition, the area of critical environmental concern must be clearly defined.

Evaluation: Critical environmental area designation is only a viable alternative for resources which have regional significance. The designation process will require a great deal of public involvement to assure support for the proposed designation. The major limitation is that it has a direct affect on only those state projects for which categorical exemptions would have been granted. This means that most development proposals will be required to submit the same environmental assessment forms as would be required without designation. State projects which had previously been exempt would be required to submit environmental assessment for any activity in the designated area. Changes in the regulations are necessary so that not all activities, no matter how trivial, would be included. However, a secondary impact of the designation is that there would be an increased awareness by the general public of the significance of the designated area. This increased awareness and public concern would discourage development proposals that would face strong public opposition. Further designation by the State would provide an incentive for the towns to take action to protect the critical area from any environmentally harmful development.

TABLE 9-10

STATUS OF LOCAL CONSERVATION/RECREATION PLANS

	Conservation/ Recreation Plan	Self Help	Land & Water Conservation Fund (L&WCF)	Comments
Abington	No			
Avon	No			
Bridgewater	Yes			1969 Plan - too old to be eligible. Must be updated.
Brockton	Yes		0	Eligibility pending final report.
East Bridgewater	Yes			Plan has been submitted.
Easton	Yes	X	0	Must add active recreation for L&WCF.
Hanson	No			
Pembroke	Yes	0	0	Need more background info.
West Bridgewater	No			
Whitman	No			

X Eligible

0 Eligibility conditional on provision of further information

1. Designate the Hockomock Swamp as a Critical Environmental Area

Description: The Hockomock Swamp is a 6000 acre wet and wooded area which lies within six southeastern Massachusetts towns: Easton, Raynham, Tuanton, West Bridgewater, Bridgewater and Norton. The nearly 10 square mile Hockomock Swamp is the largest wetland in Massachusetts. It is mostly privately owned. It is largely in its natural condition having few roads or trails penetrating it. The Hockomock Swamp holds in storage approximately 7 1/2 billion gallons of water which lessen flood crests, stabilizes groundwater levels and maintains water flow during dry weather.

The Hockomock Swamp is under an increased threat of development resulting from the proposed construction of the Interstate Highway Route 495 Extension with interchanges at Routes 123 and 138. The actual highway construction will necessitate the acquisition of approximately 27 acres of swamp. However, a more imminent threat will be the increase in land values near the highway interchanges, and the development proposals that will follow.

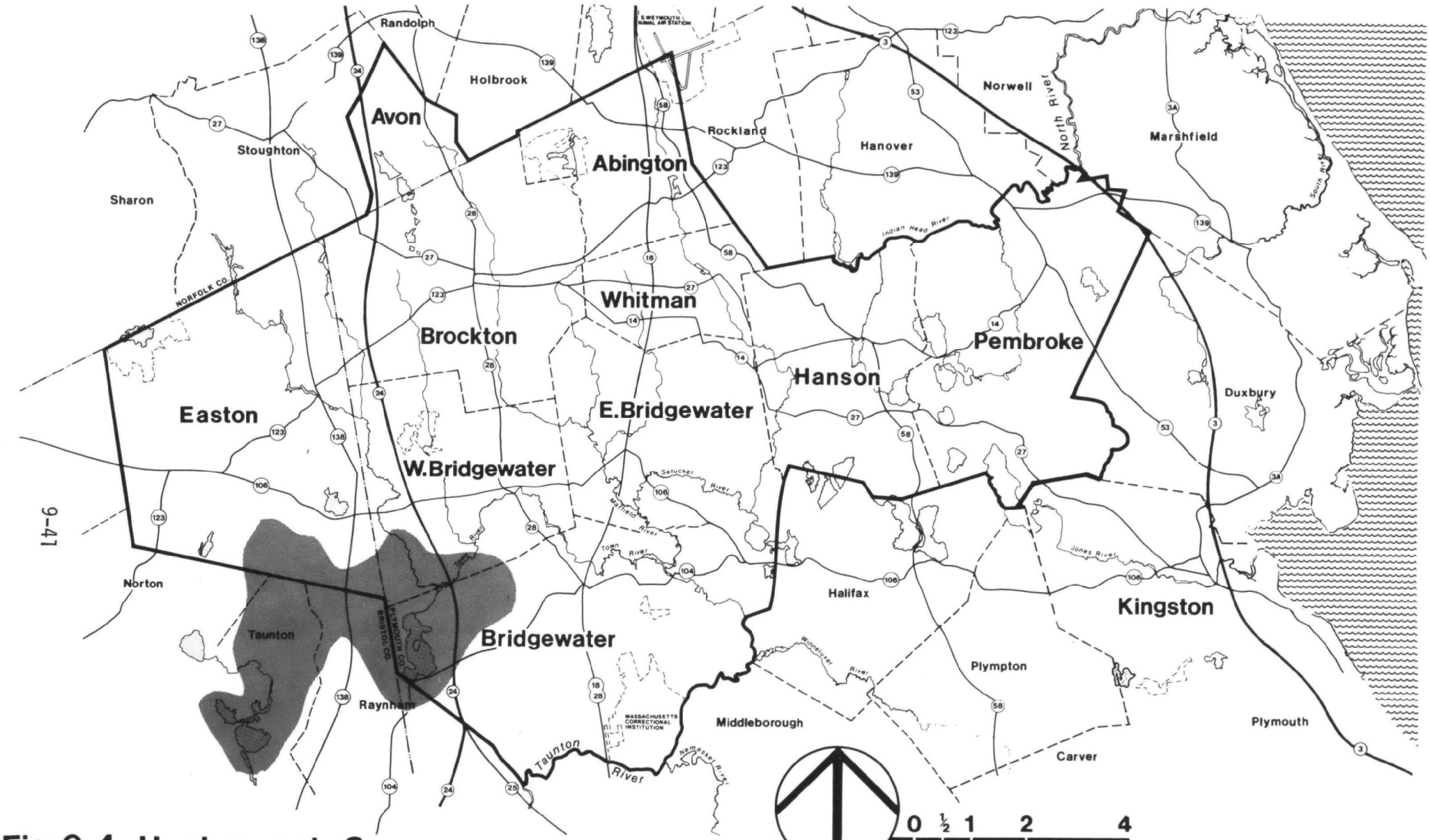
The process for critical environmental area designation would begin with the precise delineation of the area to be designated. Such a delineation would be on maps of similar detail as town assessor's maps. Information would be gathered to document the significance of the Hockomock Swamp (much of which has already been done and published in the booklet entitled "Hockomock Wonder Wetland"). After the designation request had been transmitted to the Executive Office of Environmental Affairs (EOEA) the EOEA would conduct public hearings and review the documents and comments before making a designation decision.

Evaluation: The designation of the Hockomock Swamp as a critical environmental area will aid the preservation of the Hockomock and supplement the acquisition efforts of the Mass. Division of Fish and Wildlife. Although only state projects would be directly affected by the critical area designation, it would add to community awareness and be an incentive to other protection mechanisms. (See Figure 9-4)

VI. Pesticide Programs (Non-Agriculturally Related)

A number of programs exist under which chemicals are used for the control of insects, vegetation, or plant diseases. These include spraying for mosquito control, use of herbicides to kill aquatic weeds, tree spraying, spraying for gypsy moth, and use of herbicides along utility company easements.

To some extent the chemicals used and the individuals involved in chemical application are regulated by the Massachusetts Pesticide Control Borad and the Environmental Protection Agency under the Federal Insecticide, fungicide, and Rodenticide Act (FIFRA). This law provides for the identification and labelling of pesticides subject to restricted use and the licensing of applicators (who must pass exams on their knowledge of proper



9-41

Fig: 9-4 Hockomock Swamp

Old Colony Planning Council

208 Program, 1977

pesticide use). In recent months controversy has arisen in Massachusetts over the use of Baytex for mosquito control, since the label instructions for that product point to potential hazards for aquatic life and domestic animals. The controversy indicates that the pesticide registration and applicator licensing programs have not answered all questions about the use of these chemicals.

In the case of agricultural use of pesticides, federal and state pesticide controls are supplemented by advice to farmers from the Cooperative Extension Service and the agricultural experiment stations on selection of chemicals, timing and method of application, and frequency of application. Such advice is not so readily available presently for those involved in publicly sanctioned or sponsored pest control programs. Also no agency is now engaged in assessing the cumulative impacts locally of all uses of these chemicals or in closely monitoring the observance of label instructions. This would in fact require an extensive and expensive sampling program to test for the presence of numerous chemicals.

At this point documentation is lacking on the present and potential extent of this problem and specific control alternatives cannot be presented and evaluated. The 208 staff intends to investigate further into the extent of these chemical treatment programs and to present alternatives at a later date.

CHAPTER 10

Regional Water Quality Management Alternatives

Table of Contents

	page
Background	
-Reasons for a Regional Approach to Water Quality Management	10-1
-Functions of a Regional Water Quality Management Planning Agency	
I. OCPC Gives Advice to, Refers Information to, and Coordinates with the Management Agencies	10-4
II. OCPC Assumes the Lead as the Areawide Water Quality Management Planning Agency	10-5
III. Create a Regional Water Quality Management Agency	10-5

Water has a distressing tendency to flow downhill. In the portion of the 208 area that forms the headwaters of the Taunton River, most streams flow from north to south and all eventually merge to form the Taunton River. The other communities in the area are in the headwaters of the North River (with a portion in the Neponset and Jones Rivers headwaters) which flows east to the sea. Thus the activities of all of these communities greatly affect their downstream neighbors. It is for this reason that a regional or areawide perspective is necessary to achieve and maintain fishable/ swimmable waters. No one community is independent of the decisions made by other communities.

Local,regional, state and federal control mechanisms are discussed above under each of the functional areas, i.e. public participation, groundwater protection, municipal wastewater, industrial wastewater, urban run-off, agriculture and residuals management.

However, beyond the strictly functional areas there is a need for a regional approach, a regional water quality perspective, a regional water quality management planning agency. The Old Colony Planning Council should be this agency. As such, the functions wich should be included are to:

Update the 208 plan annually
Coordinate the designated management agencies
Coordinate water quality planning with land use planning
Use planning expertise to increase the public awareness of the need for water quality implementation
Help communities find the financial resources to solve their water quality problems
Help communities with technical assistance on water quality problems

These are discussed as follows:

• Up-date the 208 Plan Annually - As a part of the Federal Regulations (Federal Register Vol. 40, No.30, Section 131.22) the designated areawide planning agency must review and, if necessary, revise the water quality management plan at least annually.

To do this the OCPC should be funded to continue its water quality sampling program with the water quality sampling contracted as in the past to the Massachusetts Division of Water Pollution Control (DWPC) and/or to Bridgewater State College. This sampling program is necessary, above and beyond the normal sampling program of the DWPC, to continue the identification of new non-point sources, to pinpoint sources only suspected from previous sampling efforts or suspected from the public participation process, and to monitor the results of implementation of the 208 plan.

In addition, continued wet-weather sampling will be necessary in Brockton to determine what sort of urban runoff control program will give the most economic results for water quality control.

The identification of new pollution sources and the pinpointing of

suspected sources may result in recommendations for new permits such as agricultural permits and stormwater permits and modifications in other permits.

In addition, sampling should be done in Kingston, a member of the Old Colony Planning Council in which no 208 planning by any agency has been done, to determine whether there is a need for 208 planning. There have been reports of repeated septic system failures in the Rocky Nook and downtown portions of Kingston for which a 201 Facilities Study is currently being done. Brockton is currently attempting to gain permission to divert the Jones River in Kingston to Silver Lake to augment its water supply and it is feared that the diversion might increase the salinity of Kingston Bay. Study is needed of the potential impacts of the diversion on the surface water quality of Jones River and Kingston Bay. The large Pembroke aquifer that serves as a water supply for Brockton, Hanson, Whitman, Abington, Rockland and Pembroke extends into Kingston. Its extent in Kingston needs to be delineated and groundwater protection measures enacted. And lastly the potential water pollution impacts of several in-town sources need to be investigated: these include sediment flowing into Fountain Head Brook from sand and gravel operations, the sediment from the numerous other sand and gravel operations in town, and battery acid and other substances from an auto wrecking yard which drains into the Jones River (see Kingston: Land Use/Water Quality Profile, Old Colony Planning Council, 1976).

• Coordinate the Designated Management Agencies - It is anticipated that rather than a designation of one over-arching water quality management agency in this region, there will be a designation of several management agencies, at least in the short term, to carry out the functions of the 208 plan and to meet the requirements of the Act. Thus there will be a need to coordinate the activities of the various management agencies. The mechanisms by which this can be accomplished are through regular informal meetings, through formal Memoranda of Understanding (MOU's), through the A-95 review process (OCPC is the regional clearinghouse for review of all projects involving state or federal money), and through comments on environmental impact statements under the National Environmental Policy Act (NEPA) and the Massachusetts Environmental Policy Act (MEPA).

• Coordination Water Quality Planning with Land Use Planning - Coordination of water quality planning with land use planning can be done in three ways: through review of permits, through the input of water quality objectives into land use planning and through formal review processes such as those mentioned above, i.e. the A-95, MEPA and NEPA reviews.

Review of permits after their preparation by the Division of Water Pollution Control based upon the DWPC's modeling efforts is desirable to ensure over-all coordination and as a way to input land use information. For example, one of the industries proposed for a permit in the 208 area was discharging directly upstream of a town's well fields. Review by the 208 agency enabled the permit to be re-written in light of the adjacent land use considerations. Agricultural permits can be reviewed with an eye to coordination with agricultural preservation efforts (such as transfer of development rights) and with financial efforts (such as grants from ASCS

and loans for pollution control).

Putting water quality objectives into land use planning can be done through a variety of means, such as through the:

Master Plan - by incorporating water quality objectives into the purposes;
Subdivision Regulations - especially controls on erosion and sedimentation, drainage, and limitations on the amounts of large impermeable areas;
Zoning By-Laws/Ordinances - by making water quality an objective of the by-law or ordinance and including wetland, floodplain, shoreline or well protection district zoning;
Board of Health Regulations - by making protection of water quality an objective as well as protection of public health;
Capital Improvement Programs - by the purchase of lands important hydrologically; and
Open Space and Conservation Plans - by the planning for and acquisition or protection of lands which function in the hydrologic cycle.

Review of plans through the A-95, MEPA or NEPA processes (discussed above) can also be a way to incorporate water quality objectives into land use planning. Review of projects from a water quality perspective with comments on improvements can be an effective water quality management tool.

• Use Planning Expertise to Increase the Public Awareness of the Need for Water Quality Implementation - As discussed above in Chapter 2 there is an important need for public involvement if the 208 plan is to be implemented at the local level. There is a need for the regional water quality planning agency to coordinate, support, and sometimes initiate public involvement. Two primary means to accomplish this are through education efforts such as writing of water quality brochures on the need for maintaining septic systems, the need for water conservation, or how to get help from state agencies on water quality problems, and for staff support of on-going public involvement programs, whether they be through an on-going Policy Advisory Committee to the Old Colony Planning Council or through support for the North and South Rivers Watershed Association and the Taunton River Watershed Association.

• Help Communities Obtain the Financial Resources to Solve Their Water Quality Problems - Many of the water quality problems in a community can be solved if the community can find the financial resources. Often the communities with the most disparate and complex water quality problems are the least able to maintain an awareness of state or federal resources or are financially unable to find the resources for matching grants. Many communities in this area have only part-time officials who hold full-time jobs elsewhere. Four sources of funds currently being explored or already obtained for the communities in the 208 area include: money from the Department of Public Works for salt pile storage, application for an area-

wide Community Block Grant for the rehabilitation of septic systems, lakes and ponds restorations grants (a successful 314 application has already been made for Ellis Brett Pond in Brockton), and applications for Bureau of Outdoor Recreation and Self-Help funds (successful application was made for a purchase on the North River in Pembroke). This kind of assistance will be needed even more in the future.

• Provide Technical Water Quality Assistance to the Communities - The kinds of technical assistance which OCPC has either already performed or should perform in the future include:

review of proposed landfill siting designations (Pembroke, Bridgewater);

review of large subdivision proposals for their impact on water quality (Pembroke);

application to the Environmental Protection Agency for sole source aquifer designation (Pembroke);

referral of communities and individuals to the appropriate state or federal agency for solution of their problem, i.e. a local-state/federal liason (all communities);

definition of well recharge areas (Avon, Abington, East Bridgewater, Easton, Hanson, Bridgewater, Pembroke, West Bridgewater and Whitman);

assistance to Boards of Health in evaluation of in-town septage disposal facilities (Bridgewater) and in printing and distribution of septic system flyers with water bills (East Bridgewater);

review of zoning by-laws for water quality impacts (Hanson, Abington);

assistance to regulatory agencies in the investigation of reports of illegal discharges of effluent (Hanson, Brockton, East Bridgewater);

investigation of citizen complaints about water quality violations (Easton, West Bridgewater, Pembroke, East Bridgewater, Brockton);

liason among communities on water quality problems originating in one community but affecting another (Brockton/East Bridgewater, Pembroke/Abington).

The possible means by which such functions could be carried out are discussed below:

I. OCPC Gives Advice to, Refers Information to, and Coordinates With the Management Agencies

Description: In this alternative the Old Colony Planning Council role would be limited to strictly one of giving advice, referring information, and coordination.

Evaluation: This is the current role of the OCPC, but perhaps slightly

expanded. It would require little in the way of additional funding and would see a reduction in the 208 staff to one person. Up-dating of the 208 Plan would be based on no new information. Technical assistance would be minimal. A-95, MEPA and NEPA reviews would continue.

II. OCPC Assumes the Lead as the Areawide Water Quality Management Planning Agency

Description: In addition to the activities outlined above the OCPC would retain its water quality staff. It would enter into formal agreements via Memoranda of Understanding with the designated management agencies and would formally coordinate their activities. OCPC would provide water quality-related technical assistance to the communities.

Evaluation: This alternative would most closely correspond to the intent of P.L. 92-500, the Federal Water Pollution Control Act Amendments of 1972 and the regulations written thereunder which require an annual revision and up-date of the 208 plan. This option would require funding from the Environmental Protection Agency of $120,000 for the ensuing year, the time when retention of an in-house staff will be required to carry through on administrative and technical tasks associated with plan implementation, including negotiation of Memoranda of Understanding with and among other agencies, assistance to communities on needed subdivision regulation and zoning by-law revisions, and review of local sewerage planning efforts. Funding from EPA would decline in future years as programs become operational, other funding sources were found, and water quality problems were solved. This alternative would ensure that the 208 Plan was actually implemented.

III. Create a Regional Water Quality Management Agency

Description: In the long-term a single, regional water quality management agency would be created which would assume the water quality functions of the previously designated management agencies.

Evaluation: A single management agency would have the obvious technical advantage of being able to assess, evaluate, and manage all water quality problems in the region. It, however, would have political and institutional problems with being created and might ultimately only end up as another layer of government, rather than as a fully functioning organization which reduced and streamlined water quality management. In concept it is the ideal arrangement. In practice it would greatly depend on how it was created. Given the highly negative response by the communities in this region to suggestions for new regional agencies raised during the Massachusetts Growth Policy process it is unlikely that such a new agency would be implementable in the near future.

APPENDIX

Water Quality Sampling Results

MEASURES OF WATER POLLUTION

FLOWING WATER: CLASS B WATER QUALITY

Dissolved oxygen:	Must be above 5 mg/l at all times. Levels below that can be harmful to fish life.
BOD_5 - Biochemical oxygen demand	Above 3 mg/l is indicative of un-decomposed organic wastes.
Total Coliform Bacteria	Not more than 1000 per 100 ml. Levels above that may indicate presence of human or animal wastes.
Fecal Coliform Bacteria	Not more than 200 per 100 ml. Levels above that may indicate presence of human or animal wastes.
Total Phosphorus (both inorganic and organic phosphorus)	Should be less than 0.05 mg/l at any stream flowing into a lake or pond, and less than 0.10 mg/l in all streams. Levels above those limits can accelerate eutrophication.
Ammonia-Nitrogen	Should be less than 3.5 mg/l (at pH of 7.0 and temperature of 77 F.) to avoid harm to fish life. Levels greater than 1 mg/l indicate presence of partially decomposed organic wastes.
Nitrate-Nitrogen	Levels greater than 1 mg/l indicate presence or organic wastes and may corroborate other evidence of human or animal pollution.
Chlorides	Should be less than 25 mg/l in streams which drain into a surface water supply or which contribute recharge to a groundwater supply. Not harmful in itself, but indicates presence of sodium, for which the drinking water standard is 20 mg/l. Sources include highway salt and septic system leachate.
Cadmium	Should be less than .001 mg/l to avoid harm to aquatic life.

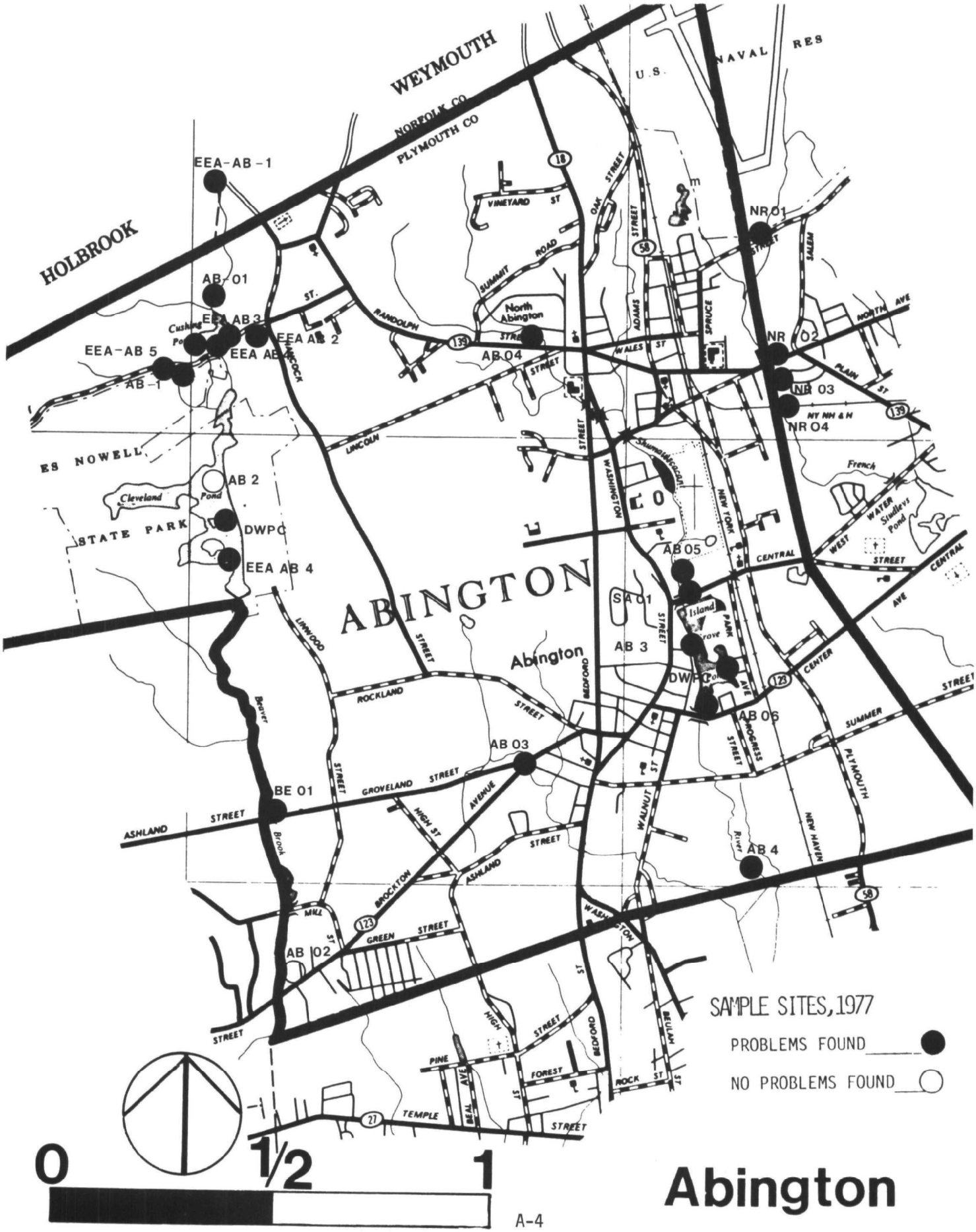
MEASURES OF WATER POLLUTION (continued)

LAKES AND PONDS

	Water Supplies (Class A)	Recreational Lakes (Class B)
Dissolved oxygen	not less than 5 mg/l	not less than 5 mg/l
Total coliform	not more than 50 per 100 ml.	not more than 1000 per 100 ml.
Fecal coliform	none	not more than 200 per 100 ml.
Nitrate-nitrogen	not more than 10 mg/l; levels above 1 mg/l indicate presence of organic wastes	levels above 1 mg/l indicate presence of organic wastes
Total phosphorus	not more than .025 mg/l	not more than 0.025 mg/l
Ammonia-nitrogen	levels above 1 mg/l indicate presence of organic wastes	levels above 1 mg/l indicate presence of organic wastes
Chlorides	should be less than 25 mg/l	N.A.
Sodium	not more than 20 mg/l	N.A.
Turbidity	not more than 1 Turbidity Unit	N.A.
Transparency (Secchi Disk)	N.A.	should be greater than 4 feet for public swimming area
Cadmium	not more than .01 mg/l for water supply or .001 mg/l for aquatic life	not more than 0.001 mg/l for aquatic life
Chromium	not more than 0.05 mg/l	not more than 0.1 mg/l
Lead	not more than 0.05 mg/l	N.A.
Manganese	not more than 0.005 mg/l	

GROUNDWATER (drinking water standards)

Nitrate-nitrogen	not more than 10 mg/l
Sodium	not more than 20 mg/l
Chlorides	should be less than 25 mg/l where data on sodium is unavailable, to correspond to a sodium standard of 20 mg/l.
Cadmium	not more than 0.01 mg/l
Chromium	not more than 0.05 mg/l
Lead	not more than 0.05 mg/l


WEYMOUTH
NORFOLK CO
PLYMOUTH CO
HOLBROOK
U.S. NAVAL RES
ABINGTON
Abington
EEA-AB-1
AB-01
EEA AB 3
EEA AB 2
EEA-AB 5
EEA AB 1
AB-1
AB 2
DWPC
EEA AB 4
AB 04
NR 01
NR 02
NR 03
NR 04
AB 05
SA 01
AB 3
AB 06
AB 03
BE 01
AB 02
AB 4
North Abington
Cleveland Pond
STATE PARK
Island Grove Park
Studley Pond
French
Shumatuscacant
RANDOLPH
LINCOLN
WASHINGTON
NEW YORK
CENTRAL
WEST
ROCKLAND
GROVELAND
ASHLAND
BROCKTON
GREEN
PINE
FOREST
TEMPLE
WALNUT
PLYMOUTH
NEW HAVEN
BEDFORD
SUMMER
CENTER
NORTH AVE
PLAIN ST
SALEM
SPRUCE
ADAMS
OAK
VINEYARD
SUMMIT
HANCOCK
LINWOOD
HIGH ST
ROCK ST
BEULAH
NY NH & H
SAMPLE SITES, 1977
PROBLEMS FOUND
NO PROBLEMS FOUND
0
1/2
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Abington

ABINGTON

I. BEAVER BROOK

At Plymouth Street in Holbrook (EEA-AB-1)
8/25/76 - Total coliform : 1,200,000/100 ml.
Fecal coliform : 900/100 ml.
Total phosphorus: 0.17 mg/l.
Suspected source(s): septic system leachate

East Inlet Brook to Cushing Pond (AB-01)
1/11/76 - BOD_5 : 3.15 mg/l.
Total Phosphorus: 0.06 mg/l.
Suspected source(s): septic system leachate

Cushing Pond (EEA-AB-6)
8/25/76 - Dissolved oxygen: 4.9 mg/l.
Total coliform : 1400/100 ml.
Fecal coliform : 1/100 ml.
Total phosphorus: 0.05 mg/l.
Suspected source(s): soil

East Outlet from Cushing Pond (EEA-AB-3)
8/25/76 - Total coliform : 30,000/100 ml.
Fecal coliform : 0/100 ml.
Total phosphorus: 0.13 mg/l.
Suspected source(s): soil

West Outlet from Cushing Pond (EEA-AB-4)
8/25/76 - Total coliform: 25,000/100 ml.
Fecal coliform: 37/100 ml.
Suspected source(s): soil

Western Tributary to Cleveland Pond at Chestnut Street (EEA-AB-5, AB-1)
8/25/76 - Dissolved oxygen: 0.5 mg/l.
Total phosphorus: 0.06 mg/l.
4/29/76 - Dissolved oxygen: 10.1 mg/l.
Total phosphorus: 0.11 mg/l.
Suspected source(s): unknown

Tributary to Beaver Brook at Chestnut Street (EEA-AB-2)
8/25/76 - Dissolved oxygen: 3.9 mg/l.
Total coliform : 550,000/100 ml.
Fecal coliform : 650/100 ml.
Suspected source(s): septic system leachate

Inlet to Cleveland Pond (DWPC)
8/4/75 - Total phosphorus: 0.55 mg/l.
Suspected source(s): unknown

Cleveland Pond (EEA-AB-7)
8/25/76 - Total coliform : 5800/100 ml.
Fecal coliform : 0/100 ml.
Total phosphorus: 0.058 mg/l.
Secci disk : 3.5
Suspected source(s): soil

At Groveland Street (BE-01)
6/12/75 - Dissolved oxygen: 4.9 mg/l. (during rainstorm)
Total phosphorus 0.12 mg/l.
7/22/75 - Dissolved oxygen 3.8 mg/l.
Total phosphorus 0.03 mg/l.
Suspected source(s): septic system leachate

II. SHUMATUSCACANT RIVER

At Randolph Street, 10 meters upstream (AB-04)
1/9/76 - BOD_5 : 3.1 mg/l.
Total coliform: 3200/100 ml.
Fecal coliform: not tested
Suspected source(s): septic system leachate

At Central Street (SA-01, AB-05) - drains into Island Grove Pond
6/10/75 - Dissolved oxygen: 3.6 mg/l.
BOD_5 : 4.2 mg/l.
Total phosphorus: 0.04 mg/l.
Chlorides : 44 mg/l.
6/12/75 - Dissolved oxygen: N.A. (during rainstorm)
BOD_5 : 3.9 mg/l.
Fecal coliform : 1900/100 ml.
Chlorides : 31 mg/l.
1/9/76 - Nitrate-nitrogen: 1.47 mg/l.
Suspected source(s): septic system leachate, highway salting

Island Grove Pond (AB-06, AB-3, DWPC)
1/11/76 - Nitrate-nitrogen: 1.46 mg/l.
5/4/76 - BOD_5 : 3.3 mg/l.
Nitrate-nitrogen: 1.29 mg/l.
Suspected source(s): unknown

Behind Meyers Avenue Well (AB-4)
5/4/76 - Nitrate-nitrogen: 1.28 mg/l.
Suspected source(s): unknown

Stream River, 10 meters above Groveland Street (AB-03)
1/9/76 - Total coliform: 2200/100 ml.
Fecal coliform: not tested
Suspected source(s): landfill leachate

III. FRENCH STREAM/NORTH RIVER

Spruce Street in Rockland (NR-01)
6/5/75 - BOD_5 : 5.4 mg/l.
Total coliform : 98,000/100 ml.
Fecal coliform not tested
Total phosphorus 0.33 mg/l.
7/29/75 - Total coliform 3000/100 ml.
Fecal coliform 3000/100 ml.
Suspected source(s): septic system leachate

North Avenue Bridge in Rockland (NR-02)

6/3/75 -	BOD_5	: 5.1 mg/l. (during rainstorm)
	Total coliform	: 25,000/100 ml.
	Fecal coliform	: 4300/100 ml.
	Total phosphorus	: 0.22 mg/l.
	BOD_5	: 4.5 mg/l.
6/5/75 -	Total coliform	: 43,000/100 ml.
	Fecal coliform	: not tested
	Total phosphorus	: 0.28 mg/l.
7/29/75 -	Total coliform	: 2000/100 ml.
	Fecal coliform	: 1000/100 ml.
	Nitrate-nitrogen	: 1.1 mg/l.
	Total phosphorus	: 0.22 mg/l.

Suspected source(s): septic system leachate

Railroad Bridge (NR-03)

6/3/75 -	BOD_5	: 5.4 mg/l. (during rainstorm)
	Total coliform	: 12,000/100 ml.
	Fecal coliform	: not tested
	Total phosphorus	: 0.24 mg/l.
6/5/75 -	BOD_5	: 4.5 mg/l.
	Total coliform	: 24,000/100 ml.
	Fecal coliform	: 430/100 ml.
	Total phosphorus	: 0.26 mg/l.
7/29/75	Total coliform	: 20,000/100 ml.
	Fecal coliform	: 1000/100 ml.
	Nitrate-nitrogen	: 1.1 mg/l.
	Total phosphorus	: 0.18 mg/l.

Suspected source(s): septic system leachate

Below North Abington Sewage Treatment Plant, in Rockland (NR-04)

6/3/75 -	BOD_5	: 5.7 mg/l. (during rainstorm)
	Total coliform	: 70,000/100 ml.
	Fecal coliform	: 24,000/100 ml.
	Total phosphorus	: 0.6 mg/l.
	BOD_5	: 9.3 mg/l.
	Total coliform	: 250,000/100 ml.
	Fecal coliform	: not tested
	Total phosphorus	: 1.7 mg/l.
	Chlorides	: 25 mg/l.
7/29/75-	BOD_5	: 7.2 mg/l.
	Total coliform	: 1,500,000/100 ml.
	Fecal coliform	: 18,000/100 ml.
	Nitrate-nitrogen	: 1.1 mg/l.
	Total phosphorus	: 0.3 mg/l.

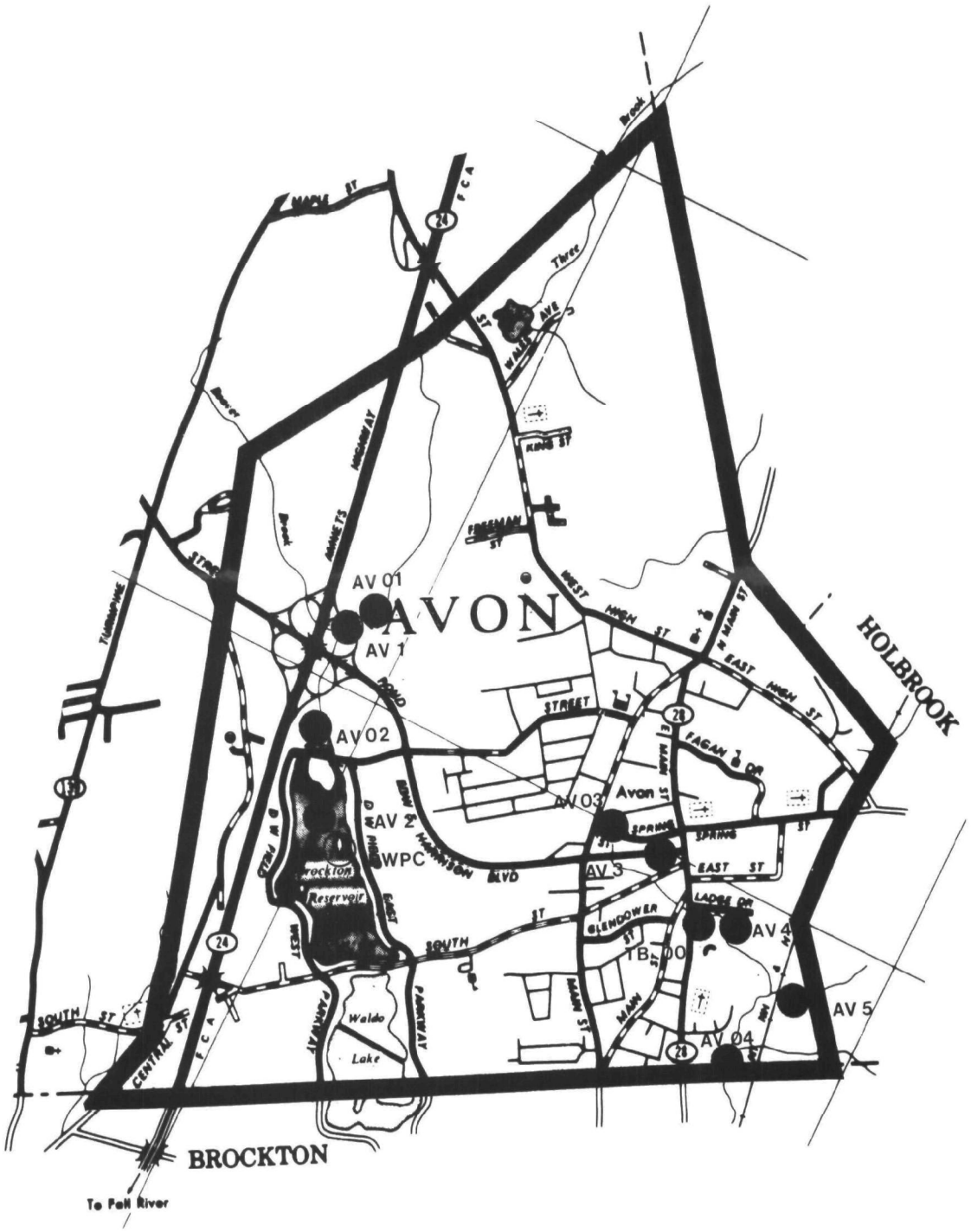
Suspected source(s): Abington Sewage Treatment Plant

IV. WELLS

Meyer's Avenue

Year	Chlorides	Sodium
1970	37	16
1972	73	28
1974	35	21
1975	42	24

Suspected source(s): highway salting, septic system leachate



SAMPLE SITES, 1977

PROBLEMS FOUND ●

NO PROBLEMS FOUND ○

0 1 2

Avon

I. BEAVER BROOK - Class A - All these sites are on a portion of Beaver Brook which drains into a public water supply.

At Route 24 Interchange (AV-1)
4/29/76 - Total coliform: 290/100 ml.
Fecal coliform: not tested
Chlorides : 45.11 mg/l.
Suspected source(s): highway run-off (salt), septic system leachate from the Industrial Park, natural

East Branch, at Route 24 (AV-01)
1/15/76 - Total coliform: 120/100 ml.
Fecal coliform: not tested
Manganese : 0.202 mg/l.
Turbidity : 1.4 NTU
Suspected source(s): highway run-off (salt), septic system leachate from the Industrial Park, natural

At Pond Street, 10 meters upstream (AV-02)
1/15/76 - Total coliform: 86/100 ml.
Fecal coliform: not tested
Chlorides : 67.89 mg/l.
Manganese : 0.158 mg/l.
Turbidity : 2.5 NTU
Suspected source(s): highway run-off (salt)

Brockton Reservoir (AV-2)
4/29/76 - Chlorides: 70.28 mg/l.
Turbidity: 1.0 NTU
Cadmium : 0.018 mg/l.
Suspected source(s): highway run-off including salt

II. TROUT BROOK

Tributary to Trout Brook at West Spring Street (AV-03)
1/15/76 - Total coliform : 50,000/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 2.82 mg/l.
Suspected source(s): septic system leachate

At School Street (AV-3)
4/29/76 - Total coliform : 6000/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 2.95 mg/l.
Chlorides : 72.37 mg/l.
Suspected source(s): septic system leachate

At Route 28 (TB-00)
7/22/75 - Total coliform : 2600/100 ml.
Fecal coliform : 1800/100 ml.
Nitrate-nitrogen: 1.7 mg/l.
Chlorides : 82 mg/l.
7/24/75 - Total coliform : 100,000/100 ml.
Fecal coliform : not tested
Total phosphorus: 0.12 mg/l.
Nitrate-nitrogen: 1.9 mg/l.
Chlorides : 102 mg/l.
Suspected source(s): highway run-off (salt), septic system leachate

At Ladge Drive (AV-4)
4/29/76 - Dissolved oxygen: 4.5 mg/l.
Total coliform : 1900/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 2.45 mg/l.
Chlorides : 71.93 mg/l.
Suspected source(s): septic system leachate, highway run-off (salt)

Tributary to Trout Brook from Holbrook (AV-5)
4/29/76 - Nitrate-nitrogen: 3.45 mg/l.
Chlorides : 109.62 mg/l.
Suspected source(s): septic system leachate from Holbrook

At Avon-Brockton line, 10 meters upstream (AV-04)
1/15/76 - BOD_5 : 3.4 mg/l.
Nitrate-nitrogen: 1.9 mg/l.
Chlorides : 51.86 mg/l.
Suspected source(s): septic system leachate

III. WELLS

Harrison Boulevard

Year	Chlorides	Sodium
1965	50	-
1968	2	-
1970	48	27
1972	58	29
1974	54	27

Suspected source(s): highway run-off (salt)

Route 28

Year	Chlorides	Sodium
1960	14	-
1965	39	-
1970	80	36
1975	58	41

Suspected source(s): highway run-off, septic system leachate

Route 28

Year	Chlorides	Sodium	Turbidity
1970	43	21	0
1972	44	25	1
1974	49	23	5

Suspected source(s): highway run-off, septic system leachate

Drive-in Theatre

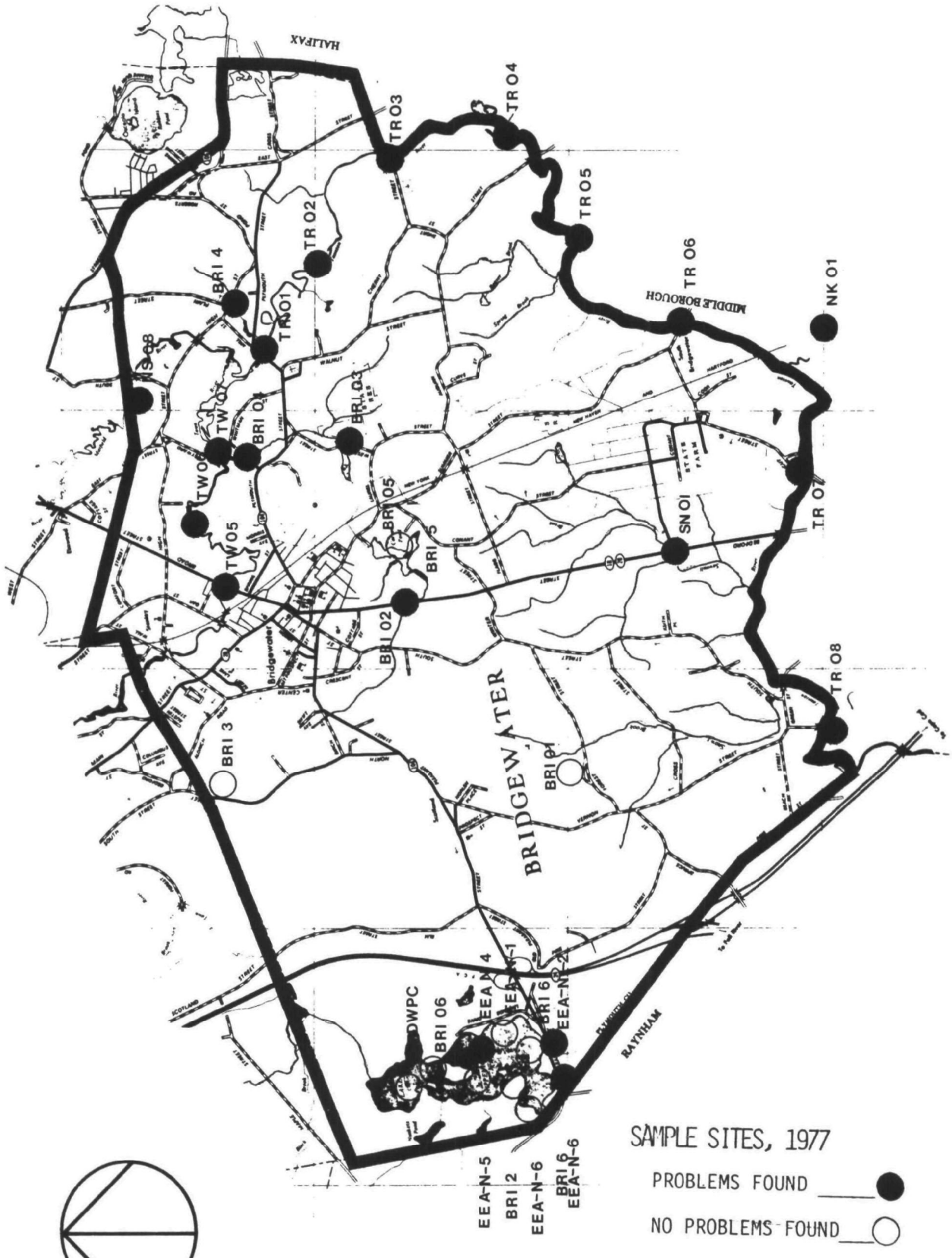
Year	Chlorides	Sodium
1965	39	-
1970	70	28
1975	56	41

Suspected source(s): highway run-off, septic system leachate

Connelly Street

Year	Chlorides	Sodium
1970	40	16
1975	42	22

Suspected source(s): highway run-off, septic system leachate



Bridgewater

BRIDGEWATER

I. SOUTH BROOK/CARVER POND

Tributary to Carver Pond at Bedford Street (Bri-02)
1/9/76 - Total coliform : 1400/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 1.345 mg/l.
Suspected source(s): septic system leachate, agricultural run-off

At Water Street, 10 meters downstream (Bri-03)
1/9/76 - Total coliform: 2100/100 ml.
Fecal coliform: not tested
Suspected source(s): septic system leachate, septage lagoon leachate

At Hayward Street, 10 meters upstream (Bri-04)
12/21/75 - Total coliform: 6000/100 ml.
Fecal coliform: not tested
Suspected source(s): septic system leachate, septage lagoon leachate, discharge or run-off from dairy processing operations.

II. TOWN RIVER

At Route 18 Bridge (TW-05)
7/22/75 - Dissolved oxygen: 3.1 mg/l.
Total coliform : 1500/100 ml.
Fecal coliform : 400/100 ml.
Chloride : 32 mg/l.
7/24/75 - Total coliform : 50,000/100 ml.
Fecal coliform : not tested
Chloride : 30 mg/l.
Suspected source(s): unknown
3/18/76 - Total coliform: 930/100 ml.
Fecal coliform: 230/100 ml.

Buoy below Bridgewater Sewage Treatment Plant (TW-06)
7/22/75 - Dissolved oxygen: 3.0 mg/l.
BOD_5 : 3.3 mg/l.
Coliform tests not done
Total phosphorus: 0.44 mg/l.
Chloride : 35 mg/l.
Suspected source(s): impact of sewage treatment plant, upstream sources may contribute to low dissolved oxygen levels

At Hayward Street (TW-07)
7/22/75 - Dissolved oxygen: 2.4 mg/l.
BOD_5 : 5.2 mg/l.
Total coliform : 6200/400 ml.
Fecal coliform : 100/100 ml.
Total phosphorus: 0.38 mg/l.
Chloride : 34.0 mg/l.
Suspected source(s): continued impact of upstream sources including the sewage treatment plant

III. Matfield River

Pond Street Bridge (MS-08)
7/22/75 - Dissolved oxygen: 0.3 mg/l.
BOD_5 : 13.0 mg/l.
Total coliform : 2500/100 ml.
Fecal coliform : 100/100 ml.
Total phosphorus: 4.0 mg/l.
Chloride : 49.0 mg/l.
BOD_5 : 4.2 mg/l.
3/18/76 - Total coliform : 4300/100 ml.
Fecal coliform : 230/100 ml.
Total phosphorus: 0.52 mg/l.
Chloride : 81 mg/l.
4/3/75 - Total coliform : 10,000/100 ml.
Fecal coliform : not tested
Suspected source(s): agricultural run-off, continued impact of Brockton Sewage Treatment Plant

High Street (MS-09)
7/22/75 - Dissolved oxygen: 0.1 mg/l.
BOD_5 : 6.9 mg/l.
Total coliform : 1100/100 ml.
Fecal coliform : 300/100 ml.
Total phophorus : 1.4 mg/l.
Chloride : 47 mg/l.
3/18/76 - Total coliform : 9300/100 ml.
Fecal coliform : 230/100 ml.
Total phosphorus: 0.5 mg/l.
Chloride : 84 mg/l.
4/2/75 - Total coliform : 13,000/100 ml.
Fecal coliform : not tested
Suspected source(s): continued impact of upstream sources (Brockton Sewage Treatment Plant, East Bridgewater landfill, agricultural run-off).

IV. TAUNTON RIVER

Plymouth Street (TR-01)
7/22/75 - Dissolved oxygen: 3.0 mg/l.
BOD_5 : 6.3 mg/l.
Total coliform : 200/100 ml.
Fecal coliform : 100/100 ml.
Total phosphorus: 1.0 mg/l.
Chloride : 39.0 mg/l.
4/3/75 - Total coliform : 10,000/100 ml.
Fecal coliform : not tested
Suspected source(s): continued impact of Brockton and Bridgewater Sewage Treatment Plants

Tributary to Taunton River at High Street (Bri-4) - drains into Blood Pond
4/22/76 - Total coliform : 18,000/100 ml.
Fecal coliform : 6700/100 ml.
Streptococcus : 260/100 ml.
Nitrate-nitrogen: 4.0 mg/l.
Total phosphorus: 0.076 mg/l.
Suspected source(s): agricultural run-off

Buoy Upstream of Child's Bridge (TR-02)
7/22/75 - Dissolved oxygen: 4.8 mg/l.
BOD_5 : 6.0 mg/l.
No coliform tests made
Total phosphorus: 0.4 mg/l.
Chloride : 41 mg/l.
7/24/75 - BOD_5 : 6.2 mg/l.
Total coliform : 29,000/100 ml.
Fecal coliform : not tested
Total phosphorus: 1.0 mg/l.
Chloride : 42 mg/l.
Suspected source(s): leachate from lagoons at Paper Mill Village, agricultural run-off, septic system leachate

Child's Bridge (TR-03)
7/22/75 - Dissolved oxygen: 2.3 mg/l.
Total coliform : 100/100 ml.
Fecal coliform : 50/100 ml.
BOD_5 : 6.3 mg/l.
Total phosphorus: 0.7 mg/l.
Chloride : 40 mg/l.
7/24/75 - Total coliform : 1600/100 ml.
Fecal coliform : not tested
Total phosphorus: 0.7 mg/l.
Chloride : 41 mg/l.
4/3/75 Total coliform : 5000/100 ml.
Fecal coliform : not tested
Suspected source(s): agricultural run-off, septic system leachate, continued impact of upstream sources

At Auburn Street (TR-04)
7/22/75 - Dissolved oxygen: 2.2 mg/l.
BOD_5 : 3.3 mg/l.
Total coliform : 400/100 ml.
Fecal coliform : 100/100 ml.
Total phosphorus: 0.4 mg/l.
Chloride : 32 mg/l.
4/3/75 - Total coliform : 3200/100 ml.
Fecal coliform : not tested
Suspected source(s): agricultural run-off, continued impact of upstream sources.

Buoy upstream of Woodward Bridge (TR-05)
7/22/75 - Dissolved oxygen: 2.7 mg/l.
Coliform testing not done
Total phosphorus: 0.4 mg/l
Chloride : 33 mg/l.
Suspected source(s): agricultural run-off

Woodward Bridge (TR-06)
7/22/75 - Dissolved oxygen: 2.8 mg/l.
Total phosphorus: 0.38 mg/l.
7/24/75 - BOD_5 : 4.8 mg/l.
Total phosphorus: 0.38 mg/l.
6/24/75 - Total coliform : 52,000 mg/l.
Fecal coliform : 600 mg/l.
Suspected source(s): agricultural run-off, continued impact of upstream sources

Nemasket River at Vaughn Street Bridge in Middleboro (NK-01)
6/26/75 - Dissolved oxygen: 4.2 mg/l.
Total coliform : 62,000/100 ml.
Fecal coliform : 30,000/100 ml.
Suspected source(s): unknown

Titicut Street (TR-07)
6/24/75 - Total coliform : 40,000/100 ml.
Fecal coliform : 2000/100 ml.
6/10/75 - Dissolved oxygen: 1.8 mg/l.
BOD_5 : 5.1 mg/l.
Total phosphorus: 0.44 mg/l.
Chloride : 26 mg/l.
Suspected source(s): agricultural run-off, continued impact of upstream sources

Saw Mill Brook at Routes 18 & 28 (SW-01)
6/24/75 - Total coliform : 35,000/100 ml.
Fecal coliform : 7000/100 ml.
Total phosphorus: 1.5 mg/l.
Chloride : 30 mg/l.
6/26/75 - Total coliform : 400,000/100 ml.
Fecal coliform : 40,000/100 ml.
7/22/75 - Dissolved oxygen: 1.4 mg/l.
BOD_5 : 7.8 mg/l.
No coliform tested
Suspected source(s): M.C.I. Sewage Treatment Plant

Pratt's Bridge (TR-08)
6/24/75 - Total coliform : 19,000/100 ml.
Fecal coliform : 3000/100 ml.
7/22/75 - Dissolved oxygen: 2.1 mg/l.
Chloride : 2.9 mg/l.
Suspected source(s): continued impact of upstream sources

V. LAKE NIPPENICKET

Southwestern (western) Tributary at Pleasant Street near Raynham Border (Bri-6 EEA-N-3)
5/6/76 - Total coliform : 765/100 ml.
Fecal coliform : 350/100 ml.
8/26/76- Total coliform : 2000/100 ml.
Fecal coliform : 1600/100 ml.
Total phosphorus: 0.156 mg/l.
Suspected source(s): agricultural run-off, septic system leachate

Southern (center) Tributary at Pleasant Street (EEA-N-2)
8/26/76 - Dissolved oxygen: 4.6 mg/l.
Total phosphorus: 0.169 mg/l.
Suspected source(s): agricultural run-off, septic system leachate

In Lake Opposite Lakeside Drive (EEA-N-4)
8/26/76 - Total coliform: 2500/100 ml.
Fecal coliform: 1350/100 ml.
Suspected source(s): septic system leachate

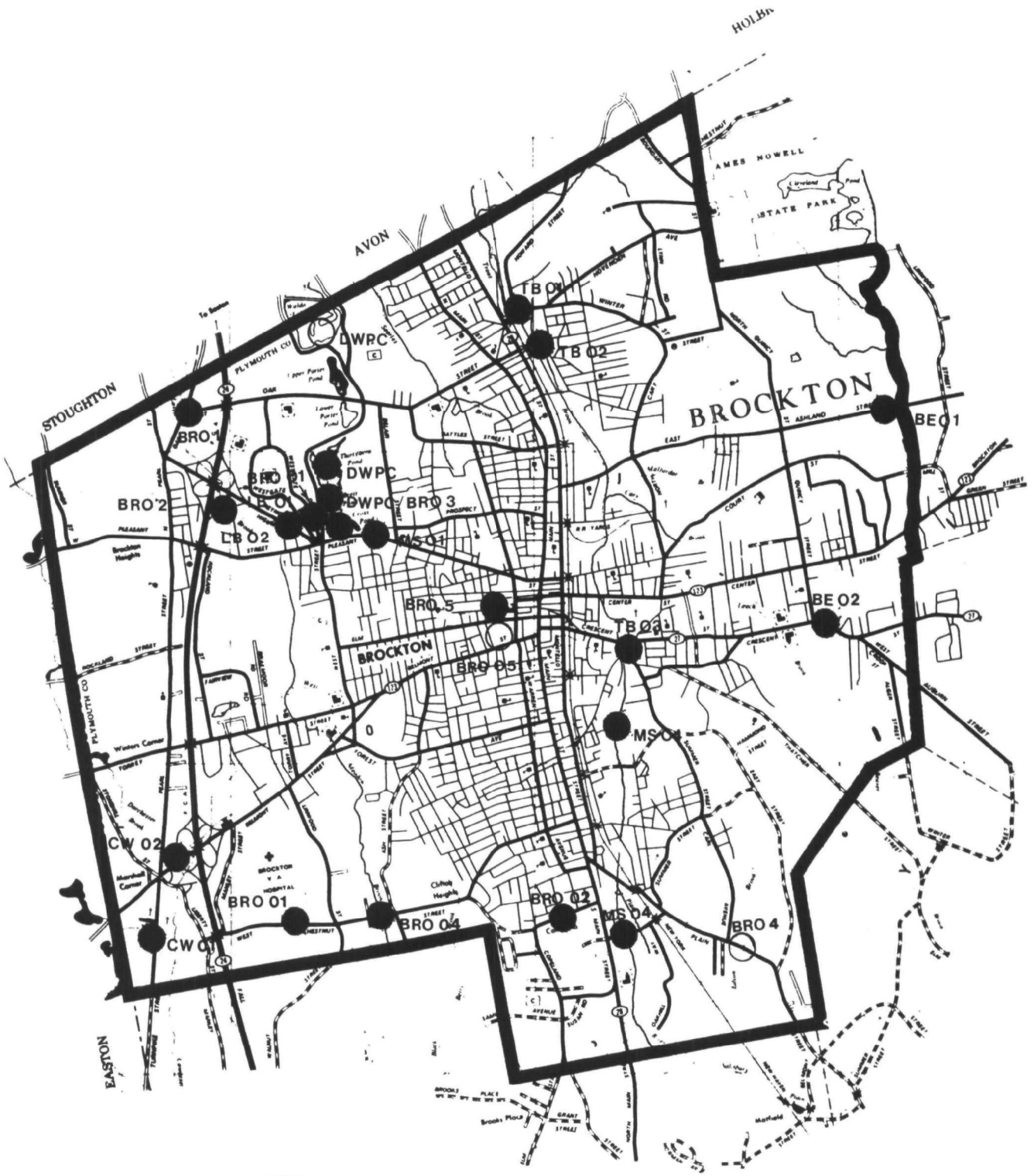
VI. WELLS

Carver Pond Well #2
4/29/76 - Sodium: 20 mg/l.
Suspected source(s): highway salting

High Street Well

Year	Nitrate-nitrogen	Turbidity
1970	5.8 mg/l.	0
1972	7.7 mg/l.	0
1974	9.1 mg/l.	0

This well was closed in 1975 when nitrate levels exceeded 10 mg/l.
Suspected source(s): unknown



DRY WEATHER SAMPLING SITES, 1977

PROBLEMS FOUND ●

NO PROBLEMS FOUND ○

Brockton

BROCKTON

I. LOVETT'S BROOK - enters Ellis Brett Pond

At Oak Street (Bro-1)
- 4/29/76 - Chloride: 103.03 mg/l.
- Cadmium : 0.02 mg/l.
- Suspected source(s): highway run-off

At Routes 27 & 24 (Bro-2)
- 4/29/76 - Chloride: 130.72 mg/l.
- Cadmium : 0.012 mg/l.
- Suspected source(s): highway run-off

At Westgate Mall (LB-01)
- 3/18/76 - Total coliform: 2400/100 ml.
- Fecal coliform: 73/100 ml.
- Chloride : 220 mg/l.
- Suspected source(s): urban run-off

Pipe from Parking Lot at Westgate Mall (LB-02)
- 3/18/76 - Total phosphorus: 0.06 mg/l.
- Chloride : 64 mg/l.
- Suspected source(s): urban run-off

At D.W. Field Parkway (Bro-3, Bro-03)
- 4/29/76 - Chloride : 124.35 mg/l.
- 1/15/76 - BOD_5 : 3.2 mg/l.
- Total coliform : 1000/100 ml.
- Fecal coliform : not tested
- Nitrate-nitrogen: 1.075 mg/l.
- Chloride : 111.59 mg/l.
- Suspected source(s): urban run-off

West Inlet (Lovett's Brook) to Ellis Brett Pond (DWPC)
- 6/11/75 - Total phosphorus: 0.05 mg/l.
- Chloride : 140 mg/l.
- Suspected source(s): urban run-off

Thirty Acre Pond (DWPC)
- 6/11/75 - Total phosphorus: 0.05 mg/l.
- Chloride : 123 mg/l.
- Suspected source(s): urban run-off

II. SALISBURY PLAIN BROOK

At Prospect Street (MS-01)
- 7/22/75 - Dissolved oxygen: 5.1 mg/l.
- Total coliform : 20,000/100 ml.
- Fecal coliform : 600/100 ml.
- Chloride : 86 mg/l.
- Total coliform : 91/100 ml.
- Fecal coliform : $<$36/100 ml.
- Chloride : 85 mg/l.
- Suspected source(s): urban run-off

At Belmont Street (MS-02)
- 3/18/75 - Chloride : 85 mg/l.
- 7/22/75 - Total coliform: 25,000/100 ml.
- Fecal coliform: 1500/100 ml.
- Chloride : 68 mg/l.
- Suspected source(s): urban run-off

At Allen Street (MS-03)
- 3/18/75 - Total coliform : 2400/100 ml.
- Fecal coliform : 430/100 ml.
- Chloride : 88 mg/l.
- 7/22/75 Total coliform : 20,000/100 ml.
- Fecal coliform : 9700/100 ml.
- Total phosphorus: 0.13 mg/l.
- Chloride : 71 mg/l.
- Suspected source(s): urban run-off

III. TROUT BROOK

At Howard Street (TB-01)
- 3/18/75 - Nitrate-nitrogen: 1.4 mg/l.
- Chloride : 110 mg/l.
- Total coliform : 2000/100 ml.
- Fecal coliform : 50/1000 ml.
- Chloride : 48 mg/l
- 6/12/75 Total coliform : not tested (during rainstorm)
- Fecal coliform : 7500/100 ml.
- Suspected source(s): urban run-off

At Ames Street (TB-02)
- 6/12/75 - BOD_5 : 5.1 mg/l. (during rainstorm)
- Total coliform : not tested
- Fecal coliform : 45,000/100 ml.
- Chloride : 35 mg/l.
- 7/22/75 - Dissolved oxygen: 3.3 mg/l.
- Total coliform : 4500/100 ml.
- Fecal coliform : 100/100 ml.
- Nitrate-nitrogen: 1.2 mg/l.
- Chloride : 38 mg/l.
- Suspected source(s): urban run-off

At Summer Street (TB-03)
- 3/18/75 - Total coliform : 1500/100 ml.
- Fecal coliform : 430/100 ml.
- Nitrate-nitrogen: 1.6 mg/l.
- Chloride : 110 mg/l.
- 7/22/75 Dissolved oxygen: 0.7 mg/l.
- Total coliform : 17,000/100 ml.
- Fecal coliform : 4500/100 ml.
- Nitrate-nitrogen: 1.3 mg/l.
- Chloride : 41 mg/l.
- Suspected source(s): urban run-off

IV. SALISBURY PLAIN RIVER

At Pine Avenue (MS-04)
3/18/75 - Total coliform : 9300/100 ml.
Fecal coliform : 230/100 ml.
Nitrate-nitrogen: 1.1 mg/l.
7/22/75 - Dissolved oxygen: 3.1 mg/l.
BOD_5 : 3.0 mg/l.
Total coliform : 8500/100 ml.
Fecal coliform : 2800/100 ml.
Chloride : 58 mg/l.
Suspected source(s): urban run-off

Tributary to French's Brook at Brookside Avenue (Bro-02)
1/15/76 - Total coliform : 2800/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 2.26 mg/l.
Chloride : 37.112 mg/l.
Suspected source(s): urban run-off

At Meadow Lane (above Brockton Sewage Treatment Plant) (MS-05)
3/18/75 - BOD_5 : 12 mg/l.
Total coliform : 24,000/100 ml.
Fecal coliform : 2400/100 ml.
Nitrate-nitrogen: 1.2 mg/l.
Chloride : 110 mg/l.
7/22/75 - Dissolved oxygen: 3.9 mg/l.
BOD_5 : 3.0 mg/l.
Total coliform : 12,000/100 ml.
Fecal coliform : 300/100 ml.
Nitrate-nitrogen: 1.0 mg/l.
Chloride : 54 mg/l.
6/12/75 - Dissolved oxygen: 3.0 mg/l. (during rainstorm)
BOD_5 : 9.0 mg/l.
Total coliform : not tested
Fecal coliform : 40,000/100 ml.
Chloride : 44 mg/l.
Suspected source(s): urban run-off

V. BEAVER BROOK

At Crescent Street (BE-02)
7/22/75 - Dissolved oxygen: 2.8 mg/l.
Total coliform : 17,000/100 ml.
Fecal coliform : 600/100 ml.
Suspected source(s): urban run-off

VI. COWEESET BROOK

At Route 24 (CW-02)
7/22/75 - Total coliform : 2100/100 ml.
Fecal coliform : 100/100 ml.
Nitrate-nitrogen: 1.5 mg/l.
Chloride : 74 mg/l.
Suspected source(s): highway run-off

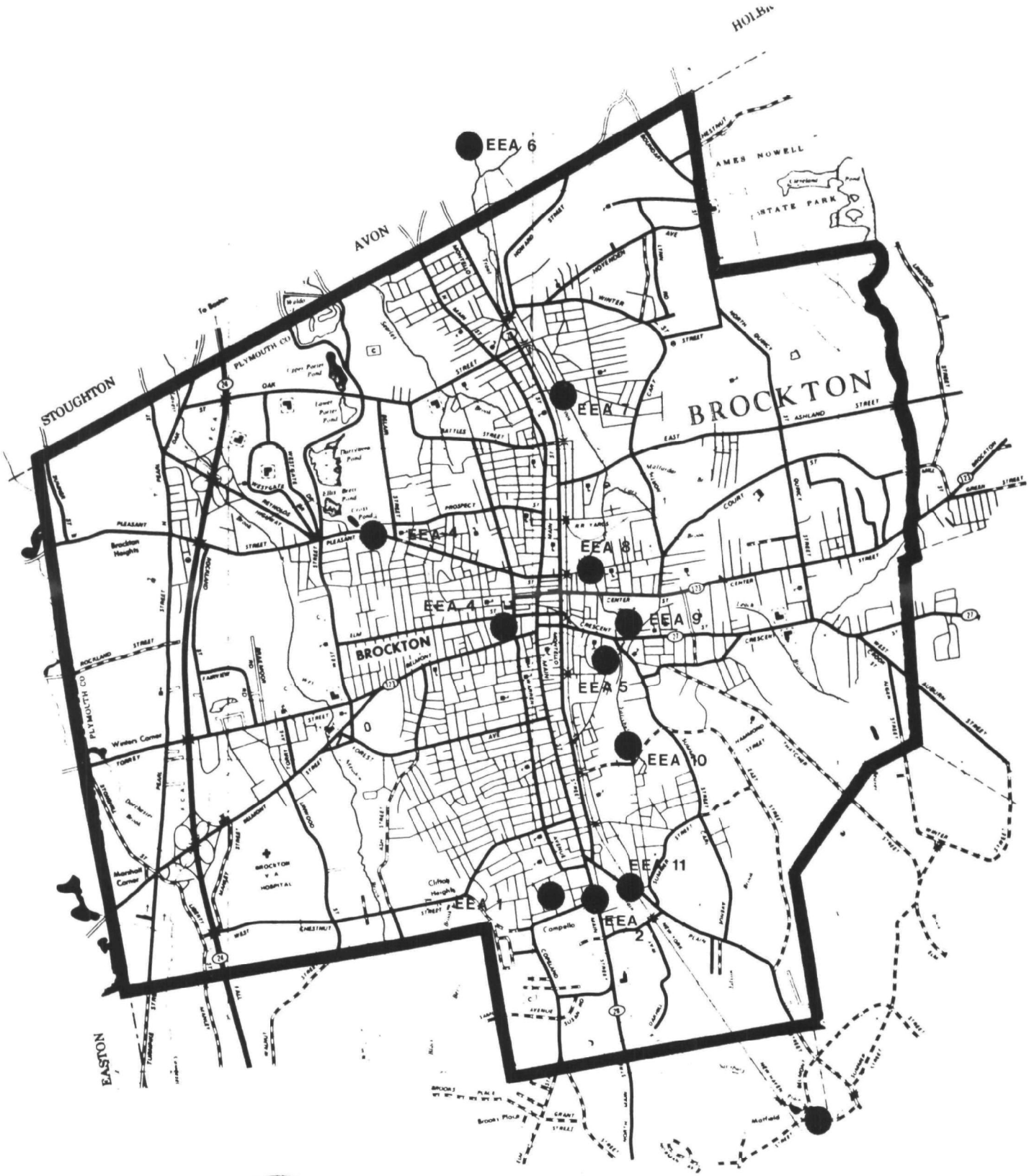
At Pearl Street (CW-01)
6/10/75 - Total coliform: 5900/100 ml.
Fecal coliform: not tested
7/22/75 - Total coliform: 400/100 ml.
Fecal coliform: 100/100 ml.
Suspected source(s): back ground

VII. WEST MEADOW BROOK

West Branch at West Chestnut Street (Bro-01)
1/15/76 - Chloride: 26.851 mg/l.
Suspected source(s): highway run-off

At Torrey Street (Bro-5)
4/29/76 - Dissolved oxygen: 4.1 mg/l.
Suspected source(s): urban run-off

Main Branch at West Chestnut Street (Bro-04)
1/15/76 - BOD_5 : 3.3 mg/l.
Nitrate-nitrogen: 1.95 mg/l.
Suspected source(s): urban run-off



WET WEATHER SAMPLING SITES, 1977

PROBLEMS FOUND ●

NO PROBLEMS FOUND ○

0 1 2

Brockton

BROCKTON
(Wet Weather, In-Stream)

I. SALISBURY PLAIN BROOK

Just South of Prospect Street (EEA-3, MS-01)
9/17/76 - BOD_5 : 1.2 mg/l.
Total phosphorus: 3.0 mg/l.
Total coliform : 40,000/100 ml.
10/20/76- BOD_5 : 6.8 mg/l.
Total phosphorus: 0.14 mg/l.
Total coliform : 400/100 ml.
10/21/76- BOD_5 : 3.5 mg/l.
Total phosphorus: 0.016 mg/l.
Total coliform : 20,000/100 ml.
Suspected source(s): unknown

Just North of Belmont Street (EEA-4, MS-02)
9/17/76 - BOD_5 : 5 mg/l.
Total phosphorus: 0.077 mg/l.
Total coliform : 100,000/100 ml.
10/20/76- BOD_5 : 27 mg/l.
Total phosphorus: 0.54 mg/l.
Total coliform : <100/100 ml.
10/21/76- BOD_5 : 0.5 mg/l.
Total phosphorus: 0.3 mg/l.
Total coliform : 8500/100 ml.
Suspected source(s): unknown

Just before Confluence with Trout Brook at Sanford Court (EEA-5)
9/17/76 - BOD_5 : 11 mg/l.
Total phosphorus: 0.1 mg/l.
Total coliform : 150,000/100 ml.
10/20/76- BOD_5 : 3.5 mg/l.
Total phosphorus: 0.112 mg/l.
Total coliform : 410,000/100 ml.
10/21/76- BOD_5 : 0.0 mg/l.
Total phosphorus: 0.023 mg/l.
Total coliform : 16,000/100 ml.
Suspected source(s): unknown

II. TROUT BROOK

At the Intersection of East Main Street in Avon (EEA-6)
9/17/76 - BOD_5 : 3.8 mg/l.
Total phosphorus: 0.099 mg/l.
Total coliform : 250,000/100 ml.
10/20/76- BOD_5 : 4.8 mg/l.
Total phosphorus: 0.048 mg/l.
Total coliform : 5600/100 ml.
10/21/76- BOD_5 : 4.5 mg/l.
Total phosphorus: 0.072 mg/l.
Total coliform : 6400/100 ml.
Suspected source(s): unknown

Downstream of Searles Brook off Spark Street (EEA-7)
9/17/76 - BOD_5 : 3.6 mg/l.
Total phosphorus: 0.54 mg/l.
Total coliform : 70,000/100 ml.
10/20/76- BOD_5 : 1.8 mg/l.
Total phosphorus: 0.018 mg/l.
Total coliform : <100/100 ml.
10/21/76- BOD_5 : 1.8 mg/l.
Total phosphorus: 0.026 mg/l.
Total coliform : 7000/100 ml.
Suspected source(s): unknown

At Court Street (EEA-8)
9/17/76 - BOD_5 : 2.6 mg/l.
Total phosphorus: 0.026 mg/l.
Total coliform : 120,000/100 ml.
10/20/76- BOD_5 : 2.7 mg/l.
Total phosphorus: 0.06 mg/l.
Total coliform : 140,000/100 ml.
10/21/76- BOD_5 : 3.8 mg/l.
Total phosphorus: 0.072 mg/l.
Total coliform : 10,500/100 ml.
Suspected source(s): unknown

Just before confluence with Salisbury Brook (EEA-9, TB-03)
9/17/76 - BOD_5 : 8.2 mg/l.
Total phosphorus: 0.17 mg/l.
Total coliform : 250,000/100 ml.
10/20/76- BOD_5 : 2.17 mg/l.
Total phosphorus: 0.6 mg/l.
Total coliform : 900/100 ml.
10/21/76- BOD_5 : 2.4 mg/l.
Total phosphorus: 0.7 mg/l.
Total coliform : 11,000/100 ml.
Suspected source(s): unknown

III. SALISBURY PLAIN RIVER

At Thornell Street (EEA-10)
9/17/76 - BOD_5 : 12.5 mg/l.
Total phosphorus: 0.194 mg/l.
Total coliform : 120,000/100 ml.
10/20/76- BOD_5 : 4.5 mg/l.
Total phosphorus: 0.088 mg/l.
Total Coliform : 2400/100 ml.
10/21/76- BOD_5 : 2.4 mg/l.
Total phosphorus: 0.11 mg/l.
Total Coliform : 9700/100 ml.
Suspected source(s): unknown

At Plain Street (EEA-11)

9/17/76 -	BOD_5	8.2 mg/l.
	Total phosphorus	0.222 mg/l.
	Total coliform	120,000/100 ml.
10/20/76-	BOD_5	11 mg/l.
	Total phosphorus	0.56 mg/l.
	Total coliform	140,000/100 ml.
10/21/76-	BOD_5	4 mg/l.
	Total phosphorus	0.084 mg/l.
	Total coliform	12,000/100 ml.

Suspected source(s): unknown

On French's Brook just south of Glen Avenue (EEA-1)

9/17/76 -	BOD_5	17.5 mg/l.
	Total phosphorus	0.245 mg/l.
	Total coliform	250,000/100 ml.
10/20/76-	BOD_5	> 40 mg/l.
	Total phosphorus	1.02 mg/l.
	Total coliform	400/100 ml.
10/21/76-	BOD_5	2 mg/l.
	Total phosphorus	0.152 mg/l.
	Total coliform	100,000/100 ml.

Suspected source(s): unknown

On French's Brook, Brookside Avenue and Main Street (EEA-2)

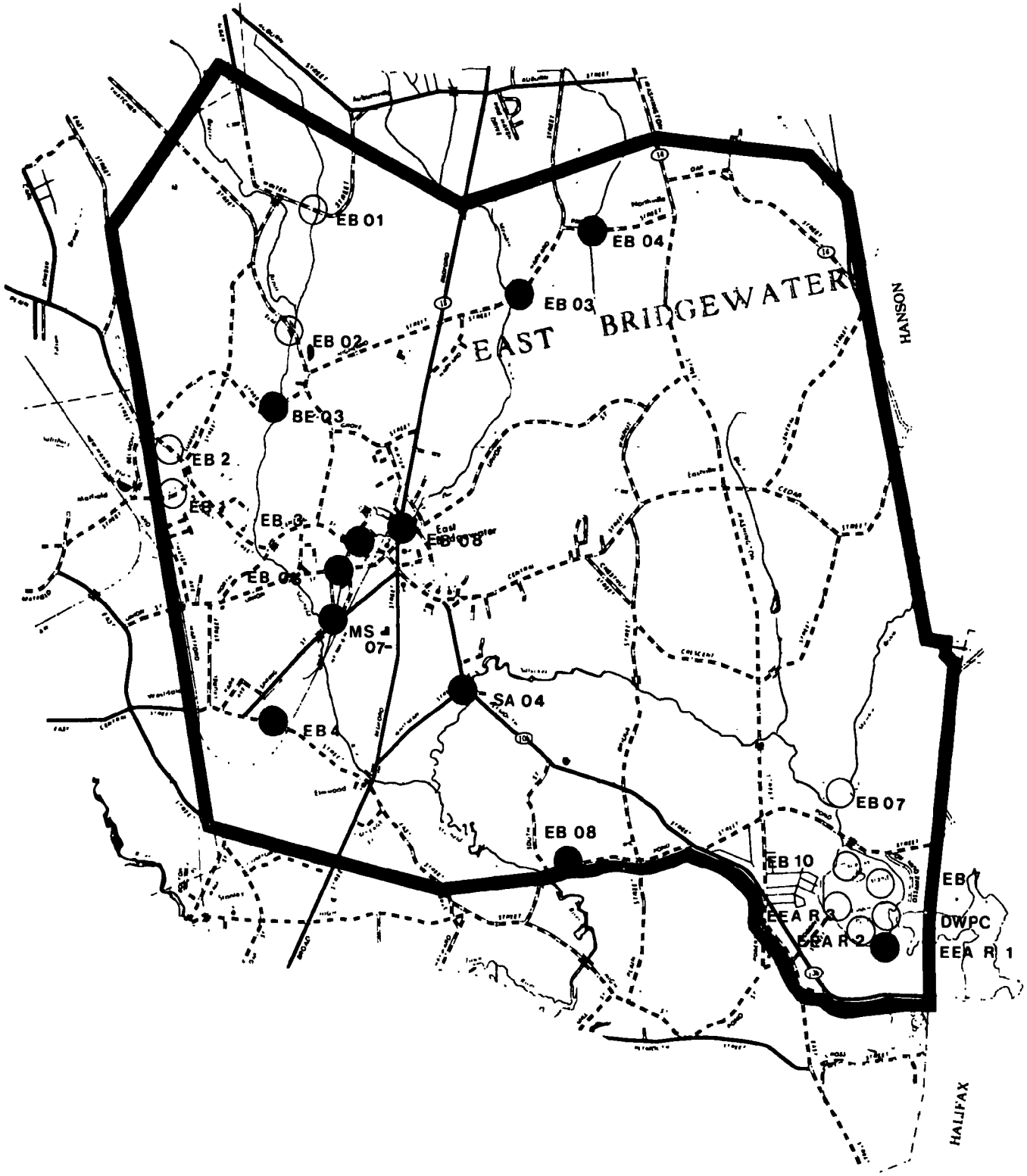
9/17/76 -	BOD_5	22.5 mg/l.
	Total phosphorus	0.188 mg/l.
	Total coliform	250,000/100 ml.
10/20/76-	BOD_5	4.3 mg/l.
	Total phosphorus	0.046 mg/l.
	Total coliform	< 100/100 ml.
10/21/76-	BOD_5	2.4 mg/l.
	Total phosphorus	0.08 mg/l.
	Total coliform	14,000/100 ml.

Suspected source(s): unknown

Just North of Matfield Street in West Bridgewater (EEA-12, MS-06)

9/17/76 -	BOD_5	11.4 mg/l.
	Total phosphorus	1.174 mg/l.
	Total coliform	6000/100 ml.
10/20/76-	BOD_5	15 mg/l.
	Total phosphorus	4.48 mg/l.
	Total coliform	600/100 ml.
10/21/76-	BOD_5	> 37 mg/l.
	Total phosphorus	2.61 mg/l.
	Total coliform	6,000,000/100 ml.

Suspected source(s): unknown



SAMPLE SITES, 1977

PROBLEMS FOUND ●

NO PROBLEMS FOUND ○

0 1 2

East Bridgewater

EAST BRIDGEWATER

I. BEAVER BROOK

At Belmont Street (BE-03)
7/22/75 - Dissolved oxygen: 4.1 mg/l.
Total coliform : 2000/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 1.5 mg/l.
Chloride : 31 mg/l.
6/12/75 - BOD_5 : 3.9 mg/l. (during rainstorm)
Total coliform : not tested
Fecal coliform : 12,000/100 ml.
Nitrate-nitrogen: 1.4 mg/l.
3/18/76 - Chloride : 43 mg/l.
Suspected source(s): septic system leachate

II. MEADOW BROOK

At Harvard Street upstream in larger left Tributary (EB-03)
12/21/75 - Total coliform : 2000/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 1.63 mg/l.
Suspected source(s): upstream sources of septic system leachate, agricultural run-off (dairy)

Tributary at Pine Street (EB-04)
12/21/75 - Dissolved oxygen: 3.4 mg/l.
Suspected source(s): natural

Forge Pond directly east of middle of bridge (EB-09)
1/11/76 - Total coliform: 1200/100 ml.
Fecal coliform: not tested
Suspected source(s): soil, septic system leachate

At North Central Street (EB-3)
4/20/76 - Nitrate-nitrogen: 1.22 mg/l.
Chloride : 48.35 mg/l.
Suspected source(s): septic system leachate, highway run-off

At Union Street, 10 meters upstream from bridge (EB-05)
12/21/75 - Total coliform : 2400/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 1.25 mg/l.
Suspected source(s): septic system leachate

III. SALISBURY PLAIN/MATFIELD RIVER

Spring Street (MS-07)
4/2/75 - Total coliform : 1600/100 ml.
Fecal coliform : not tested
7/22/75 - Dissolved oxygen : 0.8 mg/l.
BOD_5 : 6.9 mg/l.

Spring St. (cont'd)

Total coliform : 8100/100 ml.
Fecal coliform : 1200/100 ml.
Total phosphorus: 0.9 mg/l.
Chloride : 61 mg/l.
3/18/76 -Total phosphorus: 0.45 mg/l.
Chloride : 82 mg/l.
Suspected source(s): continued impact of Brockton Sewage Treatment Plant, septic system leachate, urban run-off

Tributary at West Street, Route 106 (EB-4)
4/20/76 - BOD_5: 3.1 mg/l.
Suspected source(s): unknown

Tributary at Pond Street, East of Spring Street (EB-08)
12/21/75 - Total coliform : 3900/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 1.06 mg/l.
Suspected source(s): landfill leachate

IV. BLACK BROOK/SATUCKET RIVER

Tributary at Washington Street (EB-6)
4/22/76 - Total coliform: 1200/100 ml.
Fecal coliform: 140/100 ml.
Suspected source(s): unknown

At Crescent Street (EB-06)
12/16/76 - Total coliform: 7800/100 ml.
Fecal coliform: not tested
Suspected source(s): agricultural run-off, septic system leachate

Robbins Pond (DWPC, EEA-R-2, EEE-R-3)
7/24/75 - Total phosphorus: 0.04 mg/l.
Suspected source(s): unknown

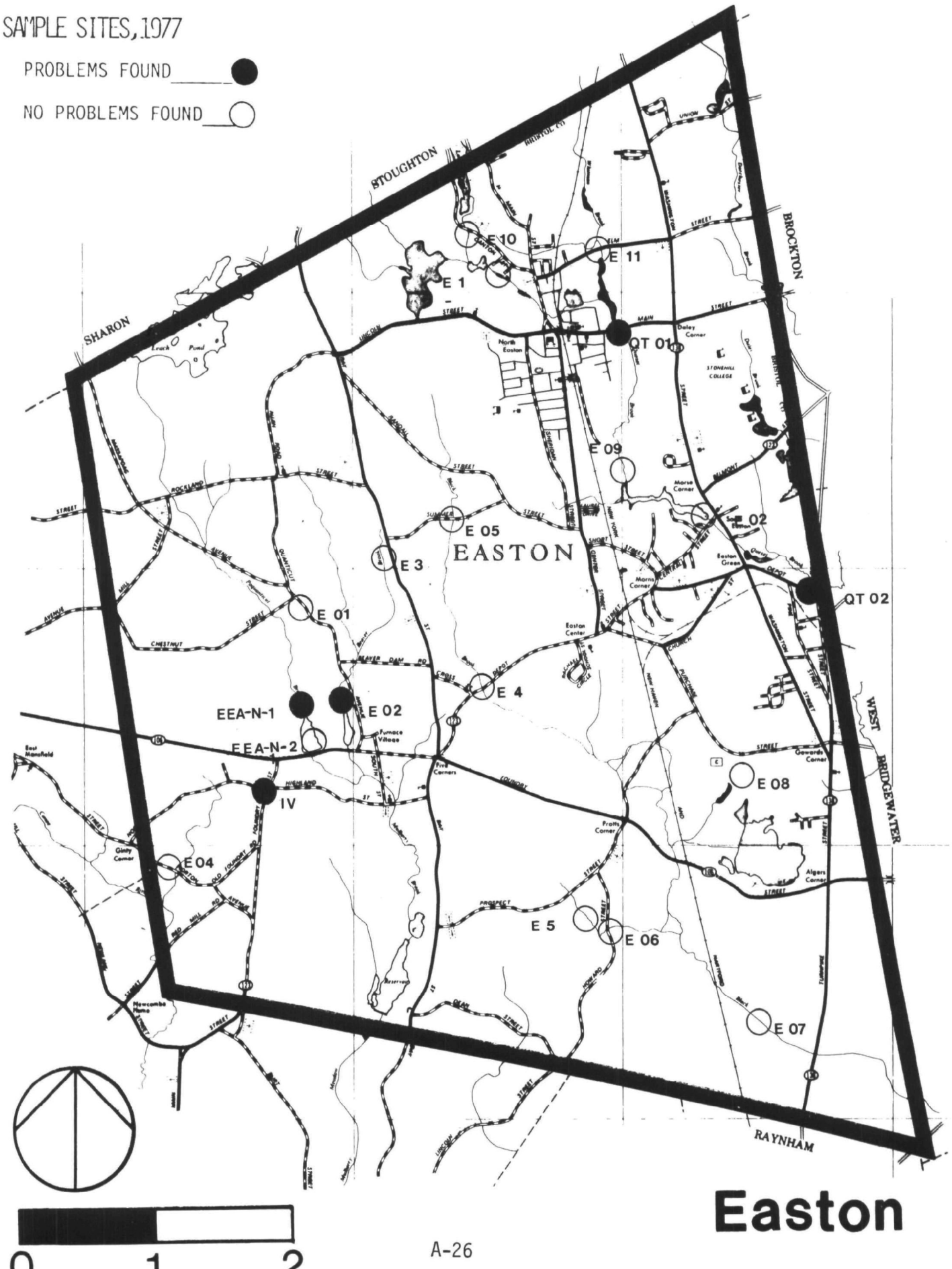
Tributary to Robbins Pond at south end (EEA-R-1)
8/26/76 - Dissolved oxygen: 4.9 mg/l.
Total phosphorus: 0.044 mg/l.
Suspected source(s): unknown

Outlet from Robbins Pond (Satucket River), (EEA-R-4)
8/26/76 - Total coliform: 2500/100 ml.
Fecal coliform: 1680/100 ml.
Suspected source(s): unknown

At Plymouth and Whitman Streets (Route 106 bridge), (SA-04)
4/2/75 - no problems found
7/22/75- Dissolved oxygen: 1.5 mg/l.
Total coliform : 7800/100 ml.
Fecal coliform : 3700/100 ml.
Chloride : 36 mg/l.
BOD_5 : 6.0 mg/l.
Suspected source(s): unknown

V. WELLS

Crescent Street Well #2
2/3/76 - Sodium: 35 mg/l.
Suspected source(s): unknown


SAMPLE SITES, 1977
PROBLEMS FOUND
NO PROBLEMS FOUND
STOUGHTON
SHARON
BROCKTON
WEST BRIDGEWATER
RAYNHAM
EASTON
E 1
E 10
E 11
QT 01
E 09
E 05
E 3
E 01
E 02
QT 02
E 4
EEA-N-1
EEA-N-2
E 02
IV
E 08
E04
E 5
E 06
E 07
0
1
2

Easton

EASTON

I. QUESET BROOK

Outlet of Langwater Pond (QT-01)
7/22/75 - Total coliform : 2000/100 ml.
Fecal coliform : 100/100 ml.
Total phosphorus: 0.6 mg/l.
Suspected source(s): soil, septic system leachate

Old Turnpike Street (QT-02)
7/22/75 - Dissolved oxygen: 4.9 mg/l.
Total coliform : 2400/100 ml.
Fecal coliform : 1100/100 ml.
Chloride : 25 mg/l.
7/24/75 Total coliform : 4500/100 ml.
Fecal coliform : not tested
Chloride : 74 mg/l.
Suspected source(s): septic system leachate

II. BLACK BROOK

No problems found

III. BEAVER BROOK/POQUANTICUT BROOK/MULBERRY BROOK

Beaver Brook at Excalibur Lane (E-02)
12/18/75 - Total coliform: 1000/100 ml.
Fecal coliform: not tested
Suspected source(s): soil, septic system leachate

Inlet to New Pond (EEA-N-1)
8/26/76 - Total coliform: 3000/100 ml.
Fecal coliform: 320/100 ml.
Suspected source(s): agricultural run-off (dairy)

IV. CANOE RIVER

Unnamed Brook at Highland Street
5/6/76 - unknown chemical (pesticide, herbicide or insecticide possible)
Suspected source(s): unknown

V. WELLS

Washington Street (1958)

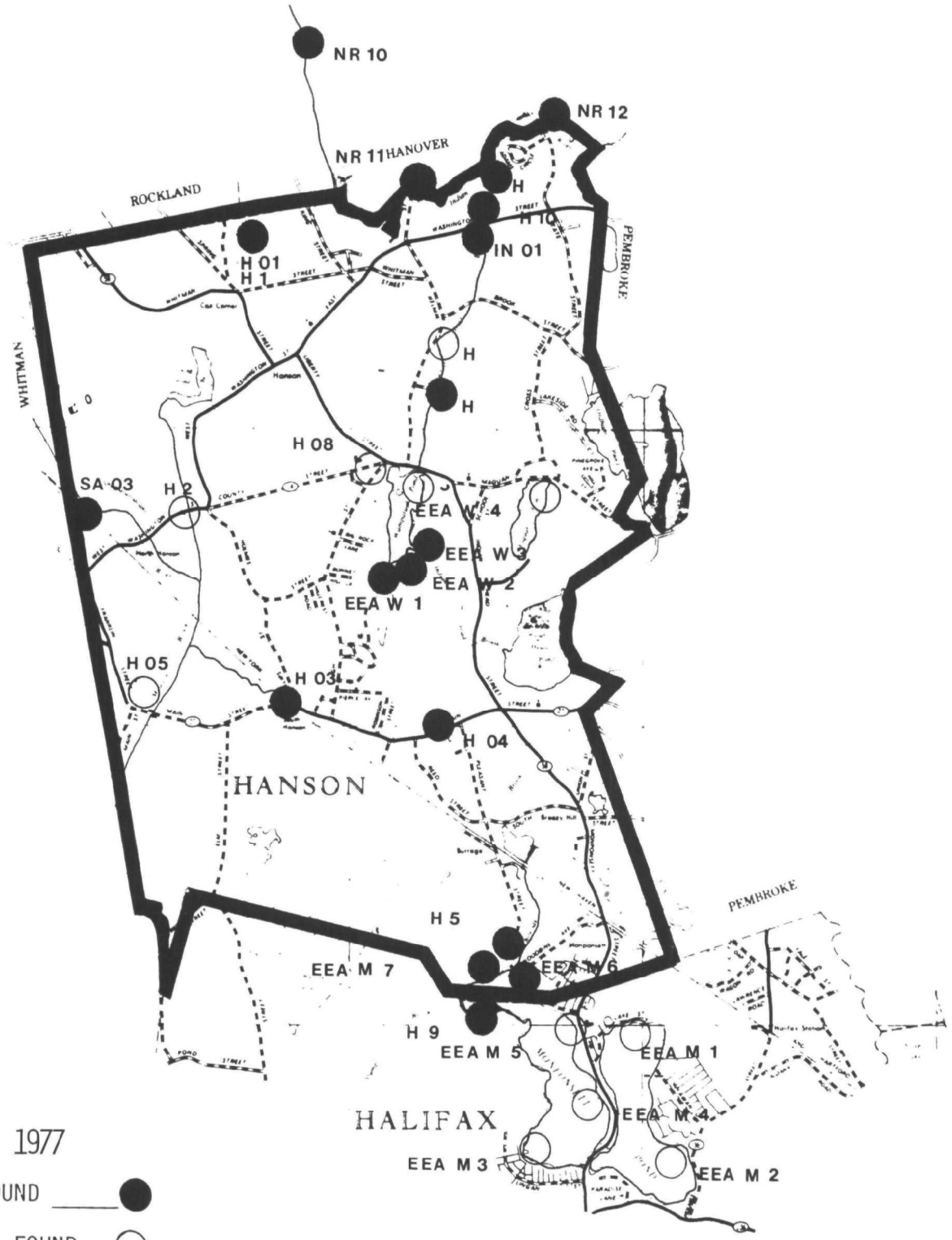
Year	Chloride	Sodium
1972	48	41
1974	21	14
1975	32	25

Suspected source(s): salt pile, highway runoff

Washington Street (1973)

Year	Chloride	Sodium
1974	13	15
1975	40	38

Suspected source(s): salt pile, highway run-off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NR 12
NR 11
HANOVER
ROCKLAND
PEMBROKE
WHITMAN
H 01
H 1
IN 01
H 10
H
H
H 08
SA 03
H 2
EEA W 4
EEA W 3
EEA W 2
EEA W 1
H 05
H 03
H 04
HANSON
H 5
EEA M 7
EEA M 6
H 9
EEA M 5
EEA M 1
EEA M 4
HALIFAX
EEA M 3
EEA M 2
SAMPLE SITES, 1977
PROBLEMS FOUND
NO PROBLEMS FOUND
0
1
2

Hanson

HANSON

I. INDIAN HEAD BROOK

Indian Head Brook at Inlet to Wampatuck Pond (EEA-W-1)
8/27/76 - Dissolved oxygen: 0.4 mg/l.
Suspected source(s): swamp, County Hospital lagoons

Central Inlet to Wampatuck Pond (EEA-W-2)
8/27/76 - Dissolved oxygen: 1.2 mg/l.
Suspected source(s): swamp, County Hospital lagoons

West Inlet to Pond from County Hospital Sewage Beds (EEA-W-3)
8/27/76 - Dissolved oxygen: 1.4 mg/l.
Suspected source(s): County Hospital lagoons

Wampatuck Pond (in pond opposite camp on northeast shore) (EEA-W-4)
8/27/76 - Secchi disk: 1.1 feet
Suspected source(s): unknown

At Pratt Place (H-3)
4/22/76 - Chloride: 59.51 mg/l.
Suspected source(s): DPW salt pile off Maquan Place, highway run-off

At Washington Street (IN-01)
6/3/75 - Total coliform : 8000/100 ml. (during rainstorm)
Fecal coliform : not tested
Chloride : 47 mg/l.
1/20/76- Nitrate-nitrogen: 1.16 mg/l.
Suspected source(s): septic system leachate, gravel pits

Off Sleigh Road (H-02)
1/20/76 - Nitrate-nitrogen: 1.1 mg/l.
Suspected source(s): septic system leachate

II. INDIAN HEAD RIVER

Tributary to Factory Pond (H-01, H-1)
1/20/76 - BOD_5 : 4.7 mg/l.
4/25/76 - Cadmium: 0.022 mg/l.
Suspected source(s): disposal of material at Rockland landfill

Factory Pond Outlet (NR-11)
6/3/75 - Dissolved oxygen: 1.1 mg/l.
Total phosphorus: 0.5 mg/l.
Chloride : 43 mg/l.
7/29/75- Total coliform : 800/100 ml.
Fecal coliform : 360/100 ml.
Total phosphorus: 0.3 mg/l.
Chloride : 47 mg/l.
Suspected source(s): continued impact of Rockland Sewage Treatment Plant

At State Street (NR-12)
6/3/75 - Dissolved oxygen: 3.6 mg/l.
Total coliform : 230/100 ml.
Fecal coliform : 230/100 ml.
Total phosphorus: 0.35 mg/l.
Chloride : 44 mg/l.
Suspected source(s): unknown

III. WHITE OAK BROOK/MONPONSETT POND

Tributary to Great Cedar Swamp below County Hospital at Main Street (H-04)
12/7/75 - Pesticides: unidentified peak
Suspected source(s): unknown

White Oak Brook at Pleasant Street (H-5)
5/4/76 - Malathion: 2 mg/l.
Suspected source(s): unknown (Malathion is not used in the cranberry bogs or for mosquito control in May).

White Oak Tributary (EEA-M-7)
8/31/76 - Dissolved oxygen: 4.8 mg/l.
Total phosphorus: 0.04 mg/l.
Suspected source(s): septic system leachate

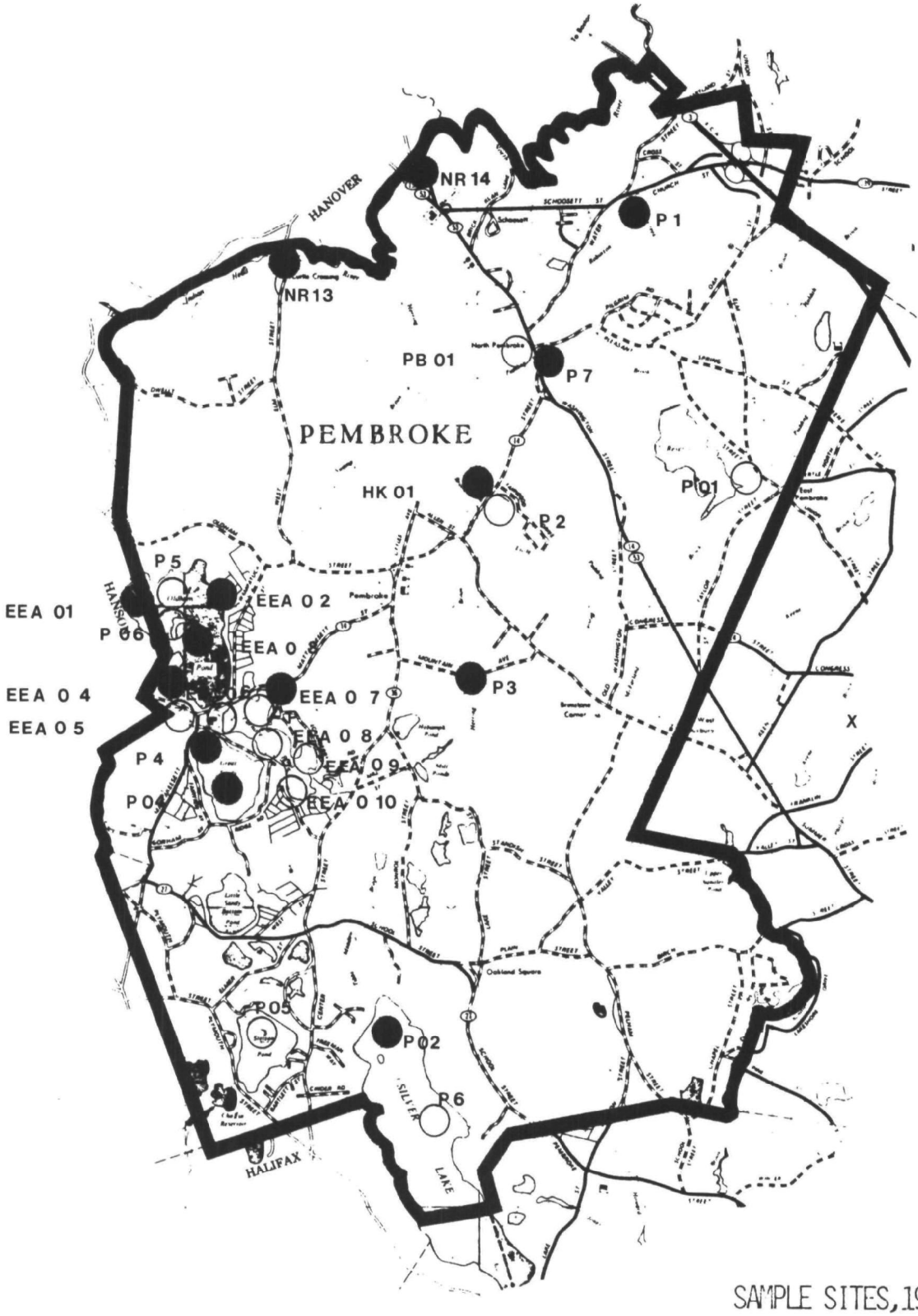
Unnamed Tributary to Pond (EEA-M-6)
8/31/76 - Total phosphorus: 0.092 mg/l.
Suspected source(s): septic system leachate

Monponsett Pond (H-09)
12/7/75 - 0.05 ppm of p.p' - DDE
Suspected source(s): unknown (p.p'- DDE is a residual breakdown product of DDT)

IV. SHUMATUSCACANT RIVER/POOR MEADOW BROOK

At Route 27 Bridge (SA-03)
6/12/75 - Total coliform : not tested (during rainstorm)
Fecal coliform : 10,000/100 ml.
Total phosphorus: 0.16 mg/l.
Chloride : 43 mg/l.
Dissolved oxygen: 3.3 mg/l.
7/22/75 - Total coliform : 400/100 ml.
Fecal coliform : 100/100 ml.
Chloride : 49 mg/l.
Suspected source(s): septic system leachate from Whitman.

Tributary to Poor Meadow Brook, west of Cranberry Co. (H-03)
12/16/75- Dissolved oxygen: 4.8 mg/l.
BOD_5 : 6.75 mg/l.
Total coliform : 1000/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 1.16 mg/l.
Suspected source(s): unknown



SAMPLE SITES, 1977

PROBLEMS FOUND ●

NO PROBLEMS FOUND ○

0 1 2

Pembroke

PEMBROKE

I. HERRING BROOK

Tributary to Oldham Pond, NW shore (EEA-0-1)
8/27/76 - Total coliform: 1600/100 ml.
Fecal coliform: 12/100 ml.
Suspected source(s): soil

In Oldham Pond opposite NE shore (EEA-0-2)
8/27/76 - Total coliform: 2300/100 ml.
Fecal coliform: 2/100 ml.
Suspected source(s): soil

In Oldham Pond opposite E shore (EEA-0-3)
8/27/76 - Total coliform: 1000/100 ml.
Fecal coliform: 2/100 ml.
Suspected source(s): soil

In Oldham Pond opposite SW shore (EEA-0-4)
8/27/76 - Total coliform: 1800/100 ml.
Fecal coliform: 1/100 ml.
Suspected source(s): soil

Tributary to Furnace Pond, NE corner (EEA-0-7)
8/27/76 - Dissolved oxygen: 1.9 mg/l.
Suspected source(s): swamp

Tributary to Furnace Pond at Mattakeeset Street (P-4)
5/4/76 - Chloride : 40.94 mg/l.
Malathion: 5 mg/l.
Suspected source(s): *unknown, salt storage pile, road salting

Herring Brook at Mountain Ave. (P-3)
5/4/76 - Malathion: 2 mg/l.
Suspected source(s): *unknown

Herring Brook at Route 14 Bridge (HK-01)
6/3/75 - Total coliform: 2130/100 ml.
Fecal coliform: 230/100 ml.
7/29/75- Total coliform: 800/100 ml.
Fecal coliform: 360/100 ml.
Suspected source(s): septic system leachate

Pudding Brook at Washington Street (P-7, PB-01)
6/3/75 - BOD_5 : 3.0 mg/l.
Total phosphorus: 0.1 mg/l.
Chloride : 26 mg/l.
7/29/75- Dissolved oxygen: 4.9 mg/l.
5/4/76 - Total coliform : 1500/100 ml.
Fecal coliform : 16/100 ml.
Malathion : 1 mg/l.
Suspected source(s): *unknown, soil

*At these sites, a chemical compound was found in the samples. The compound was compared with 11 known chemicals, and of these 11, the compound most closely resembled malathion, in concentrations of 1 to 5 mg/l. The 208 staff is not aware of any use of this chemical at this time of year nor in those concentrations; specifically malathion was not used at that time for pest control on cranberry bogs or for mosquito control.

II. ROBINSON CREEK

East of Schooset and Water Street (P-1)
5/6/76 - Total coliform: 2100/100 ml.
Fecal coliform: 93/100 ml.
Suspected source(s): soil, septic system leachate

III. NORTH RIVER

Curtis Crossing (Elm Street) (NR-13)
6/3/75 - Dissolved oxygen: 4.5 mg/l.
Total phosphorus: 0.3 mg/l.
Chloride : 44 mg/l.
Suspected source(s): continued impact of upstream sources (Rockland Sewage Treatment Plant)

Washington Street (NR-14)
7/29/75 - Dissolved oxygen: 3.5 mg/l.
Total phosphorus: 0.17 mg/l.
Chloride : 200 mg/l.
Suspected source(s): run-off from Hanover Mall

IV. WATER SUPPLY LAKES

Silver Lake - (P-02) - Brockton/Whitman/Hanson water supply
12/4/75 - Chloride : 25.932 mg/l.
Turbidity: 2.2 NTU

	Raw (untreated water)	Finished (treated water)
1/21/76 - Sodium:	10 mg/l.	20 mg/l.
5/7/76 - Sodium:	10 mg/l.	14 mg/l.
8/24/76 - Sodium:	13 mg/l.	20 mg/l.

Suspected source(s): unknown

Great Sandy Bottom Pond (P-04) - Abington-Rockland supply
12/7/75 - BOD_5 : 3.3 mg/l.
Chloride : 32.467 mg/l.
Turbidity: 1 NTU
1974 - Sodium : 23 mg/l.
1975 - Sodium : 20 mg/l.
4/20/76 - Sodium : 26 mg/l.
Suspected source(s): salt storage pile, highway salting

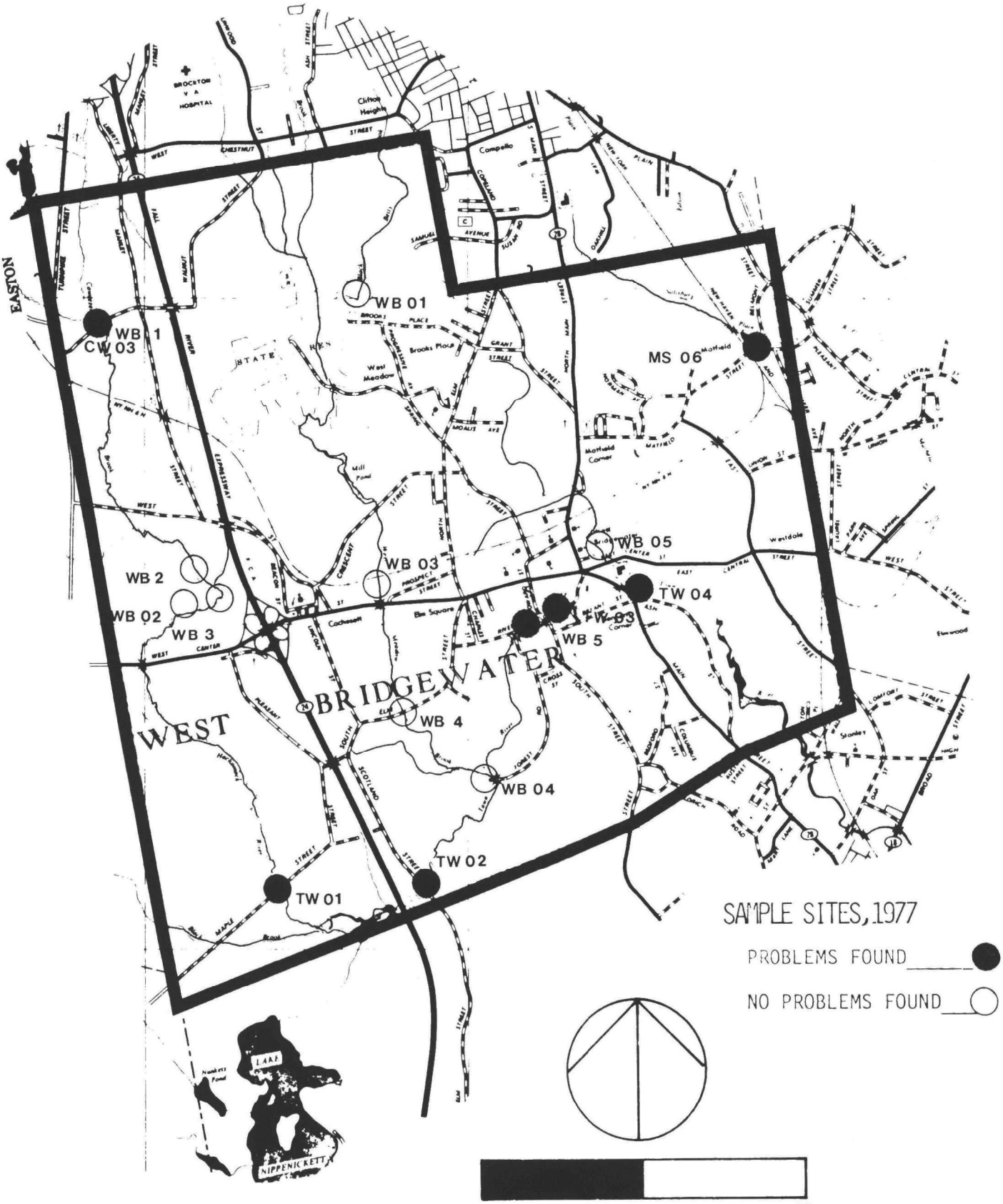
V. WATER SUPPLY WELLS

Well at Great Sandy Bottom Pond - Abington-Rockland Supply
1970 (avg.) - Sodium: 28 mg/l.
1972 " - " : 68 mg/l.
1974 " - " : 60 mg/l.
1975 " - " : 85 mg/l.
4/20/76 - " : 50 mg/l.
Suspected source(s): salt storage, highway salting

Well off Hobomock Street (Pembroke supply)
1970 - Sodium: 6.5 mg/l.
1972 - " : 12 mg/l.
1974 - " : 19 mg/l.
1975 - " : 13 mg/l.
6/9/76- " : 20 mg/l.
Suspected source(s): highway salting

Well off Center Street (Pembroke supply)
1972 - Sodium: 14 mg/l.
1974 - " : 32 mg/l.
1975 - " : 19 mg/l.
6/9/76 - " : 20 mg/l.
Suspected source(s): highway salting

Well off School Street (Pembroke supply)
1974 - Sodium: 20 mg/l.
1975 - " : 23 mg/l.
3/1/76 - " : 26 mg/l.
6/9/76 - " : 35 mg/l.
Suspected source(s): highway salting



West Bridgewater

WEST BRIDGEWATER

I. COWEESET BROOK/HOCKOMOCK RIVER/TOWN RIVER

Coweeset Brook at Walnut Street (CW-03, WB-1)
7/22/75 - Dissolved oxygen: 4.6 mg/l.
Total coliform : 1200/100 ml.
Fecal coliform : 400/100 ml.
Nitrate-nitrogen: 1.0 mg/l.
Chloride : 39 mg/l.
4/20/76 - Total coliform : 1500/100 ml.
Fecal coliform : not tested
Suspected source(s): agricultural run-off, continued impact of upstream sources (septic system leachate)

Hockomock River at Maple Street (TW-01)
7/22/75 - Dissolved oxygen: 0.4 mg/l.
Total coliform : 400/100 ml.
Fecal coliform : 300/100 ml.
Total phosphorus: 0.56 mg/l.
Chloride : 32 mg/l.
Suspected source(s): agricultural run-off, highway run-off

Town River at Scotland Street (TW-02)
7/22/75 - Dissolved oxygen: 3.1 mg/l.
Total coliform : 700/100 ml.
Fecal coliform : 400/100 ml.
Total phosphorus: 0.76 mg/l.
Chloride : 30 mg/l.
Suspected source(s): agricultural run-off, highway run-off

Town River at River and Forest Streets (WB-5)
4/22/76 - Total coliform: 1400/100 ml.
Fecal coliform: 150/100 ml.
Suspected source(s): septic system leachate, agricultural run-off

Town River at South Street (TW-03)
7/22/75 - Dissolved oxygen: 1.9 mg/l.
Total phosphorus: 0.12 mg/l.
Chloride : 30 mg/l.
7/24/75 - Total coliform : 2300/100 ml.
Fecal coliform : not tested
Suspected source(s): agricultural run-off, septic system leachate

Town River at Main Street (TW-04)
7/22/75 - Dissolved oxygen: 4.3 mg/l.
Total coliform : 900/100 ml.
Fecal coliform : 400/100 ml.
Chloride : 30 mg/l.
Suspected source(s): agricultural run-off, septic system leachate

II. WEST MEADOW BROOK

No problems found.

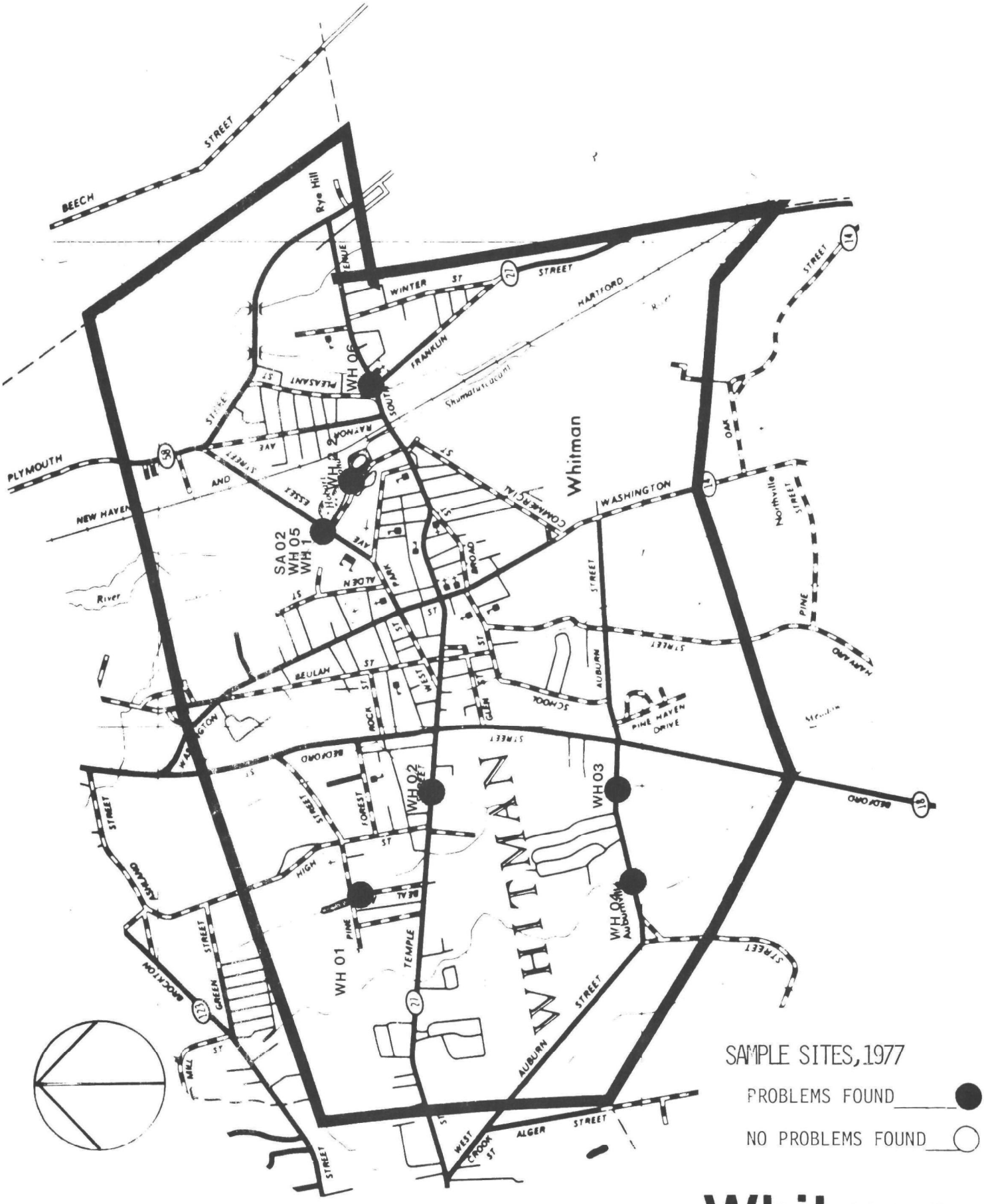
III. SALISBURY PLAIN RIVER

At Matfield Street (MS-06)
7/22/75 - Dissolved oxygen: 0.4 mg/l.
BOD_5 : 18.0 mg/l.
Total coliform : 7000/100 ml.
Fecal coliform : 1000/100 ml.
Total phosphorus: 3.6 mg/l.
Chloride : 64 mg/l.
Suspected source(s): Brockton Sewage Treatment Plant

IV. WELLS

Norman Avenue
1976 - Sodium: 22 mg/l.
Suspected source(s): highway salting

Manley Street
1974 - Sodium: 23.25 mg/l.
1975 - " : 35 mg/l.
1976 - " : 23 mg/l.
Suspected source(s): highway salting


SAMPLE SITES, 1977
PROBLEMS FOUND
NO PROBLEMS FOUND
WH 01
WH 02
WH 03
WH 04
WH 05
WH 06
SA 02
WH 1
WHITMAN
Whitman
0
1
2

Whitman

I. MEADOW BROOK

West Branch at Pine Street (WH-01)
1/9/76 - Total coliform: 4800/100 ml.
Fecal coliform: not tested
Suspected source(s): septic system leachate

East Branch at Temple Street (WH-02)
1/9/76 - Total coliform : 3300/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 2 mg/l.
Suspected source(s): septic system leachate

At Auburn Street (WH-03)
1/9/76 - Total coliform : 12,000/100 ml.
Fecal coliform : not tested
Nitrate-nitrogen: 1.8 mg/l.
Suspected source(s): septic system leachate

Tributary to Meadow Brook at Auburn Street (WH-04)
1/9/76 - Total coliform: 4200/100 ml.
Fecal coliform: not tested
Suspected source(s): septic system leachate

II. SHUMATUSCACANT RIVER

At Essex Street (WH-05, WH-1, SA-02)

6/12/75 - Dissolved oxygen: 2.0 mg/l. (during rainstorm)
Total coliform : not tested
Fecal coliform : 350/100 ml.
Chloride : 49 mg/l.
7/22/75 - Dissolved oxygen: 0.3 mg/l.
BOD_5 : 11.0 mg/l.
Total coliform : 20,000/100 ml.
Fecal coliform : 1500/100 ml.
Total phosphorus: 0.4 mg/l.
Chloride : 62 mg/l.
1/9/76 - Nitrate-nitrogen: 1.21 mg/l.
Chloride : 39.75 mg/l.
3/18/76 - BOD_5 : 3.9 mg/l.
Chloride : 68 mg/l.
5/4/76 - Chloride : 47.86 mg/l.
Suspected source(s): a septage lagoon had been immediately upstream of this site at the Whitman landfill which may have caused the 1975 readings. Current problems are suspected to be from highway and/or urban run-off.

Hobart Pond (WH-2)
5/6/76 - Chloride: 50.94 mg/l.
Suspected source(s): highway run-off, landfill leachate

Tributary to Shumatuscacant River at South and Franklin Streets (WH-06)
1/9/76 - Total coliform: 1400/100 ml.
Fecal coliform: not tested
Suspected source(s): septic system leachate